The Impact of Political Instability on Foreign Direct Investment: An Econometric Study of Direct Investment from the United Kingdom and the United States into Canada, Across Industries and Over Time.

By
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A Dissertation
Entitled

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We hereby certify that this Dissertation submitted by Karl-Heinz Arvind Ermisch conforms to acceptable standards, and as such is fully adequate in scope and quality. It is therefore approved as the fulfillment of the Dissertation requirements for the degree of Doctor of Business Administration.

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2000

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ABSTRACT

The Impact of Political Instability on Foreign Direct Investment: An Econometric Study of Direct Investment Flows from the United Kingdom and the United States into Canada, Across Industries and Over Time

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This paper has examined the relationship between political instability and FDI, among three industrialized countries, for fifteen industries and over time. The five models studied were: (1) single-equation static models, (2) partial adjustment models, (3) Almon distributed-lag models, (4) simultaneous-equation models, and (5) cointegration models.

All of the five models examined have shown a different degree of support for the statistical significance of political instability and its impact on FDI.

The static and partial adjustment models include a significant political instability variable in many of the industry regressions, for both countries. However, the sign of the coefficient does not accord, in some cases, with the hypothesized negative sign.

In the Almon distributed-lag models, the emphasis was placed on determining the possible distribution, if any, of political instability lags with respect to time, in order to determine the form through which FDI is impacted by past political instability. The results obtained indicate a major presence of a pattern whereby the political instability coefficients generally increase and then decrease with the lag length.

The objective of the use of simultaneous-equation models was to investigate a hitherto neglected phenomenon, namely the likely simultaneous effect between political instability and FDI. Though the findings show hardly any support for this effect, Granger-causality tests previously explored suggest an important and frequent relationship that -in most industries, for both countries and for both versions- flows from FDI to political instability, accompanied by a lesser number of cases exhibiting bilateral causality between the two variables.

The cointegration models were aimed at finding whether there is a significant long-run relationship between political instability and FDI. The results showed, with the exception of three industries, no such long-run relationship.

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Overall, the implications for managers, drawn from the findings above, were somewhat specific to the models examined. However, the one major and common implication is the unique behavior of FDI with respect to the political and non-political variables examined; in that sense, each industry behaves differently from the others.

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CHAPTER 1

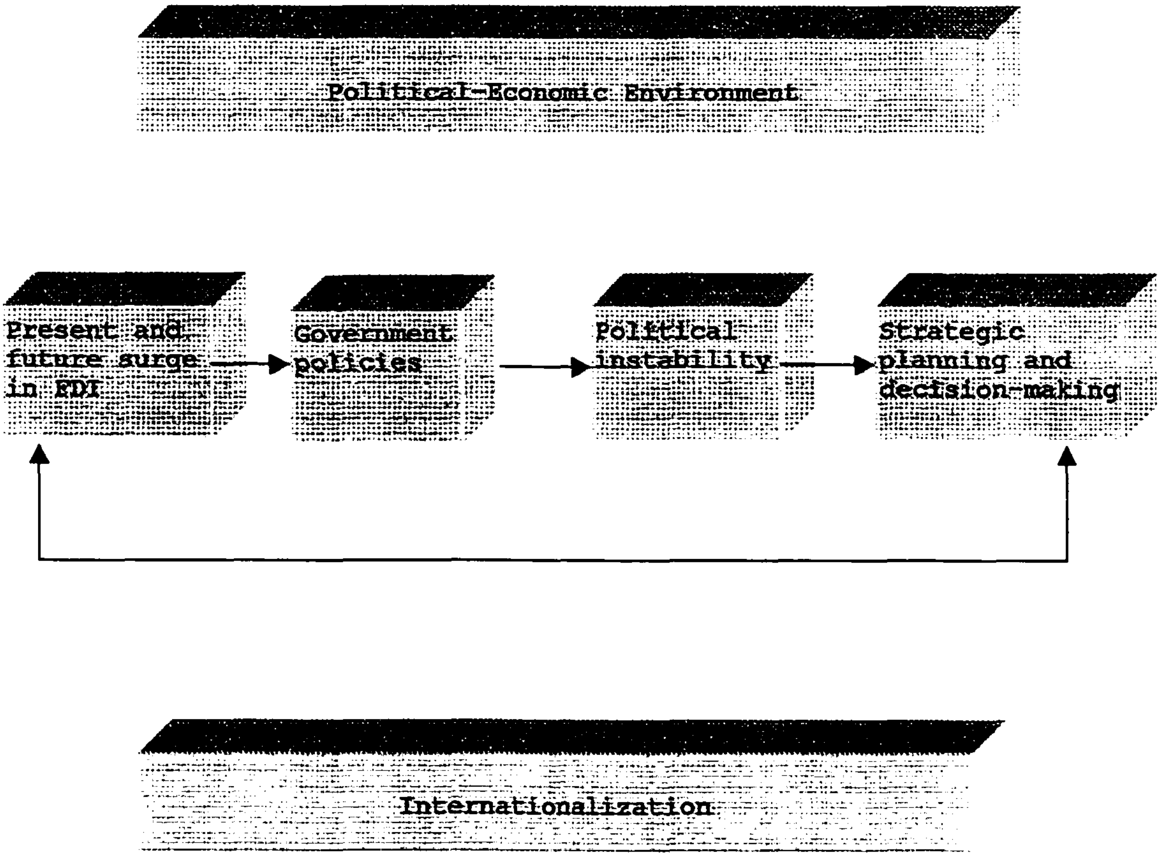
INTRODUCTION

Background of the Problem

Since the mid-1980s, there has been a massive surge in foreign direct investment (FDI) which has led to a deep integration of the world economy. The future trend is also towards increasing flows of FDI. This pattern has led governments to reconsider the nature of policies that could affect those FDI flows. To the extent that changes in government policies could impact FDI, they constitute a major source of political instability. Accordingly, increasing political instability has forced multinational companies (MNCs) to incorporate overseas political environments into their strategic planning and decision-making process, which in turn determines the location and level of future FDI. The relationships among all the variables above have been influenced by developments in the political-economic environment and by the internationalization of production. Figure 1 illustrates these issues, which constitute the background of the problem to be addressed in this paper. The following sections in this chapter briefly examine each of those issues.

Figure 1

Background of the Problem Illustrated



FDI: Present and Future Trends

FDI flows, both outward and inward, accounted for 4 percent of the world's gross fixed capital formation in 1994. Table 1 shows the percentages for various regions and selected countries across the world. China and Hong Kong constitute the most striking example in the trend of FDI flows becoming an important source of fixed capital formation. Overall, the increase in developing countries has notably surpassed that in developed countries.

Another major measure of the importance of FDI is given in Table 2, which displays the share of FDI stock in gross domestic product (GDP). Worldwide, this share has doubled since 1980. Furthermore, the share of FDI has increased in both the developed countries and the developing countries, with the rise in the latter being much larger than for the former set of nations. As in the case of gross fixed capital formation, it is important to note the dramatic rise of FDI in terms of GDP experienced by China and Hong Kong.

In terms of FDI-related international production, the world gross product of foreign affiliates (a value-added measure of their output produced abroad) accounted for over 6 percent of world GDP in 1991, compared with 5 percent in 1982. Table 3 shows the figures broken down by regions of the world.

Table 1

Share of Inward and Outward FDI Flows to Gross Fixed Capital Formation, by Region and Economy, 1984-1994

Region/ economy	1984-1989 (Annual average)	1990	1991	1992	1993	1994
World						
inward	3.1	4.0	3.1	3.2	3.8	3.9
outward	3.3	4.7	4.2	3.9	4.2	4.0
Developed countries						
inward	3.9	4.9	3.3	3.1	3.5	3.3
outward	4.7	6.5	5.8	5.0	5.2	4.8
United Kingdom						
inward	11.5	17.0	9.4	9.1	10.2	6.6
outward	19.8	10.1	9.5	11.6	18.1	16.5
Canada						
inward	5.4	6.5	2.4	4.2	5.0	5.9
outward	5.3	3.9	4.9	3.4	5.8	4.7
United States						
inward	5.8	6.0	3.0	2.2	4.7	4.8
outward	2.2	3.4	4.5	4.9	7.8	4.4
Developing countries						
inward	2.8	3.2	4.0	4.8	6.3	7.5
outward	1.0	1.7	0.9	2.2	3.0	3.4
Chile						
inward	15.6	8.3	7.3	7.2	7.2	19.9
outward	0.2	0.1	1.7	3.9	3.7	7.0
China						
inward	1.8	2.6	3.3	7.8	20.0	24.5
outward	0.5	0.6	0.7	2.8	3.2	1.5
Hong Kong						
inward	12.2	8.5	2.3	7.7	7.1	8.2
outward	15.6	11.7	11.6	28.7	74.5	86.3

Source: UNCTAD, World Investment Report 1996, Annex table 5.

Table 2

Share of Inward and Outward FDI Stock in Gross Domestic Product, by Region and Economy, 1980, 1985, 1990, and 1994

Region/economy	1980	1985	1990	1994
World				
Inward	4.6	6.3	8.3	9.4
Outward	4.9	5.9	8.1	9.7
Developed countries				
inward	4.8	6.0	8.4	8.6
outward	6.5	7.5	9.8	11.2
Netherlands				
inward	11.3	19.5	26.0	27.7
outward	24.9	37.3	38.5	43.7
United Kingdom				
inward	11.7	14.0	22.3	20.9
outward	14.9	21.9	23.6	27.5
Canada				
inward	20.4	18.5	19.7	19.2
outward	8.5	11.7	13.7	19.2
United States				
inward	3.1	4.6	7.2	7.5
outward	8.1	6.2	7.9	9.1
Developing countries				
inward	4.3	7.7	8.3	12.5
outward	0.2	0.8	1.7	3.5
China				
inward	..	1.2	3.8	17.9
outward	..	..	..	..
Hong Kong				
inward	6.3	10.5	18.7	20.5
outward	0.5	7.0	18.5	62.7
Singapore				
inward	52.9	73.6	86.6	72.8
outward	5.6	7.5	12.7	16.0

Source: UNCTAD, World Investment Report 1996, Annex table 6

Table 3

Gross Product of Foreign Affiliates and GDP, by Region, 1982, 1990 and 1991

Region/ country	Gross product of foreign affiliates[a] (Billions of dollars)			Gross product of foreign affiliates as a ratio to home country GDP (Percent)		
	1982	1990	1991	1982	1990	1991
Developed Countries	410	1102	1120	5.2	6.7	6.5
European Union	164	572	592	5.7	8.7	8.7
North America	177	408	403	5.1	6.7	6.4
Developing Countries	143	274	288	5.7	6.6	6.5
Africa	23	33	33	6.8	8.6	9.4
Latin America and the Caribbean	58	97	103	7.5	8.9	8.9
Asia	61	141	150	4.6	5.4	5.1
Oceania	1.2	1.7	1.8	28.6	32.2	30.1
Central and Eastern Europe	0.1	1.5	2.9	0.0	0.7	1.3
World	548	1378	1410	5.2	6.6	6.4

Source: UNCTAD, World Investment Report 1996, Table I.6.

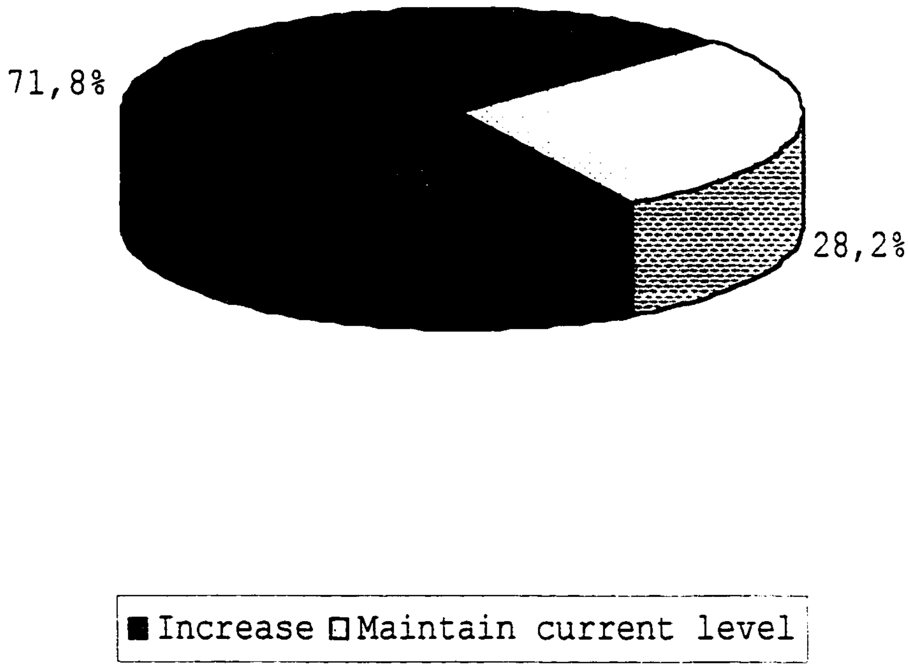
[a] Worldwide gross product is estimated by extrapolating the worldwide gross product of foreign affiliates of United States TNCs on the basis of the relative share of this country in the worldwide inward FDI stock. Regional gross products are estimated by applying the relevant shares of each region in worldwide inward stock to the estimated worldwide gross product.

However, past performance does not guarantee future performance. Hence, it becomes important to assess the magnitude and direction of future FDI. To that end, an UNCTAD (United Nations Conference on Trade and Development) survey was conducted in 1995[1], in which future investment plans of the 100 largest TNCs (Transnational Corporations) suggest a strong upward trend in FDI (as well as domestic investment), fueled by improved economic conditions and robust growth forecasts for several developing countries (Figure 2).

The present FDI pattern, whereby most investment originates in, and is directed to, developed countries will continue. Figure 3 shows that those TNCs based in North America view Europe as the most important investment location in the future, especially in high-technology and consumer-goods industries. Likewise, European TNCs view the United States as an important investment location and plan to improve their presence there. However, for Japanese TNCs, South, East and South-East Asia feature as the most promising investment locations for the future.

Figure 2

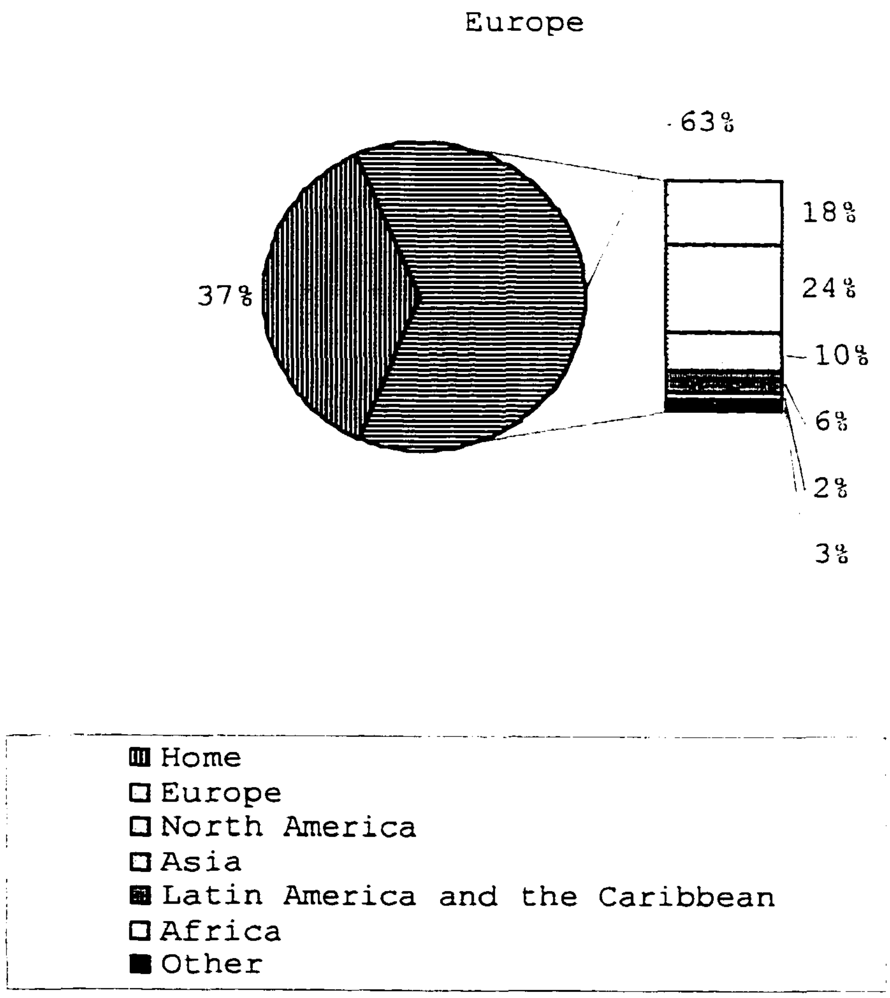
Will FDI Increase Over the Next Five Years?



Source: UNCTAD, World Investment Report 1996, Figure I.14.

Figure 3

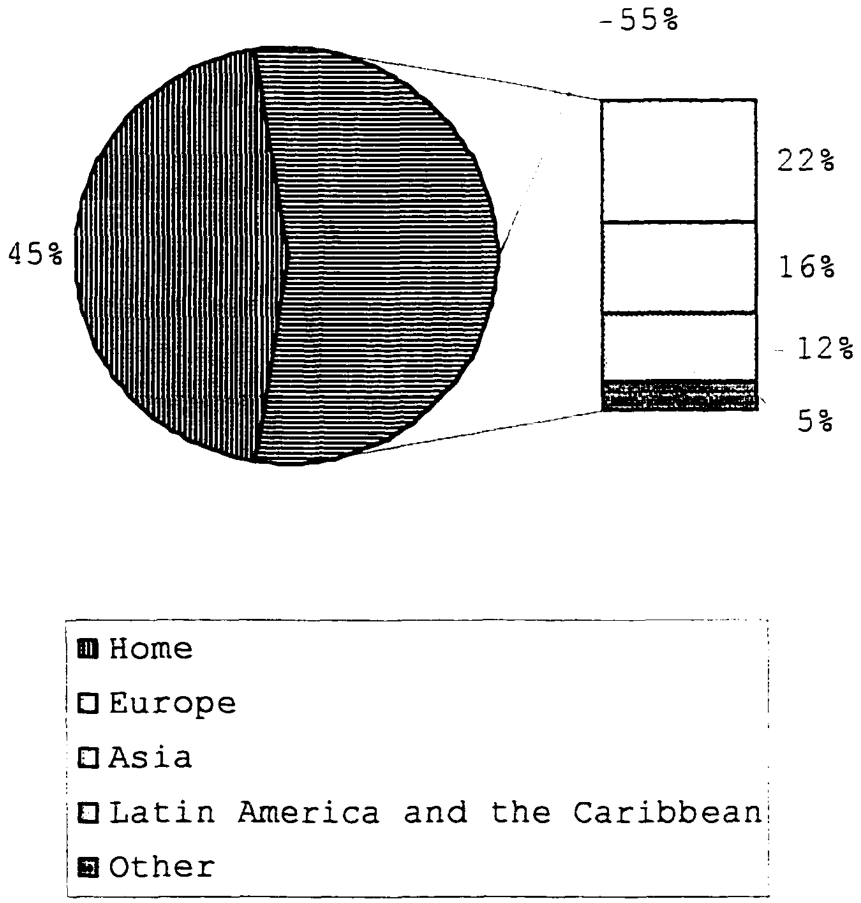
Future[a] Patterns of TNC Investments



Source: UNCTAD, World Investment Report 1996, Figure I.15.
[a] 1996-2000

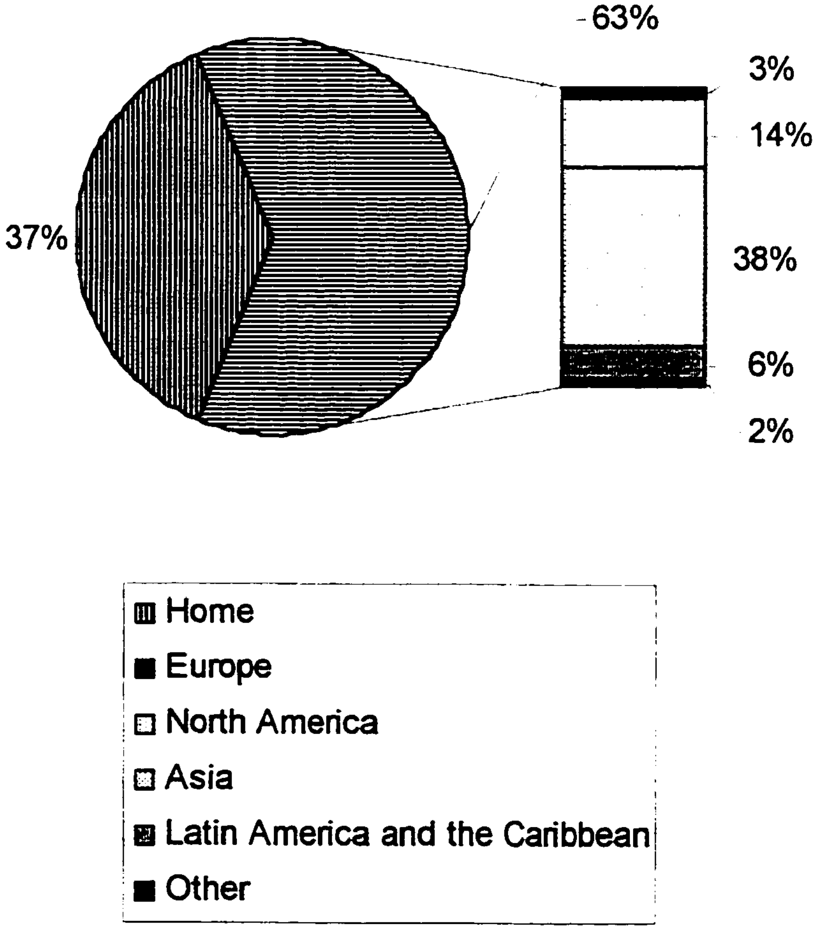
(figure continues)

North America



(figure continues)

Japan



However, FDI does not contribute only capital to the world economy. Foreign operations of large multinational firms also help transform the economies in which they operate through technology transfer, and by introducing new and better management techniques, providing market access to other countries, and increasing competition.

Government Policies

Thus, the recent surge in FDI has led many governments to reconsider their attitudes and policies toward FDI and global operations. According to Graham (1996), this relationship between national governments and global corporations calls for new international rules to govern investment, based on the following four premises:

1. Growing numbers of corporations are increasingly global in terms of the scope of their operations and the nature of their concerns.
2. Despite the 10-year trend toward globalization of business that began during the mid-1980s and continues into the mid-1990s, global corporations operate in a world economy that remains imperfectly integrated and a political system wherein nation-states, pursuing interests that are necessarily national, set regulatory and other policies.
3. Conflicts inevitably arise between governments and business enterprises; these can lead to inefficiencies and/or misallocation of resources that reduce global and national welfare.
4. The goal and priorities of both global corporations and national governments are legitimate. (pp. 2-6)

The role of governments in business has always been an important factor in corporate operations. The extent of government's role varies from country to country and, in the same country, from industry to industry. Corporate reaction to undesirable forms of government intervention has varied. Some firms aggressively attempt to control such behavior directly, while others treat intervention as a fact of life over which they have little, if any, control. What is clear is that there are numerous and diverse types of home and host government policies that significantly affect FDI flows. In a recent study, Brewer (1993) emphasized the diversity of government policies and the diversity of their effects on market imperfections and the foreign direct investment behavior of firms. Brewer argues that, complementary to what the internalization/eclectic theory emphasizes, namely that government policies increase market imperfections which in turn make FDI more attractive than trade and licensing, government policies can decrease market imperfections, and market imperfections can make FDI less attractive as a strategic alternative.

FDI flows can be increased and/or decreased by specific government policies; in fact, it is possible for a single government policy to simultaneously increase and decrease FDI. For example, the privatization of government-owned enterprises increases inbound FDI as foreign firms acquire privatized firms; at the same time, outbound FDI decreases as domestic investors acquire privatized firms at home rather than investing abroad.

Tables 4 through 7 list some government policies for each of the four combinations of effects on market imperfections and FDI, as illustrated in figure 4.

Figure 4

Government Policy Effects on Market Imperfections and FDI

	Effects on market imperfections	
Effects on FDI	Increase	Decrease
Increase	I	II
Decrease	III	IV

Source: Brewer (1993), p. 112.

Table 4
Government Policies that Increase Market Imperfections and Increase Foreign Direct Investment (Cell I in Figure 4)

Host government (Inbound FDI)
- Some protectionist import policies
- Weak enforcement of intellectual property protection
- Subsidies on inbound FDI
- Undervalued currency
- Weak antitrust (competition) policy measures against acquisitions by foreign-owned firms
- Government procurement policies that discriminate against foreign firms, but not against foreign-owned domestic firms
- Technical standards setting processes that exclude access by firms that are not domestic firms, whether domestically owned or foreign-owned

Home government (Outbound FDI)
- Overvalued currency
- Subsidies on outbound FDI
- Export controls
- Price controls

Source: Brewer (1993), p. 112.

Table 5
Government Policies that Decrease Market Imperfections and Increase Foreign Direct Investment (Cell II in Figure 4)

Host government (Inbound FDI)
- Liberalization of restrictions on inbound FDI
- Privatization of government-owned enterprises
- Institution of currency convertibility
- Implementation of anti-dumping measures against imports
- Imposition of countervailing import duties against subsidized exports from other countries
- Reduction in favoritism toward domestically owned local firms, compared with foreign-owned local firms, in government procurement
- Stronger enforcement of antitrust (competition) policies toward protected domestically owned industries
- Rebates on tariffs on imports for export-oriented FDI projects
- Liberalization of trade restrictions (which increase expectations for growth)

Home government (Outbound FDI)
- Liberalization of capital controls on outbound FDI

Source: Brewer (1993), p. 113.

Table 6
Government Policies that Increase Market Imperfections and Decrease Foreign Direct Investment (Cell III in Figure 4)

Host government (Inbound FDI)
- Overvalued currency
- Increased restrictions on inbound FDI
- Price controls
- Some import restrictions on inputs to FDI projects
- Exports controls on outputs of FDI projects
- Restrictions on remittances of profits from subsidiaries to parents

Home government (Outbound FDI)
- Undervalued currency
- Wage controls
- Export subsidies

Source: Brewer (1993), p. 113.

Table 7
Government Policies that Decrease Market Imperfections and Decrease Foreign Direct Investment (Cell IV in Figure 4)

Host government (Inbound FDI)
- Vigorous enforcement of antitrust (competition) policies
- Vigorous enforcement of arm's-length transfer pricing

Home government (Outbound FDI)
- Privatization of government-owned enterprises
- Vigorous enforcement of arm's-length transfer pricing

Source: Brewer (1993), p. 114.

Political Instability

Such an array of government policies as those discussed above undoubtedly affects the operations, policies, and nature of multinational companies. Furthermore, that MNCs perceive different degrees of political risk when symptoms of political instability emerge in a host country may be linked to the economic objectives and aspirations of the host country. In a like manner, Shapiro (1981) observes "... that political risk is not independent of the firm's activities; the configuration of the firm's investments will, in large measure, determine its susceptibility to changing government policies." (p. 64).

When an investor invests in a foreign country, he assumes a wide range of risk related to the attitudes, policies, and covert behavior of the host government and other local powers (Root, 1968). The importance of government policies in determining the extent of political instability for MNCs can be seen in the theoretical models of political risk discussed below. In all these models, host- and/or home-government policies are a key factor influencing political risk and, hence, political instability.

Strategic Planning and Decision-Making

It is generally recognized that corporations must adapt to their environments, if they are to survive (e.g. Kennedy, 1984). The environment itself has become more volatile and less predictable, making it difficult for MNCs to follow, much less anticipate, environmental changes.

One of the key mechanisms noted for facilitating a corporation's interaction with its environment is strategic planning. Effective strategic planning requires the analysis of environmental information, which typically includes political assessments; these assessments are especially relevant for MNCs that conduct scanning and analyses involving foreign direct investment decisions. Stapenhurst (1992, p. 14) argues that "... a corporation's strategic planning is an important determinant of its profitability and that environmental scanning, including political risk assessment, is a vital input to this strategic planning process. "

The link, as shown in Figure 1, between strategy and foreign direct investment can best be summarized by Shapiro's (1981) statement that "[o]nce the firm has analyzed the political environment of a country and assessed its implications for corporate operations, it must then decide whether to invest there and, if so, how to structure its investment to minimize political risk." (p. 64)

Thus, political instability, through changing government policies, has become directly relevant to strategic planning and decision making. Kobrin (1982) suggests that this new addition to the organization results from two interrelated postwar trends: (1) the internationalization of production and (2) changes in the political-economic environment.

Internationalization

At this point, it is worth pointing out that this trend towards globalization is another attempt at economic and financial integration such as that which took place before World War I:

> That period of globalization, like the present one, was driven by reductions in trade barriers and by sharp falls in transport costs, thanks to the development of railways and steamships. The present surge of globalization is in a way a resumption of that previous trend... The trend towards globalization is clear. But its extent can be exaggerated. ("One World?", 1997, p. 79).

Furthermore, Zevin (1992, p. 46) contends "... that, compared to the high gold standard in the late nineteenth and early twentieth centuries, today's world may be less integrated." By various measures, the markets for products, capital and labor are not more –indeed, less- integrated today than they were at the start of the century. Taking, for example, financial integration, Appendix A provides some measures of international financial integration. Panel A provides a condensation of various indices of financial-market integration and real integration for the high gold standard and for the interwar period. Panel B displays similar calculations made by Zevin (1992), performed on data starting in 1960. Generally speaking, every available descriptor of financial markets in the late nineteenth and early twentieth centuries suggests they were more integrated then than they were before or have been since.

Nevertheless, in some new and different ways international integration is now proceeding with more impetus that it at the turn of the century, for a number of reasons. Firstly, unlike the pre-1914 global economy, today large parts of the world are participating in the globalization movement. Secondly, whereas 19^{th}-century globalization was driven by falling transport costs, it is now being driven by falling communication costs. Finally, though net flows of global capital may be smaller than in the past, gross international financial flows are much bigger.

Internationalization is reflected in both physical expansion abroad and strategic evolution toward increased centralization of control, coordination, and rationalization. In its early stages, the individual firm was a loose confederation of autonomous subsidiaries linked to the parent through a rather primitive system of financial control. Perlmutter (1969, p. 12) termed this organizational structure polycentric:

> Polycentric firms are those which, by experience or by the inclination of a top executive (usually one of the founders), begin with the assumption that host-country cultures are different and that foreigners are difficult to understand... A polycentric firm, literally, is a loosely connected group with quasi-independent subsidiaries as centers.

Appendix B illustrates three primary attitudes among international executives toward building a multinational enterprise. These attitudes Perlmutter describes as ethnocentric (or home-country oriented), polycentric (or host-country oriented) and geocentric (or world-oriented).

As international operations become more important, managers begin to realize the potential returns from worldwide integration. In Perlmutter's (1969, p. 13) terms, the strategy becomes geocentric:

> The ultimate goal of geocentrism is a worldwide approach in both headquarters and subsidiaries. The firm's subsidiaries are thus neither satellites nor independent city states, but parts of a whole whose focus is on worldwide objectives as well as local objectives, each part making its unique contribution with its unique competence. Geocentrism is expressed by function, product and geography... This conception of geocentrism involves a collaborative effort between subsidiaries and headquarters to establish universal standards and permissible local variations, to make key allocational decisions on new products, new plants, new laboratories.

In the real world, international firms do not simply have to operate efficiently in a large number of countries. Rather, they have to work toward global or system-wide objectives by simultaneously operating in many disparate environments. Perlmutter (1969, pp. 15-16) notes that "[T]he obstacles toward geocentrism from the environment stem largely from the rising political and economic nationalism in the world today, the suspicions of political leaders of the aims and increasing power of the multinational firm."[2] The multinational firm has to function in a world organized on the basis of sovereign national states. Appendix C summarizes a series of external and internal factors that contribute to or hinder the growth of geocentric attitudes and decisions.

Blake and Walters (1987, p. 99) describe the current multinational organization as an integrated international enterprise:

> ...organized in such a fashion as to advance regional or global objectives and activities; no particular nationality, whether parent or host country prevails. Instead, corporate goals, corporate standards of performance, and corporate practices dominate... In this structure, the potential for clashes with host state interests is great, but the source of such conflict comes from the truly international or anational character of the firm.

This type of firm is particularly sensitive to political and economic developments in various states and in the global economy.

According to Kobrin (1982, pp. 55-56), "... this process of internationalization tends to increase managerial perceptions of politically generated contingencies in two ways. First, it increases vulnerability to such contingencies and emphasizes their potential costs. Second, the transformation of politics from a parameter to a variable –as a result of internationalization- heightens the level of uncertainty in the task environment[3]."

With the enlargement of international operations, a global strategy evolves; integration and rationalization across national borders become essential if the firm is to exploit fully its potential multinationality. However, though global strategy increases the pressure for unification, environmental (particularly political) differences act as constraints. As Kobrin (1982, p. 56) states:

> The unification/fragmentation conflict, the balance between global optimization and adaptation to local environments, is the fundamental managerial issue facing multinational corporations. With internationalization and the evolution of a global strategy, the relevance and the potential cost of politically generated contingencies increase.

Hence, internationalization forces corporations to recognize the potential contingencies arising from the political environment because (1) those contingencies more directly affect global strategy, and (2) levels of uncertainty, and thus business risk, are increased.

The Political-Economic Environment

Since the end of World War II, the political-economic environment has undergone a profound transformation. The following four interrelated environmental changes are major contributors to this transformation.

The Politicization of Economics

Despite the growing penetration of national economies by TNCs, the political institution of the nation-state remains a most significant force in shaping the world economy. All governments intervene to varying degrees in the operation of the market. It can be argued that the world economy is today more, rather than less, politicized as the interdependence between countries has increased. Thus, questions of trade imbalances, exchange rates and the like are as much political, as economic, phenomena. National governments continue to play a most important role in shaping the global economic map and in either encouraging or inhibiting the global ambitions and strategies of business firms. As Dicken (1992, pp. 149-150) notes:

> Although the TNC may well be the single most important force creating global shifts in economic activity, it is not the only force involved. Both TNCs and nation states are interlocked within the complex processes of globalization. It is the outcome of this interaction that is producing the increasingly complex geography of the global economy.

Nationalism

A second major change in the environment is nationalism, that is, the development of strong emotional attachments to the central state (adding to the traditional loyalties to provinces or towns) and involvement of the average citizen or subject in his/her government's political life. Since the beginning of the 1990s, nationalism has led to the formation of new independent nation-states such as those that were born out of the breakup of the USSR and Yugoslavia. This increase in the number of nations, each of which has differing priorities and goals, is likely to lead to conflicts between foreign investors and host states.

The growth of nationalism has been accompanied by a shift in bargaining power from the MNC to the host country. With the development of administrative, managerial, and technical capabilities has come a greater capacity for regulating foreign enterprises.

The following statement by Holsti (1988, p. 81) summarizes the political implications of increasing nationalism for international business:

> The modern global system of states is an anarchy: that is, no legitimate superior authority exists to control or manage the foreign policies of individual states. Each state develops its external relations in the context of its own interests, accepts no limitations upon its autonomy except those it adheres to voluntarily, and ultimately must rely upon itself when confronted with threats or war. There is a hierarchy of power and influence... but this does not negate the essentially anarchical nature of contemporary international politics. The power of ***decision*** and ***action*** resides solely within the governments of the more than 160 states[4] comprising the system.

Instability

The emergence of new nations and their drive for industrialization and modernization have increased intrastate political conflict and instability. Such conflict is a response to the breakdown of traditional sociopolitical structures and the efforts to centralize power and legitimate national authority in the face of diverse regional loyalties.

Interstate Politics

The change in interstate politics can be best described by Kissinger (1994, pp. 23-24):

> ... the international system of the twenty-first century will be marked by a seeming contradiction: on the one hand, fragmentation; on the other, growing globalization. On the level of the relations among states, the new order will be more like the European state system of the eighteenth and nineteenth centuries than the rigid patterns of the Cold War. It will contain at least six major powers –the United States, Europe, China, Japan, Russia, and probably India- as well as a multiplicity of medium-sized and smaller countries. At the same time, international relations have become truly global for the first time. Communications are instantaneous; the world economy operates on all continents simultaneously.

Holsti (1988) considers a list of the various existing and potential sources of change in the global system. This list is reproduced in Appendix D. The first two sources –ethnic nationalism and the increase in the number of states- can be considered the most relevant to international business since they reflect the increasing importance of politically-based actions by a newer and larger set of political actors.

Also significant in the new 'game' of interstate politics is the emerging independence of issue areas that result from the reduced usefulness of military force in a nuclear age and the scarcity and unequal distribution of natural resources. International political-economic relations are more complex and variable than ever before.

Conclusion

These changes in the political-economic environment since the end of World War II mean that political factors abroad will have more impact on managerial strategy. In most countries where MNCs operate, their subsidiaries are major economic actors. The increased politicization of economic activity has strengthened the pressure on regimes to exert control over their economies and over important economic actors. The inevitable intervention has been both direct, in terms of competition from public-sector enterprises, and indirect, through policies designed to affect the behavior of private firms. As a result, potential constraints, such as local-content regulations, price controls, and the like, have become more of a threat.

The conflict in objectives between global firms and nation-states suggests that increased nationalism will lead to more intensive pressure for national control. The problem is exacerbated by the economic independence and the political ramifications of MNCs as autonomous transnational actors.

These changes have also increased the complexity and variability of the business environment for international firms. The number of nation-states has risen dramatically and, accordingly, so has the range of differences among them. Within states, the firm may not have to deal with a single coherent government, but with a host of interest groups with conflicting positions and objectives. Thus, political variables have become relevant to strategic planning and decision making. This increased relevance of the political environment has two main components. First, political factors are more likely to have a direct impact on decision outcomes, that is, on the magnitude of cash flows and returns. Second, heterogeneity, variability, and turbulence increase business risk by making decision outcomes uncertain. It is the differences in environments which provide the unique set of potential constraints and opportunities facing international firms; as the number of environmental – especially political- elements and the differences between them grow larger, prediction of the future environment and its impact on corporate operations becomes more difficult.

The international environment is likely to pose continued difficulties to the MNCs. Those that can monitor, assess and evaluate the social, political and economic risks and derive appropriate corporate strategies to capitalize on opportunities and minimize risks, are the ones that will survive and prosper in the 1990s.

Purpose of the Study

The major purpose of this study is to determine empirically the investment behavior of multinational corporations with regard to one aspect of the political environment: political instability. There are other types of political risk, but the emphasis here will be upon political instability, since it is generally the most significant form of political risk. Furthermore, Green and Korth (1974) argue that "... while many examples of political risk in relatively stable environments can be cited (the threat of a Communist Party-dominated coalition governing Italy, for example), the most dramatic, most common, most arbitrary actions normally result from political instability." (p. 23)

Therefore, the objective is to derive the relationship that exists between a nation's level of political instability and the multinationals' allocation of foreign direct investment across industries and over time. The results are expected to facilitate greater understanding and prediction of the investment behavior of multinational companies in response to conditions of political instability.

Naturally, FDI behavior is also affected by non-political environmental factors, such as, the host country's market size or its labor costs. To analyze the relationship between political instability and FDI, it is essential to take into consideration these non-political factors. The relationship between the non-political factors and FDI, however, is of secondary importance to this study and of concern only to the extent that it contributes to the elucidation of the relationship between political instability and FDI.

Besides analyzing the relationship between political instability and FDI, this paper will deal with three other secondary, but important, objectives.

One is to evaluate the relationship above among developed countries.

This follows from the fact that, in the face of increasingly risky foreign environments, some MNCs have refocused their activities in the less risky environments of North America and Western Europe, where political risks are perceived to be lower. Ahrens (1996, p. 26) observes that

> Most companies have flocked to the already developed nations, even when emerging markets promise so much upswing potential, because the industrialized countries offer stable political climates, familiar business practices, ease of entry, convertible currencies, skilled workforces and sophisticated consumers –in a nutshell, less apparent risk.

Stapenhurt (1992, p. 55) further notes the following:

> This realignment of strategy has often been accompanied with a cut in PRA [political risk assessment], on the assumption that political risks are lower in developed country markets. This is false logic, given the inherent, albeit different, political risks associated with business in developed countries.

This paper discusses the relevance of political instability, in one host-developed country (Canada), as a determinant of FDI behavior on the part of two source-developed countries (United Kingdom and United States).

Another objective of the study addresses the issue of a decline in the 1980s of the use of political risk assessment by corporations, as noted by Stapenhurst (1992). This author cites three reasons for this decline. First, there was a failure in many companies to incorporate the results of political risk analysis into corporate decision-making because many executives viewed it as an ivory tower exercise with little relevance to corporate activities; second, the increased level of risk in the 1970s and 1980s led to retrenchment by smaller MNCs resulting in a lesser need for such assessments; and third, the profit squeeze experienced by many corporations trimmed political risk assessment functions. Based on the empirical findings obtained, this study will discuss whether or not political risk assessment at the corporate level is merited.

A final objective relates to the specification of the model. This study is partly based both on what Agarwal (1980) terms 'the propensities of countries to attract FDI' and on Dunning's (1973, 1977, 1979, 1980, 1981, 1988a, 1988b) notion of location advantages of particular foreign countries to attract FDI. However, in this research, a model is tested in which characteristics of not only the host country but also of the investing country are incorporated. Because a firm is simultaneously confronted by both domestic and foreign investment opportunities, this is *a priori* a more realistic specification.

Research Questions

What sorts of host-country characteristics tend to attract FDI? And more specifically, how important is political instability in determining the allocation of foreign direct investment in a particular nation?. This study is an attempt to shed light on these questions by estimating a model of the location of U.S. and U.K. FDI in Canada, across a number of industries, while accounting for political factors as well as host-country cost and demand conditions.

Summary

This chapter has introduced the nature of the research problem addresses in this study. The rest of the paper is organized as follows: Chapter II presents a review of the literature on FDI and political risk, from which the research hypotheses are derived. Chapter III discusses the research methodology employed. Chapter IV provides and analyzes the research findings obtained. Finally, chapter V concludes the paper with discussions of the implications for managers, the research limitations of the study, and suggestions for further research.

CHAPTER 2

LITERATURE REVIEW

This chapter examines the literature in the fields of foreign direct investment and political risk. Though political risk is considered in some of the FDI theories, this chapter treats the theories in both fields in two different sections, for clarification purposes. Two other sections discuss the empirical studies on political and non-political determinants of FDI. A final section lists the relevant research hypotheses tested in the dissertation.

General Definitions: FDI and TNCs[5]

Transnational Corporation[6]

Transnational corporations are incorporated or unincorporated enterprises comprising parent enterprises and their foreign affiliates. A ***parent enterprise*** is defined as an enterprise that controls assets of other entities in countries other than its home country, usually by owning a certain equity capital stake. An equity capital stake of 10 percent or more of the ordinary shares or voting power of an incorporated enterprise, or its equivalent for an unincorporated enterprise, is normally considered as a threshold for the control of assets.[7] A ***foreign affiliate*** is an incorporated or unincorporated enterprise in which an investor, who is resident in another economy, owns a stake that permits a lasting interest in the management of that enterprise (an equity stake of 10 percent for an incorporated enterprise or its equivalent for an unincorporated enterprise).

Three factors characterize a TNC: (1) its control of economic activities in more than one country; (2) its ability to take advantage of geographical differences between countries and regions in factor endowments; and (3) its geographical flexibility, that is, its ability to shift its resources and operations between locations on a global scale (Dicken, 1992).

Foreign Direct Investment

Foreign direct investment is defined as investment involving a long-term relationship and reflecting a lasting interest and control by an entity in one economy (foreign direct investor or parent enterprise) of an enterprise resident in an economy other than that of the foreign direct investor (FDI enterprise or affiliate enterprise or foreign affiliate). Foreign direct investment implies that the investor exerts a significant degree of influence on the management of the enterprise resident in the host economy. Such investment involves both the initial transaction between the two entities and all subsequent transactions between them and among foreign affiliates, both incorporated and unincorporated. Foreign direct investment may be undertaken by individuals as well as business entities.

Foreign direct investment inflows and *outflows* comprise capital provided (either directly or through other related enterprises) by a foreign direct investor to an FDI enterprise, or capital received from an FDI enterprise by a foreign direct investor. There are three components to FDI: equity capital, reinvested earnings and intra-company loans. *Equity capital* is the foreign direct investor's purchase of shares of an enterprise in a country other than its own. *Reinvested earnings* comprise the direct investor's share (in proportion to direct equity participation) of earnings not distributed as dividends by affiliates or earnings not remitted to the direct investor. Such retained profits are reinvested. *Intra-company loans* or *intra-company debt transactions* refer to short- or long-term borrowing and lending of funds between direct investors (parent enterprises) and affiliate enterprises.

Brewer (1993) identifies twenty-three different indicators of FDI flows at the national level, as shown in Table 8. In this manner, FDI can be analyzed as a sequential process, not merely as a single, discrete strategic decision. Furthermore, firms' decisions concerning the several components of FDI can be fundamentally different, in particular among the initial investment decisions, the reinvestment decisions, and the capital repatriation decisions. Brewer (1993, p. 111) suggests that:

> ... FDI is a multidimensional, evolutionary process. Decisions about initial equity, reinvestment of earnings, long-term debt and short-term debt are different decisions that are made at different points in time and in different stages of an FDI project.

Table 8

Components of FDI Flows

Inbound FDI	
1.	Initial equity investment
2.	Long-term debt inflows (from affiliated firms)
3.	Long-term debt repayment (to affiliated firms)
4.	Net long-term debt inflows (2-3)
5.	Short-term debt inflows (from affiliated firms)
6.	Short-term debt repayment (to affiliated firms)
7.	Net short-term debt inflows (5-6)
8.	Reinvestment
9.	Gross inbound (1+2+5+8)
10.	Capital repatriation
11.	Net inbound FDI (1+4+7+8-10)
Outbound FDI	
12.	Initial equity investment
13.	Long-term debt outflows (to affiliated firms)
14.	Long-term debt repayment (from affiliated firms)
15.	Net long-term debt outflows (13-14)
16.	Short-term debt outflows (to affiliated firms)
17.	Short-term debt repayment (from affiliated firms)
18.	Net short-term debt inflows (16-17)
19.	Reinvestment
20.	Gross outbound (12+13+16+19)
21.	Capital repatriation
22.	Net outbound FDI (12+15+18+19-21)
Net FDI	
23.	Net, net FDI (11-22)

Source: Brewer (1993), p. 115.

Foreign direct investment stock is the value of the share of capital and reserves (including retained profits) attributable to the parent enterprise, plus the net indebtedness of affiliates to the parent enterprise.[8]

There are three main types of investments a corporation can undertake according to the nature of the business involved: (1) Investments in manufacturing, usually entailing the greatest investment in fixed facilities, which are difficult to move, and in training workers and managers; (2) investments in extractive activities (natural resources), which are less expensive, but even less movable; and (3) investments in services, which tend to be less expensive and easier to walk away from if conditions change.

Theories of FDI

The above mentioned pattern changes in FDI have triggered numerous attempts to explain FDI behavior through a comprehensive theory. This section will consider five approaches to organizing FDI theories.

Agarwal (1980)

Agarwal probably offers the most comprehensive survey of the various theories that attempt to explain FDI behavior. The author classifies these theories into four groups of hypotheses. The first group includes hypotheses, which assume full, or nearly full, competition on factor and/or product markets. The second group comprises the hypotheses which take market imperfections for granted and assume that the firms investing in foreign countries have one or more comparative advantages over their rivals in the host countries. The third group includes hypotheses on the propensities of countries, industries or firms to undertake FDI; and the fourth group on the propensities of countries to attract these investments.

Hypotheses Assuming Perfect Markets

Four hypotheses are covered here. They are the differential rate of return hypothesis, the portfolio hypothesis, and the output and market size hypotheses.

Differential rate of return hypothesis

This approach argues that foreign direct investment is the result of capital flowing from countries with low rates of return to countries with high rates of return. This hypothesis is derived from the idea that, in evaluating their investment decisions, firms equate expected marginal returns with the marginal cost of capital. If expected marginal returns are higher abroad than at home, and assuming that the marginal cost of capital is the same for both types of investment, there is an incentive to invest abroad rather than at home.

This hypothesis gained popularity in the 1950s when U.S. foreign direct investment in Europe increased sharply. At that time, after-tax rates of return of foreign subsidiaries of American companies were consistently above the rate of return on U.S. domestic investment. However, this hypothesis suffered a setback in the 1960s when U.S. FDI in Europe continued to rise, although rates of return for European subsidiaries of U.S. companies were below the rates of return on domestic investment (Hufbauer, 1975).

Empirical tests of this hypothesis were conducted at several levels. Some authors tried to find a positive relationship between the ratio of a firm's FDI to its domestic investment and the ratio of its foreign profits to its domestic profits. Others tried to relate FDI and the rate of foreign profits, usually allowing for a certain time lag. Another approach was to examine the relationship between relative rates of return in several countries and the allocation of foreign direct investment among those countries. As reported by Agarwal (1980), most of these empirical studies failed to provide strong supporting evidence, partly owing to serious statistical problems. The underlying theory of the hypothesis is that FDI is a function of expected profits, but the available statistics are on reported profits. Reported profits are likely to differ from actual profits, which in turn may differ from expected profits. This divergence of reported profits from actual profits is mainly due to intra-firm pricing for transactions between a subsidiary and the parent firm, and among subsidiaries. Intra-firm pricing is likely to be influenced, for example, by the desire to minimize the tax burden for the company as a whole and to avoid exchange controls. Furthermore, the hypothesis refers to profits recorded during the whole period of an investment whereas, reported profits are related to a shorter period, usually a year, and to combinations of investments. Thus, it is not surprising that most of the studies of this hypothesis have failed to discover a significant relationship between international differences in profit rates and flows among countries.

Another major flaw of this hypothesis is the assumption that investors, especially MNCs, always try to maximize profits. Even if they do, their strategy need not necessarily be to earn higher profits on FDI than on domestic investment; the case might arise, for example, when an investor is willing to accept a lower rate of profit on a particular FDI in order to achieve higher economies of scale in the domestic market. The objective of profit maximization, in general, has been challenged by managerial and behavioral schools of thought.

Baumol (1959) maintained that managers are preoccupied with maximization of sales rather than profits. Several reasons are offered for this attitude of top management. Firstly, salaries and other earnings of top managers are correlated more closely with sales than with profits. Secondly, banks and other financial institutions keep a close eye on the sales of firms and are more willing to finance firms with large and growing sales. Thirdly, personnel problems are handled more satisfactorily when sales are growing. Employees at all levels can be given higher compensation and better conditions of work in general. Declining sales, on the other hand, may make necessary the reduction of salaries and other payments and perhaps the lay-off of some employees. Fourthly, large sales, growing over time, give prestige to the managers, while large profits go into the pockets of shareholders. Fifthly, managers prefer a steady performance with satisfactory profits to spectacular profit maximization projects. If they realize maximum high profits in one period, they might find themselves in trouble in other periods when profits are less than maximum. Finally, large, growing sales strengthen the power to adopt competitive tactics, while a low or declining share of the market weakens the competitive position of the firm and its bargaining power vis-à-vis its rivals.

Marris (1964) argues that the goal of the firm is the maximization of its balanced rate of growth, that is, the maximization of the rate of growth of demand for the products, and of the growth of its capital supply. By jointly maximizing the rate of growth of demand and capital, the managers can achieve maximization of their own utility as well as of the utility of the owner-shareholders. Marris argues that the difference between the goals of managers and the goals of the owners is not so wide as other managerial theories claim, because most of the variables appearing in the utility functions of both the managers and the owners are strongly correlated with a single variable, namely the size of the firm.

Williamson (1963) suggests that managers have discretion in pursuing policies that maximize their own utility rather than attempting the maximization of profits, which maximizes the utility of owner-shareholders. Profit acts as a constraint to this managerial behavior, in that the financial market and the shareholders require a minimum profit to be paid out in the form of dividends; otherwise, the job security of managers is endangered.

The behavioral theories of the firm (Simon, 1955, 1959; Cyert and March, 1963) conceive the firm as a coalition of different groups which are connected with its activity in various ways. The most important groups within the framework of these theories are those most directly and actively connected with the firm, namely the managers, the workers and the shareholders. There is a dichotomy between ownership and management. There is also a dichotomy between individual members and the firm-organization. The consequence of these dichotomies is conflict between the different members of the coalition.

Behavioral theory recognizes that modern corporate business has a multiplicity of goals. The goals are ultimately set by the top management through a continuous process of bargaining. These goals take the form of aspiration levels rather than strict maximizing constraints. Attainment of the aspiration level 'satisfices' the firm: the contemporary firm's behavior is satisficing rather than maximizing. Satisficing is considered as rational, given the limited information, time, and computational abilities of top management.

Portfolio diversification hypothesis

This hypothesis postulates that, in choosing among the various available projects, a firm would presumably be guided by both expected returns and the possibility of reducing risk. Since the returns on activities in different countries are likely to have less than perfect correlation, a firm could reduce its overall risk by undertaking projects in more than one country. Foreign direct investment can therefore be viewed as international portfolio diversification at the corporate level. There have been various attempts to test this theory. One approach was to try to explain the share of FDI going to a group of countries by relating it to the average return on those investments, and to the risk associated with them, as measured by the variance of average returns. Another approach was to estimate first the optimal geographical distribution of assets of multinational firms based on portfolio considerations, and then to assume that firms gradually adjust their flow of FDI to obtain that optimal distribution. A final approach was to ascertain whether large firms with more extensive activities showed smaller fluctuations in global profits and sales.

These tests have offered weak support for the portfolio diversification hypothesis. In some cases, results that were favorable for a group of countries did not hold for individual countries. In others, the results were not significant or were more consistent with alternative theories. Although the lack of strong empirical support may be due partly to the difficulties associated with measuring expected profits and risk, there are more basic, theoretical, problems with this hypothesis.

To begin with, the hypothesis does not explain why MNCs are the greatest contributors to FDI and why they prefer direct investments to portfolio investments which could eventually provide a better instrument for geographical and sectoral diversification of their portfolios. Ragazzi (1973) argues that FDI may be attracted toward areas where average rates of profit are higher when such rates are not equalized internationally by portfolio capital flows owing to inefficiencies in securities markets. He cites, as a relevant example, two major factors that may contribute to making the holding of portfolio shares in European companies unattractive, even in companies with a high expected rate of return. First, the lack of information about the company's affairs in most European countries. Stockholders receive less information –than in the United States- about the current position of their company. For portfolio investors, this increases the risk of possible deviations from the expected rate of return. For the direct investor, the risk is limited to the industrial risk inherent in the operations of the company. The second factor is that the market for stocks is much smaller in most European countries than in the United States; this may cause much larger fluctuations in the market price of stocks. These wide market fluctuations have a higher negative weight for portfolio investors, concerned with the short run, than for direct investors, interested in the medium- and long-term.

Another flaw in the hypothesis is that it cannot account for the observed differences in the propensities of different industries to invest abroad. Some industries are more internationally oriented than others and these differences cannot be explained in terms of risks and returns alone.

Output and market size hypotheses

These two hypotheses are two sides of the same coin. They relate FDI to some measure of output of the multinational firm in the host country. The output hypothesis is applied at the micro level and considers the relevant variable to be output (sales) in the host country. The market size hypothesis is applied at the macro level and uses the host country's GNP (gross national product) or GDP as a proxy for potential sales. The relevance of output for FDI can be derived from models of neoclassical domestic investment theory, whereas the relevance of the host country's market size has been taken for granted rather than derived from a theoretical model. Despite the lack of explicit theoretical modeling, the market size hypothesis has been very popular, and a variable representing the size of the host country appears in a large number of empirical papers.

These hypotheses have been tested in a number of ways.[9] One approach was to develop models of domestic investment and estimate them using FDI data to see whether output of multinational firms in host countries is a significant explanatory variable. Another technique employed was to see whether the share of FDI of a given home country going to a group of host countries was correlated with the income level of the individual host countries. In some of the studies, the rate of growth of income in the host country, or the difference between the rate of growth of income in the host and the investing country, were also used as explanatory variables. Some authors distinguished between external and internal determinants of FDI with market size being an external factor and sales of foreign subsidiaries an internal factor.

Practically all these empirical studies support the notion that higher levels of sales by the foreign subsidiary and of the host country's income, or income growth, have been associated with higher FDI flows. The support for these hypotheses is generally valid across a variety of countries, periods, estimation techniques, and specification of the variables.

However, there are a few major caveats with both hypotheses. First, the market size hypothesis lacks a theoretical background from which the estimated relationships can be derived. Second, the size and growth of the host country's market should affect FDI that is used to produce for the domestic market, not for exports. In most of the empirical studies, however, no distinction is made between the two types of investment. Finally, the decision of firms on initial FDI and expansion FDI are very likely to be guided by different considerations. Therefore, it would be incorrect to use the same variables to explain all types of FDI.

Hypotheses Assuming Market Imperfections

The hypotheses in this section include (1) industrial organization, (2) internalization, (3) eclectic theory, (4) product cycle, and (5) oligopolistic reaction.[10]

Industrial organization hypothesis

Hymer, in his seminal doctoral dissertation written in 1960 and published in 1976, argued that the very existence of multinational firms rests on market imperfections. Two types of market imperfection are particularly important: structural imperfections and transaction-cost imperfections. Structural imperfections help the multinational firm to increase its market power and arises from economies of scale, knowledge advantages, distribution networks, product diversification, and credit advantages. Transaction-cost imperfections make it profitable for the multinational firm to substitute an 'internal' market for external transactions. There are four types of transaction costs: (1) the cost of finding a relevant price (brokerage cost), (2) the cost of defining the obligations of both parties to a contract (the definitional cost), (3) the risk associated with accepting such contracts, and (4) the taxes paid on market transactions. Where these transactional costs are high, the firm sells to itself or to a fully-owned affiliate. The literature focusing on structural imperfections gave rise to the industrial organization theory of FDI, whereas that focusing on transaction costs led to the internalization theory of FDI.

The industrial organization hypothesis argues that when a foreign firm establishes a subsidiary in another country, it faces a number of disadvantages when competing with domestic firms. These include the difficulties of managing operations spread out in distant places, and dealing with different languages, cultures, legal systems, technical standards, and customer preferences. If, in spite of those disadvantages, a foreign firm engages in FDI, it must have some firm-specific advantages with respect to domestic firms. The advantages of the multinational firm are those associated with brand name, patent-protected superior technology, marketing and managerial skills, cheaper sources of financing, preferential access to markets, and economies of scale.

The industrial organization hypothesis is not a complete theory of FDI. While the existence of some firm-specific advantages explains why a foreign firm can compete successfully in the domestic market, such advantages do not explain why this competition must take the form of foreign direct investment: the foreign firm could just as well export to the domestic market, or license or sell its special skills to domestic firms. The internalization theory and the eclectic approach, discussed below, offer explanations of why firms choose FDI over other alternatives.

Internalization hypothesis

This hypothesis explains the existence of FDI as the result of firms replacing market transactions with internal transactions. This in turn is seen as a way of avoiding market imperfections in the markets for intermediate products (Buckley and Casson, 1976). Modern businesses conduct many activities in addition to the routine production of goods and services. All these activities, including marketing, research and development, and training of labor, are interdependent and are related through flows of intermediate products, mostly in the form of knowledge and expertise. However, market imperfections make it difficult to price some types of intermediate products.

For example, it is often hard to design and enforce contractual arrangements that prevent someone who has purchased or leased a technology from passing it on to others without the knowledge of the original producer. This problem provides an incentive to bypass the market and keep the use of the technology within the firm. This produces an incentive for the creation of intra-firm markets.

The internalization hypothesis is closely related to the theory of the firm. The question of why firms exist was first raised by Coase (1937) and later examined by Williamson (1975). They argued that, with certain transaction costs, the firm's internal procedures are better suited than the market to organize transactions. These transaction costs arise when strategic or opportunistic behavior is present among agents to an exchange, the commodities or services traded are ambiguously defined, and contractual obligations extend in time. When these three conditions are present, enforcing and monitoring costs may become prohibitive. Under those circumstances, the firm opts to internalize those transactions. The main feature of this approach, therefore, is treating markets on the one hand, and firms on the other, as alternative modes of organizing production.

It is the internalization of markets across national boundaries that gives rise to the international enterprise, and thus, to FDI. This process continues until the benefits from further internalization are outweighed by the costs. As indicated by Agarwal (1980), the benefits include avoidance of time lags, bargaining and buyer uncertainty, minimization of the impact of government intervention through transfer pricing, and the ability to use discriminatory pricing. The costs of internalization include administrative and communication expenses.

The internalization hypothesis is a rather general theory of FDI. In fact, Rugman (1980) has argued that most, if not all, of the other hypotheses for FDI are particular cases of this general theory. As a result, this approach has been criticized on the grounds of being almost tautological, and of having no empirical content. Rugman (1986), however, argues that with a precise specification of additional conditions and restrictions, this approach can be used to generate powerful implications.

Buckley (1988) further examined the difficulties in formulating appropriate tests for the internalization hypothesis. He agreed that the general theory cannot be tested directly, but argued that it may be sharpened to obtain relevant testable implications. Since much of the argument rests on the incidence of costs in external and internal markets, the specification and measurement of those costs is crucial for any test. Empirical evidence suggests that transaction costs are particularly high in vertically integrated process industries, knowledge-intensive industries, and communication-intensive industries. Therefore, the internalization theory predicts that those will be the industries dominated by multinational firms. Buckley also cited evidence showing that the pattern of FDI across industries, and nationalities, is broadly consistent with the theory's predictions, but he emphasized that tests need to be more precise and rigorous to increase confidence in the theory.

The eclectic hypothesis

Dunning (1977, 1979, 1988a, 1988b) developed an eclectic approach by integrating three strands of the literature on FDI: the industrial organization theory, the internalization theory, and the location theory. He argued that three conditions must be satisfied if a firm is to engage in foreign direct investment. First, the firm must possess some form of sustainable ownership-specific advantage that allows it to compete with the other firms in the markets it serves regardless of the disadvantages of being foreign. Second, the firms must view FDI as preferable over trade and licensing, which can occur when internalized transactions that are possible through FDI become relatively more efficient than the transaction costs associated with trade and licensing. Finally, certain foreign countries must possess some form of locational advantages than make them more attractive sites for FDI than domestic investment; otherwise, foreign markets would be served exclusively by exports. Thus, for FDI to take place, the firm must have ownership and internalization advantages, and a foreign country must have locational advantages over the firm's home country.

The eclectic approach postulates that all FDI can be explained by reference to the above conditions. It also postulates that the advantages mentioned above are not likely to be uniformly spread among countries, industries, and enterprises, and are likely to change over time. The flows of FDI of a particular country at a particular point in time depend on the ownership and internalization advantages of the country's firms, and on the locational advantages of the country, at that point in time. Dunning (1979, 1980) used this approach to suggest reasons for differences in the industrial pattern of the outward FDI of five developed countries, and to evaluate the significance of ownership and location variables in explaining the industrial pattern and geographical distribution of the sales of U.S. affiliates in 14 manufacturing industries in seven countries.

Product cycle hypothesis

This hypothesis postulates that most products follow a life cycle, in which they first appear as innovations and ultimately become completely standardized. FDI results when firms react to the threat of losing markets as the product matures, by expanding overseas and capturing the remaining rents from development of the product. This hypothesis, developed by

Vernon (1966), was mainly intended to explain the expansion of U.S. multinational firms after World War II.

Innovation can be stimulated by the need to respond to more intense competition or the perception of a new profit opportunity. The new product is developed and produced locally (e.g., in the United States) both because it will be designed to satisfy local demand and because it will facilitate the efficient coordination between research, development, and production units. Once the first production unit is established in the home market, any demand that may develop in a foreign market (e.g., Europe) would ordinarily be satisfied by exports. However, rival producers will eventually emerge in foreign markets, since they can produce more cheaply (owing to lower distribution costs) than the original innovator. At this stage, the innovator is compelled to examine the possibility of setting up a production unit in the foreign location. If the conditions are considered favorable, the innovator engages in foreign direct investment. Finally, when the product is standardized and its production technique is no longer an exclusive possession of the innovator, the latter may decide to invest in developing countries to obtain some cost advantages, such as cheaper labor.

Agarwal (1980) describes a number of studies offering support for the product-cycle hypothesis. Those studies generally refer to U.S. FDI, although they also cover some German and U.K. FDI.

Despite those favorable results, the explanatory power of the product-cycle hypothesis has declined considerably because of changes in the international environment. Vernon (1979) has noted that, since U.S. multinational firms now have better knowledge of market demands all around the world, they no longer follow the typical geographical sequence of first setting up subsidiaries in the markets with which they are most familiar, such as in Canada and the United Kingdom, and then in less familiar areas, such as Asia and Africa. Therefore, the assumption that U.S. firms receive stimulus for the development of new products only from their home market is no longer tenable. Furthermore, since the income and technological gap between the United States and other industrial countries has declined, it is less defensible to assume that U.S. firms are exposed to a very different home environment from that faced by firms from other countries. Vernon (197) speculated that the hypothesis is likely to remain important in explaining FDI carried out by small firms and in developing countries.

Oligopolistic reaction hypothesis

Knickerbocker (1973) suggested that, in an oligopolistic environment, FDI by one firm would trigger similar investments by other leading firms in the industry to maintain their market shares. Using data from a large number of multinational firms, he calculated an entry concentration index for each industry, which showed the extent to which subsidiaries' entry dates were bunched in time. As indicated by Hufbauer (1975), the entry concentration index was positively correlated with the U.S. concentration index, implying that increased industrial concentration caused increased reaction by competitors to reduce the possibility of one rival gaining a significant cost or marketing advantage over the others. The entry concentration index was also positively correlated with market size, implying that the reaction was stronger the larger the market at stake. The entry concentration index was negatively correlated with the product diversity of the multinational firms and with their expenditure on research and development. This suggested that the reaction of firms was less intense if they had a variety of investment opportunities, or if their relative positions depended on technological considerations. Flowers (1976) also tested this hypothesis with data on FDI in the United States by Canadian and European firms. He found a significant positive correlation between the concentration of FDI in the United States and the industrial concentration in the source countries.

An implication of this hypothesis is that the process of FDI by multinational firms is self-limiting, since the invasion of each other's home market will increase competition and thus reduce the intensity of oligopolistic reaction (Agarwal, 1980). However, while FDI has increased competition in many industries, this has not resulted in a corresponding reduction in FDI.

This hypothesis has also been criticized for not recognizing that FDI is only one of several methods of servicing foreign markets. In addition, there is no explanation of the reason for the initial investment that starts the FDI process.

To examine the factors motivating the initial investment of multinational firms, Yu and Ito (1988) studied one oligopolistic and one competitive industry. Their results suggest that in an oligopolistic industry, FDI is motivated by the behavior of rivals, as well as host country-related and firm-related factors; in contrast, in more competitive industries, firms do not generally match their competitors' foreign direct investments. Consequently, the authors argued that firms in oligopolistic industries, besides considering their competitors' activities, make their FDI decisions on the basis of the same economic factors as firms in competitive industries.

Hypotheses on the Propensity to Invest

Agarwal (1980) examines two hypotheses: the liquidity and currency area hypotheses. The latter is covered in the section on exchange rates since it pertains to one of the explanatory variables considered in this paper.

Liquidity hypothesis

U.S multinational firms have traditionally committed only modest amounts of resources to their initial FDI, and subsequent expansions of their activities were carried out by reinvesting local profits. Therefore, it has been postulated that there is a positive relationship between internal cash flows and the investment outlays of subsidiaries of multinational firms. This relationship is said to arise because the cost of internal funds is lower than the cost of external funds.

Agarwal (1980) presented the results of empirical studies, which provided mixed support for this hypothesis. Some studies concluded that there was no evidence that the expansion of subsidiaries was financed only by their retained earnings. Internally generated funds seemed to be allocated between the parent and the subsidiaries to maximize the overall profits of the firm. However, other studies found that the most important sources of funds for the expansion of subsidiaries were undistributed profits and depreciation allowances, although the share of new investment thus financed varied from country to country. In other studies, liquidity-related variables were based on the accelerator theory of investment.

Some other studies, based on interview data, suggested that small and large international firms may behave differently, with subsidiaries of smaller firms being more dependent on internally generated funds to finance their expansion and therefore behaving more in agreement with the liquidity hypothesis. These studies also suggested that it is important to distinguish between the overall cash flow of the firm and the cash flow of the subsidiary, particularly when examining FDI in developing countries. Since new investment in developing countries is likely to be only one of many reinvestment opportunities open to the firm, the firm's overall cash flow may not be an important determinant in a particular country. Cash flows of the subsidiary, on the other hand, may be important, particularly in developing countries that place restrictions on repatriation of profits and capital.

Based on the results above, Agarwal (1980) concludes that the liquidity hypothesis has some empirical support. An expansion of FDI seems to be partly determined by the subsidiaries' internally generated funds. This factor may be especially relevant for investment in developing countries owing to their restrictions on movements of funds of foreign firms and the lower degree of development of their financial and capital markets.

Summary[11]

Agarwal concludes by noting that there is no unique widely accepted theory of foreign direct investment and that Dunning's eclectic approach may be the one offering a relatively complete picture of FDI decisions and determinants.

Calvet (1981)

This second approach follows from work by Calvet (1981) who proposed three stages into which to divide theories on FDI.

The first stage is associated with Hymer (1960) who linked FDI to the study of market imperfections in industrial organization, ending a period in which FDI had been associated with capital flows[12]. Kindleberger (1969) went on to provide the first comprehensive survey of the various theories along the lines suggested by Hymer. He argued that, within the framework of the perfectly competitive model of neoclassical economics, direct investment could not exist in a world of pure competition. The Hymer-Kindleberger school of thought emphasizes the monopolistic nature of FDI and deals with market imperfections –in either factor or goods markets- in the context of partial equilibrium. Kindleberger (1969) summarizes the thinking of this stage as follows:

> The nature of the monopolistic advantages which produce direct investment can be indicated under a variety of headings: (1) departures from perfect competition in goods markets, including product differentiation, special marketing skills, retail price maintenance, administered pricing, and so forth; (2) departures from perfect competition in factor markets, including the existence of patented or unavailable technology, of discrimination in access to capital, of differences in skills of managers organized into firms rather than hired in competitive markets; (3) internal and external economies of scale, the latter being taken advantage of by vertical integration; (4) government limitations on output or entry. (pp. 13-14)

The second stage started with Johnson (1970), who went beyond the Hymer-Kindleberger framework to investigate the efficiency and welfare implications of international transfers of knowledge; technological and managerial knowledge was considered a factor of production.

The discussion of FDI in the context of welfare economics shows how limited the monopolistic market imperfections perspective is. However, a major drawback is that welfare economics has little to say if prices are not taken as given, for then the resulting equilibrium need not be Pareto efficient[13]. Hymer also pointed to the fact that, to the extent that MNCs erode the effectiveness of government policies, they similarly prevent corrective action in situations where it is necessary to achieve social efficiency.

One contribution Johnson made was to divide economic theory into two approaches. One is the microeconomic approach of industrial organization theory, and the other is the general macroeconomic equilibrium approach of international trade theory. As will be seen below, Kojima and Ozawa (1984) also synthesize FDI theories as belonging either to the microeconomic approach -often called by the authors the international business approach- or to the macroeconomic approach.

The third stage began with authors such as McManus (1972), Magee (1976), Buckley and Casson (1976, 1981), Hennart (1982, 1986), Parry (1980, 1985), Rugman (1981, 1986), and McClintock (1988). In this stage, emphasis is placed on the theory of MNCs rather than on the theory of FDI itself. Various theories belong to this stage, among them the appropriability, the internalization, and the diversification theory.

The appropriability theory, best represented in the work of Magee (1976, 1981), combines the industrial organization approach to FDI and neoclassical ideas on the private appropriability of the returns from investments in information. This theory stresses that valuable information is generated by MNCs at five different stages: new product discovery, product development, creation of the production function, market creation, and appropriability[14].

The theory contends that because sophisticated technologies are less prone to be imitated than simple ones, MNCs are more successful in appropriating the returns from these technologies than from the simple ones. Moreover, sophisticated information is transferred more efficiently via internal channels than through the market. Because of these two factors, there is a built-in incentive in the economic system to generate the sophisticated information, to the detriment of users' needs. Magee further argues that production is information-saving, so that ultimately there is a decline in the production of new information.[15]

In other words, there is a technology cycle at the industry level; young industries are those in which information is being created at a fast pace, which in turn implies that the size of the firm expands because of the internalization of the information produced. As the industry matures, the amount of information being created is minimal, and optimum firm size diminishes accordingly. In terms of the international expansion of the firm, the assertion that optimum firm size declines after the innovation stage suggests that, after a certain point, licensing should increase relative to direct investment.

The appropriability theory predicts that products in Vernon's (1966, 1979) product cycle will move to stage II when developed countries start successful emulation of the product and to stage III when developing countries start successful emulation. The profit-maximizing price strategy an MNC should follow is to sell new products at below the monopoly price and slowly cut the price of the product as appropriability mechanisms erode. In the long run, the MNC will be forced to sell at the perfectly competitive price. If the MNC has no long-run profit advantage over the producers, its long-run market shares should approach zero as the perfectly competitive price is approached.

The internalization theory explains the existence of foreign direct investment as the result of firms replacing market transactions. This in turn is seen as a way of avoiding imperfections in the markets for intermediate inputs. The modern business sector carries out many activities apart from the routine production of goods and services. All these activities, including R&D, marketing, and training of labor, are interdependent and are related through flows of intermediate products, mostly in the form of knowledge and expertise (Buckley and Casson, 1976).

However, market imperfections make it difficult to price some types of intermediate products. This problem provides and incentive to bypass the market and keep the use of the technology within the firm. This situation produces an incentive for the creation of intrafirm markets. This theory is dealt with in a detail in the section describing Agarwal's (1980) literature review of FDI determinants.

The theory of diversification starts with the premise that there is no reason for firms to carry out diversification activities for their stockholders in perfect capital markets, since any desired diversification could be obtained directly by individual investors. Hence, the focus is on financial market imperfections. These encourage MNCs to internalize financial transactions across national boundaries.

Agmon and Lessard (1977) have argued that for international diversification to be carried out by corporations, two conditions must hold. First, barriers or costs to portfolio flows must exist that are greater than barriers or costs to foreign direct investment. Second, investors must recognize that multinational firms provide a diversification opportunity that is otherwise not available. The authors postulate a simple model in which the rate of return of a security is a function both of a domestic market factor and of a rest-of-the-world market factor. They tested the proposition that securities prices of firms with relatively large international operations were more closely related to the rest-of-the-world market factor and less to the domestic market factors than shares of firms that are essentially domestic. They obtained favorable results for a sample of data applied to U.S. firms. Although, as noted by Adler (1981) and Agmon and Lessard (1981), these results are consistent with the second condition they do not support a fully developed theoretical model.

Jacquillat and Solnik (1978) find that portfolios made up of MNCs' shares are poor substitutes for international portfolio diversification and that the extent of foreign influence on stock prices is very limited when compared to the extent of firms' foreign involvement.

Errunza and Senbet (1981) developed a framework in which both firms and investors face barriers to international capital flows: individual investors demand diversification services, and MNCs are able to supply those services. In equilibrium, individual investors accept lower expected returns on multinational stocks than on domestic stocks in order to obtain diversification benefits. The authors use a value-added, rather than a price-based, method to assess the effects of international operations in financial markets. Their results suggest that (1) a systematic relationship exists between the current degree of international involvement and excess market value, and (2) this relationship was stronger during the period characterized by barriers to capital flows in comparison with the period in which no substantial restrictions were in effect.[16]

These three theories of international production are important contributions towards explaining the propensity of firms to choose FDI over other alternatives. However, on the one hand, according to these theories MNCs take advantage of imperfections to augment their competitive advantages; on the other hand, MNCs facilitate the transfer of factors, goods, and services which otherwise would be handled inefficiently.

After classifying the various FDI theories into three stages, Calvet (1981) himself proposes four classes of market imperfections which can give rise to FDI.

Market Disequilibrium

This hypothesis suggests that FDI will occur when factor markets and foreign exchange markets are in disequilibrium and will last until the markets return to equilibrium. In factor markets, capital market imperfections and low factor costs in a country can increase the flow of FDI (Ragazzi, 1973), and the greater the ability of a country to develop new technologies, the higher will be its outflows of FDI. In exchange markets, if the foreign exchange rate does not reflect a currency's true value or if too much volatility of exchange rates is linked to a currency, FDI can increase or decrease (Kindleberger, 1969; Ragazzi, 1973; and Gruber et al., 1967). Once rates return to equilibrium, flows of FDI would cease; foreign investors would sell their foreign assets, realize the capital gains, and return to domestic operations.

Government-Imposed Distortions

Although this type of distortions could belong to the hypothesis above, there is a major difference between the two hypotheses in that there do not seem to be any equilibrating forces that correct the distortions imposed by governments. Tariffs and non-tariff barriers in the host countries can induce foreign firms to invest in local production facilities (Horst 1972, 1979; Yu, 1987). ***Ceteris paribus***, to increase trade, firms may establish a subsidiary inside the protected market rather than export to it.

Another significant government-imposed distortion is taxes. Incentive to invest abroad can originate in differences in tax laws among countries (Horst, 1979; Riedel, 1975; Cheng, 1986). If the host country's tax laws encourage expatriation of capital, the incentive to invest abroad will be even stronger.

Market-Structure Imperfections

This hypothesis refers to the deviation from purely market-determined prices brought about by monopolistic or oligopolistic characteristics. Caves (1971) considered the superior ability of foreigners to differentiate the products sold in foreign markets. MNCs have a special advantage in their ability to differentiate products and, by direct investment, can extract monopoly profits based on this ability. The oligopolists could use their economic profits to diversify at home, but reject that alternative and instead move abroad in the area of their expertise. However, Brown (1976) cites three major problems with Caves' theory. Firstly, the bulk of U.S. direct investment abroad -in the years prior to Caves' paper- has been financed out of foreign earnings, depreciation, and borrowing. Secondly, the protection of market position is far more important to most oligopolists than the return on any specific investment. Finally, firms that have surpluses of capital tend to be concerned with returns on investment and portfolio objectives, but not with market share.

Kindleberger's (1969) approach through monopolistic competition theory fits observed behavior better than does Caves'. The former author starts with the premise that foreign direct investment is not necessary to transfer abroad goods, capital, technology, know-how, or brand names. This is because there are efficient goods and capital markets, workable licensing systems for technology and brand names, and contractual arrangements for lending managerial skills. However, most firms deal only with wholly-owned affiliates. Kindleberger suggests that this situation results from the unique or monopolistic characteristics of the MNC. He reasons that the higher costs of doing business abroad call for higher returns on foreign investment than on domestic investment; this implies that the MNC must get higher returns than its national competitors both at home and abroad. Moreover, these higher returns can only be achieved and maintained by having an uncopiable asset. The problem is that unique elements can be sold through licensing. Accordingly, the reason suggested for not selling them must be to better exploit the monopolistic situation. As Kindleberger (1969, pp. 17-18) notes: "Where the license fee fails to capture the full rent inherent in technical superiority, the advantage lies in direct investment."

The main question with Kindleberger's analysis can be stated as follows: Why should it be difficult to collect the full rent of a monopolistic advantage through the market? An explanation for this question comes from the work of Coase (1937), which, as discussed above, helped develop the internalization theory of foreign direct investment.

Market Failure Imperfections

Market failure imperfections are characteristic in production and commodity properties which prevent a market mechanism from allocating resources efficiently. These types of imperfections have been explored in the literature by Johnson (1970) with respect to the public good nature of knowledge; by Rugman (1981, 1986) in terms of dissipating the firm's advantages by not using them internally; by Teece (1976, 1981, 1985) regarding the effective transfer of technologies to other firms; and by Magee (1976, 1981) and Magee and Young (1982) as to the appropriability of the return on a firm's new technologies. Market failure imperfections may explain why firms choose FDI as an entry mode.

Kojima and Ozawa (1984)

A third approach employed in studying FDI behavior is based on work by Kojima and Ozawa (1984). The authors classify the theories of FDI into two major strands: one is microeconomic-theoretic, the other macroeconomic-theoretic. The first type encompasses: the industrial organization theory (Hymer, 1976; Kindleberger, 1969; Caves, 1971); the product cycle theory (Vernon, 1966, 1979); the appropriability theory (Magee, 1976); the risk-diversification theory (Grubel, 1968; Agmon and Lessard, 1977; Rugman, 1980); the intermediate-market-internalization theory (Buckley and Casson, 1976; Casson, 1979; Rugman, 1980); and the eclectic theory (Dunning, 1977, 1981). The macroeconomic-theoretic approach includes the currency premium theory (Aliber, 1970); the development stage theory (Dunning, 1981); and the dynamic comparative advantage theory (Kojima, 1973, 1975).

However, according to Kojima and Ozawa (1984), these two approaches have neglected the issue of how multinational investment activities affect the national welfare of the home and host countries. To address this issue, the authors propose a model that incorporates both microeconomic and macroeconomic aspects, their aim being to discuss the compatibility of the social and private interests of FDI.

The model put forward is based on the Heckscher-Ohlin (H-O) factor-proportions theory. The H-O theory begins with two assumptions: (1) countries differ in their relative factor endowments; and (2) industries differ in their relative factor intensities. In its most basic form, the H-O theory considers a world with just two countries, two factors of production, and two goods. There is perfect competition and each industry employs the same constant returns to scale technology. This simple "2x2x2" model is further assumed to apply in a world where each country has uniquely defined and similar community preferences. Finally, the factors of production are freely mobile within countries but not between them, the supplies of factors to each country are uniquely given, and each country's isoquant map displays continuous limited substitutability between the factors. There is no joint production of goods.

Under these conditions, the H-O theory claims that: (1) the country will export that commodity which is relatively intensive in its relatively plentiful factor of production; and (2) free trade in goods is a substitute for inter-nation factor mobility because factor prices are equalized across countries.

Given this background, Kojima and Ozawa (1984) consider a special case of the factor endowment theory, namely the "E model". Under the assumption of identical factor proportions between two factors -capital (K) and labor (L)- and between two countries -countries A and B-, the authors argue that there is room for trade in manufactures so long as firm-generated advantages (industrial knowledge) are different between countries. This model is called the "entrepreneurial endowment" model (the E model).

Assuming two goods, X and Y, two countries, A and B, and full employment for both countries, the E model is presented as:

$$\bar{K}_A / \bar{L}_A = \bar{K}_B / \bar{L}_B \tag{1}$$

$$w_A / r_A = w_B / r_B \tag{2}$$

$$E_{yA} / E_{xA} > E_{yB} / E_{xB} \tag{3}$$

where $\bar{K}$ and $\bar{L}$ denote full employment of capital and labor, respectively; w/r is the ratio of wages to rentals; and E represents firm-generated advantages.

Assuming that the larger the size of E the higher the productivity and the smaller the production cost, C, then,

$$C_{yA} / C_{xA} < C_{yB} / C_{xB} \tag{4}$$

Thus, it follows that country A has a comparative advantage in good Y, while country B has a comparative advantage in good X. The basis of trade is determined solely by differences in relative entrepreneurial endowments. As the authors note (p. 3) this "particular case illustrates trade in high-technology manufactures among industrialized countries whose factor endowments (hence factor price ratios) are nearly identical", as also explained by Posner (1961) and Gray (1980).

To allow for differences in factor endowments –that is, by the original H-O conditions-, Kojima and Ozawa develop the H-O-E model with the following assumptions:

$$\bar{K}_A / \bar{L}_A > \bar{K}_B / \bar{L}_B \tag{5}$$

$$w_A / r_A > w_B / r_B \quad (6)$$

$$C_{yA} / C_{xA} < C_{yB} / C_{xB} \quad (7)$$

Again, country A has a comparative advantage in good Y, and country B in good X. Good X is labor intensive, while good Y is capital intensive. The assumptions above are graphically shown in such a way as to render: (1) industrial knowledge in both industries superior in country A relative to country B; and (2) efficiency in good Y inferior relative to good X in country B, in terms of the use of industrial knowledge.

Mathematically, the above situation is expressed as:

$$E_{xA} > E_{xB} \text{ and } E_{yA} > E_{yB} \quad (8)$$

$$(E_x / E_y)_A < (E_x / E_y)_B \quad (9)$$

To evaluate the welfare consequences of FDI within the framework of the H-O-E model, Kojima and Ozawa discuss two models: (1) the North-to-South model; and (2) the North-to-North model. The main assumption that is applied to both models is the transfer by multinationals of E-assets with capital and labor being internationally immobile.

North-to-South Model

Since the firms in country A have absolute advantages in both goods X and Y over their counterparts in country B, they will become multinational operating in country B. From this initial condition, the following four cases are derived in terms of their being trade-biased or anti-trade-biased.

Anti-trade-biased FDI

This extreme example –unlikely to occur, according to Kojima and Ozawa- is one where the entrepreneurial endowments are completely equalized between the two countries as a result of the transfer of superior E-assets from country A to country B through multinationals. This transfer of E factors improves the competitiveness of country B's comparatively disadvantaged good Y more than that of its comparatively advantaged good X, the result being anti-trade-biased, since such transfer reduces the strength of comparative advantage.

Both countries would be better off if country B received part of country B's increased output in payment for transferred E-assets (i.e. country A's multinationals are able to repatriate profits from country B). However, this complete transfer in both goods is not likely to happen for two major reasons. Firstly, "... country B's absorptive (or learning) capacity may not be sufficient, especially in good Y, in which that country has a much greater knowledge gap and of which that country initially produces none or only a negligibly small amount very inefficiently." (p. 5). And secondly, "... country B is likely to perform better in learning from country A technologies for good X, a labor-intensive good, in which country B has a much smaller technology gap and a comparative advantage (hence more accumulated experience and an established industrial base that assist country B in absorbing advanced knowledge from country A)." (p. 6).

Pro-trade-biased FDI

As a result of the impediments mentioned above, the likely outcome of country A's transfer of E-assets to country B's industries is a greater efficiency improvement for country B's good X than for good Y. This leads to FDI and trade being complements rather than substitutes.

Ultra-pro-trade-biased FDI

From the viewpoint of trade expansion and welfare maximization, a most desirable case would be one where country A invests only in country B's X industry. In this case, world welfare would be maximized according to two propositions put forward by Kojima and Ozawa (1984, p. 6):

> Proposition 1: Countries gain from trade and maximize their economic welfare when they export comparatively advantaged goods and import comparatively disadvantaged goods.
> Proposition 2: Countries gain even more from expanded trade when superior entrepreneurial endowments are transferred through multinational corporations from the home countries' comparatively disadvantaged industries in such a way as to improve the efficiency of comparatively advantaged industries in the host countries.

Country B's welfare is improved through two complementary effects. One is the efficiency improvement effect, whereby country A's transfer of E-assets to country B's X industry leads to the greater absorption/learning capacity relative to industry Y. This leads to the trade gain effect that results from the strengthening of country B's comparative advantage in good X.

Country A's welfare is also improved as a result of the reallocative efficiency effect and the expanded trade effect brought about by an improvement in the terms of trade in favor of good Y.

However, there is the possibility of ultra-pro-trade-biased FDI resulting in the Bhagwatian immiserizing growth. In a famous paper, Bhagwati (1958) showed, within a rigorously specified economic model, that export-biased growth would worsen a country's terms of trade so much that the country would be worse off than if it had not grown at all. Thus, the change in country B's terms of trade must be large enough to offset the initial favorable effects of an increase in country B's productive capacity for good X. Growth is likeliest to be immiserizing when technical change is confined to a country's export industry and foreign demand is inelastic.[17]

Ultra-anti-trade-biased FDI

This case occurs when E-assets are transferred only for good Y, in which country B has a comparative disadvantage. The transfer into the good Y sector reduces the basis for trade. Under these circumstances, country B's welfare components, the efficiency improvement effect and the trade effect, become substitutes. Country A's welfare declines with a contraction of trade and, possibly, unemployment rises in the good Y sector as a result of the export-replacing nature of FDI.

North-to North Model

Trade and investment patterns in this model are based on differences in H-O factors. The assumptions of this model are: (1) identical factor endowments for two advanced economies, A and B; and (2) country A's E-assets superior in good Y and country B's E-assets superior in good X.

Thus, trade is created only by the difference in the E-assets proportions of the two countries. Both countries produce both goods, but country A exports good Y while country B exports good X.

The authors further assume that country A specializes completely in good Y and country B in good X "...as a result of dynamic economies of scale (economies that derive from learning-by-doing, qualitative improvements in productive facilities, and reduced procurement costs of inputs."(p. 14).

This ideal type of mutual specialization can be achieved in two ways. Firstly, specialization may be automatically promoted as the further result of the initial possession of superior E-assets. And secondly, it may be promoted through trade-augmenting FDI, whereby country A invests in the good-X sector of country B, which in turn invests in the good-Y sector of country A. Therefore, each country makes an overseas investment in its comparatively disadvantaged sector; FDI complements trade.

Summary and Further Comments

Kojima and Ozawa (1984) and Kojima (1973, 1975, 1985) have been primarily concerned about explaining the differences in the patterns of U.S. and Japanese foreign direct investment in developing countries and the consequences of those differences for the expansion of international trade and world welfare. In these studies, FDI was viewed as providing a means of transferring capital, technology, and managerial skills from the source country to the host country. However, FDI was classified as being either trade-oriented or anti-trade-oriented. FDI is trade-oriented if it generates an excess demand for imports and an excess supply of exports at the original terms of trade. The opposite occurs if FDI is anti-trade-oriented.

The studies have also proposed that trade-oriented FDI was welfare-improving in both source and host countries, while anti-trade-oriented FDI was welfare-reducing. Since trade-oriented FDI implied investment in industries in which the source country has a comparative disadvantage, it would accelerate trade between the two nations and promote a beneficial industrial restructuring in both countries. In contrast, anti-trade-oriented FDI would imply investment in industries in which the source country has a comparative advantage. In this case, international trade would be reduced, and industry would be restructured in a direction opposite to that recommended by comparative advantage considerations. This would reduce welfare in both countries, creating balance of payment problems, the export of jobs, and incentives for trade protectionism in the source country.

It was also argued that Japanese FDI has been trade-oriented, while U.S. FDI has been anti-trade-oriented. This is because Japanese FDI was mainly directed toward development of natural resources in which Japan has a comparative disadvantage, and toward some manufacturing sectors in which Japan had been losing its comparative advantage. Japanese investment was also viewed as being more export-oriented, occurring in less sophisticated industries with smaller firms being more labor intensive, and with a higher share of local ownership. In contrast, it was suggested that the United States has transferred abroad those industries in which it had a comparative advantage. The reason for this was found in the dualistic structure of the U.S. economy, with a group of innovative and oligopolistic new industries coexisting alongside a group of traditional price-competitive stagnant industries. Only the innovative and oligopolistic industries undertook FDI, since their rate of return on foreign investment was higher owing to their oligopolistic advantages. Since these were the industries in which the United States had a comparative advantage, such foreign direct investment was anti-trade-oriented.

Therefore, the studies concluded that while U.S. FDI was rational from the point of view of private interests, it was damaging to national welfare and economic development. Consequently, some policies were needed to rectify these investments. The policies could potentially involve selecting the types of industries in which FDI would be allowed, requiring the use of licensing arrangements instead of FDI, allowing only joint ventures with local capital instead of wholly-owned subsidiaries, and requiring a progressive transfer of ownership to local residents. These proposed modifications in investment behavior would, according to the studies, be consistent with comparative advantage and would result in a higher level of international welfare.

This hypothesis has been evaluated at two levels. At the empirical level, there is the issue of whether significant differences exist in the patterns of U.S. and Japanese foreign direct investment as implied by the hypothesis. However, the evidence is not conclusive. While favorable evidence was presented in Kojima (1985) for investment in a group of Asian developing countries, Lee's (1983) analysis of the Korean experience, and Chou's (1988) discussion of Taiwan Province of China yielded mixed results. Furthermore, Mason (1980) argued that the existing differences in the pattern of foreign direct investment mainly reflected different stages in the evolution of U.S. and Japanese multinational companies.

At the theoretical level, there is the issue of whether the neoclassical framework adopted is appropriate for studying foreign direct investment. According to Dunning (1988a), the approach can neither explain nor evaluate the welfare implications of foreign direct investment prompted by the desire to rationalize international production, since it ignores the essential characteristic of foreign direct investment, namely, the internalization of intermediate product markets. The neoclassical framework of perfect competition does not allow for the possibility of market failure. Furthermore, Lee (1984) argued that Kojima and Ozawa have not succeeded in establishing a plausible microeconomic basis for their theory.

Boddewyn (1985)

According to Boddewyn, the various theories of foreign direct investment can be classified into one or more of three types of categories. These three explanatory types are defined as follows:

> 1. ***Condition***, that is, something essential to the existence or occurrence of something else; a prerequisite.
> 2. ***Motivation***, that is, an inner drive, impulse, intention, incentive, goal, etc. that causes a person to do something or act in a certain way.
> 3. ***Precipitating circumstance***, that is, a hastening element that causes something to happen before [it is] expected, needed or desired. (pp. 57-58)

The author relates each of these explanatory categories to terms used by the philosopher Aristotle. Thus, condition is what Aristotle called a "necessary antecedent"; motivation is related to his "final cause"; and precipitating circumstance is related to his "efficient cause".

Given this background, Boddewyn analyses both foreign investment theories and foreign divestment theories in terms of the three explanatory categories.

Foreign Investment Theory

The author's analysis relies mainly on Grosse's (1981) review of FDI theories, as shown in Table 9. Boddewyn contends that most of the theories stress factors that are really conditions –necessary but not sufficient- to explain foreign direct investment. These various theories, wholly or partly, emphasize that the relevant companies, industries and/or countries must possess significant specific advantages without which foreign direct investment cannot take place.

In terms of motivations, there are those theories that stress perceived profitability as a motivator for firms to invest abroad. Firms do so either by minimizing profit risk (Investment Theory (b)), by capitalizing on their growth potential through internalization (Theory of the Firm), or by extracting a monopoly rent (Industrial Organization Theory).

With regard to precipitating circumstances, economic theories do not explicitly take into account this explanatory category. However, there are some elements of precipitating circumstances that can be found both in economic and in non-economic theories. Boddewyn highlights three major traits in these theories. Firstly, most condition-based theories include references to changes in some factors, particularly on the part of host governments. Secondly, overseas investment can be precipitated by competitors moving or, having moved, abroad. Thirdly, foreign investments can result from the endeavors of brokers/intermediaries who bring them to the attention of a potential investor.

Table 9

Boddewyn's Five Views of Foreign Direct Investment

(1) International Trade theory

(a) Comparative cost view: emphasizes supply-side conditions; usually focuses on commercial-policy constraints to exports and FDI (which are usually substitutes); usually emphasizes production costs rather than distribution costs; frequently has a macroeconomic orientation.

(b) Product-life-cycle view: a descriptive "stage" theory which considers both supply and demand explicitly; emphasizes the roles of technology and marketing in describing the sequence of FDI in different products into different countries.

(2) Location Theory: similar to trade theory in orientation toward the supply side and cost conditions; emphasizes transportation costs rather than commercial policy; often resource availability is a central variable in the analysis.

(3) Investment Theory

(a) Imperfect capital markets view: one position is that an undervalued exchange rate (which allows production costs in the country to remain below those of other countries) attracts FDI if foreign firms also have a technological advantage over local firms; another position is that long-term investment in LDCs will often be FDI rather than purchase of securities because no organized securities market exists; a third position is that lack of knowledge about host-country securities favors FDI instead because FDI allows control of host-country assets.

(b) Portfolio-of-FDI view: similar to portfolio approach in securities analysis, except that risk is diversified across national economies; emphasizes risk reduction from commercial and exchange-rate changes.

(4) Theory of the Firm: Assumes imperfect information, and presents managerial models of firm behavior; descriptive, often historical view; emphasizes the individual firm rather than the country; takes a microeconomic perspective; includes the "internalization" view.

(5) Industrial Organization Theory: focuses on market imperfections that created oligopolies; emphasizes company-specific advantages such as technology and management know-how; explores inter-industry differences in FDI; attempts to show why FDI is used to exploit company-specific advantages.

Source: Boddewyn (1985, p. 59)

Foreign Divestment Theories

Regarding foreign divestment (FD) conditions, the author mentions his previous study (Boddewyn (1983)) which uses Dunning's (1979, 1980) eclectic approach to develop a theory of foreign divestment by reversing the conditions exposed by the latter author. According to this reverse theory:

> ... foreign direct divestment takes place whenever a firm: (1) ceases to possess net competitive advantages over firms of other nationalities; (2) or, even if it retains net competitive advantages, it no longer finds it beneficial to use them itself rather than sell or rent them to foreign firms -that is, the firm no longer considers it profitable to "internalize" these advantages; (3) or the firm no longer finds it profitable to utilize its internalized net competitive advantage outside its home country -that is, it is now more advantageous to serve foreign markets by exports and the home market by home production, or to abandon foreign and/or home markets altogether. (Boddewyn, 1985, p. 61)

In terms of motivations, Boddewyn explains foreign divestment as resulting from the non-achievement of certain objectives and/or the consideration of better strategic alternatives to the achievement of such goals.

FD-precipitating circumstances can be either internal or external to the firm. The former type stresses as a necessary trigger the decision to divest. The latter type includes triggers such as the sudden appearance of brokers, the threat of burdensome regulations and competitors' moves.

Table 10 provides some examples of divestment studies cited by Boddewyn (1985). Although Boddewyn's perspective is simple, it contains a few major caveats. First, the categories suggested by the author are rather general and overlapping. Second, while in principle all three elements are necessary but not sufficient individually, one of them can reach such intensity that it can lead to direct investment, independently of whether the other two factors are absent or weak. Finally, Boddewyn's taxonomy lacks, to some extent, a dynamic explanation of foreign investment and divestment.

Table 10

Boddewyn's Examples of Divestment Studies

Condition-based theories	**Motivation-based theories**	**Precipitating-circumstances-based theories**
Porter (1976) and Wilson (1980) • "barriers to exit" are low enough Spanhel and Boddewyn (1982); Boddewyn (1983) • the decision-making structure and process must be conductive to making foreign-divestment decisions which are easier to make than domestic ones anyway Boddewyn (1979b) • U.S. firms around the world as well as foreign firms operating in the United States find it easier to divest than European firms operating in Europe on account of various cultural, legal and other circumstances	Boddewyn (1979a) • Divestment helps improve profits and achieve better strategic fit	"Reverse" Dunning (1979) and Rugman (1981) • loss of net competitive advantages • internalization of advantages is no longer advantageous • internalization through foreign production is no longer advantageous Torneden (1975) and Boddewyn (1983) • a "new man" helps decide the "unthinkable" • a buyer becomes available • regulation abroad is threatening • competitor's moves change the stakes involved

Source: Boddewyn (1985), p. 62.

Grosse and Behrman (1992)

A final approach to categorizing FDI theories is proposed by the authors above. They consider eight theories, each of which is described as a function of: (1) the functional base they come from; and (2) the key issues they seek to explain. Table 11 reproduces the characteristics of present theories according to Grosse and Behrman. They concluded that none of the theories is an explanation of the distribution of costs and benefits between firms and governments and "...any theory of international business must be a theory of policies and activities of business and governments, in conflict and cooperation." (p. 94). It is argued that the present theories are only explanations of production and income-generation, and that "...a theory of international business should explain how the issues of government concerned with TNC activities are defined, how they are negotiated, what trade-offs are involved, how differences are resolved, what adjustments are made over time and why." (p. 97).

Hence, Grosse and Behrman proceed to provide a concise and testable theoretical structure within the framework of bargaining theory. Of the many actors that are relevant to policy-making, TNCs constitute a particularly significant group. In turn, governments are crucial in affecting company strategies, since they set the rules of the game.[18]

This "...bargaining relationship will lead to outcomes based on the efforts of the two sides to achieve their own goals, constrained by their own limited resources, on their interdependence and on their relationships with other relevant groups." (p. 100).

Table 11
Characteristics of Present Theories

Theory	Functional base(s)	Key issues explained	Examples
International product cycle	Economics and marketing	FDI and trade flows; importance of technology on IB; importance of market conditions	Vernon (1966) Wells (1972) Vernon (1979)
Monopolistic competition	Economics	Reasons for TNC competitiveness and strategies	Hymer (1976) Caves (1971) Kindleberger (1969) Grosse (1985)
Internalization	Economics	Company expansion, including across national barriers	Buckley and Casson (1976) Rugman (1981)
Transaction Costs	Economics	Structure and functioning of corporate hierarchies	Teece (1976, 1986) Hennart (1982) Casson (1983)
Competitive advantages	Business strategy	Reasons for the ability of TNCs to compete; industry competitiveness	Caves (1971) Kogut (1985) Ghoshal (1987) Porter (1990)
Eclectic theory	Economics	Same as items 3 and 5 combined	Dunning (1977, 1988a)
National market arbitrage	Finance	National market segmentation; direction of FDI flows; international banking activities	Aliber (1970)
Bargaining theory	Political science; business strategy firms and governments	Dealings with governments of home and host countries; distribution of costs and benefits between firms and governments	Vernon (1971) Moran (1974, 1985) Gladwin and Walter (1980) Fayerweather (1969) Robinson (1964)

Source: Grosse and Behrman (1992, p. 113)

The authors suggest three dimensions that influence the outcome of bargaining situations between a company and a government. The first dimension includes the relative resources available to each party in the bargaining process: on the government side, mainly the host-country market or the host-country factors of production; on the TNC side, assistance in raising host-country income and employment; improvement of the host-country's balance of payments; and/or assistance in achieving the government's non-economic goals. Table 12 shows a list of these major bargaining resources of TNCs and governments of host countries.

The second dimension is the relative importance of the situation to each of the parties. As Gladwin and Walter (1980) noted, the relative stakes that each party holds in a given situation affect the bargaining outcomes just as do the relative resources of each. Table 13 lists some of the more important relative stakes of TNCs and governments of host countries.

The third dimension is the degree of similarity of interests between the foreign firm and the government of the host country. The more convergent the goals of a TNC and the host-country government, the less the need for the government to constrain TNC activities. Table 14 summarizes the strategies for improving bargaining advantages.

Table 12

Bargaining Resources of TNCs and Governments of Host Countries.

Transnational corporations offer	Governments of host countries offer
1. Assistance in improving host country internal balance (e.g., income, employment) • Proprietary technology • Access to funds for investing in the host country • Managerial/marketing skills	1. Control over access to the host country market • Control over access to the market in general • Ability to offer an important market to TNCs when the government itself is a customer
2. Assistance in improving host country external balance •Access to low-cost inputs from abroad •Access to foreign markets for exports •Replacement of imports through local production	2. Control over access to factors of production •Natural resources, such as minerals and metals, farmland, forests and fisheries •Low-cost production inputs such as labor •Funding and investing opportunities in local financial markets
3. Assistance in achieving host-country non-economic goals • Coopting pressure groups by providing jobs and other benefits •Local presence of TNC aids the government of the host country in dealing with the firm's home government	

Source: Grosse and Behrman (1992, p. 102).

Table 13

Relative Stakes of TNCs and Governments of Host Countries.

Factors contributing to the stakes of the firm	Factors contributing to the stakes of the government
Availability of other markets to replace the one in question	Availability of other firms to replace the one in question
Availability of other sources of supply to replace this country	Importance of the situation to the government's interests
Importance of this negotiation in the firm's dealings with the given country	Importance of this negotiation in the government's dealings with the given firm
Relationship of the business in this country to the firm's total global business	Relationship of this situation to the country's overall interests

Source: Grosse and Behrman (1992, p. 103).

The other two dimensions are considered relevant but have less significance than the three cited above. One of the two dimensions is the ability of TNCs and governments to form coalitions with similar actors to strengthen their positions. Governments can do so through regional institutions or United Nations agencies. TNCs can strengthen their positions by setting precedents in bargains completed with other governments, and they can form strategic alliances with other firms to reduce the government's alternatives in a given situation. The second dimension is the history of relations between the given firm and the government; more positive previous dealings are likely to lead to more positive current outcomes.

Table 14

Strategies for Improving Bargaining Advantages

Bargaining resources
•Form a strategic alliance with a firm that possesses a desired resource (e.g., technology, local ownership in the host country, foreign distribution network).
•Acquire a desired resource through a purchase or contracting arrangement
Relative stakes
•Diversify business to activities outside of the control of the government of the host country
•Establish multiple sites in different countries for the given business, so that the firm is not "hostage" to any one of them.
•Share the business venture with a local firm, such that the firm can push the government to offer favorable treatment.
•Form a strategic alliance with other firms that might offer the government of the host country an alternative, thus raising the government's stakes in the bargain.
Similarity of interests
•Retreat from initial bargaining position to offer more benefits (as seen by the government) to the host country.
•Involve the government of the host country in the business venture (e.g., through a state-owned company) such that interests become mutual in the venture.
•Structure activities of the venture (such as profit remittances, financing, importing of inputs, training) to meet key concerns of the government.

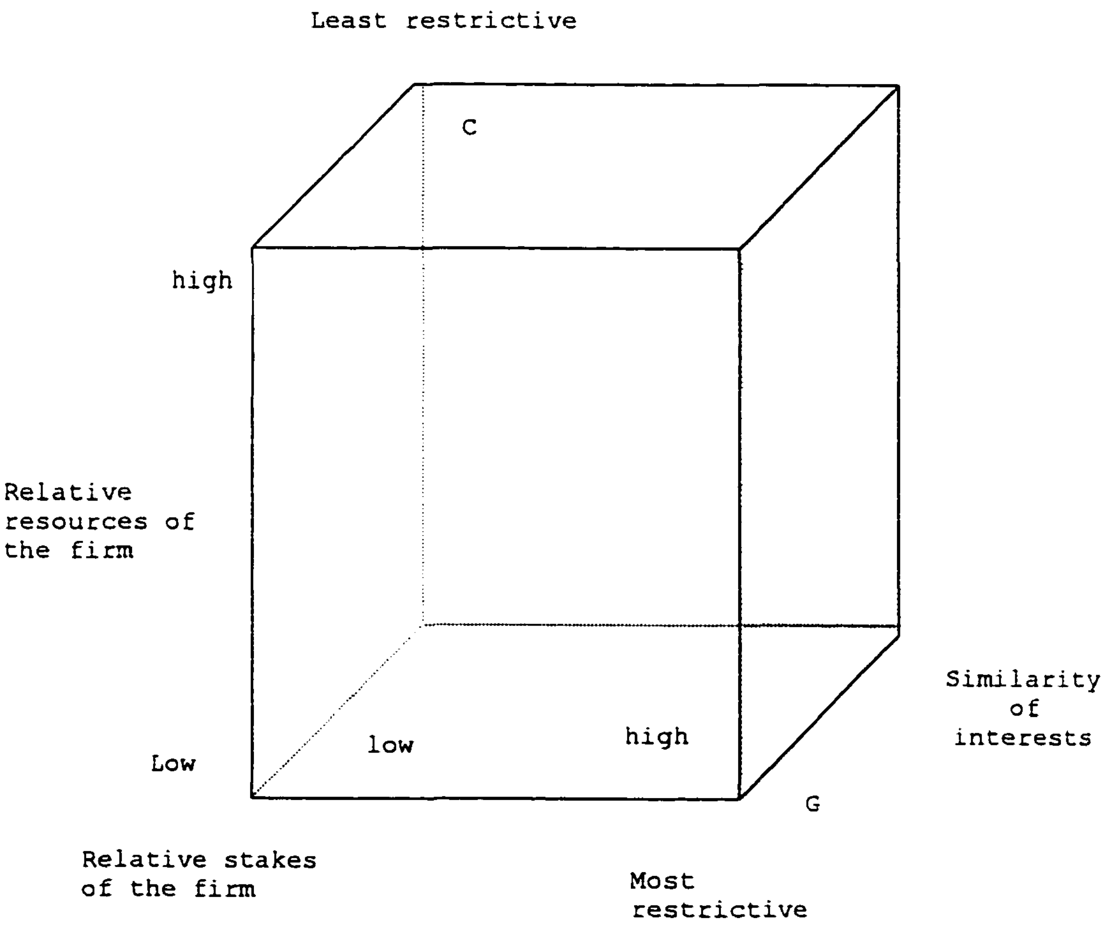
Source: Grosse and Behrman (1992, p. 104).

The three main dimensions are shown graphically in Figure 5. The bargaining relationship is more likely to lead to a cooperative treatment of a TNC by a government when the situation falls near point C in the figure, whereas the relationship is likely to be more conflictive when the situation falls near point G.

Grosse and Behrman (1992, p. 105) encourage the use of their bargaining model as follows:

> By examining international business problems, such as the management of government relations, country risk assessment, exchange risk management and response to trade policies, through a bargaining approach, both company managers and government policy makers can better understand their own strengths and weaknesses and the likely reactions of the other bargaining party.

Figure 5
Bargaining Relationship Between Transnational Corporations and Governments of Host Countries.



Source: Grosse and Behrman (1992, p. 105).

Non-Political Determinants of FDI

Companies, most of the time MNCs, tend to invest in a country because of some advantage of doing business there. It may be natural resources, cheap labor, geographical location, or other factors. Two types of determinants are usually thought to affect FDI decision-making: economic and political. Although in this study the emphasis will be on the latter, the economic dimension will be briefly considered: as shown below, political risk can arise from economic factors.

Output and Market Size

The output hypothesis assumes a positive relationship between FDI and output (usually sales) in the host country; it applies at the micro level. The market size hypothesis considers FDI to be a function of output or sales, proxied by the size of the market (usually GDP or GNP) of the host country; it applies at the macro level. The rationales for these hypotheses are the following: (1) as domestic sales increase so does investment by firms (output hypothesis); (2) as GDP in a country rises so does domestic investment (market size hypothesis).

Most of the research supports the dependent relation of FDI to the output of the foreign subsidiary and/or the market size of the host country. Goldberg (1972) stated that U.S. FDI in EEC countries could be explained by growth of the market. Reuber (1973) found that flows of FDI per capita into LDCs correlate with their GDP but not with GDP growth. Schollhammer and Nigh (1984, 1986), Nigh (1985), and Tallman (1988) concluded that market size and growth variables have a positive effect on FDI.

The Exchange Rate

The exchange-rate hypothesis can be divided into two strands depending on whether FDI is impacted by the level of the exchange rate or by the risk of changes in the exchange rate.

Exchange Rate Risk

This hypothesis, first put forward by Aliber (1970, 1971), assumes that the pattern of FDI can be explained in terms of the existence of different currency areas. He argues that when there is a risk of change in the exchange rate the firms of the strong-currency area are at an advantage and are stimulated to invest in the weak-currency area. This is due to the following situation: FDI reflects the fact that the firm in the source country capitalizes the same income stream of expected earnings (that of the host-country firm) at a higher rate than does the host-country firm. When a change in the exchange rate is expected, capitalization rates on equities, as well as on debt issues, are lower –that is, interest and profit rates are higher- in the weak-currency area. Under perfect market conditions, there would be no incentive for FDI, because the exchange risk would offset the lower capitalization rate applied to the income stream of the weak-currency firm. However, Aliber argues that the market for equities is biased, in that it does not attach a currency premium to the foreign income of the source-country firm. Thus, the latter may issue equities in its market –at a higher capitalization rate- and buy the host-country firm, whose income stream is capitalized by the market at a lower rate owing to the exchange risk.

There are, however, three major flaws in Aliber's argument. First, it is not clear why the existence of a currency premium should cause the interest and profit differential to exceed the expected change in the exchange rate. Second, there is no reason why the market should capitalize the additional income to the source-country firm, deriving from the acquisition of the host-country firm, without discounting it for the exchange risk. Finally, if the market does not attach a currency premium to the foreign income of the source-country firm, it also should not attach a currency premium to the foreign liabilities of the host-country firm; the latter could then increase its income stream by borrowing at lower rates in the strong-currency area, and thus offset any advantage that the foreign firm might have.

Kohlhagen's (1977) study of major exchange rate realignments of the currencies of the U.K., France and Germany during the 1960s showed that currency devaluations increase the relative profitability of domestic production vis-à-vis foreign production and thus induce the inflow of FDI into the devaluing countries. Thus, a domestic firm expecting a foreign currency devaluation would defer direct investment until after the devaluation, when it would be more profitable relative to exporting.

Itagaki (1981) constructed a model involving both domestic and foreign production as well as intra-firm transfers of goods and royalty payments. This model suggests either positive or negative foreign currency exposure. If positive, exchange risk reduces foreign production and domestic exports, while if negative, the effects are reversed. Itagaki also notes that an expected devaluation of the home currency always increases the incentive for foreign production and sale of final goods.

Cushman (1985) tested for risk and expectational effects on FDI using bilateral flows from the United States to the United Kingdom, France, Germany, Canada, and Japan for the years 1963 through 1978. He considered a two-period world in which the firm maximizes the certainty equivalent of future real profits expressed in the domestic currency. He examined four cases in which the firm (1) produces and sells output abroad using foreign inputs, (2) produces and sells abroad with inputs imported from home, (3) produces and sells at home with imported foreign inputs, and (4) produces at home and abroad for foreign sale. The model includes terms for both the real exchange rate level and the firm's subjective estimate of the risk-adjusted expected change in the real exchange rate. The results show significant reductions in U.S. FDI associated with increases in the current real value of the foreign exchange, and very strong, highly significant reductions associated with the expected appreciation of the real foreign currency.

Cushman (1988), compared to Cushman (1985), uses an additional measure of exchange rate risk and an improved expectations variable. The data covers the same set of countries but runs through 1986 rather than 1978. Consistent with his previous findings, Cushman reports that expected appreciation –as well as high levels- of the dollar are associated with reductions in U.S. FDI inflows from the five countries considered. Increases in risk are significantly associated with increases in these inflows.

Campa (1993) tested the effects that real exchange rate fluctuations had on foreign direct investment into the United States during the 1980s. His study was based on Dixit's (1989a, 1989b) application of the theory of option pricing to analyze investment decisions (Pindyck, 1988). Dixit assumed that at each point in time, a firm has the option to enter (exit) a market or to wait one period and then decide. As the exchange rate becomes more volatile, firms will tend to wait longer, widening the exchange rate interval in which neither entry nor exit occurs. Likewise, a higher level of uncertainty will deter entry in the presence of risk-neutral firms. Campa applied this theory to 61

U.S. wholesale trade industries for the period 1981 to 1987. The results show that for risk-neutral firms, uncertainty about the future exchange rate significantly deters entry. This is because firms would rather wait until they get more information about the behavior of the exchange rate and then decide whether to enter or to keep waiting.

Exchange Rate Level

This hypothesis is based on the casual empiricism that overvaluation of a currency is associated with outflows of FDI and undervaluation with inflows of FDI. A currency is undervalued when, at the current exchange rate, production costs for tradable goods in the country are, on average, lower than in other countries. The undervaluation of the currency represents an incentive for the location of internationally traded commodities in the country. This alone could not explain FDI, since local producers are supposedly more efficient than affiliates of foreign firms. However, if both certain local firms and certain foreign firms have some technological advantage over their competitors, the undervaluation of the currency may play an important role, in that it stimulates foreign firms to exploit their advantage through FDI in the country where they may benefit from lower production costs, whereas local firms have no incentive to produce outside their own country. In summary, if the exchange rate does not equalize production costs among different countries, there is a potential incentive for FDI to flow to a country with an undervalued currency.

It is also worth pointing out that the impact of exchange rates on FDI depends, to a large extent, on whether or not trade and FDI are substitutes. If trade and FDI are substitutes, then a domestic firm may sell abroad goods in country *k*, either produced within the domestic country or produced in host country *k*. In this case, a low value of country *k*'s currency will make domestic goods expensive in host country *k*, thus discouraging trade and encouraging domestic firms to conduct FDI in country *k*. On the other hand, if the goods produced by domestic subsidiaries abroad use imported inputs, then a low value of host country *k*'s currency will discourage domestic firms investing in country *k*.

Scaperlanda (1974) found that the depreciation of the Canadian dollar vis-à-vis the U.S. dollar had a negative effect on the flow of U.S. FDI in Canada. However, the majority of the studies have concluded that devaluation encourages inflows of FDI and discourages outflows of FDI.

Boatwright and Renton's (1975) study on inward and outward FDI of the U.K. indicated that the depreciation of the pound sterling raised the value of FDI in the U.K., but also raised UK's FDI abroad instead of reducing it.

Logue and Willet (1977), in their analysis of U.S. data on FDI for the period 1967 through 1973, found that the devaluation of the U.S. dollar discouraged the outflow and encouraged the inflow of FDI into the country.

Stevens (1977) found a negative relationship if a firm sold abroad goods either produced domestically or by a foreign subsidiary (exports versus FDI), but a positive relationship if the foreign-produced goods utilized imported intermediate goods.

Caves (1988) argued that exchange rates have an impact on FDI inflows through two channels. First, changes in the real exchange rate modify the attractiveness of foreign investment in the United States by changing a firm's real costs and revenues. The net effect on FDI is ambiguous, depending on certain characteristics of the firm's activity, such as the share of imported inputs in total costs and the share of output that is exported. The second channel is associated with expected short-run exchange rate movements. A depreciation that is expected to be reversed will encourage FDI inflows to obtain a capital gain when the domestic currency appreciates.

Caves studied the behavior of FDI inflows into the United States using panel data from several source countries. The results showed a significant negative correlation between the level of the exchange rate, both nominal and real, and inflows of FDI. Despite these empirical results, the theory cannot satisfactorily explain why foreign residents would have an advantage over domestic residents at bidding for a given firm; nor is it clear why expected changes in the exchange rate would lead to direct investment inflows instead of portfolio inflows.

Froot and Stein (1989) argued that a low real value of the domestic currency may be associated with FDI inflows owing to informational imperfections in the capital market that cause firms' external financing to be more expensive than their internal financing. Since the availability of internal funds depends on the level of net worth, a real depreciation of the domestic currency that lowers the wealth of domestic residents and raises that of foreign residents can lead to foreign acquisition of some domestic assets.

Their analysis of U.S. data indicates that FDI inflows into the United States are negatively correlated with the real value of the dollar. Moreover, other types of capital inflows have not shown a similar negative correlation, so that this relationship is a distinctive characteristic of FDI, as expected from the theory. However, this negative correlation between FDI inflows and the real value of currency was not evident in three out of the other four countries examined.

Dewenter (1995) reports that a depreciating U.S. dollar is associated with higher levels of foreign acquisitions into the United States. The results also show that the exchange rate relationship with absolute foreign investment flows exists for exchange rate levels and changes at lags of 3 to 4 quarters, suggesting that both long- and short-run PPP (purchasing power parity) deviations play a role in the foreign investment process. These findings are consistent with those of Cushman (1985).

Summary and Summary (1995) found exchange rates to have a significant negative impact on U.S. FDI to 54 developing countries from 1978 through 1986. This finding is consistent with the argument that U.S. FDI and trade are substitutes in developing countries.

Grosse and Trevino (1996) also reported exchange rates negatively affecting FDI flows to the United States from various sourcing countries, for the period 1980-1991.

Labor Costs

Theoretically, labor costs in both source and host countries could be important determinants of FDI flows. In the literature, it is generally believed that FDI will flow from high labor cost to low labor cost areas. However, in those studies, explicit theoretical models have not been formulated.

Based on Cushman (1987), labor costs can significantly affect FDI flows in various ways. If the foreign real wage rises, foreign labor usage falls which lowers foreign capital's productivity and the demand for foreign capital falls. However, if constant returns to scale are assumed, a rise in the foreign real wage leads to a fall in foreign output, so output price rises, offsetting the fall in capital's productivity, and the demand for foreign capital may also rise (foreign capital-labor substitution effect).

If the home country real wage rises, domestic production and hence the volume of exports falls, tending to raise the price of foreign output. This increases the demand for foreign capital. However, if one assumes that a domestic firm has some monopsony power in financial markets at home, then the home cost of borrowing becomes a rising function of domestic capital and foreign capital. Therefore, if a rise in the home country real wage causes a fall in domestic capital, then the corresponding fall in the home cost of borrowing can, if the home substitution effect is strong, lead to an increase in the demand for domestic capital and a fall in the demand for foreign capital.

To summarize, a rise in the foreign wage discourages FDI unless the foreign capital-labor substitution effect is strong. A rise in the home wage encourages FDI unless the substitution effect between domestic labor and capital is strong. To the extent that domestic and foreign production substitute for each other, the positive association between the home wage and FDI is reinforced.

Caves (1974), in a cross-sectional study of industries in Canada and the U.K., finds that the proportion of sales by foreign-owned firms seems to be associated with low relative labor costs in these two host countries, but the coefficients are not significant.

Riedel (1975) found a strong negative association between wages in Taiwan and FDI into that country.

Similarly, Little (1978) reported a significant negative relationship between wage levels and the location of FDI by foreigners within the United States based on cross-sectional data.

Agarwal (1978) shows a significant positive correlation between German FDI and relative wage cost in Brazil, India, Iran, Israel, Mexico, and Nigeria. Relative wage cost in the study is given by the share of wages and salaries in value added per employee in Germany, divided by the corresponding quotient in the host countries (cited in Agarwal 1980).

Juhl (1979) also found similar results at the sectoral level for German FDI in South American countries.

Dunning (1980), analyzing the proportion of output produced by U.S. affiliates in seven foreign countries, reports a negative impact from a high relative U.S. wage, and a positive impact from a high host-country wage.

Kravis and Lipsey (1982), using cross-sectional data (proportion of exports produced by foreign-owned firms), found that, within industries, low-wage U.S. firms choose high-wage countries as production locations, and vice versa. However, when foreign wages are adjusted for labor productivity, regressions show that export production by U.S.-owned firms is negatively, but insignificantly, associated with high adjusted wages across various foreign countries.

Meredith (1984) also found no significant effects when analyzing the relative U.S. versus Canadian wage at the industry level in a cross-sectional study of Canadian industries.

Cushman (1987), using a neoclassical framework, supported the hypothesis that rising wages encourage FDI outflows and discourage FDI inflows. His study was based on bilateral U.S. FDI flows to and from the U.K., France, Germany, Canada, and Japan for the years 1963 to 1981.

Culem (1988) estimated a model that included relative unit labor costs as an explanatory variable. In the four sample periods studied, of FDI flows among six industrialized countries over the period 1969-1982, he found unit labor costs to be statistically significant in two of the four samples, and to have the expected negative sign in only one of those two.

Swamidass (1990) specified two models of plant location strategies by foreign and domestic firms for the periods 1973-1977 and 1977-1983. The labor cost explanatory variable was insignificant for the models considered.

Ning and Reed (1995) investigated the locational determinants of U.S. FDI in food and kindred products by using data from six industrialized countries from 1983 to 1989. They found the wage rate differential to be significant in two of the three equations studied.

Labor Productivity

Labor productivity will have similar but opposite effects on FDI flows to those of the labor-cost hypothesis. Thus, a rise in foreign productivity is likely to increase FDI while a rise in home productivity will lower FDI; strong substitution effects can reverse the directions. In a unique article[19], Cushman (1987) found falling productivity to encourage FDI outflows and to discourage FDI inflows. Furthermore, non-U.S. productivity appeared to be the most important of the various labor variables in determining FDI flows for six industrialized countries for the period 1963-1981.

Political Risk

A major risk associated with foreign direct investment is that which emanates from political developments in either the home country of the investor, the host country, or the international scene. To understand the nature of this type of risk and its consequences for international business, a number of studies have attempted to: (1) arrive at a solid, coherent definition of the term "political risk"; (2) develop theoretical models of political risk in its relationship with foreign direct investment; and (3) empirically analyze the significance of the political risk dimension on FDI decision-making.

The Concept of Political Risk

The term "political risk" has been used widely –and mostly incorrectly by standard definitions- in management literature. Despite the expanse of theoretical and empirical applications this term has received, there is still a capital lack of consensus on its exact meaning.

There have been various definitions of political risk in the literature which, according to Fitzpatrick (1983), can be classified into four groups.

A first group (Ady, 1972; Aliber, 1975; Allen, 1973; Dunning, 1971; Kronfol, 1972; Nehrt, 1972; Whitman, 1965; Zenoff, 1969) defined political risk in terms of government or sovereign action. This definition concentrates on the unwanted consequences of government interference. This orientation "...embodies the assumption of the universality of government as a negative factor." (Fitzpatrick, 1983, p. 249). Likewise, Kobrin (1979, p. 69) argues that "[t]he emphasis on the negative consequences of government intervention entails an implicitly normative assumption that may not be universally valid." In this perspective, political risk relates only to the host government's interference with the business environment. Actions that are non-governmental in nature, which have the potential of adversely affecting the operation and profitability of MNCs, are explicitly excluded from the definition. Furthermore, risks that could arise from inter-state relationships between the host and the home countries are not included in the definition.

The second group (Haner, 1979; Green and Cunningham, 1975; Stobaugh, 1969; Van Agtmael, 1976; Zink, 1973) identifies political risk in terms of occurrences of a political nature, "usually political events or constraints imposed at the specific industry or specific firm level" (Fitzpatrick, 1983, p. 249). The political events typically are changes in government or heads of state and violence, which can be focused (such as the bombing of supermarkets in Argentina in 1969) or unfocused (such as riots). The typical constraints on the firm include expropriation, restrictions on remittance of profits, discriminatory taxation, and public-sector competition. This group perceives political risk as a combination of government interventions (the focus of the first group's definition) and political instability. As in the case of the first group, this second group of investigators does not consider inter-nation relationships between the host country and the home country of the investor as an important source of political risk for MNCs.

The third group (Ball, 1975; Drysdale, 1972; Haendel, West & Meadow, 1975; Hofer and Haller, 1980; LaPalombara and Blank, 1977; Levis, 1979; Pomper, 1976; Robock, 1971; Root, 1968a; Rummel and Heenan, 1978) considered political risk in terms of an environment rather than in isolation. This third category is typified by Robock's (1971) operational definition of political risk:

> ...political risk in international business exists (1) when discontinuities occur in the business environment, (2) when they are difficult to anticipate and (3) when they result from political change (p. 7).

For political changes to constitute a risk in the business environment, they (1) must not be predictable, and (2) must be unanticipated.

Consequently, to constitute a risk, political changes must have the potential "...for significantly affecting the profit or other goals of a particular enterprise." (Robock, 1971, p. 7). Hence, fluctuations in the political environment that do not have the potential of affecting the business environment are not considered as constituting risk for international business.

Robock (1971) also draws out two other aspects of political risk that are neglected by authors in the preceding groups. First, he makes a distinction between political risk and political instability; the latter term is recognized as being a separate, but related phenomenon, from that of political risk. Robock (p. 8) argues that "...political instability, as represented, for example, by an unexpected change in government leadership, may or may not involve political risk for international business." Second, he distinguishes between macro risk ("when discontinuities and politically motivated environmental changes are broadly directed at all foreign enterprise") and micro risk ("abrupt and politically motivated changes in the business environment that are selectively directed toward specific fields of business activity") (1971, pp. 9-10). Macro risk can be either indirect and spasmodic or direct and relatively permanent. An example of indirect macro risk occurred in 1969, when a large number of U.S.-owned supermarkets in Argentina were bombed on the occasion of Governor Nelson Rockefeller's visit to Buenos Aires as a special envoy of President Richard Nixon. The supermarkets were owned by the International

Basic Economy Corporation, which Nelson Rockefeller had founded. An illustration of direct macro risk was the takeover of private enterprise in 1959-1960 by the Castro regime in Cuba.

As a final summary of Robock's classic views on political risk, Table 15 reproduces a conceptual framework showing the sources of political risk, the political groups through which political risk can be generated and the types of influences that political risk elements can have on international business activities.

The fourth group (Drake and Praeger, 1977; Dymsza, 1972; Green and Smith, 1972) also, like the third group, considered political risk in the context of a general environment, but with the difference that the authors did not offer a specific definition of political risk.

Table 15

Robock's Conceptual Framework of Political Risk

Sources of political risk	Groups through which political risk can be generated	Political risk effects: Types of influence on international business operations
Competing national philosophies (Nationalism, socialism, communism)	Government in power and its operating agencies	Confiscation: loss of assets without compensation
Social unrest and disorder	Parliamentary opposition groups	Expropriation with compensation: loss of freedom to operate
Vested interests of local business groups	Non-parliamentary opposition groups (Algerian 'FLN,' guerrilla movements working from within or outside of country)	Operational restrictions: market shares, product characteristics, employment policies, locally shared ownership, etc.
Recent and impending political independence	Non-organized common interest groups: students, workers, peasants, minorities, etc.	Loss of transfer freedom: financial (e.g. dividends, interest payments), goods, personnel or ownership rights
Armed conflicts and internal rebellions for political power	Foreign governments or intergovernmental agencies such as the EEC	Breaches or unilateral revisions in contracts and agreements
New international alliances	Foreign governments willing to enter into armed conflict or to support internal rebellion	Discrimination such as taxes, compulsory sub-contracting
		Damage to property or personnel from riots, insurrections, revolutions and wars

Source: Robock (1971), p. 7.

The literature reviewed suggests that the concept of political risk

> ...should encompass all aspects of the risk to international business that are contained in its political environment. On closer examination, however, the literature is found to define political event risk rather than political risk. Such a definitional situation is unsatisfactory. The character of politics is a continuous process rather than a discrete event series. The definition of political risk would be improved if it were evolved in terms of process variables rather than event variables. (Fitzpatrick, 1983, p. 250).

Kobrin (1979) suggests four factors that have limited the operationalization of political risk. First, there exists an ambiguous distinction between events in the political environment that are of concern to the international firm and those that are not. Second, there is difficulty in establishing an explicit relationship between environmental processes (continuous versus discontinuous change) and decision makers' perceptions (uncertainty versus risk) to the extent that it can be incorporated into the investment decision model. Third, research literature has concentrated on discontinuous change, neglecting the remaining elements of the political environment. Fourth, the literature has focused on the negative aspects of government intervention, implying an assumption of universal validity.

Theoretical Models

Many theoretical models have been developed to try to explain the relationship between political risk and the foreign direct investment behavior of MNCs. Among these models, eight major ones are discussed in this section: Smith's (1971), Root's (1972, 1988), Akhter and Lusch's (1978), Schollhammer's (1978), Simon's (1982, 1984), Desta's (1985), Sethi and Luther's (1986), and Boddewyn's (1988).

Smith's Model

One of the earliest models seeking to explain the linkage between the flow of FDI and the socio-political characteristics of host countries is Smith's theoretical model. The starting point of the model is Smith's discussion about the quantification of internal and external conflict situations among the nations of the world. According to Smith (p. 7), "[M]ost company plans reflect the tendency of planners to be impressed by the latest international political developments and to exaggerate the longer-term importance of these developments upon the firm."

Two works are cited as conceivably being of considerable value to business planners, despite their tentativeness and the probability of their eventual revision. The first study, by Denton (1969), consists of a listing of 660 identifiable internal and external conflicts, resulting in 1000 or more casualties which occurred between 1750 and 1960 throughout the world.[20] In this series, there is a long-term cycle of conflict about 100 years in duration and a short-term change in the level of conflict about every 25 years. The second study, by Denton and Phillips (1968), analyses the subject matter of conflict for the 660 conflicts occurring during the 1750-1960 period. One conclusion Smith (1971) draws from this study is that, even though conflicts over territory are the most frequent subject matter in international violence, such an issue is more likely to occur during the periods of low-conflict characteristics at the beginning of a conflict cycle, rather than at the culminating stage of the 1970 and 1980 decades. Conversely, disputes over the form of a polity, although relatively infrequent, are highly characteristic of the culminatory stage of the cycle.

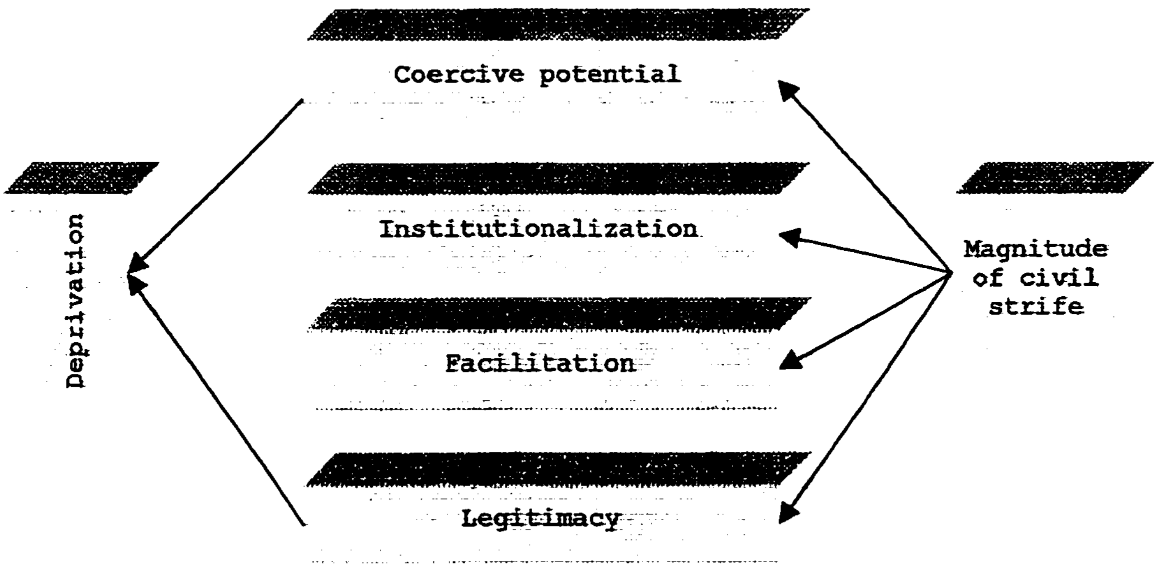
Thus, the two studies above lead Smith (p. 8) to suggest "...that long-range business planners during the present culminatory, or high-conflict, period of the current cycle should base their environmental political assumptions upon an assessment of the nature of the relationships between the power élites and the constituents within the polities of interest to them."

According to Smith, then, investment climate is mainly determined by incumbent power élites; a sudden change of a power élite can change an attractive investment into an unattractive one. Consequently, Smith (p. 9) proposes that "...in this culminatory stage of the present conflict cycle, the assessment of élite stability (the level of civil strife) may be more important to a forecast of investment climate than gross national product, cost of living, and other popular economic indicators presently thought to portend the future."

Thus, Smith contends that FDI decisions by MNCs are influenced by the magnitude of the internal civil strife in a host country. Smith's model, depicted in Figure 6, is based on the theory of relative deprivation developed by Gurr (1968). Perceived relative deprivation, according to the model, is the primary cause of civil strife.

Figure 6

Smith's Model of Political Risk



Gurr (1968) defines relative deprivation as the discrepancy between value expectations (material goods and conditions of life to which the citizens of the polity believe themselves justifiably entitled) and value capabilities (the amount of these goods that they think they are able to get and keep). Hence, if perceived deprivation is high, citizens respond with discontent and anger. This response is manifested by aggressive behavior which is termed civil strife. Intervening between civil strife and perceived relative deprivation are the following mediating variables:

> Coercive potential (police power); Institutionalization (the extent to which societal structures beyond the primary level are broad in scope, command substantial resources and/or personnel, and are stable and persisting); Facilitation (the historical tendency of some polities to resort to strife when others do not); Legitimacy (the level of popular support for the existing regime). (Smith, 1971, p. 10)

Thus, aggressive responses by the citizens of a polity to perceived relative deprivation determines the magnitude of civil strife, depending upon the levels of coercive potential, institutionalization, facilitation, and legitimacy. Civil strife, in turn, determines the FDI behavior of MNCs.

In summary, in Smith's model the primary source of political risk for MNCs lies in the level of political instability within a host country.

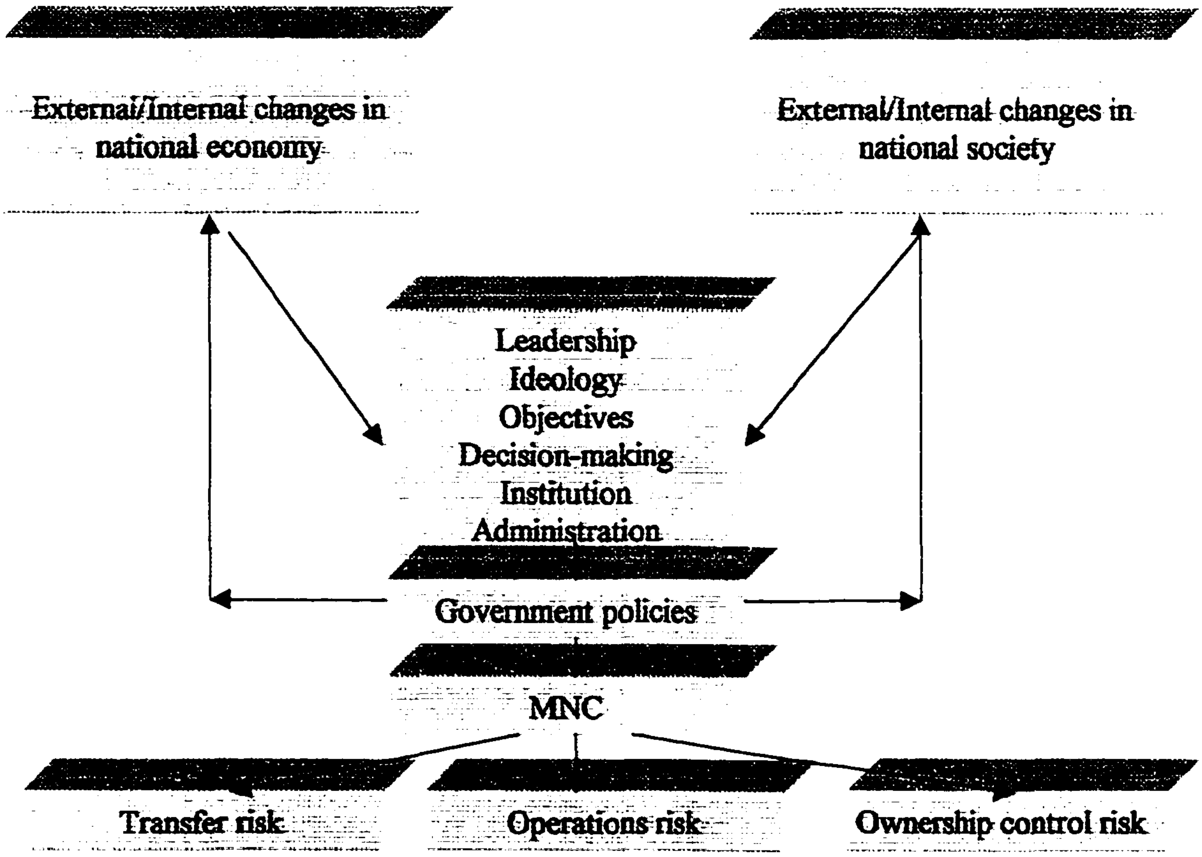
Root's Model

According to Root (1972), the host government's actions/decisions determine the nature of the political risk prevalent within a host country.

Business managers feel uncertain about future government policies and/or political situations in one or more countries that would affect the safety and profitability of actual or future business ventures. Political risk –country risk in Root's (1988) terminology[21]- "...derives from a manager's ***subjective uncertainty*** about the ***future*** values of government policy/political situation variables that he perceives as ***critical*** to the performance of a ***business venture***." (Root, 1988, p. 115). The host government is constantly responding to the external/internal changes in its national economy (political-economic changes) and the external/internal changes in the national society (political-social changes). As shown in Figure 7, governments' responses to these forces are manifested by changes in policies towards MNCs.

Figure 7

Root's Model of Political Risk



Root's framework suggests that the potential impact of political risk is to be found in the firm's ownership/control, transfers, and operations. Ownership and control risk stems from government policies designed to change firm ownership or influence managerial control. A classic example of ownership risk is the threat of expropriation. Demands by a government for significant minority interest in a venture reflect policies designed to constrain managerial control. Transfer risks refer to government interventions which may impede flows of products, capital, payments, people or technology between a firm and its subsidiaries. Import quotas or local-content requirements reflect two of the more frequently observed forms of transfer risk. Root (1972, p. 357) includes "... monetary and fiscal policies, price controls, taxation, labor codes and regulations, [and] local content requirements," as operations risks. Table 16 illustrates a range of political risks and their impact upon the firm as they pertain to Root's (1972) framework.

Table 16

Host and Home Country Political Risks and their Potential Impact on the Firm

	Transfers	Ownership control
Host country		
• Countertrade	x	
• Import/export regulations	x	
• Import, currency restrictions	x	
• Boycotts	x	
• Local content restrictions	x	
• Export requirements	x	
• War and revolution	x	x
• Nationalization/expropriation		x
• Protests, strikes, riots		x
• Terrorist attacks		x
• Indigenization		x
• Environmental standards		x
• Pressure for joint ventures		x
• Disinvestment pressure		x
• Local ownership requirements		x
		x
Home country		
• Countertrade	x	
• Export requirements	x	
• Taxation	x	
• Import and loan restrictions	x	
• Technology transfer controls	x	
• Foreign Corrupt Practices Act enforcement	x	
• Use of embargoes		x
• Price/wage and production controls		x
• Licensing requirements		x
• Pressure for divestment		x
International		
• War	x	x
• Foreign policy disputes	x	x
• Trade wars, blockades, embargoes	x	

The type and nature of government responses is determined by the host country's domestic political process as indicated in Figure 8. The nature of political risk prevailing in a host country is determined by the relationships between the power distribution of social groups, the political ideology of social groups, informal political institutions, and the government. Interaction among these social groups is translated into governmental decisions and policies which, in turn, determine the type and nature of political risks faced by MNCs.

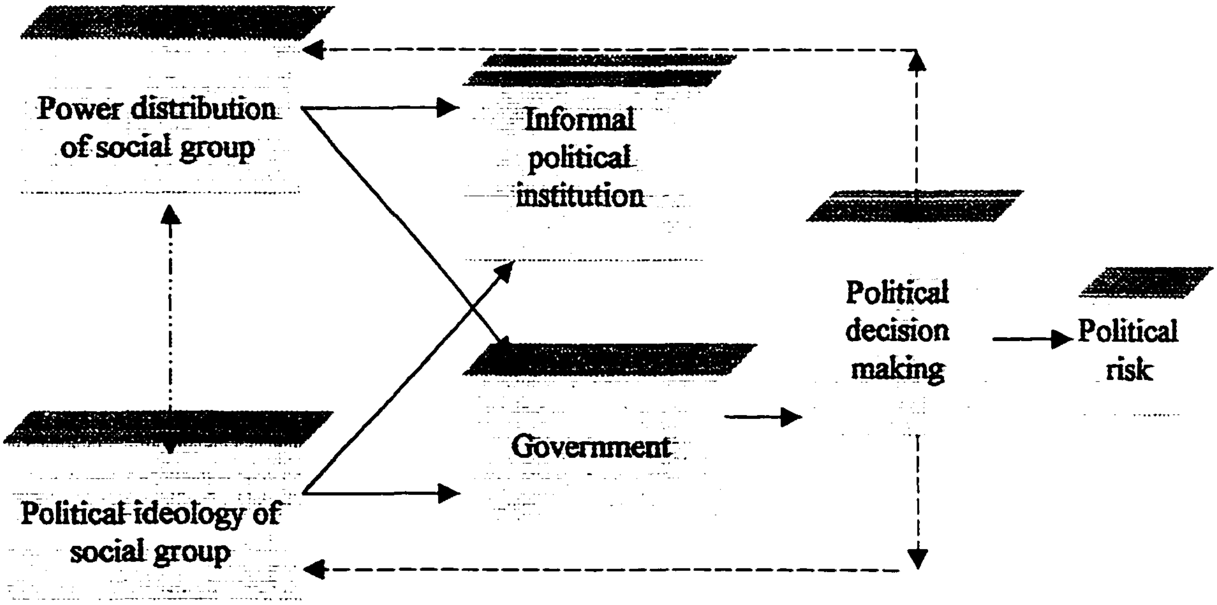
However, Root (1988) suggests that multinational corporations can control somewhat their external environment so as to reduce exposure to country and other risks. The MNC's external environment consists of a transactional environment and a contextual environment:

> The *transactional* environment consists of actors with whom the MNC has actual or potential direct relations (transactions), such as customers, host governments, suppliers, competitors, banks, and so on. The transactional environment, therefore, is the set of actual and potential transactions between the MNC and external entities. In contrast, the *contextual* environment consists of a multiplicity of actors linked by political, economic, technological, socio-cultural, and physical interactions that can constrain the MNC's transactional interactions but do not enter them. Examples of contextual interactions include the behavior of foreign exchange rates, political revolutions, scientific discovery, the communications infrastructure, and population growth. (p. 112)

Thus multinational managers can somewhat influence the behavior of transactional actors, but they cannot affect the behavior of contextual actors.

Figure 8

Root's Political-Social Process Model



Political risks are classified as system risks or policy risks. System risks arise from potential macro changes in the political system, such as revolution, subversion, civil strife, and war. Policy risks arise from a government's potential actions that might affect MNCs, such as expropriation, local content requirements, and transfer restrictions. System risks occur in the contextual environment, while policy risks may arise from either the contextual or the transactional environments. In most cases, managers are concerned with policy risks, that is, possible changes in host government policies.

Root's (1988) model defines country risk as a downside risk, algebraically expressed as:

$$E\ (L_i) = X_i * P(V_i)$$

where $E\ (L_i)$ is the expected loss to the multinational firm from event (i), X_i is the firm's exposure to event (i), and $P(V_i)$ is the probability that event (i) will occur over a designated future period.

To manage country risks, MNCs can follow two kinds of strategies: (1) risk-exposure strategies, and (2) risk-control strategies. The first set of strategies aim at lowering the economic values exposed to risk in a foreign venture; these strategies are addressed to the contextual environment and consist of four instruments: (1) avoidance (the potential or actual reduction of the MNC's gross assets in the host country); (2) insurance (the transfer of risk from the MNC to an outside agency); (3) hedging (the reduction of the MNC's net assets in the host country); and (4) retention (the deliberate assumption of exposure to political risk).

The second set of strategies aims at preventing the occurrence of loss situations by influencing the behavior of host governments, the key transactional actors in the country environment. Figure 9 shows the risk-exposure and risk-control strategies of the multinational corporation.

Since MNCs are mostly concerned with policy risks –that is, possible changes in government policies in a foreign host country- and the host government is the transactional actor whose behavior is most critical to the country viability of the MNC's venture, it follows that MNCs need some kind of risk-control strategy to deal with these policy risks. According to Root (1988), "... bargaining leverage is the foundation of risk-control strategies." (p. 120).

The MNC's bargaining leverage with the host government is greatest prior to its entry into the host country. However, once a venture is established, the MNC loses some of its bargaining leverage. Thus, to maintain bargaining leverage with the host government after entry two conditions must be satisfied:

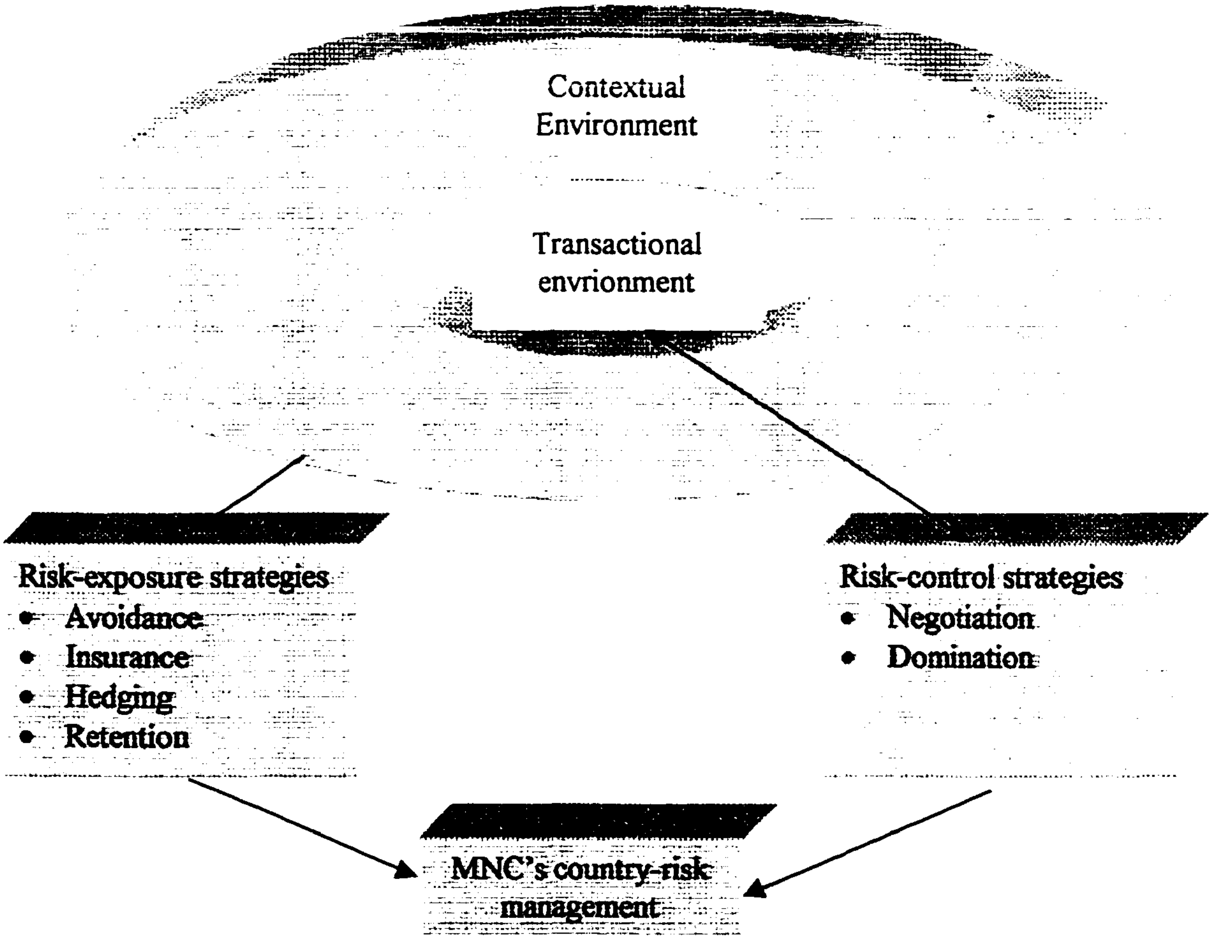
> ... (1) the host government's perception that the social benefits of the MNC's venture continue to exceed its social costs, and (2) the host government's perception that the MNC is an indispensable source of net social benefits, a source that would be impossible or costly to

replace with a local entity. (p. 122)

However, the host government's perception of the net social benefits of an MNC's local venture tends to shift in a negative direction over time; this situation is conceptualized by Root (1988) as the foreign investment country-risk life cycle. Hence, the first condition is necessary but not sufficient to maintain host-country viability. The MNC must be viewed by the host government as indispensable sources of social benefits. Thus, unlike Smith's model, political risk in Root's model derives from the host government's actions and decisions.

Figure 9

Root's Risk-Exposure and Risk-Control Strategies of the Multinational Corporation



Akhter and Lusch's Model

This model attempts to offer an explanation and understanding of political risk from a systems perspective. A country or society is viewed as having constituent elements whose relationship, determined by the system's purpose and functions, creates the political structure. When these constituent elements become increasingly disorderly or chaotic, societal systems experience entropy, that is, disorder or chaos. Subsequently, attempts will be made to rearrange the elements of the system, thereby creating fluctuations in the system.[22]

From the preceding statements, Akhter and Lusch (1978) define political risk "... as the manifestation of the internal adjustment process within a society, whereby a society (as a social structure) restructures itself." (p. 88). This definition emphasizes the structural fluctuations within a society that generate a new order.

A system can be open (one that maintains exchange with its environment) or closed (one without exchange with its environment). However, no social system can be completely closed or completely open. Moreover, open societal systems are preferred by foreign businesses over closed societies, since in the former type political risk will occur "... but is less likely [than in closed societies] to be deleterious because entropic processes will result in fluctuations that create a new balance or order in the system." (p.88)

From the preceding discussion, the authors consider political risk from a new perspective:

> As a society restructures its polity and economy to evolve and better perform societal functions, political risk arises. Since all societies evolve, political risk is a naturally occurring phenomenon. And since evolution allows societies to better perform societal functions, we see that political risk is not a negative or deleterious phenomenon; on the contrary, it is a very important part of all societies. Political risk and instability go hand-in-hand. Instability is the agent of a new structure; order emerges from disorder. (pp. 88-89)

Besides being open or closed, systems also possess stability and flexibility components. Cook (1980, p. 2) defines stability as "... the ability to maintain informal continuity... so that the system can continue as a unified entity over relatively long periods of time," and flexibility as "... the capability for informational alteration... so that the system will function in ways appropriate to its ever-changing environment." Systems with high evolutionary potential have the proper mix of flexibility and stability. One without the other can be detrimental to the system:

> ... a system that has only a stability component will be too rigid and will ignore all information signals in the external environment. Because it ignores its environment, its ability to adapt will decline and thus it will set itself on the path to extinction. On the other hand, a system that has only a flexibility component will continuously alter its structure based upon all signals from the external environment and thus will not filter inputs. This system will always be fluctuating and thus will never be able to adequately accomplish its goals or functions. (Akhter & Lusch, 1978, p. 89)

In summary, societies are structures that exist to perform societal functions. Entropy or political risk will arise when the structure no longer adequately performs its functions. This entropy can be overcome by negentropy (importation of information) but this situation can only occur in relatively open systems. All systems will have some mix of stability and flexibility components. As the society evolves and becomes more complex, it will need to be more flexible.

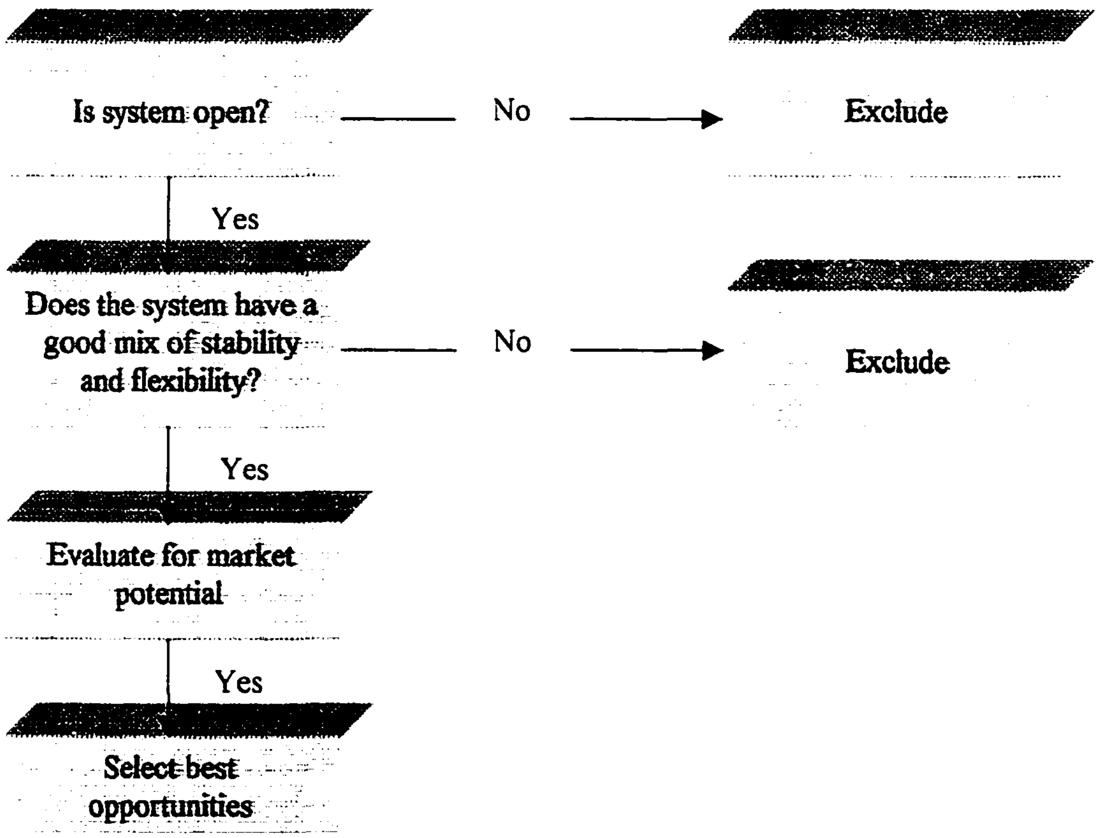
In terms of political risk, countries should be evaluated not only on the basis of their past behavior but also on the basis of their future possibilities:

> Business investments are made on future expectations rather than on past performance, and hence it becomes feasible to sort countries not only on the basis of past manifestations of political risk, but on the ability of these countries to create new structures more congenial to foreign businesses. (p. 90)

Based on these views, Akhter & Lusch propose a process for evaluating the future political risk of a country, as depicted in Figure 10.

Figure 10

Akhter and Lusch's Evaluation of Political Risk of a Country



To ascertain the degree of openness of a country, the authors list the characteristics shown in Table 17.

The larger the values of each indicator, the more open a society is. The next issue involves assessing whether or not the country has a good balance between the stability and flexibility components. According to the authors, "[T]he desired mix of stability and flexibility in a social system is achieved by the functions and responsibilities of the executive and legislative branches of the government." (p. 92). Cook (1980, p. 159) also notes that "... the division of the government into two information-bearing components allows potentially for flexibility and rapid response-ability to the people through the executive branch and stability and reliance upon the philosophical wisdom of the nation through the legislative branch." Thus, the independence of the legislative branch is important for maintaining stability in social systems, whereas interactions between the executive branch and the population ensure flexibility.

Accordingly, Akhter & Lusch suggest a list of indicators, shown in Table 18, as measures of stability and flexibility.

Table 17

Akhter and Lusch's Indicators of Openness/Closedness of a Country

- Number of countries with which the country has diplomatic relations
- Number of people traveling outside the country every year
- Number of foreign publications allowed in the country
- Number of foreigners visiting the country every year
- Amount of cultural exchanges with other countries
- Share of imports in gross national product
- Share of exports in gross national product

Table 18

Akhter and Lusch's Indicators of Stability and Flexibility

- Per capita income
- Distribution of income
- Growth rate of savings
- Growth rate of investment
- Growth rate of gross national product
- Number of newspapers
- Number of opposition parties
- Number of executive transfers
- Number of political strikes
- Number of restrictions imposed by the government
- Number of dissensions among political parties
- Independence of the legislative branch
- Consistency of social contracts
- Preservation of individual existence
- Provision of human rights
- Laws protecting social obligations and responsibilities

The authors further note the equivocal use, in the writings on political risk, of the indicators above as measures of political risk. Furthermore, they state that these variables "... as reflectors of stability and flexibility, determine the likelihood of the process of restructuring; and restructuring does not always result in political risk." (p. 94)

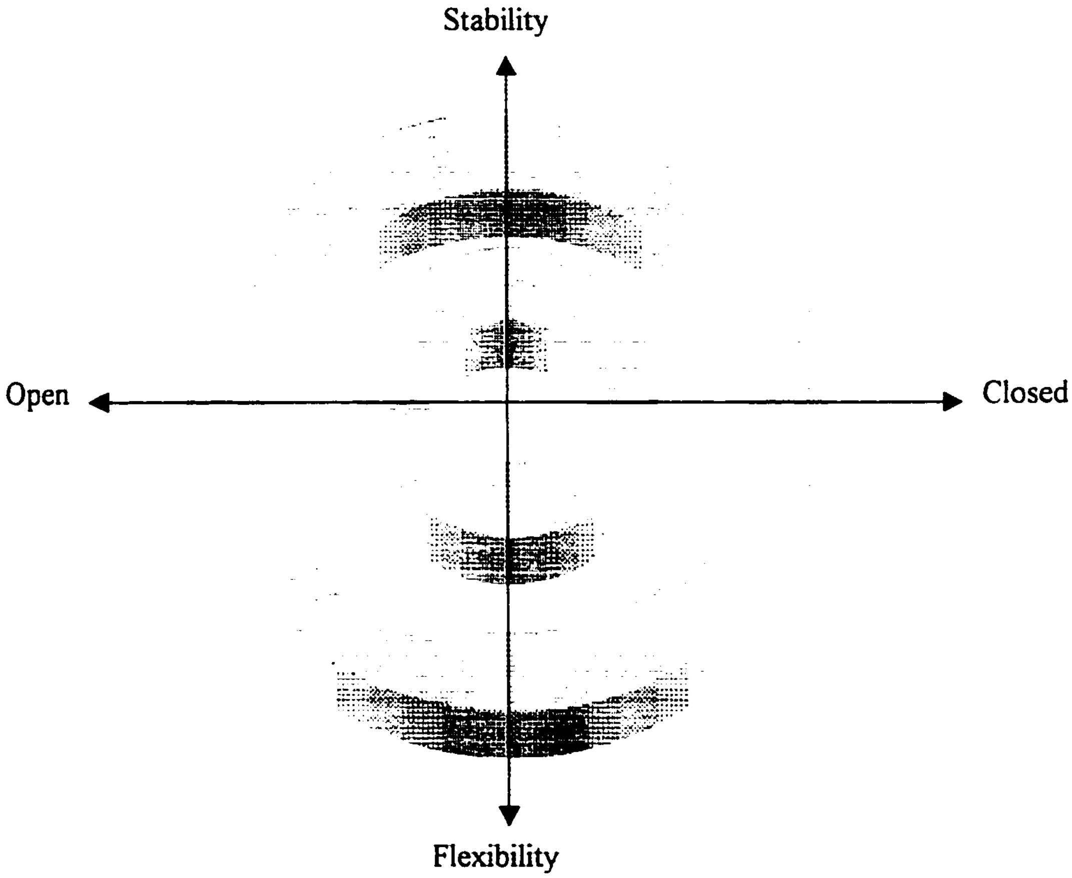
Once the two sets of indicators have been measured, countries can be positioned on a map, such as that in Figure 11, in terms of the openness and stability/flexibility variables. Countries closer to the origin show greater potential for evolutionary survival and therefore will be more predictable. Countries that fall in the outermost concentric circles will, in the long run, go through more volatile fluctuations and hence will be more risky.

To summarize, Akhter & Lusch emphasize three major issues derived by examining the phenomenon of political risk within the framework of a structural analysis:

> First, political risk is an inherent adjustment process which prevails in every society in varying degrees. Second, the measurement of political risk should incorporate the notion of the ability of a society to meet the needs of its people, and also the ability of a society to move from one structure to another. Third, the structural adjustment process is an ongoing process, and hence a society's position in the country position map may change with the passage of time. (pp. 95-96)

Figure 11

Akhter and Lusch's Country Position Map



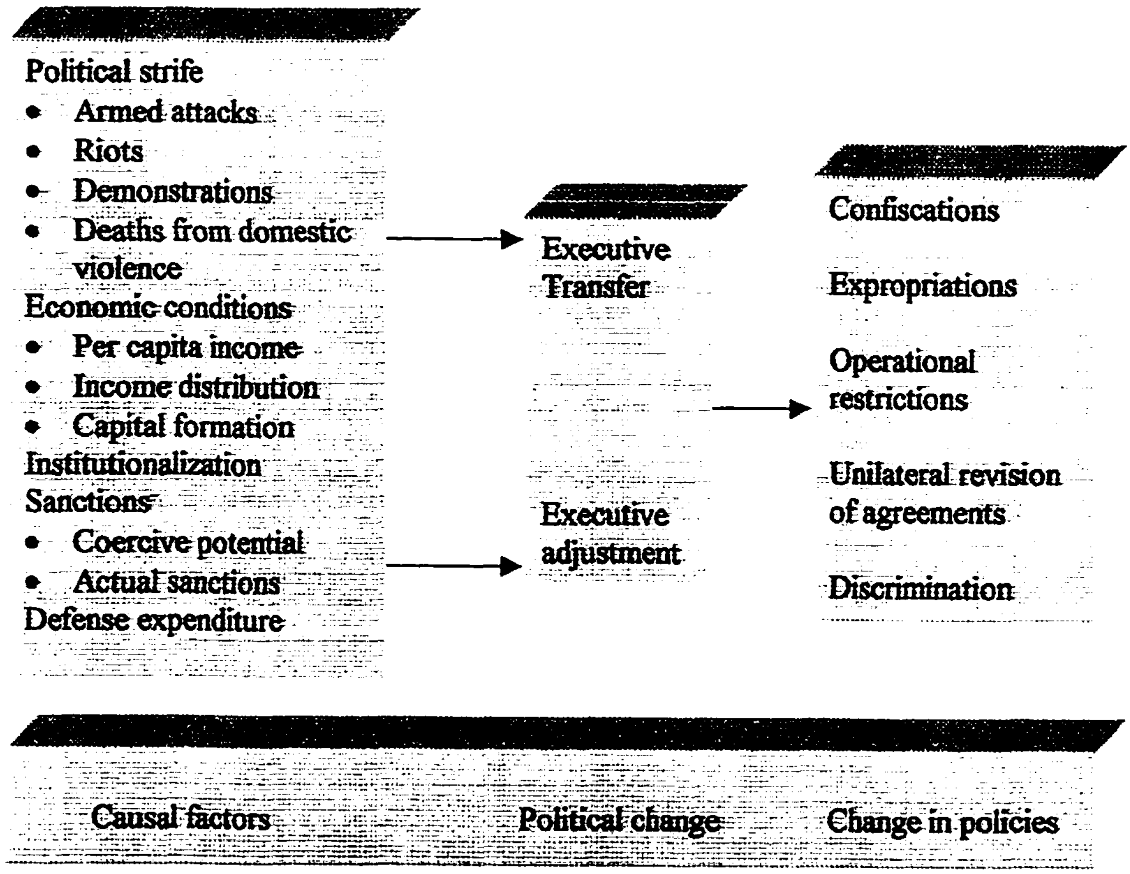
Schollhammer's Model

This model attempts to integrate both Root's (1972) and Smith's (1971) models. According to Schollhammer (1978), political risk derives from changes in host government policies towards MNCs. As Figure 12 shows, changes in government policies are responses to changes in such factors as civil strife, economic conditions, institutionalization, sanctions, and defense expenditures. Mediating between these factors and changes in host government policies are executive transfers and executive adjustment. Thus, political risk (confiscation, expropriation, operational restrictions, unilateral revision of agreements, and discrimination) is a function of the domestic characteristics of the host country.

This model takes into account both the political instability in the host country and changes in host government policies. Thus, it integrates Root's (1972) and Smith's (1971) models.

Figure 12

Schollhammer's Model of Political Risk



Simon's Model

According to Simon (1982), political risk can arise from many sources as shown in Table 19. These sources are internal societal-related, internal governmental-related, external societal-related, and external governmental-related. Moreover, these sources can emanate at the macro level (where actions and policies are directed at all foreign enterprises) or at the micro level (where actions and policies are aimed only at selected fields of foreign business). Thus, political risk is defined as "... governmental or societal actions and policies, originating either within or outside the host country, and negatively affecting either a select group of, or the majority of, foreign business operations and investments." (p. 68)

Likewise, Simon (1984) suggests that the MNC is constantly faced with political risks from various environments: the host country environment, the home country environment, the international environment, and the global environment. Figure 13 illustrates this issue. The MNCs' foreign investment behavior is determined by their perception of the magnitude of the political risk in these environments. Political risk is perceived to derive not only from the host country, but also from the home country and the global environment in general.

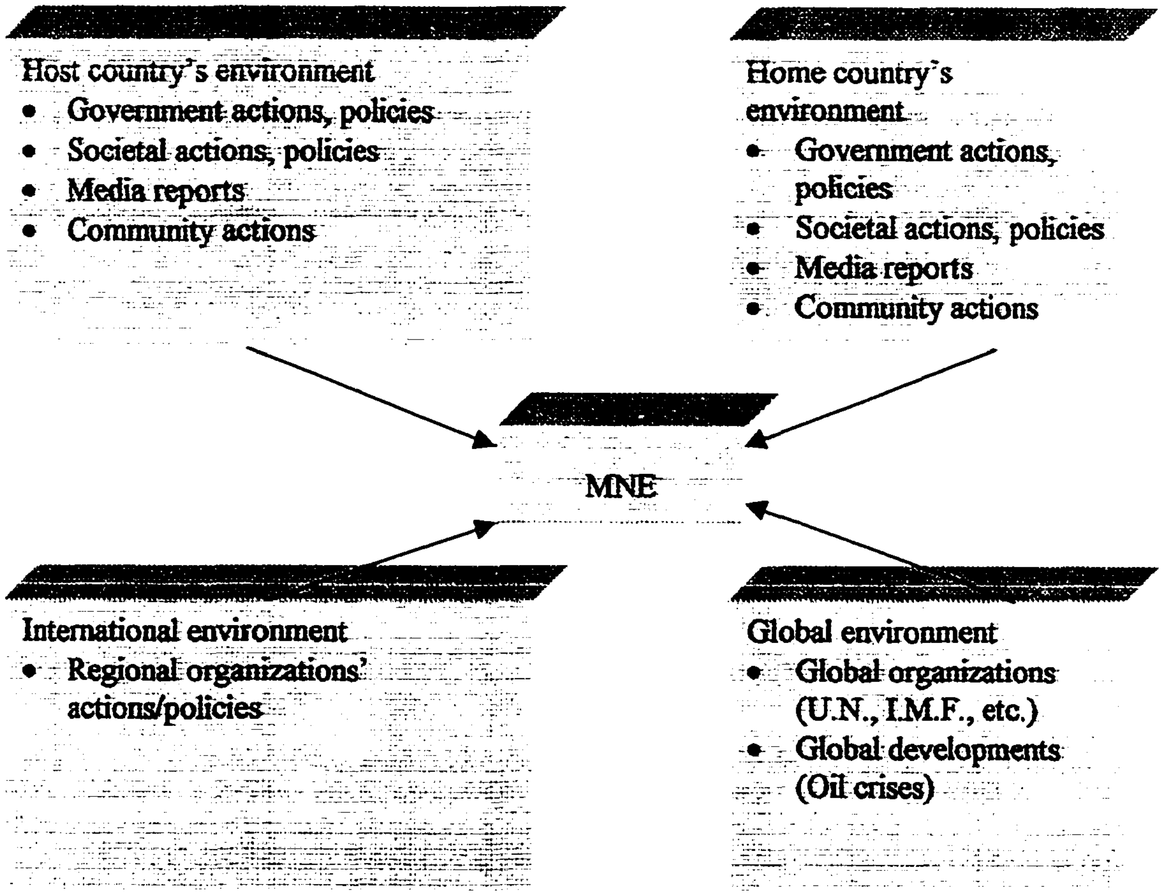
Table 19

Simon's Framework for Political Risk Sources

	Macro		Micro	
	Societal-related	*Governmental-related*	*Societal-related*	*Governmental-related*
Internal	• Revolution • Coup d'etats • Civil war • Factional conflict • Ethnic/religious turmoil • Widespread riots/terrorism • Nationwide strikes/protests / boycotts • Shifts in public opinion • Union activism	• Nationalization/ expropriation • Creeping nationalization • Repatriation restrictions • Leadership struggle • Radical regime change • High inflation • High interest rates • Bureaucratic politics	• Selective terrorism • Selective strikes • Selective protests • National boycott of firm	• Selective nationalization/ expropriation • Selective indigenization • Joint venture pressure • Discriminatory taxes • Local content/hiring laws • Industry-specific regulations • Breach of contract • Subsidization of local competition • Price controls
External	• Cross-national guerrilla warfare • International terrorism • World public opinion • Disinvestment pressure	• Nuclear war • Conventional war • Border conflicts • Alliance shifts • Embargoes/ International boycotts • High external debt service ratio • International economic instability	• International activist groups • Foreign MNE competition • Selective international terrorism	• Diplomatic stress between host and home country • Bilateral trade agreements • Multilateral trade agreements • Import/export restrictions • Foreign government interference

Figure 13

Simon's Model of Political Risk



Desta's Model

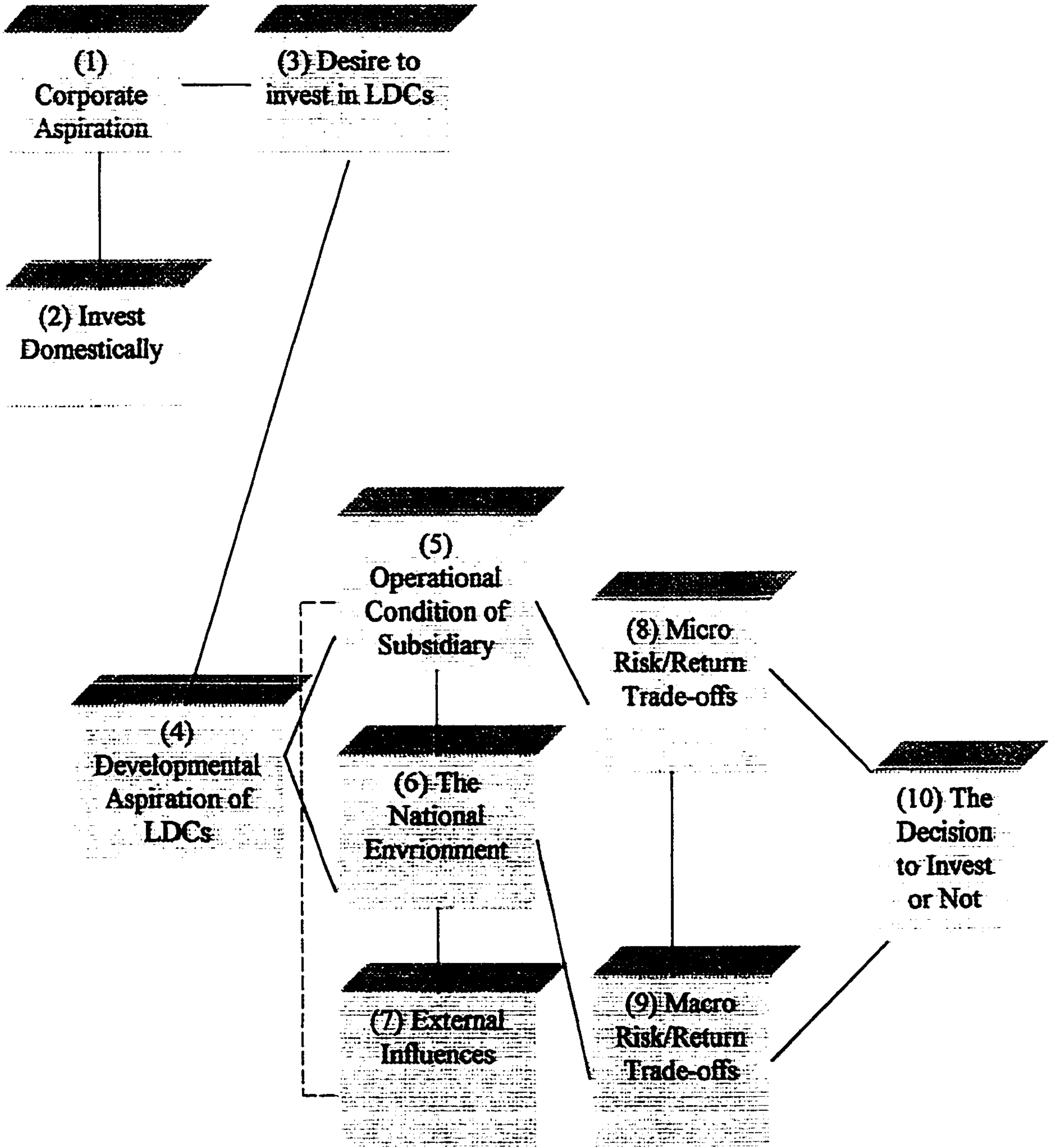
Desta (1985) developed a conceptual framework for assessing political risk in less developed countries. To be of value to decision-makers in their strategic planning, political risk assessment should be viewed as a function of how several factors interact with the operating conditions of the foreign-owned enterprise. These factors are current and future national environments, the socioeconomic developmental aspiration of the host country, and externally-induced situations. Thus, political risk in less developed countries can emanate from four potential sources:

> (1) not fulfilling the socioeconomic aspirations of the host country; (2) the operational condition or the business policy of the foreign-owned firm; (3) conditions in the national polity or a segment of the polity; and (4) the international scene or shift in the alliance commitments of the host country. (p. 51)

The proposed framework and the relationship of the variables are depicted in Figure 14. Before an MNC decides to invest in a less developed country, it needs to investigate the existence of a real or perceived match/mismatch between its business goals and the socioeconomic developmental aspirations of the polity and the specific region where the investment is going to be located. Thus, reconciling the socioeconomic developmental plans of the prospective host country on the one hand, and the satisfaction of the business motive of the MNC on the other, becomes a significant, delicate task.

Figure 14

Desta's Framework for Political Risk Assessment



Eiteman et al. (1994, p. 503) summarize this issue succinctly:

> The most important type of micro risk arises from a conflict between bona fide objectives of governments and private firms. Governments are normally responsive to a constituency consisting of their owners and other stakeholders. The valid needs of these two separate sets of constituents need not be the same, but it is governments that set the rules. Consequently, governments impose constraints on the activities of private firms as part of their normal administrative and legislative functioning.

Foreign direct investments that reflect the socioeconomic developmental aspirations of the host countries and are perceived to be indispensable, or more expensive to replace by local operations, are less likely to face political risk. Likewise, a subsidiary of a multinational is less likely to face micro-risk when it:

> (1) attempts to modify or redesign its operational procedures to better fit local needs, (2) uses local resources, (3) adapts its structures and policies, (4) works in harmony with local authorities, and (5) is perceived to produce internationally competitive products that can boost the foreign exchange earnings of the host country. (Desta, 1985, p. 51)

National environment refers to the economic and sociopolitical components of the prospective host country. In terms of economic factors, a polity can achieve economic growth when cumulative changes that result from positive conditions are recorded over a long period of time. These changes include "... real per capita income growth, decrease in population growth, movement toward income distribution, balanced sectoral growth, low external debt-service ratio, and positive balance-of-payments outlook." (pp. 51-52)

At the sociopolitical level, three factors are essential. The first factor is integration; real and perceived antagonism between the ruled and ruling élites as well as interethnic, interregional, and social class conflicts must be reduced to a manageable level. The second factor relates to the notion of capacity, viz. the government's capacity and ability to meet the demands and needs of the society, and the government's possession of built-in mechanisms to adjust to changing circumstances. The third and final factor is the ruling elite's ability to fulfill societal welfare expectations.

Hence, the author suggests that a regime faced with the problems of low real economic growth, low level of integration, and managerial incapacity "... is likely to have the propensity to take political risk-related action against a selected few or all foreign enterprises in order to prolong its stay in power." (p. 52).

External influences represent political and economic factors that derive from outside the national polity. These include "... alliance commitments, alliance shifts, cross-national guerrilla warfare, disinvestment pressure, international boycotts and embargoes, and other externally created economic instabilities." (p. 52).

As shown in Figure 14, the solid line from the external influences to the national environment implies that the external factors can have probable effects in shaping the national environment and its institutions. The broken line between the external influences and the operational condition of the foreign subsidiary represents a possible relationship. Thus, the author assumes that the direct impact of the external factors on the operation of the affiliate is likely to be less pervasive than on the national environment.

The resulting two outcome variables, political micro-risk and macro-risk, are then assessed, leading to the decision either to invest or not.

In summary, the author believes that this "... analytical framework will help decision-makers to form a coherent outlook for future investments and to monitor the international business environment as it unfolds." (p. 53).

Sethi and Luther's Model

Sethi & Luther (1986) propose a classification of political risks that is more extensive than that prevalent in the literature. Thus, they consider not only risks posed by host country developments, but also risks emanating from parent or home country policies. Table 20 shows the various dimensions of political risk and the different avenues of containment. According to the authors, this matrix"... helps in the task of political risk assessment by making explicit the multidimensional nature of the political risk problem." (p. 60).

Table 20

Sethi and Luther's Sources of Political Risk and Methods of Containment

Sources of Political Risk	Methods of Containment		
	International	Home Country	Host Country
Host Country Conditions			
Political	• Insurance against political risk	• Foreign aid • Military aid	• Joint ownership • Shorter payback period
Economic	• International/ multilateral agreements	• Foreign aid restrictions on technology transfer • Bilateral agreements	• Higher ROI restrictions on technology transfer
Sociocultural	• Changes in public opinion	• Maintain a low profile • Posture of non-involvement	• Change in product design
Home Country Conditions			
Political	• Use of international organizations • Pressure from other countries	• Lobbying for change in laws and government policy • Threat of international reparations	• Insulate local subsidiaries from home country laws • Be a good corporate citizen
Economic	• International/ multilateral agreements	• Coalition of businesses with common interests	• Increase economic benefits and host country dependence on foreign enterprise
Sociocultural	• International public opinion	• Create positive public opinion towards needs and aspirations of people in the host country	• Be a good corporate citizen • Maintain a low profile

Risk to foreign enterprises is viewed as a combination of three interrelated factors –political, economic, and sociocultural- arising in both the host country and the source country. Corporate response to any of the pressures derived from these factors is important. By anticipating possible sources of conflict, corporations can make adjustments in their business practices and ownership patterns and hence can take a proactive stance. The common reactive stance seems to occur because assessment resources are limited and therefore are used sparingly. A proactive stance would entail anticipating the political risk problem well in advance and taking measures to lessen social conflict.

Sethi & Luther emphasize the relevance of their proposed matrix in the following terms:

> Careful identification of the sources of risk will go a long way in suggesting possible strategies of containment against political risks. Definitions that do not take into account the broad spectrum of the political risk problem are not likely to be useful for formulating responses. (p. 63)

Boddewyn's Model

This model attempts to enrich Dunning's (1980, 1981, and 1988a, 1988b) eclectic paradigm by explicitly incorporating political elements in the consideration of ownership, internalization and location advantages.

Boddewyn contends that the dominant multinational enterprise (MNE)-theory models have not sufficiently acknowledged, incorporated and/or accepted the significance of political behavior:

> 1. Noneconomic environmental factors have usually been viewed as *constraints* (or "uncontrollables") to which firms must adapt, rather than as more or less enactable variables.
> 2.These non-market factors have typically been perceived as presenting *risks* rather than opportunities, as in the unfavorable distinction between "market opportunities" and "political risks," as if there were not also "political opportunities."
> 3. Finally, the activities of MNEs have been analyzed in an *autonomous market-economy* mode relying on *economic rationality* instead of on broader concepts and models borrowed from the social sciences. (p. 347)

Hence, Boddewyn treats political behavior as an explicit activity of international companies, whereby government is not exogenous to the economy, and firms constantly function as both economic and political actors. The author supports Gilpin's (1975) view that governments of both home and host countries try to bend the behavior of inward and outward investors to their domestic and international purposes; in turn, these governmental policies lead MNEs to develop a political strategy of their own. Contrary to this view are those exposed in most of MNE strategy studies -such Poynter's (1985)- which regard government policies toward foreign investors as givens to which MNEs have to respond. As Boddewyn notes: "... political behavior is not a second-best substitute for economic behavior but an alternative means –better, equal or worse- in resource allocation and appropriation as well as in MNE strategy." (p. 344). Thus, political risk is implicitly embedded in the notion of political behavior.

In his subsequent discussion, the author applies the term "political" to: (1) the actors belonging to the non-market environment, including not only the state but also the community and private-interest associations, and (2) particular means used by firms in interacting with the non-market environment: lobbying, public and government relations, alliances with other firms and associations, bribery, lawsuits, etc.

Boddewyn makes use of Dunning's eclectic paradigm of international production to incorporate various political considerations, hitherto neglected in MNE theory. As discussed above, Dunning's paradigm explains why international production takes place[23], namely, that foreign direct investment requires that a firm possess ownership (firm-specific) advantages which it finds beneficial to exploit by itself (internalization advantage) in foreign countries offering location advantages. Hence, Boddewyn's analysis is done in terms of these advantages.

Ownership Advantages

Ownership advantages are extended to include political knowledge or expertise[24] that is advantageous in dealing with the non-market environment. Such political advantages can include: "(1) better intelligence about political actors and opportunities; (2) readier access to political opinion- and decision-makers; and (3) superior influence skills at handling the latter through various means." (p. 348). These political advantages can be considered as intermediate products whose markets may be internalized and exploited by the MNE in foreign locations.

Relevant to both the issue of firm-specific advantages and internalization advantages is the purpose of the former type of advantages. Casson (1987) and Rugman (1986) suggest that firm-specific advantages may be used: (1) to close markets through asset power, and (2) to overcome natural transaction costs. In the first case, MNEs are rent-seekers that may reduce social welfare; in the second case, they are efficiency-seekers that generally increase social welfare. However, the two views are compatible, as Rugman (1986) notes:

> While a pedagogical distinction can be drawn between the industrial organization (asset power) and welfare economics (transaction cost) views of the theory of the MNE, in practice such a distinction is not useful since the MNE incorporates both characteristics in its operating behavior. Thus, the creation of a missing arm's length market for knowledge, by the process internalization, in turn yields some elements of asset power to the MNE. (p. 108)

Internalization Advantages

Internalization refers to the ownership advantages –better political intelligence, access and influence skills- being built into the hierarchy of the MNE rather than transacted in the market. Internalization takes place either because there is no market for the intermediate products needed by MNEs or because the external market for such products is inefficient.

With regard to political intermediate products, there are two types for which a market exists or may be created. The first refers to facilitating intelligence, access and influence skills that are needed by MNEs when first considering or entering a new foreign country. Such facilitating skills are essentially obtainable from agents who can often be internalized. The second type of political intermediate products concerns beneficial government decisions made by principals who are harder to internalize. Furthermore, there is a market for each of the two political intermediate products. Nevertheless, full internalization of the market for the two types is not always possible due to its riskiness. The quasi-internalization of principals amounts to corruption which can lead to loss of reputation in many cultures. With respect to the use of political facilitators, changes in political regimes may eliminate their usefulness or even generate antagonisms against MNEs associated with the previous government.

Location Advantages

As mentioned above, Dunning's eclectic paradigm also requires that foreign locations be favorable to the internal exploitation of a firm's specific advantages. Boddewyn notes that in Dunning's paradigm a country's advantages are exogenously determined, that is, countries have different *given* comparative advantages. He further argues that location advantages can be of a political nature and, hence, their inclusion in Dunning's eclectic paradigm is achievable.

In summary, Boddewyn's model implicitly considers political risk as a manifestation of the political behavior that can be adopted -even 'internalized'- by firms in their interaction with various actors external to the firm.

Political Determinants of FDI

Recently, considerable attention has been devoted to understanding the influence of political variables on FDI. The premise motivating this attention is that political instability discourages foreign investments in a country by raising the risk level. However, as shown below, empirical findings have been inconclusive.

The role of political instability has been examined empirically using both survey data and econometric analysis.

Survey Studies

This first group consists of studies that involved collecting data through contacts with multinational corporations and inquiring how their investment policies in foreign countries are affected by political risk[25].

One of the first studies to examine the relationship between FDI and political risk was sponsored by the International Bank for Reconstruction and Development and the International Chamber of Commerce, in 1962. The study involved 400 companies operating in 21 countries. Three categories of risk were suggested in the questionnaire: (1) *political risk* (loss of control or ownership or loss of benefits of the enterprise by governmental action); (2) *transfer risk* (restriction on profit remittances or capital repatriations); and (3) *calamity risk* (war, revolution, etc.). It was found that 47% of the respondents considered political risk to be the principal deterrent to foreign investment, while only 3% considered calamity risk as a major constraint.

Basi (1963) employed a mail survey to obtain international executives' opinions on investment determinants. His respondents were requested to rate the importance of 15 variables presumably affecting foreign investment decisions, along a three-point scale. The aggregated findings were then ranked, to indicate the overall importance of each of the variables in determining the desirability of a nation for investment. Basi found a nation's political instability to be one of the two most critical factors in deciding upon a foreign investment site; the other factor was the nation's market potential.

Aharoni (1966) arrived at similar conclusions. His study, in-depth interviews with international personnel in 38 firms, revealed that the most feared factors from a foreign investor's point of view are political (war, expropriation, revolution, and instability); economic (inflation, devaluation, inconvertibility of local currency); and nuisance (lack of basic services). His results indicated that a nation must exhibit a minimum market size and a certain minimum level of political and economic stability before it will be considered as an investment site. Moreover, he notes that the determination of risk is neither objective nor investment specific: "[I]t is rather described in general terms and stems from ignorance, generalization, projection of U.S. culture and standards to other countries, and an unqualified deduction from some general indicator to a specific investment." (p.94)

Root (1968) revealed that market opportunity and political risks are the dominant factors in most investment decisions, based on personal interviews with executives of eighteen companies. According to these executives, the important political risk factors that might affect foreign investment decisions are: political instability, government attitudes and restrictions, currency stability, the degree of inflation, and so on.

Interestingly enough, no executive "... offered any evidence of a *systematic* evaluation of political risks, involving their identification, their likely incidence, and their specific consequences for company operations. In a formal sense, at least, American companies do not appear to go much beyond a general recognition of political risks and an ill-defined appraisal of their significance." (1968, p.75).

Stobaugh (1969) discusses four types of investment-climate analysis: (1) *Go-no go* (the manager either accepts or rejects a particular country based on an examination of one or two characteristics); (2) *premium for risk* (the company demands a higher return on investment the worse the investment climate becomes); (3) *range of estimates* (the manager makes a best estimate of what values will be for the various factors that will affect the project's profitability); and (4) *risk analysis* (estimates are made of the probable outcomes of various events). The study of 40 international companies concludes that the second technique is used by 80% of the U.S-based managers interviewed, primarily because of its simplicity and because of the intuitive feeling that it is difficult to make accurate estimates about the future in foreign countries.

Piper (1971) found that foreign investment decisions, in general, tend to emphasize financial and economic variables and de-emphasize social and political variables. He also noted an absence of formal risk evaluation procedures, identifying this as a malaise that is not confined to international business but is rather common to both domestic and foreign investment decision-making.

Keegan (1974) found that the executives responsible for the international operations of MNCs rely very little on systematic environmental scanning. He also notes that executives in large business organizations rely much more on external sources for information about their business environment than is commonly believed.

Bass, McGregor, and Walters (1977) asked respondents in a survey to rate 44 variables on a scale 0-4 on the basis of their relative importance in manufacturing foreign direct investment. On the whole, the factors that were found important were: host government policies, government stability, and accessibility to markets.

Kobrin, Basek, Blank and LaPalombara (1980) studied the assessment of non-economic environments of large U.S. national firms, interviewing 113 managers in 37 companies. In terms of the most important aspects of the overseas environment, almost 80 percent of the firms felt that political stability and the foreign investment climate were of critical importance.

Ajami and Ricks (1981) investigated the opinions of corporate decision-makers of 39 non-American firms as to corporate motives and reasoning behind their investments in the U.S. economy over the period

1974-1978. The large size of the U.S. market, the desire to enter a new market, the need to preserve markets established by exporting, a favorable U.S. political climate, and a favorable attitude toward foreign investors were the most frequently cited reasons for investing in the U.S.

Almost all of these studies have concluded that political risk is an important factor in decisions regarding foreign direct investment.

Econometric Studies

This group of studies used secondary data in their analysis. One of the early studies was done by Green (1972). In a cross-national study of 81 developed and developing nations, the author attempted to identify the nature of the relationship between political instability and foreign marketing investment. The study did not find a significant relationship between political instability, as represented by the Feierabend and Feierabend (1966) political instability index (a weighted index of politically relevant, aggressive behaviors occurring within a nation over a particular time period), and foreign marketing investment.

Bennett and Green (1972) investigated the influence of political instability on marketing FDI in 46 countries and found no significant relationship for the overall sample, nor for subsets of developed and less-developed countries.

Green and Smith (1972) used the year 1965 and data for 23 countries in their study, the dependent variable being the earnings ratio for each of four investment areas (total, manufacturing, mining and petroleum). The results suggest that political instability is an important (although not the only) factor in the investment decision.

Green and Cunningham's (1975) cross-sectional analysis included 25 nations, also for the year 1965. As in the three studies cited above, the Feierabend index was used as a proxy for political instability. Market potential, proxied by the gross national product (GNP), was a major determinant of investment behavior. Political instability was not found to be significantly related to the investment allocation decisions of U.S. investors.

Kobrin (1976) examines the relationship between FDI and the investment environment on an *ex post* basis. His objective is to explain the variation of FDI in terms of economic, political, social, and cultural variables. The author defines environmental variables as factors which (1) are a function of a given country's processes of political, social, and economic development, and (2) are relatively independent of foreign investment. Kobrin tested the following two hypotheses:

1. A substantial proportion of the variance of flows of manufacturing FDI, among host countries, can be explained by indicators of market size and potential. We would expect the relationship, expressed in terms of the signs of correlation and/or regression

coefficients, to be positive.

2. A direct or additive relationship between flows of manufacturing FDI and political event data –indicators of disruption and instability per se– cannot be established. We would not expect their correlation and/or regression coefficients to be significant. (p. 31)

The hypotheses were tested by regressing U.S. manufacturing FDI (measured by the number of new subsidiaries established from 1964-1967) on six variables representing various aspects of the environment. Of these six variables, three are related to the political environment: (1) rebellion, (2) instability, and (3) subversion. The results were given for the group of countries as a whole (62 countries) and for the less-developed countries (48 countries) alone. Kobrin found a significant relationship between manufacturing FDI and the environmental variables only for market-related factors: market size, growth, and socio-economic development. When controlled for market size, no significant relationship could be established between manufacturing FDI and the remaining (i.e. political) environmental variables.

Thunell (1977) examined countries with 30 or more investments recorded in the Harvard MNC Project Database and failed to find meaningful relationships between political events and the level of FDI, but indicated that political events may be related to the "trend change" of foreign investment.

Agodo's (1978) study was based on a sample of 33 U.S. firms having 46 manufacturing subsidiaries in 20 African countries. The author shows that no single factor determines U.S. private manufacturing investment in Africa, and that political instability is one of several factors showing strong correlation with the level of U.S. manufacturing investment in that continent.

Kobrin (1978) used data for 48 nations to determine whether the number of U.S. manufacturing subsidiaries established in each country over the period 1964-1967 can be explained by two levels (high and low) of the severest form of political conflict labeled 'conspiracy.' No direct relationship between conflict and flows of manufacturing FDI was found. "It depends on both the *nature* of the conflict and the *socio-economic conditions* under which it occurs." (1978, p. 120).

Root and Ahmed (1979) used direct foreign investment from investors worldwide in 70 countries during the period 1966-1970, as well as a variety of economic, social and political variables. The findings showed that most economic and social variables were significant, as was one political variable, the number of constitutional changes in government leadership.

Levis (1979), using regression analysis on 25 developing countries for the period 1962-1970, found all economic variables to be significant determinants to the flow of direct foreign investment. The political stability index showed less consistency in determining the flow of direct foreign investment and was considered important, but not a prime determinant of direct foreign investment decisions.

Schollhammer and Nigh (1984) examined the relationship between variables indicating investment return potential, such as annual GNP, and growth rate of GNP and the political risk variables of intra- and inter-nation political conditions as quantified by Azar and Sloan's Conflict and Peace Data Bank (COPDAB), and annual changes in foreign direct investment position. The relationship was examined for foreign direct investments by German firms from 1965 to 1978. While market size and market growth proved to be consistent determinants of the flow of foreign direct investment, the various political variables showed less consistency overall.

Nigh (1985), using similar independent variables and methodology as Schollhammer and Nigh (1984), examined the determinants of U.S. manufacturing direct foreign investment during the period 1954-1975 for 24 developed and less developed countries. The author concluded that market size was consistently a significant determinant and, less consistently, certain classes of political events were determinants in certain groups of countries differing in degree of economic development; for the less developed countries, both inter-nation and intra-nation conflict and cooperation affect FDI, while the developed countries appear to be affected only by inter-nation conflict and cooperation.

Schneider and Frey (1985) employed a research methodology that allowed them to reconcile direct foreign investment and return. Four economic models, (1) political; (2) economic; (3) 'amalgamated'; and (4) politico-economic, were econometrically tested by multiple regression over 54 developing countries for three different years, 1976, 1979 and 1980. In terms of both the goodness of fit and the quality of (*ex post*) forecasts, the politico-economic model performed significantly better than the three competing models. Among the political determinants, the amount of bilateral aid coming from Western countries has the strongest stimulating effect. Political stability is also a significant negative factor, while the government's ideological position does not have a statistically significant influence.

Chase, Kuhle, and Walther (1988) studied 46 developed and less developed countries from five continents in which U.S. direct foreign investment has been situated, from 1972 to 1984. The authors examined the relationship between annual political risk premia and political risk ratings. " ... the findings of the study suggest that country-specific political risk as measured by the two commercially available country risk indices did not, in most years, get compensated by a risk premium." (1988, p. 37).

Fatehi-Sedeh and Safizadeh (1988) analyzed the relationship between FDI and sociopolitical instability for South and Central American countries during the years 1950 to 1982. As a group, no relationship was found between sociopolitical instability and FDI. However, separate analyses for individual countries yielded the expected negative association for some of the countries.

Tallman (1988) examined whether political risk in the home country had an effect on outward FDI. Using the United States as the host country and a number of industrialized countries as home countries, he examined the effects of international and domestic political and economic events on FDI. His results indicated that reducing domestic political risk reduced outward FDI, while improved political relations between countries increased outward FDI.

Fatehi-Sedeh and Safizadeh (1989) examined the relationship between political instability and foreign direct investment. Fifteen countries were analyzed for the period 1950-1982. Both positive and negative regression coefficients for seventeen different sociopolitical instability variables were present; in most cases the same variables were significant in models involving one, two and three year lags.

Akhter and Lusch (1991) studied the influence of developed and developing countries' environments on foreign direct investment from the United States to 54 countries, for the period 1975 through 1980. The findings showed no significant relationship between political instability and foreign direct investment. Furthermore, the authors noted the following with respect to political instability:

> Investments ... are made not on the basis of current conditions, but on future returns and expectations. Therefore, if current political instability is not perceived as leading to the creation of an adverse business climate for foreign firms in the future, the inflow of FDI will not be negatively affected. (pp. 349-350)

Koechlin (1992) estimated a model of the location of U.S. FDI in manufacturing that takes into account sociopolitical factors as well as host-country demand and cost conditions. The author analyzes four models of the location of FDI: (1) a cost model, in which location decisions are a function of host-country conditions; (2) a demand model, in which the flow of U.S. FDI is a function of market size; (3) a hybrid economic model that includes both demand and supply-side factors; and (4) a political economic model that adds three sociopolitical variables to the economic model. The sample in this study pools 10 time-series observations (the flow of FDI for each two-year period between 1966 and 1985) for each of 23 host countries.

Koechlin arrived at two major conclusions. First, the demand and cost models are each underspecified. Secondly, the significance of three sociopolitical variables indicates that the economic model of FDI is underspecified as well. Moreover, the inclusion of sociopolitical variables results in substantially different estimates of the relative importance of the economic determinants of FDI location.

The three sociopolitical variables are: (1) the Business Environment Risk Index (BERI); (2) English (a multinational firm is likely to face lower costs of being foreign when the predominant language of the source and host country are the same); and (3) Dependency (a host government is less likely to mistreat firms originating in a country on which the host depends economically, politically and/or militarily). Of the six political-economic models estimated, one stands out in which demand, cost, and sociopolitical variables are statistically significant and jointly explain a large part of U.S. manufacturing FDI. In this equation, restated in terms of standardized regression coefficients, GDP is by far the most influential of the eight variables considered. While labor cost, tax and distance are all statistically significant in the fully specified political-economic model, the influence of each of the sociopolitical variables is greater than any of the three cost measures.

Fatehi and Safizadeh (1994) examined the effect of socio-political instability on the flow of U.S. manufacturing, mining, and petroleum foreign direct investment in 14 developing countries for the period 1950-1982. The reported findings showed that there was not a consistent pattern of fluctuations in the flow of the three types of U.S. FDI in reaction to political turmoil.

Summary

These mixed results may reflect a variety of factors. First, it is difficult to measure political risk or political instability. Second, a given political event may give rise to different levels of risk depending on the country of origin of the investment or the type of industry in which the investment was made. Furthermore, some cross-country econometric studies did not allow for lags between the time when a change in risk is perceived and the time when the change in foreign direct investment takes place. Finally, some of the early studies did not include factors other than political risk as explanatory variables of foreign direct investment.

Summary

This chapter has provided an overview of the literature on foreign direct investment and political risk. This included a discussion of theoretical models and empirical findings from which the relevant hypotheses were derived. The next chapter examines the research methodology employed in the dissertation.

CHAPTER 3

METHODOLOGY

Introduction

The major objective of this study is to examine the relationship between the investment behavior of MNCs and the political instability prevalent in a host country over time. To that end, a convenient data set is used that covers the foreign investment of two source countries –United Kingdom and United Sates- in one host country –Canada-, across 15 industries.

This paper improves over previous studies in a number of ways. Firstly, analysis is conducted at an industry level whereas the usual approach has been to examine aggregate FDI data. Secondly, the time period under study is larger and more current than that hitherto used. Thirdly, the relationship between FDI and political instability is investigated on an industry-case basis, supporting the belief that the effects of political instability are likely to be different across industries. Fourthly, emphasis is placed on the nature of investment decisions carried out by two source countries and one host country, whereas previous research has focused on one single source country and multiple host nations. Fifthly, the reciprocal relationship between FDI and political instability will be discussed by means of simultaneous-equation models. Finally, the long-run relationship between political instability and FDI will be examined through cointegration analysis.

The latter two points constitute new methodological approaches in the analysis of FDI and political instability –this author has not identified anystudies in which these methods has been applied to political instability or political risk-.

The following sections shall deal with: (1) the sources of data employed, (2) the operationalization of the variables used in the analysis, (3) the research hypotheses tested in the paper, and (4) the analytical methods by means of which the above hypotheses will be examined.

Sample Data: Sources and Operationalization of Variables

Dependent Variable: FDI

The dependent variable is foreign direct investment. FDI has both stock and flow dimensions. At any point in time there is a stock of accumulated FDI; this is the book value of historical flows of FDI. Flows relate to a specific period of time, usually a year and they reflect a change in the magnitude of FDI over that period.

Levis (1979, p. 63) has argued that the flow dimension of FDI is preferable to the stock concept since the flows are "... dynamic, in the sense that they represent the annual change of direct investment, whether it is positive or negative, ...". Indeed, it could be argued that the flow is too dynamic in the sense that it may be impacted by unrepresentative events in the environment which may sometimes cloud the effects of more fundamental forces. Another drawback of the flow dimension is that, if any negative flows are present in a dataset, one cannot apply log transformations to such data, where such transformations are necessary.

The stock dimension is more static than the flow dimension. Unlike the latter, which is susceptible to current managerial decisions, the stock of FDI can be seen as the cumulative outcome of past and current decisions. Therefore, the stock represents a more permanent decision which is less likely to be susceptible to current decisions alone. For this reason, and also because of the lack of data for flows at the industry level, the stock of FDI is selected as the dependent variable.

The source for this variable is *Canada's international investment position, Historical Statistics, 1926 to 1992* (Cat. No. 67-202); Tables 31 and 32, pp. 109-112. The data is given in millions of Canadian dollars and by type of industry, the industries being those listed in Table 21. In this paper, a minor adjustment is made in the UK FDI data of the "Animal products" industry for the years 1987 and 1988. For these years there is no data due to the insignificant amount of FDI stock; therefore, in order to allow

Table 21

List of Industries Used in the Research

Industry Number	Industry Name
1	Vegetable products
2	Animal products
3	Textiles
4	Wood and paper products
5	Iron and products
6	Non-ferrous metals
7	Non-metallic minerals
8	Chemical and allied products
9	Manufacturing (Sum of all above)
10	Petroleum and natural gas
11	Mining and smelting
12	Utilities
13	Merchandising
14	Finance
15	Total (Sum of all above)

for future possible transformations, an arbitrary value of 0.5 C$ million will be assigned to those particular years.

The FDI Series

Foreign direct investment in Canada has been a major factor in the financing of this country's spending, as shown by the current-account deficits which predominated throughout its history. This financing usually came from the United States and continued until the mid-1970s when three major developments led to more geographically-diversified sources of financing. These developments were: (1) the creation and rapid acceptance of the Eurocredit market; (2) advances in technology which facilitated the transfers of capital flows; and (3) world-wide deregulation that encouraged capital to flow to domestic industries previously protected.

Despite the geographical diversity of FDI sources, concerned mounted in the late 1960s over the increasing foreign ownership trend in the Canadian economy.[26] In 1974, the Foreign Investment Review Agency (FIRA) was set up in order to screen new foreign investment and to review foreign acquisitions of existing assets. In 1980, the National Energy Program (NEP) was created to, among other things, monitor the extent of foreign control in the energy industry. These two government acts led to a drop in the foreign control ratio –defined as the proportion of foreign capital to all capital employed in the non-financial industries- from a peak of 36% at the end of

1971 to 23% at the end of 1986, largely through Canadian takeovers of foreign controlled companies. In 1985, however, the nationalist trend was reversed with the creation of Investment Canada, which was designed to promote foreign direct investment in Canada. The foreign control ratio rose to 28% at the end of 1991. Figure 15 illustrates the time pattern of the foreign control ratio.

At the country level, the UK and the U.S. have dominated the FDI "market". Figure 16 shows each country's share of the FDI total, for the period 1948 to 1991. It is important to note that although the U.S. has always remained the dominant investor, its share has declined considerably over time, whereas the UK share has remained relatively constant. However, both countries still accounted, as of 1991, for over 75% of the total FDI stock in Canada. Therefore, it becomes necessary to investigate the determinants that motivate UK and US investors to locate in Canada.

At the industry level, the UK stock levels, for all industries, are lower than those of the United States. In the UK case, the dominant industry is Manufacturing, followed by Finance and Petroleum. Likewise, in the case of the U.S., Manufacturing dominates followed by Finance and Petroleum. Appendix E depicts a cross-country comparison of the levels of FDI stock for each industry.

Figure 15

Control of Capital Employed in Non-Financial Industries in Canada, By all Foreign Countries, From 1951 to 1991

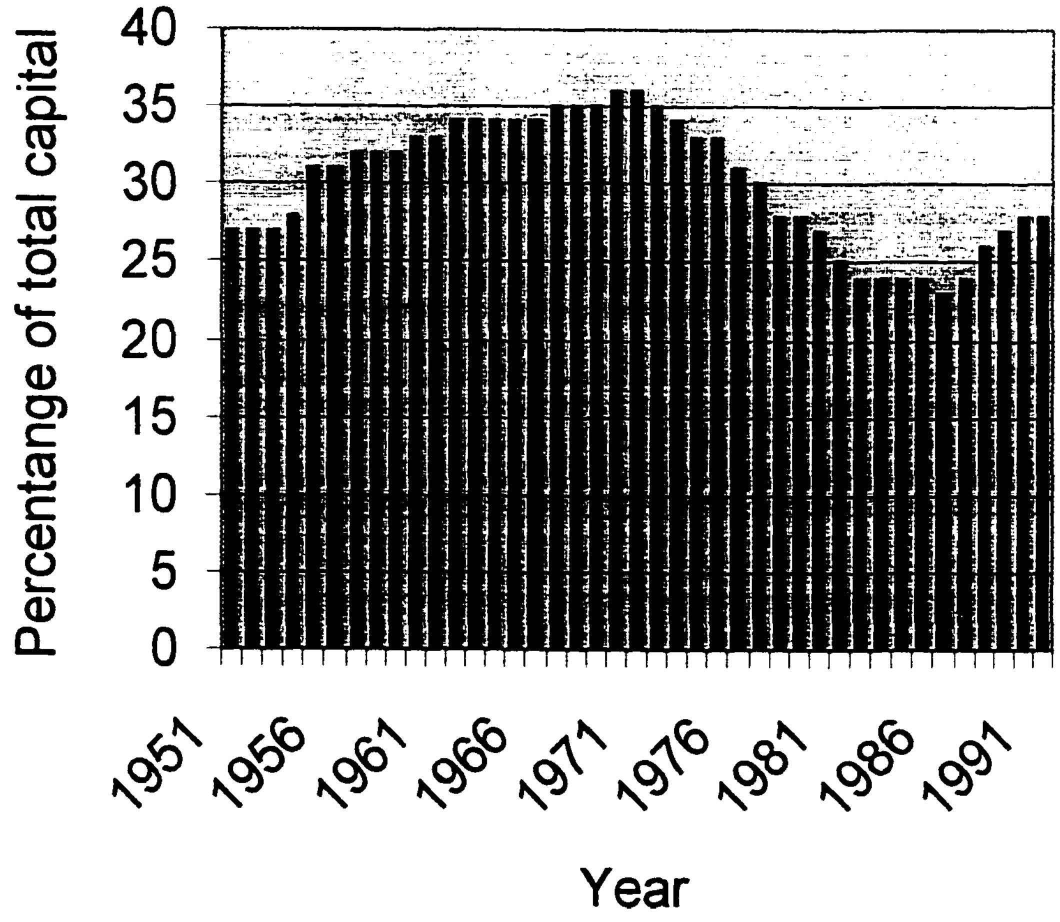
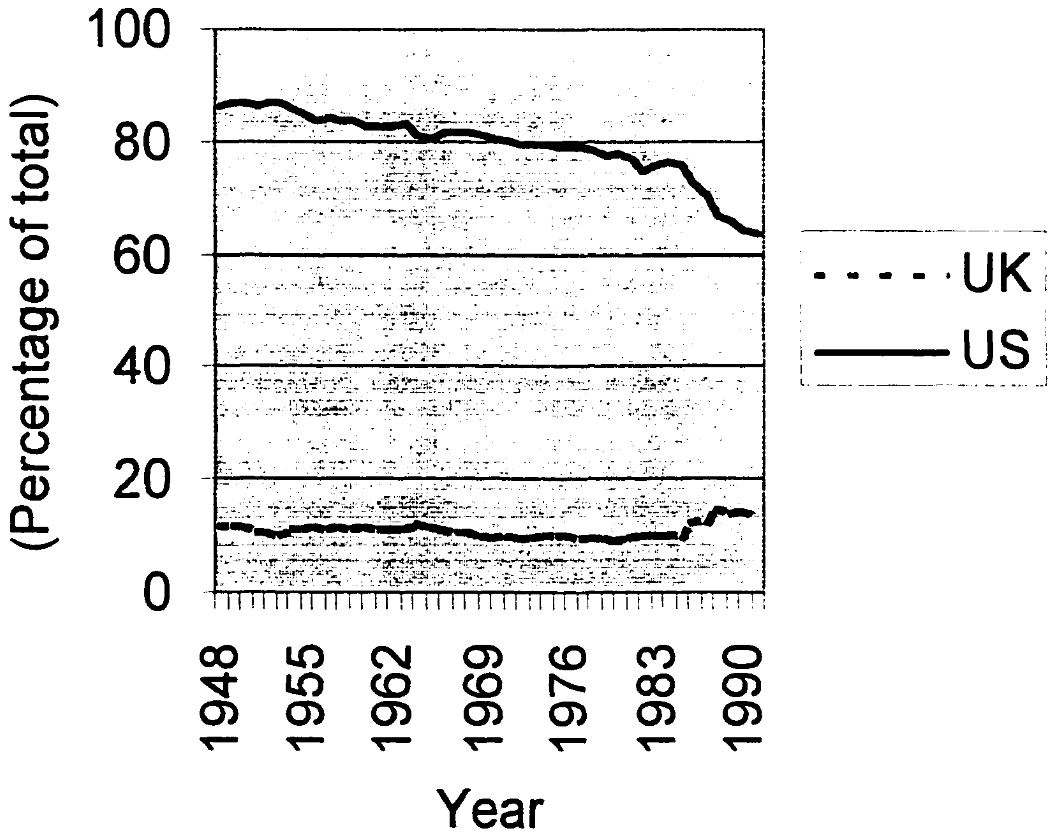


Figure 16

Percentage Share of FDI, From the UK and U.S., in the Canadian FDI Total



Main Independent Variable: Political Instability

This section briefly discusses the problems of obtaining an adequate index of political instability to be used for empirical research. Given these problems, the section continues with the indices most used in the literature and the two indices used for this research paper.

Measurement Problems of Political Instability/Risk

The measurement problems stem from problems related to (1) data collection, and (2) analysis and interpretation of data.

Data collection of a political nature is difficult, often biased or subjective, and time-consuming. Some major obstacles in data collection have been: (1) guarded response to sensitive questions by host-country respondents, (2) censorship of published reports and sources, (3) "doctoring" of data supplied by official agencies to create positive rather than objective impressions, (4) non-availability of certain types of data, (5) non-availability of data in useful orderly formats, and (6) risk-averse attitudes that lead to "bad" information being hidden. More importantly, Sethi and Luther (1986, p.64) note the following:

> The decision-related dimension of political risk assessment does not feature in the collection stage. Pursuance of a particular strategy generates its own unique risk exposure, and correct evalyation of this risk requires not just general or broad data, but rather strategy-specific

information. Furthermore, data have to be somewhat firm- and industry-specific. The issue of data collection, therefore, is ultimately tied to strategic containment avenues that are contenplated by a business.

In terms of analysis and interpretation, political risk assessment has also suffered from methodological problems. Until recently, impressionistic and qualitative assessments of political risk were made (Desta, 1985). As a result, quantitative techniques are being increasingly used, the major techniques being (1) Delphi methods based on expert opinions, (2) rank-ordering approaches, (3) decision-tree methods, (4) cluster analytic methods, (5) multiple regression analysis, and (6) discriminant analyses.

Nevertheless, according to Boxx and Dant (1990, p.221), political risk assessment still suffers from problems related to:

> ... (1) the non-disclosure of definitions of key indicators of indices, making replications impossible, (2) the non-assessment of inter-judge reliability coefficients, reducing the usefulness of predictions, (3) the standardization of factors across countries even though they have different meanings in different country contexts, (4) the non-standardization of reported country scores, limiting their comparability, (5) double-counting, (6) the inherent interpretational flaws associated with parameters like GNP and PCI, (7) the static as opposed to dynamic or longitudinal analyses, (8) the selection of indicators without reference to well-grounded analytical frameworks, (9) linearity assumptions, and (10) too much aggregation.

Measures of Political Instability in the Literature

Several techniques have been developed to measure a nation's level of political instability. The factors and methods used vary considerably, as does the potential usefulness of these techniques for the international business manager. Moreover, these measures have a limited time span; none of them covers the entire post World War II era.

The Russett measure

The approach developed by Russett (1964) uses two measures as indicative of a nation's level of political instability. The first is a count of the number of deaths per one million population which occurred as a result of political violence. This measure is based on the assumption that by observing the number of deaths stemming from political violence, one can infer the amount and intensity of such violence a nation incurs. The second measure is termed "executive stability." It consists of the number of years a nation has been independent and the number of chief executives it had from 1945 to 1961. These two measures are combined to form the index of political instability.

The Banks and Textor measure

This measure was developed by Banks and Textor (1963). Their method consists of assigning each nation to one of four governmental stability categories:

- Government generally stable since World War II or major interwar constitutional change;
- Government generally stable since World War II or major postwar

constitutional change;

- Government moderately stable since World War II or major constitutional change; or
- Government unstable since World War II or major postwar constitutional change.

The Feierabend measure

This measure was developed by Feierabend and Feierabend (1966). It is based on the theory that a nation's political instability is reflected in the amount and intensity of aggressive, politically relevant behavior occurring within a society. The authors define political instability as:

> ... the amount of aggression directed by individuals or groups within the political system against other groups or against the complex of officeholders and individuals and groups associated with them. Or, conversely, it is the amount of aggression directed by these officeholders against other individuals, groups, or officeholders within the polity. (p.250)

Using this definition the authors constructed a seven-point scale of political instability based upon the number and intensity of political activities of a nation. They considered thirty types of political activity to which they assigned different weights; the more destabilizing the activity, the higher the weight it receives. Table 22 presents a list of thirty indicators. The weights given to each type of event were validated by a team of judges working independently of the authors and of each other.

In this manner a three-digit score of political stability is calculated for each nation which ranges from 000 to 699. The first digit represents the weight attached to the most destabilizing event occurring within the nation over the time period being considered. This digit assigns the country to its position within the seven-point scale. The remaining two digits represent the sum of the weights assigned to each of the destabilizing events occurring within the polity over the time period. These digits determine a nation's relative position within each of the scalar positions.

Table 22

Events Considered in the Feierabend Index

1. Elections
2. Vacating of office
3. Significant change of laws
4. Acquisition of office
5. Severe trouble within a non-governmental organization
6. Organization of opposition party
7. Governmental action against significant groups
8. Micro strikes
9. General strikes
10. Macro strikes
11. Micro demonstrations
12. Macro demonstrations
13. Micro riots
14. Macro riots
15. Severe macro riots
16. Arrests of significant persons
17. Imprisonment of significant persons
18. Arrests of few insignificant persons
19. Mass arrests of insignificant persons
20. Imprisonment of insignificant persons
21. Assassinations
22. Martial law
23. Execution of significant persons
24. Executions of insignificant persons
25. Terrorism and sabotage
26. Guerrilla warfare
27. Civil war
28. Coups d'etát
29. Revolts
30. Exile

The COPDAB measure

This measure was developed by Azar (1980). The conflict and Peace Data Bank (COPDAB) gives full dimensions of the frequency and intensity for both conflict and cooperation of inter- and intra-nation political events with multiple sources of information. COPDAB obtains its basic political events data from a large number of newspapers and chronologies. It contains about 500,000 event records which describe the actions of 135 countries toward one another, and within each country, during the period 1948 to 1978.

In general, COPDAB employs the following process to obtain the dimesions of interaction:

1. Daily event statements are collected from public sources.
2. The event statements are coded to produce descriptive events.
3. The descriptive events are scaled, weighted, and aggregated to produce the dimensions of interaction.

The COPDAB scales for international and domestic events are each constituted of 15 points. On the international scale, point 1 is the value given to the most cooperative event between two nations (for example, nations A and B unite into one nation-state). A scale value of 15 is the most conflictive event between two or more nations (total war). On the domestic scale, 1 is the most cooperative event (e.g., governmental programs to increase socioeconomic freedom and equality) and 15 is the most conflictive of domestic events, namely, a civil war.

Further, in order to get a measure of the relative intensity of the different classes of events, COPDAB ran a series of experiments in which expert judges indicated, in numerical terms, the amount of conflict and cooperation represented by each scale point relative to the neutral point. From this a weighted value is assigned to each scale point. The domestic scale ranges from a conflict score of 85, through the neutral point, to a cooperative maximum of 70. The maximum inter-nation conflict is 102 and the maximum cooperation is 92. The dimensions of interaction take into account both the frequency and intensity of the events that occur during a given year. The inter- and intra-nation conflict and cooperation values are calculated by multiplying the yearly frequency of events at each conflict (cooperation) point on the relevant scale by the weighted value of that point and adding together the resulting scores on the conflict (cooperation) part of the scale.

The Economist measure

In 1986, The Economist created an index of risk based on 100 points. Of these 100, 33 were attributed to economic factors, 50 to politics, and 17 to society. For each of the three areas, specific variables were selected that the writers felt reflected that particular domain. The Economist chose six political variables worth a total 50 points in weight and four social variables worth 17 points to represent what is generally termed political risk. These variables are briefly discussed below.

- Bad neighbors (3 points). It is argued that being near any superpower almost automatically means trouble in that superpowers tend to control their peripheries, often with the use of force.
- Authoritarianism (7 points). Whether totalitarian or authoritarian, the lack of democracy in a state constitutes an adverse situation; even rigid totalitarian control is only temporary.
- Staleness (5 points). Legitimacy implies an uncoerced and positive acceptance of the part of the population of a state. Political risk is a function of the gap between acceptability and a government's persistence in power.
- Generals in power (6 points). In response to instability or the lack of competent civilian authority (or the military's perception of competence), military authorities often step in and take control themselves. It is argued that most military people do not know how to govern nor how to step aside gracefully.
- War/Armed insurrection (20 points). Apart from the obvious destruction of physical facilities, war disrupts the economy and brings about losses in a number of other ways; for example, raw goods and supplies are delayed or diverted to war use.
- Urbanization pace (3 points). When the urbanization process is too

rapid, or is too concentrated on a single city, a number of problems accompany the shift. These include, among other things, crime and economic irregularities. It is not the urbanization itself but rather the nature of the process and its effect on society that threatens the foreign investor.

- Islamic fundamentalism (4 points). It is argued that Muslim radicals could still change the world and where they are strong, the risk to investors is high.
- Corruption (6 points). Corruption can distort the economy in ways that the best of investor awareness cannot accommodate.
- Ethnic Tension (4 points). Ethnic, religious, and racial tension can lead to an environment in which industry cannot flourish. It may involve restrictions on investors, restrictions on labor resources, or it may result in outright open conflict.

The Business Environment Risk Intelligence (BERI) measure

The BERI Political Risk Index (PRI) was first published in 1978. The Index is based on scores assigned by experts to 10 political variables. The total number of experts employed is over 70, covering 48 countries. In an initial run, each of the 10 variables can be assigned as many as seven points by the expert analyst. A score of 7 represents the optimal circumstance, the least amount of risk. Thus, a totally riskless situation would be represented by a score of 70. Bonus points may be added, creating a possible total of 100 for the Index.

The 10 variables are divided into three categories: (1) internal causes of political risk, (2) external causes of political risk, and (3) symptoms of political risk.

(1) Internal causes of political risk

(a) Fractionalization of the political spectrum. It represents divisions among political perspectives in the society, with numbers of perspectives seen as representing a threat to consistency and regularity in political processes.

(b) Fractionalization by ethnic, language, and religious groups. This is considered as the social counterpart of the variable above. Risk would be increased by the amount of the divisions, as well as by the increased power of the distinct groups.

(c) Restrictive measures to retain power. The existence of authoritarianism or the use of coercive measures reflects an attitude of arbitrary action, abrupt changes of rules, and alienation due to a government's handling of the implementation of decisions.

(d) Mentality: Xenophobia, nepotism, nationalism, corruption, willingness to compromise.

(e) Social conditions: wealth distribution and population density. This is similar to The Economist's "urbanization" variable. Wealth distribution adds another dimension, that of disparity between levels of society.

(f) Organization/power of the radical left. This variable mainly represents the concerns of the 1970s.

(2) External causes of political risk

(a) Dependence on and/or importance to a hostile major power. This variable closely parallels The Economist's "bad neighbors" variable.

(b) Negative influences of regional political forces. This variable also parallels the "Bad neighbors" variable.

(3) Symptoms of political risk

(a) Societal conflict: strikes, violence, demonstrations. There is concern with the nature of the environment of business operations.

(b) Non-constitutional changes, assassinations, guerrilla wars.

BERI's experts grade a country's political risk climate by variable, assigning up to seven points for each of the 10 variables, including the symptoms. However, an additional value may be assigned to any of the first eight internal or external variables if the condition reflected by the variable is notably favorable for business operations. The total of these bonus points may range as high as 30, making a maximum of 100 points possible if the risk conditions were absolutely perfect. BERI provides the following ranges as guidelines in characterizing the level of political risk: 70-100 stable environment typival of an advanced industrialized economy, low risk; 55-69 moderate risk countries with complications in day-to-day operations, moderate risk; 40-54 high risk for foreign-owned businesses; 0-39 unacceptable business conditions for foreign-owned businesses.

The measures of political instability cited above are either outdated or too recent, with no single measure covering the period 1948 to 1991. Furthermore, there are not two measures that can be combined to cover such period. For these reasons, the following available two measures of political instability will be used in this research. The first measure covers the period 1948 to 1982; the second measure covers the period 1983 to 1991. The use of these measures is likely to pose some statistical problems; however, in a later section some practical remedies will be discussed.

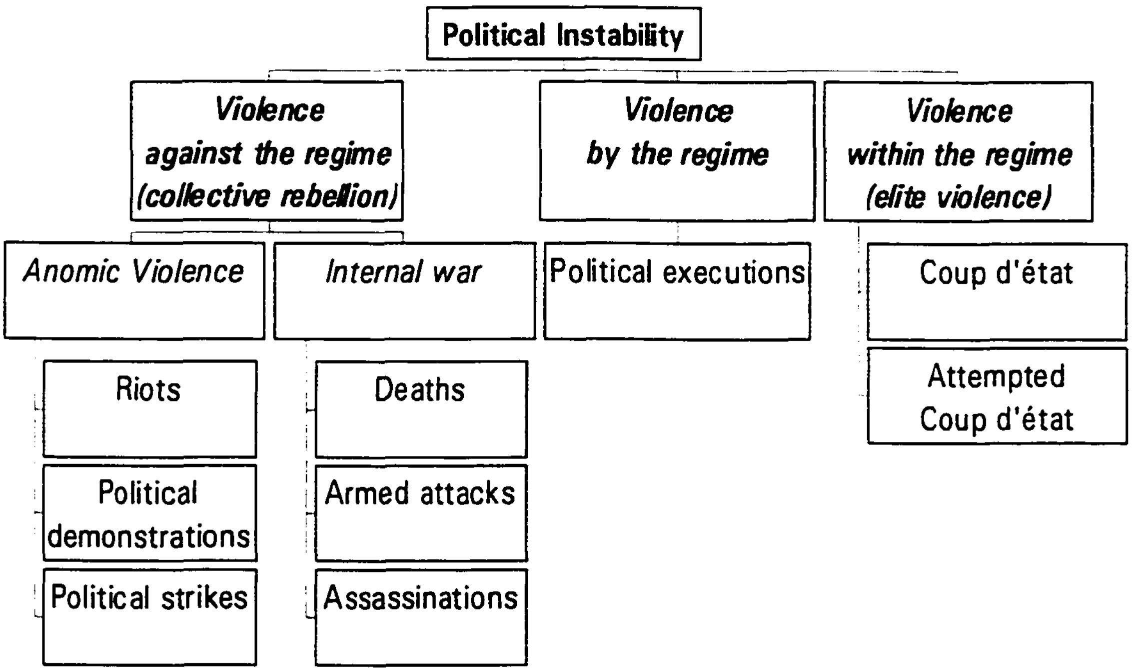
Measures of Political Instability in this Research

The Gupta measure

Gupta (1990) starts from the premise that incidents of political violence can explain the relative instability of a nation. He classifies the overall environment of political violence within a nation into three broad categories: violence against the regime, violence within the regime, and violence by the regime. The first category is composed of: (1) riots, (2) political strikes, (3) anti-government demonstrations, (4) armed attacks, (5) deaths from domestic violence, and (6) political assassinations. The second category includes successful and unsuccessful coup d'états. The third category is accounted for by the frequency of political executions. The nine measures of mass, elite, and regime political violence are depicted in Figure 17. Along with the nine measures of instability, the author included a tenth one, namely, political legitimacy of the goverment. It is assumed that a democratic country is politically more stable than a non-democratic one. Therefore, if two nations have similar frequencies of political violence, and if one of the countries is a democratic one and the other is not, then the former is inherently more stable than the latter. This is because democracy tolerates more expressions of dissent and enjoys the perception of legitimacy from its people.

Figure 17

Gupta's Dimensions of Political Instability



Source: Gupta (1990, p. 194).

The index for political instability was created in two steps. In the first step, 104 noncommunist countries were classified into groups of relative political stability. The data were pooled for the average of three five-year periods, 1953-57, 1963-67, and 1973-77, giving a total of 312 observations. The author used cluster analysis in order to classify cases into similar groups by measuring distances among them; more specifically, cluster analysis was used to measure Euclidean distances, where the Euclidean distance between two cases, j and k, is defined as:

$$d_{jk} = \sqrt{\sum_{i=0}^{n} (x_{ij} - x_{ik})^2}$$

Next, a stable nation is defined as one with zero level of incidents of political instability and is a democracy. From this definition, Gupta calculated the standardized distance for each country from this hypothetical country; the farther a country is from this definition, the more unstable it is. However, since the distance measured does not distinguish between the various types of political violence and assigns an equal weight, the distances were recalculated by omitting the three variables of the so-called anomic violence (political demonstrations, riots, and political strikes). The countries were thus classified into groups. Furthermore,

> ... these classifications were obtained without arbitrarily assigning the relative weights for the ten individual manifest variables of political instability but by assigning equal weight to the standardized values of the measures of internal war and

> the measures of elite violence, coups d'état, and unsuccessful coups d'état. This [...] yields lower weights for the measures of anomic violence in the functions for creating the index for political instability. (p. 199)

In the second step, Gupta used discriminant analysis and a multinomial logit model to explain which variables of political instability account for the classification of two or more group of countries into relative levels of political instability. The two functions were estimated by pooling the three five-year averages for the countries in the sample set. Though the two methods of estimation yielded similar results, the author used the following discriminant function to compute the political instability quotient (PIQ) for the 104 noncommunist countries:

$$PIQ^{*} = 1.14 + 0.0007PD + 0.0049RT + 0.0086PS + 0.43 \times 10^{-5}D + 0.13AS + 0.0008AA + 0.0033PX + 1.38CD + 0.264UCD + 0.92GP$$

*89% of the countries were correctly classified

where:

PD = number of political demonstrations
RT = number of riots
PS = number of political strikes
D = number of deaths from political violence
AS = number of assassinations
AA = number of armed attack events
PX = number of political executions
CD = dummy variable for the occurrence of coups d'état
UCD = dummy variable for the occurrence of unsuccessful coups d'état
GP = government profile (=0 if democracy; =1 otherwise)

This measure of political instability was tested for construct validity. The test involves relating a measuring instrument to an accepted scale or a theoretical framework in order to determine whether the instrument is tied to the concepts it is attempting to measure. The author calculated the Spearman's rank correlation between his rankings and those of the Feierabend index discussed above. The correlation was 0.72 and was statistically significant at the 0.1% level. The difference between the two rakings was attributed to the fact that: (1) the two studies employed different data sets and different definitions of political instability, and (2) the Feierabend ranking was based on a longer time period (1948-1966).

The IRIS measure

This dataset was compiled by the IRIS Center (University of Maryland) from the International Country Risk Guide (ICRG), a monthly publication of the Political Risk Services (PRS) Group. The IRIS measure covers the period 1982 to 1995, and consists of five variables. Each variable's value for a given country and year is a simple average of the two values for April and October (for 1995, only April is used; for 1982, no observations are available prior to September). These data were used by Knack and Keefer (1995) and by Clague et al. (1995).

The variables considered in the IRIS dataset are as follows.

(1) Government repudiation of contracts. It is measured on a scale of 0 to 10. This indicator addresses the possibility that foreign business, contractors, and consultants face the risk of a modification in a

contract taking the form of repudiation, postponement, or scaling down. A country may initiate contract modification with a foreign business because of an income drop, budget cuts, indiginized pressure, a change in government, or a change in government economic and social priorities. Low point totals signify a greater likelihood that a country will modify or repudiate a contract with a foreign business.

(2) Risk of expropriation. It is measured on a scale of 0 to 10. It encompasses outright confiscation and forced nationalization. The risk of expropriation may vary by type of business or by the investor's country of domicile. However, this indicator does not make these distinctions. The low risk ratings are given to countries where expropriation of foreign investment is a likely event.

(3) Corruption. It is measured on a scale of 0 to 6. It measures corruption within the political system. Such corruption is a threat to foreign investment for several reasons: (a) it distorts the economic and financial environment, (b) it reduces the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability, and (c) it introduces an inherent instability into the political process.

(4) "Rule of law." It is measured on a scale of 0 to 6. A country with

an established law and order tradition has sound political institutions, a strong court system, and provisions for an orderly succession of power. This indicator reflects the degree to which the citizens of a country are willing to accept the established institutions to make and implement laws and adjudicate disputes. A high risk point total means that there is a strong law and order tradition, while a low risk point total means there is a tradition of depending on physical force or illegal means to settle claims. In countries with poorly developed law and order traditions, governments may be less likely to accept the obligations of the previous regime.

(5) Bureaucratic quality. The institutional strength and quality of the bureaucracy is a shock absorber which tends to minimize revisions of policy when governments change. Therefore, high risk points are given to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruption in government services. In these low-risk countries, the bureaucracy tends both to be somewhat autonomous from political pressure and to have an established meachnism for recruitment and training. Countries that lack the cushioning effect of a strong bureaucracy receive low risk rating points because a change in government

tends to be traumatic in terms of policy formulation and day-to-day administrative functions.

For this paper, a composite index is constructed based on the values taken by the five variables, namely: for each year between 1983 and 1991 the values of each variable are added up and divided by the total possible value that a nation can receive, i.e. 30 points. However, the resulting index cannot be compared with that of Gupta (1990) because the latter assumes that the closer the values are to zero the higher the level of political stability of a nation. On the contrary, the IRIS dataset starts from the premise that the closer the values are to zero the higher the level of political instability of a nation. Therefore, the calcualted value of a composite index from the IRIS dataset is substracted from one in order to make both measures comparable.

The Political Instability Series

Figures 18 and 19 show that, for most of the period covered, Canada has been politically more stable than the UK and the United States, regardless of the political instability measure used. Furthermore, the U.S. has been more stable than the UK. Given this visual facts, one may hypothesize that, *ceteris paribus*, UK and U.S. investors will invest abroad (Canada) rather than invest domestically.

A final comment on the political series is in order: Since some data points in both measures exhibit the value of zero, they are transformed by adding the arbitrary value of 0.0001 so that they remain close to the original value but become a positive number that can be used in subsequent transformations, more specifically for log transformations.

Figure 18

The Gupta Measure: 1948-1982

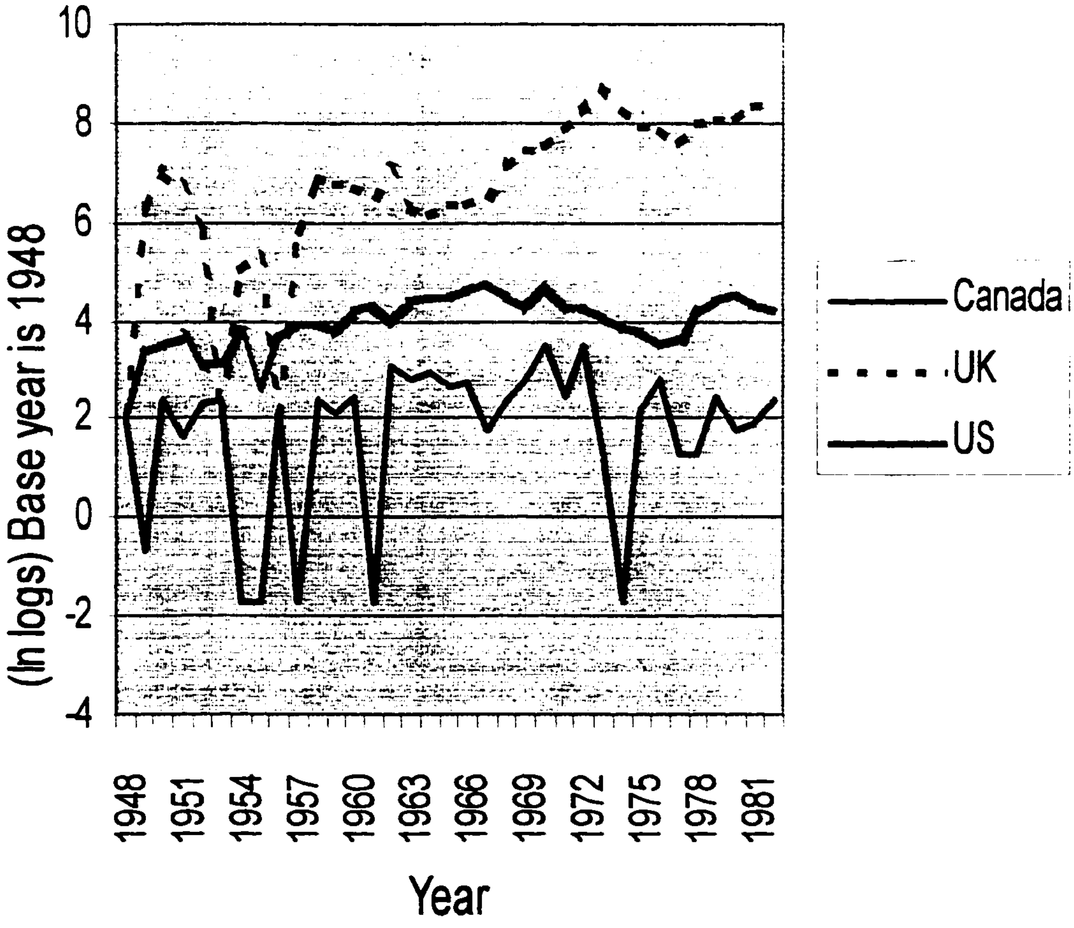
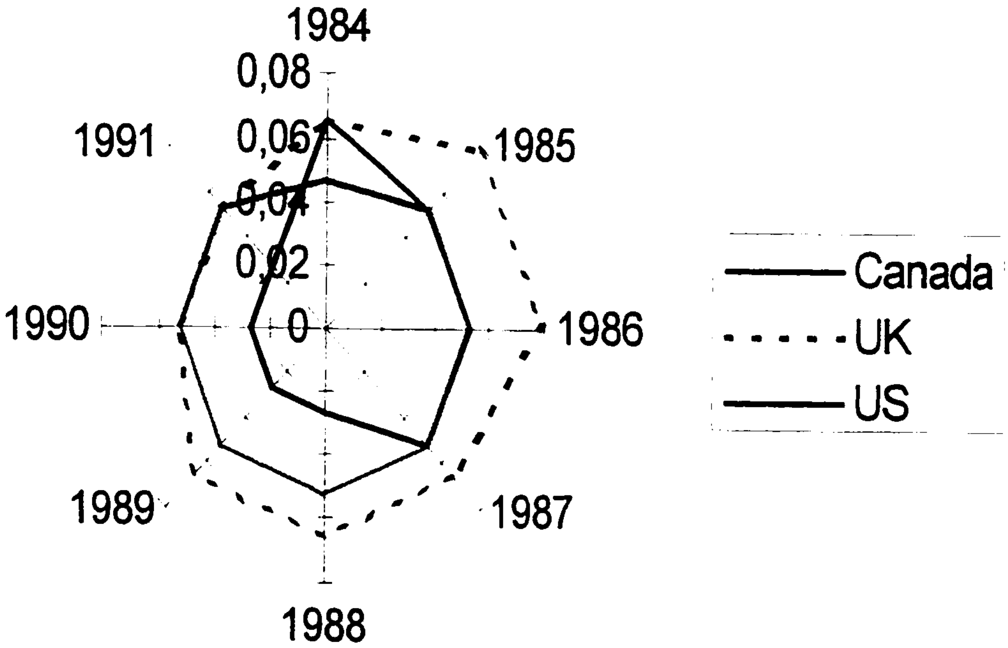


Figure 19

The IRIS Measure: 1983-1991



Market Size

The proxy for this variable will be GDP. The source of this figure for Canada is the same as for the FDI series. For the UK, the figures are obtained from various issues of the CSO (Central Statistical OFFice) Blue Book of National Accounts. For the U.S., the figures were available in the Internet. Since all these figures are reported in the respective national currencies, they will be converted to an index with the base year being 1986. The choice of this particular base year is due to the fact that many of the following series involving indices have the year 1986 as their base year.

Exchange Rate Level

This is the current value of the real exchange rate (weighted with consumers price indices, 1986=100). The nominal exchange rates are the rates as reported on transactions between banks in the exchange market. The data source for the bilateral rates (C$/US$, C$/£) is the same as for the FDI series.

Expected Exchange Rate

This variable is constructed in the same way as in Cushman (1985, 1987). The expected real exchange rate is equal to the current value of the real exchange rate multiplied by the expected change in the real exchange rate (E). The expected change in the real exchange rate is calculated as

$E_{trend,t}/E_t$ where $E_{trend,t}$ is the fitted value from the regression $E_t = a + bt$ (where t is time, and a and b are coefficients).

Exchange Rate Risk

This variable is the real exchange rate risk, calculated as the standard deviation of annual changes in the real exchange rate and converted to an index number with 1986 as the base year. This calcualtion follows that performed by Cushman (1985, 1987).

Labor costs

The wage index is used as a proxy for labor costs. For Canada, the data was obtained from the following sources: (1) Employment, Earnings and Hours Division of Statistics Canada; (2) CANSIM time-series diskette for Average Weekly Wages and Salaries, Canada, Industrial Composite; and (3) Canadian Economic Observer (Cat. No. 11-210), 1994/1995.

For the UK, the source is the CSO Blue Book of National Accounts, various issues. For the U.S., the data was retrieved from the Internet.

Productivity

The variable is proxied by real GDP per hour worked in the case of the Canada, whereas for the UK and U.S. the variable is real GDP per person at work.

For Canada, the source is the CANSIM databank: Indexes of real Gross Domestic Product Per Person-Hour Worked of Persons at Work by Input-Output Industries and Special Aggregations, 1986=100, annual data (I191106 Manufacturing Industries).

For the UK, the source is the same as that for the wage index. For the U.S., data on productivity was also retrieved from the Internet.

Research Hypotheses

The following hypotheses will be tested in this dissertation. All hypotheses, except for those related to the exchange rate, are given in terms of both absolute level and relative level of the explanatory variables. Thus, the absolute level only takes into account the host country's locational characteristics. The relative level consider the characteristics of both the investing country and the recipient country. Furthermore, the hypotheses are stated in the null and alternative forms.

Political Instability

Recent developments in the literature have lent support for the hypothesis that political instability in a host country is negatively associated with FDI inflows into that country.

$H1_0$: Foreign direct investment is not or positively correlated with political instability in a host country.

$H1_{Alt}$: Foreign direct investment is negatively correlated with political instability in a host country.

Furthermore, in relative terms, the higher the political instability of the host country relative to that in the home country, the lower the amount of FDI flows to the host country.

$H2_0$: Foreign direct investment is not or positively correlated with the relative political instability between the host country and the home country.

$H2_{Alt}$: Foreign direct investment is negatively correlated with the relative political instability between the host country and the home country.

Non-Political Determinants

Market Size

In practically all the empirical studies on FDI, the host country's GDP and/or GDP growth rate has been found to positively, and significantly, affect FDI flows to the host country.

$H3_0$: Foreign direct investment is not or negatively correlated with the host country's GDP.

$H3_{Alt}$: Foreign direct investment is positively correlated with the host country's GDP.

In terms of relative level, investors would prefer a foreign location in order to take advantage of its high growth rate compared to that of their domestic market (Culem, 1988).

$H4_0$: Foreign direct investment is not or negatively correlated with the relative growth rate between the host country and the home country.

$H4_{Alt}$: Foreign direct investment is positively correlated with the relative growth rate between the host country and the home country.

Exchange Rate Level

Exchange rate changes may have, according to the literature, both positive and negative effects on FDI flows (Cushman, 1985, 1988). Foreign investors are interested in maximizing their returns on the host country's assets converted to their home country's currency. A depreciation of the host country's currency decreases the return on the host country's assets as well as the demand for that country's currency. This would lead to a fall in the amount of FDI going to the host country. On the other hand, a depreciation of the host country's currency induces the investing country's firms to choose FDI over exports, as the investing country's goods become expensive in the recipient country.

Assuming FDI and exports to be close substitutes and foreign production is not exported back to the home country, the relevant hypotheses are as follows.

$H5_0$: Foreign direct investment is not or positively correlated with a fall in the host country's currency.

$H5_{Alt}$: Foreign direct investment is negatively correlated with a fall in the host country's currency.

Expected Exchange Rate

The effects on FDI by expected changes in the exchange rate are the same as those by exchange rate levels, assuming FDI and exports to be close substitutes and foreign production is not exported back to the home country.

$H6_0$: Foreign direct investment is not or positively correlated with an expected fall in the host country's currency.

$H6_{Alt}$: Foreign direct investment is negatively correlated with an expected fall in the host country's currency.

Exchange Rate Risk

A rise in exchange rate risk has the opposite effects to those of expectations and levels of the exchange rate.

$H7_0$: Foreign direct investment is not or negatively correlated with a rise in the exchange rate risk of the host country's currency.

$H7_{Alt}$: Foreign direct investment is positively correlated with a rise in the exchange rate risk of the host country's currency.

Labor Costs

As mentioned above, a rise in the foreign wage discourages FDI unless the foreign capital-labor substitution effect is strong (Cushman, 1987).

$H8_0$: Foreign direct investment is not or positively correlated with the host country's wage level.

$H8_{Alt}$: Foreign direct investment is negatively correlated with the host country's wage level.

In terms of relative levels, a rise in the home wage can encourage FDI unless the substitution effect between domestic labor and capital is strong. Thus, the attractiveness of foreign locations can be measured in relative – rather than absolute- terms by the wage level differential between the host country and the home country, so that labor cost conditions in the investing country are also taken into account when FDI is decided.

$H9_0$: Foreign direct investment is not or positively correlated with the relative wage level between the host country and the home country.

$H9_{Alt}$: Foreign direct investment is negatively correlated with the relative wage level between the host country and the home country.

Productivity

The effects of productivity levels are opposite to those of labor costs. Thus, a rise in foreign productivity encourages FDI unless the foreign capital-labor substitution effect is strong.

$H10_0$: Foreign direct investment is not or negatively associated with the host country's productivity level.

$H10_{Alt}$: Foreign direct investment is positively correlated with the host country's productivity level.

In relative terms, a rise in home productivity will lower FDI unless the substitution effect between domestic labor and capital is strong. Thus, in this hypothesis, the productivity of the investing country is also taken into account.

$H11_0$: Foreign direct investment is not or negatively correlated with the relative productivity level between the host country and the home country.

$H11_{Alt}$: Foreign direct investment is positively correlated with the relative productivity level between the host country and the home country.

Table 23 shows a list of the research hypotheses together with the forms, absolute and realtive, in which they are tested.

Table 23

List of Research Hypotheses

Hypothesis Name	Hypothesized relationship with FDI	Hypothesis format	
		Absolute level	Relative level
Political instability	Negative	X	X
Market size			
1. GDP	Positive	X	X
2. GDP growth	Positive	X	X
Exchange rate level	Negative	X	
Expected exchange rate	Negative	X	
Exchange rate risk	Positive	X	
Labor costs	Negative	X	X
Productivity	Positive	X	X

Data Analysis and Models[27]

Single-Equation Regression Models

In these models, one variable, called the dependent variable, is expressed as a linear function of one or more other variables, called the explanatory variables. In such models, it is implicitly assumed that any causal relationships between the dependent and explanatory variables flow in one direction only, namely, from the explanatory variables to the dependent variable.

Regression Analysis

In this dissertation use is made of regression analysis based on various secondary datasets to test the hypotheses set forth above.

Regression analysis is concerned with describing and evaluating the relationship between a given variable (often called explained or dependent variable) and one or more other variables (often called the explanatory or independent variables). This study considers multiple regression analysis since it involves more than one explanatory variable in the relationship under consideration.

PRF and SRF

The key concept underlying regression analysis is the concept of the population regression function (PRF). It states that the population mean of the distribution of the dependent variable Y, given the explanatory variable X_i, is functionally related to X_i. That is, it tells how the mean or average response of Y varies with X. Symbolically,

$$E(Y|X_i) = f(X_i)$$

or

$$Y_i = E(Y|X_i) + u_i$$

where u_i is known as the stochastic disturbance or stochastic error term. $E(Y|X_i)$ is known as the systematic, or deterministic, component; u_i is the random, or nonsystematic, component.

If $E(Y|X_i)$ is assumed to be linear in X_i, then

$$\begin{aligned} Y_i &= E(Y|X_i) + u_i \\ &= \beta_1 + \beta_2 X_i + u_i \end{aligned} \tag{1}$$

This paper deals with linear PRFs, that is, regressions that are linear in the unknown parameters. They may or may not be linear in the dependent variable Y and the independent variable(s) X. However, the PRF is an idealized concept, since in practice one rarely has access to the entire population of interest. Generally, one has a sample of observations from the population. Therefore, one uses the stochastic sample regression function (SRF) to estimate the PRF. In its stochastic form, the SRF can be expressed as

$$Y_i = \hat{\beta}_1 + \hat{\beta}_2 X_i + u_i \tag{2}$$

where $\hat{\beta}_1$ is the estimator of β_1 and $\hat{\beta}_2$ is the estimator of β_2.

There are several methods of constructing the SRF, but in regression analysis, the method that is used most extensively is ordinary least squares (OLS), which minimizes the sum of the squared residuals obtained from Equation (2).

Hypothesis Testing

Assuming that the fitted model is a reasonably good approximation of reality, one has to find out whether the estimates obtained in Equation (1) are in accord with the expectations of the theory that is being tested, in this case the theory of FDI. This is the purpose of hypothesis testing. Thus, in order to test the research hypotheses listed above some essential points are borne in mind.

1. A hypothesis test is a procedure that answers the question of whether the observed difference between the sample value and the population value hypothesized is real or due to chance variation.

2. The hypothesis to be tested is the null hypothesis. The probability of rejecting it when, in fact, it is true, is called the significance level. To test whether the observed difference between the data and what is expected under the null hypothesis is real or due to chance variation, a test statistic is used.

3. This paper follows the advice given by Kmenta (1971, p. 114) who notes that "... just as a court pronounces a verdict as 'not guilty' rather than 'innocent,' so the conclusion of a statistical test is 'do not reject' rather than 'accept'." In this study, the decision rules are either to reject or fail to reject.

4. The observed significance level or P-value is the probability of getting a value of the test statistic that is as extreme or more extreme than the observed value of the test statistic. This probability is computed on the basis that the null hypothesis is correct.

5. It is common to say that the result is statistically significant or not significant, the meaning of these two terms being as follows:

(a) Statistically significant. Sampling variation is an unlikely explanation of the discrepancy between the null hypothesis and sample values.

(b) Statistically insignificant. Sampling variation is a likely explanation of the discrepancy between the null hypothesis and the sample value.

6. It is usual to reject the null hypothesis when the test statistic is statistically significant at a chosen significance level and not to reject the null hypothesis when the test statistic is not statistically significant at the chosen level of significance. Corresponding to the two cases of reality and the two conclusions drawn, there are four possibilities, as shown in Table 24. There

are two possible errors one can make: (1) rejecting the null hypothesis when it is true (type I error or α error), and (2) not rejecting the null hypothesis when it is not true (type II error or β error). In the literature, the probability of not committing type II error, $(1-\beta)$, is called the power of the test. Ideally, one would like to minimize both type I and type II errors. However, for any given sample size, it is not possible to do so. The usual procedure that is suggested (also called the Neyman-Pearson approach) is to fix α at a certain level and minimize β, that is, choose the test statistic that has the most power. In practice, tests such as the t, chi-square, and F tests, have been shown to be the most powerful tests.

Table 24

Hypothesis Testing: Type I and Type II Errors

	Reality	
Result of the test	H_0 is true	H_0 is false
Significant (reject H_0)	Type I error or α error	Correct conclusion
Not significant (do not reject H_0)	Correct conclusion	Type II error or β error

Basic Models

Since the research hypotheses are stated both in absolute terms and in relative terms, the corresponding basic models are as follows.

Absolute terms

$$FDI_{ijt} = \alpha + \beta_1 PICAN_t + \beta_2 GDPCAN_t + \beta_3 ERL_{it} + \beta_4 EER_{it} + \\ + \beta_5 ERRISK_{it} + \beta_6 WAGECAN_t + \beta_7 PRODCAN_t + u_t$$

i=UK, US (countries); j=1,2, ... , 15 (industries)

where

FDI_{ijt} =Foreign direct investment from the ith country, in the jth industry at time t.

$PICAN_t$ =Political instability in Canada at time t.

$GDPCAN_t$ =Canadian Gross Domestic Product at time t.

ERL_{it} =Bilateral exchange rate between the ith country's currency and the Canadian dollar at time t.

EER_{it} =Expected bilateral exchange rate between the ith country's currency and the Canadian dollar at time t.

$ERRISK_{it}$ =Bilateral exchange rate risk between the ith country's currency and the Canadian dollar at time t.

$WAGECAN_t$ =Canadian wage level at time t.

$PRODCAN_t$ = Canadian productivity level at time t.

u_t = Disturbance term at time t.

The hypothesized signed of the coefficients are:

$\beta_1 < 0, \beta_2 > 0, \beta_3 < 0, \beta_4 < 0, \beta_5 > 0, \beta_6 < 0, \beta_7 > 0$

Relative terms

$$FDI_{ijt} = \alpha + \beta_1 RELPI_{it} + \beta_2 RELGROW_{it} + \beta_3 ERL_{it} + \beta_4 EER_{it} + \\ + \beta_5 ERRISK_{it} + \beta_6 RELWAGE_{it} + \beta_7 RELPROD_{it} + w_t$$

i=UK, US (countries); j=1,2, ... , 15 (industries)

where the prefix REL indicates relativity for the variable in question. Each of these variables has the form

$$\left(\frac{XCAN}{X_i}\right)_t$$

where XCAN is the Canadian variable X (i.e. PI, WAGE, etc.) and X_i is the corresponding variable for country i. It is assumed that, if the bracketed term is greater than one, then the value of the Canadian variable is greater than the the value of the corresponding variable for the ith country. The hypothesized signs of the coefficients are the same as those of the equation in absolute terms.

Classical Linear Regression Model (CLRM)

In estimating these models there are a number of implicit assumptions whose violation can lead to undesirable estimates of the regression coefficients.

Assumptions

The Gaussian, standard, or classical linear regression model, makes 10 assumptions, discussed here in the context of multiple regression models. For the sake of simplicity, these assumptions are discussed in terms of only two explanatory variables.

Assumption 1. Linear regression model. The regression is linear in the parameters,

$$Y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + u_t \tag{3}$$

The regressand Y and the regressors X_2, X_3 may be nonlinear.

Assumption 2. The values of X_2 and X_3 are fixed in repeated sampling. Values taken by the two regressors are considered fixed in repeated samples. That is, X_2 and X_3 are assumed to be nonstochastic; regression analysis is conditional regression analysis, i.e., conditional on the given values of the two regressors.

Assumption 3. Zero mean value of the disturbance term u_t. Given the values of X_2 and X_3, the mean, or expected, value of the random disturbance term is zero. Technically speaking, the conditional mean value of u_t is zero. Symbolically, we have

$$E(u_t | X_{2t}, X_{3t}) = 0$$

In other words, this assumption states that the factors not explicitly included in the model, and therefore contained implicitly in u_t, do not systematically affect the mean value of Y.

Assumption 4. Homoscedasticity or equal variance of u_t. Given the values of X_2 and X_3, the variance of u_t is the same for all observations. That is, the conditional variances of u_t are identical. Symbolically,

$$\begin{aligned} \text{var}(u_t | X_{2t}, X_{3t}) &= E\left[u_t - E(u_t) | X_{2t}, X_{3t}\right] \\ &= E(u_t^2 | X_{2t}, X_{3t}) \\ &= \sigma^2 \end{aligned}$$

where *var* stands for variance. This assumption states that all Y values corresponding to the various X_2's and X_3's are equally important.

Assumption 5. No autocorrelation between the disturbances. Given any two X values, X_i and X_j $(i \neq j)$, the correlation between any two u_i and u_j $(i \neq j)$ is zero. Symbolically,

$$\begin{aligned} \text{cov}(u_i, u_j | X_i, X_j) &= E\left[u_i - E(u_i) | X_i\right]\left[u_j - E(u_j) | X_j\right] \\ &= E(u_i | X_i)(u_j | X_j) \\ &= 0 \end{aligned}$$

where i and j are two different observations and where *cov* means covariance. No autocorrelation, or no serial correlation, means that, given X_i, the deviations of any two Y values from their mean value do not exhibit any systematic patterns. The same reasoning can be applied to situations where there are two or more explanatory variables.

Assumption 6. Zero covariance between u_i and X_i, or $E(u_i X_i) = 0$. Symbolically,

$$\begin{aligned}
\operatorname{cov}(u_i, u_j | X_i, X_j) &= E[u_i - E(u_i)|X_i][u_j - E(u_j)|X_j] \\
&= E[u_i(X_i - E(X_i))] \\
&= E(u_i X_i) - E(X_i)E(u_i) \\
&= E(u_i X_i) \\
&= 0
\end{aligned}$$

In Equation (1), it was assumed that X and u have separate influences on Y. But if X and u are correlated, it is not possible to assess their individual effects on Y.

Assumption 7. The number of observations n must be greater than the number of parameters to be estimated. Alternatively, the number of observations n must be greater than the number of explanatory variables.

Assumption 8. Variability in X values. The X values in a given sample must not all be the same. Technically, var(X) must be a finite positive number. Variation in both Y and X is issential to use regression analysis as a tool.

Assumption 9. The regression model is correctly specified. Alternatively, there is no specification bias or error in the model used in empirical analysis.

Assumption 10. There is no perfect multicollinearity. That is, there are no perfect relationships among the explanatory variables.

Given the assumptions of the classical linear regression model, the least squares estimators possess some ideal properties which are contained in the well-known Gauss-Markov theorem.

> **Gauss-Markov Theorem:** Given the assumptions of the classical linear regression model, the least squares estimators, in the class of unbiased linear estimators, have minimum variance, that is, they are BLUE (best linear unbiased estimators).

Since the objective of this paper is not only estimation but also hypothesis testing, one needs to specify the probability distribution of the disturbances u_t. The reason runs as follows: since the OLS estimators in (3) are linear functions of u_t, which is random by assumption[28], the sampling or probability distributions of the OLS estimators will depend upon the assumptions made about the probability distribution of u_t. And since the probability distributions of these estimators are necessary to draw inferences about their population values, the nature of the probability distribution of u_t plays an important role in hypothesis testing. Therefore, an assumption must be made about the probability distribution of u_t. Including this assumption results in the so-called classical normal linear regression model (CNLRM). This model differs from the CLRM in that it specifically assumes that the disturbance term u_t entering the regression model is normally distributed. The CLRM does not require any assumption about the probability distribution of u_t; it only requires that the mean value of u_t is zero and its variance a finite constant.

Assumption 11. Normality of disturbances. The classical normal linear regression assumes that each u_t is distributed normally with:

Mean: $E(u_t) = 0$ (4)

Variance: $E(u_t^2) = \sigma^2$ (5)

$\mathrm{cov}(u_i, u_j): E(u_i, u_j) = 0 \qquad i \neq j$ (6)

More compactly, these assumptions can be stated as

$u_t \sim N(0, \sigma^2)$ (7)

Furthermore, with the normality assumption, (6) implies not only that u_i and u_j are uncorrelated but also independently distributed.[29] Therefore, (7) can be written as

$$u_t \sim NID(0, \sigma^2)$$

where NID stands for normally and independently distributed.

With the normality assumption, the OLS estimators are not only best unbiased estimators (BUE)[30] but also follow well-known probability distributions. The OLS estimators of the intercept and slopes are themselves normally distributed and the OLS estimator of the variance of $u_t (= \hat{\sigma}^2)$ is related to the chi-square distribution.

Relevant assumptions in this research

Assumptions 1,2,3,6,7, and 8 will not be discussed in this paper for the following reasons.

Assumption 1. There is a pragmatic reason that linear-in-parameters regression models have proved quite successful in many empirical phenomena. Sometimes, such models can be taken as first-degree approximations to the more complicated nonlinear regression models.

Assumptions 2 and 6. This study assumes that for the problem at hand the values of the explanatory values are given, though the variables themselves may be intrinsically stochastic or random. Hence, the results of the regression analysis are conditional upon these given values. Even if the regressors were random or stochastic, as long as they are distributed independently of, or at least uncorrelated with, the error term, one can continue to operate as if the regressors were nonstochastic.

Assumption 3. Taking the two-variable linear regression model as in (3), we assume that

$$E(u_i|X_{2i}, X_{3i}) = w$$

where w is a nonzero constant.

Taking the conditional expectation of (3) given this assumption, then

$$E(Y_t|X_{2t},X_{3t}) = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + w$$
$$= (\beta_1 + w) + \beta_2 X_{2t} + \beta_3 X_{3t}$$
$$= \alpha + \beta_2 X_{2t} + \beta_3 X_{3t}$$

where the original intercept β_1 cannot be estimated; the term α contains β_1 and $E(u_t) = 0$. Thus, one obtains a biased estimate of β_1. However, in many practical situations, the intercept term is of little importance; more meaningful are the slope coefficients, which remain unaffected even if Assumption 3 is violated.

Assumptions 7 and 8 are satisified in this study.

Thus, the remaining assumptions -4,5,9,10, and 11- will be examined to determine if they are being met. The following lines discuss, for each of the assumptions, the suggested methods of detecting their possible violation and the remedial measures so they may lead to unbiased, consitent and efficient estimators.

Violation of Relevant Assumptions: Detection and Remedial Measures

Heteroscedasticity

Detection

There are only a few rules of thumb for detecting heteroscedasticity. The following methods are based on the examination of the OLS residuals $\hat{u}_t$ since they are the ones that are observed, and not the disturbances u_i.

1. Graphical method.

Since there is *a priori* no empirical information about the nature of heteroscedasticity, the usual regression analysis is conducted on the assumption that there is no heteroscedasticity and then an *ex post* examination of the residual squares $\hat{u}_t^2$ is made to see if they exhibit any systematic pattern. Although $\hat{u}_t^2$ are not the same as u_t^2, they can be used as proxies especially if the sample size is large.

For each of the regressions analyzed, $\hat{u}_t^2$ are plotted against the estimated regressand and against each of the explanatory variables. Knowledge of the relationship between $\hat{u}_t^2$ and the explanatory variables may help in transforming the data in such a manner that in the regression on the transformed data the variance of the disturbance is homoscedastic.

2. Park test.

Park (1966) formalizes the graphical method by suggesting that σ_t^2 is some function of the explanatory variable X_t. The functional form he suggested was

$$\sigma_t^2 = \sigma^2 X_t^{\beta} e^{v_t}$$

or, taking logs on both sides,

$$\ln \sigma_t^2 = \ln \sigma^2 + \beta \ln X_t + v_t \qquad (8)$$

where v_t is the stochastic disturbance term.

Since σ_t^2 is generally not known, Park suggests using $\hat{u}_t^2$ as a proxy and running the following regression:

$$\begin{aligned}\ln \hat{u}_t^2 &= \ln \sigma^2 + \beta \ln X_t + v_t \\ &= \alpha + \beta \ln X_t + v_t\end{aligned} \tag{9}$$

If β turns out to be statistically significant, it would suggest that heteroscedasticity is present in the data. If it turns out to be insignificant, one may fail to reject the assumption of homoscedasticity. Thus, the Park test is a two-stage procedure. In the first stage, the OLS regression equation (3) is run disregarding the issue of heteroscedasticity. From this regression $\hat{u}_t$ are obtained, and in the second stage regression (9) is run.

However, Goldfeld and Quandt (1972, pp. 93-94) argued that the error term v_t in (9) may not satisfy the OLS assumptions and may itself be heteroscedastic. Nevertheless, as an exploratory method the Park test will be used in this paper.

3. Glejser test.

After obtaining the residuals $\hat{u}_t$ from the OLS regression, Glejser (1969) suggests regressing the absolute values of $\hat{u}_t$ on the explanatory variable that is thought to be closely associated with σ_t^2. In his experiments, Glejser used the following functional forms

$$|\hat{u}_t| = \beta_1 + \beta_2 X_t + v_t$$

$$|\hat{u}_t| = \beta_1 + \beta_2 \sqrt{X_t} + v_t$$

$$|\hat{u}_t| = \beta_1 + \beta_2 \frac{1}{X_t} + v_t$$

$$|\hat{u}_t| = \beta_1 + \beta_2 \frac{1}{\sqrt{X_t}} + v_t$$

$$|\hat{u}_t| = \sqrt{\beta_1 + \beta_2 X_t} + v_t$$

$$|\hat{u}_t| = \sqrt{\beta_1 + \beta_2 X_t^2} + v_t$$

However, Goldfeld and Quandt note that the error term has some problems in that its expected value is nonzero, it is serially correlated, and it is heteroscedastic. Another difficulty with the method is that the suggested last two models are nonlinear in the parameters and therefore cannot be estimated by the usual OLS procedure.

Still, Glejser found that for large samples the first four of the preceding models give, generally speaking, satisfactory results in detecting heteroscedasticity.

4. Goldfeld-Quandt test

This popular method is applicable if one assumes that the heteroscedastic variance, σ_t^2, is monotonically related to one of the explanatory variables in the regression model. This would mean that σ_t^2 depends on the values taken by the selected explanatory variable X_t. Then, heteroscedasticity is most likely to be present in the model. To test this, Goldfeld and Quandt (1972) suggest the following steps.

Step 1. Order and rank the observations according to the values of X_t, beginning with the lowest X value.

Step 2. Omit c central observations, where c is specified ***a priori,*** and divide the remaining (n-c) observations into two groups each of (n-c)/2 observations.

Step 3. Fit separate OLS regressions to the first (n-c)/2 observations and the last (n-c)/2 observations, and obtain the respective residual sums of squares RSS_1 and RSS_2; RSS_1 representing the RSS from the regression corresponding to the smaller X_t values (the small variance group) and RSS_2 that from the larger values X_t values (the large variance group). These RSS each have

$$\frac{(n-c)}{2} - k \text{ or } \left(\frac{n-c-2k}{2}\right) \text{ degrees of freedom}$$

where k is the number of parameters to be estimated, including the intercept term.

Step 4. Compute the ratio

$$\lambda = \frac{RSS_2/df}{RSS_1/df}$$

If u_t are assumed to be normally distributed, and if the assumption of homoscedasticity is valid, then λ follows the F distribution with the numerator and denominator each having (n-c-2k)/2 degrees of freedom.

If, in an application, the computed λ is greater than the critical F at the chosen level of significance, one can reject the hypothesis of homoscedasticity.

The c central observations are omitted to sharpen the difference between the small variance group and the large variance group. To do this successfully depends on how c is chosen. Goldfeld and Quandt suggest that c=8 if n=30 and c=16 if n=60. But Judge et al. (1982) suggest that c=4 if n=30 and c=10 if n is about 60. If there is more than one explanatory variable in the model, the ranking of observations can be done according to any one of them. Since, in this paper, one is not *a priori* sure which explanatory variable is the appropriate one, the test will be conducted on each of the explanatory variables.

5. Breusch-Pagan-Godfrey (BPG) test

The success of the previous test depends not only on the value of c (the number of central observations to be omitted) but also on identifying the correct explanatory variable with which to order the observations. This can be avoided through the use of the BPG (1978, 1979) test.

Consider the k-variable linear regression model

$$Y_t = \beta_1 + \beta_2 X_{2t} + \ldots + \beta_k X_{kt} + u_t \tag{10}$$

Assuming that the error variance σ_t^2 is described as

$$\sigma_t^2 = f(\alpha_1 + \alpha_2 Z_{2t} + \ldots + \alpha_m Z_{mt}) \tag{11}$$

that is, σ_t^2 is some function of the nonstochastic variables Z's; some or all of the X's can serve as Z's. Also assume that

$$\sigma_i^2 = \alpha_1 + \alpha_2 Z_{2i} + \ldots + \alpha_m Z_{mi} \tag{12}$$

that is, σ_i^2 is a linear function of the Z's. If $\alpha_2 = \alpha_3 = \ldots = \alpha_m = 0$, then $\sigma_t^2 = \alpha_1$, which is a constant, and therefore homoscedastic. The BPG test proceeds as follows.

Step 1. Estimate (10) by OLS and obtain the residuals $\hat{u}_t$.

Step 2. Obtain $\tilde{\sigma}^2 = \sum \hat{u}_t^2 / n$. This is the maximum likelihood (ML) estimator of σ^2.

Step 3. Construct variables p_t defined as

$$p_t = \frac{\hat{u}_t^2}{\tilde{\sigma}^2}$$

Step 4. Regress p_t on the Z's as

$$p_t = \alpha_1 + \alpha_2 Z_{2t} + \ldots + \alpha_m Z_{mt} + v_t \tag{13}$$

Step 5. Obtain the ESS (explained sum of squares) from (13) and define

$$\Theta = \frac{1}{2}(ESS)$$

Assuming u_t are normally distributed, if there is homoscedasticity and if the sample size n increases indefinitelt, then

$$\Theta \approx \chi^2_{m-1}$$

that is, Θ follows the chi-square distribution with (m-1) degrees of freedom.

Thus, if the computed Θ exceeds the critical χ^2 value at the chosen level of significance, one can reject the hypothesis of homoscedasticity.

The BPG test is an asymptotic test; hence, in small samples the test is sensible to the assumption that the disturbances u_t are normally distributed. Consequently, the normality assumption will be tested by the Bera-Jarque (BJ) test discussed below.

6. White's general heteroscedasticity test

The general test of heteroscedasticity proposed by White (1980) does not rely on the normality assumption and is easy to implement. For simplicity, consider the following three-variable regression model:

$$Y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + u_t \tag{14}$$

The White test procedure is as follows.

Step 1. Given the data, estimate (14) and obtain the residuals, $\hat{u}_t$.

Step 2. Run the following auxiliary regression:

$$\hat{u}_t^2 = \alpha_1 + \alpha_2 X_{2t} + \alpha_3 X_{3t} + \alpha_4 X_{2t}^2 + \alpha_5 X_{3t}^2 + \alpha_6 X_{2t} X_{3t} + v_t \tag{15}$$

That is, the squared residuals from the original regression are regressed on the original X regressors, their squared values, and the cross-product(s) of the regressors.[31] Higher powers of regressors can also be introduced. Obtain the R^2 from this auxiliary regression.

Step 3. Under the null hypothesis that there is no heteroscedasticity, the sample size (n) times the R^2 obtained from the auxiliary regression asymptotically follows the chi-square distribution with degrees of freedom equal to the number of regressors in the auxiliary regression. That is,

$$n \cdot R^2 \approx \chi^2_{df} \tag{16}$$

Step 4. If the chi-square value obtained in (16) exceeds the critical chi-square value at the chosen level of significance, the conclusion is that there is heteroscedasticity. If it does not exceed the critical chi-square value, there is no hetroscedasticity, which means that in the auxiliary regression (15), $\alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = 0$.

If a model has several regressors, then introducing all the regressors, their squared (or higher-powered) terms, and their cross-products can quickly consume degrees of freedom; sometimes, as will be done in this paper, one can omit the cross-product terms. In cases where the test statistic is significant, heteroscedasticity may not necessarily be the cause, but specification errors, to be discussed below. Thus, the White test can be a test of heteroscedasticity or specification error or both.

Remedial measures

If the true σ_i^2 are known, one can use the weighted-least-squares (WLS) method to obtain BLUE estimators. Since the true σ_i^2 are rarely known, other methods must be employed to obtain consistent estimates of the variances and covariances of OLS estimators even if there is heteroscedasticity.

1. White's heteroscedasticity-consistent variances and standard errors

White shows that this estimate can be performed so that, asymptotically, valid statistical inferences can be made about the true parameter values.

2. Data transformation

Apart from being a large-sample procedure, one drawback of the White procedure is that the estimators obtained may not be so efficient as those obtained by methods that transform data to reflect specific types of heteroscedasticity. Thus, based on the OLS residuals, one can make educated guesses of the likely pattern of heteroscedasticity and transform the original data in such a way that in the transformed data there is no heteroscedasticity.

These transformations are *ad hoc*. Which of the transformations will work depends on the nature of the problem and the severity of heteroscedasticity. Additional problems with transforming data are:

(a) In the case of a model with more than two variables, one may not know a priori which of the explanatory variables should be chosen for transforming the data. However, in practice, one may plot $\hat{u}_t^2$ against each variable and decide which explanatory variable may be used for transforming the data.

(b) In case where log transformation is used, this transformation is not applicable if some of the Y and X values are zero or negative. However, sometimes one can use $\ln(Y_t + k)$ or $\ln(X_t + k)$, where k is a positive number chosen in such a way that all the values of Y and X become positive.

(c) Spurious correlation. This refers to the situation where correlation is found to be present between the ratios of variables even though the original variables are uncorrelated or random.

(d) When σ_t^2 are not directly known and are estimated from any transformation conducted on a particular explanatory variable, then the usual testing procedures are, strictly speaking, valid only in large samples.

Autocorrelation

Detection

1. Graphical method

The assumption of nonautocorrelation of the classical model relates to the population disturbances u_t, which cannot be observed directly. Instead, one has their proxies, the residuals $\hat{u}_t$ which can be obtained from the usual OLS procedure. Although the $\hat{u}_t$ are not the same thing as u_t, a visual examination of the estimated residuals can help detect the presence of autocorrelation in the u's.

There are various ways of examining the residuals. One way is simply to plot them against time, the so-called time sequence plot. Another way is to plot the standardized residuals against time. The standardized residuals are simply $\hat{u}_t$ divided by $\hat{\sigma}$, the standard error of the estimate. The values thus obtained will be pure numbers and can, therefore, be compared with the standardized residuals of other regressions. Besides, the standardized residuals have zero mean and approximately unit variance. A third way is to examine the plot of $\hat{u}_t$ against $\hat{u}_{t-1}$, that is, the residual at time t against its value at time (t-1). If the residuals are nonrandom, they would exhibit a pattern denoting either positive or negative correlation.

2. The runs test

The runs test, also known as the Geary (1970) test, is a nonparametric test. A run is defined as an uninterrupted sequence of one symbol attribute (in the case of the residuals a + or − sign). The length of a run is defined as the number of elements in it. By examining how runs behave in a strictly random sequence of observations one can derive a test of randomness of runs. If there are too many runs, it would mean that the estimated residuals change sign frequently, thus indicating negative serial correlation. Similarly, if there are too few runs, they may suggest positive autocorrelation.

Letting

n = total number of observations = $n_1 + n_2$

n_1 = number of + symbols (i.e., positive residuals)

n_2 = number of − symbols (i.e., negative residuals)

k = number of runs

then, under the null hypothesis that succesive outcomes (in this case, residuals) are independent, and assuming that $n_1 > 10$ and $n_2 > 10$, the number of runs is distributed (asymptotically) normally with

Mean: $E(k) = \dfrac{2n_1n_2}{n_1 + n_2} + 1$

Variance: $\sigma_k^2 = \dfrac{2n_1n_2(2n_1n_2 - n_1 - n_2)}{(n_1 + n_2)^2(n_1 + n_2 - 1)}$

If the hypothesis of randomness is sustainable, then k, the number of runs obtained in a problem, is expected to lie between $[E(k) \pm 1.96\sigma_k]$ with 95% confidence. Therefore, the decision rule is as follows: Do not reject the null hypothesis of randomness with 95% confidence if $[E(k) - 1.96\sigma_k \leq k \leq E(k) + 1.96\sigma_k]$; reject the null hypothesis if the estimated k lies outside these limits.

3. Durbin-Watson d test

The most popular test for detecting serial correlation is that developed by Durbin and Watson (1951). The Durbin-Watson (DW) d statistic is defined as

$$d = \frac{\sum_{t=2}^{n} (\hat{u}_t - \hat{u}_{t-1})^2}{\sum_{t=2}^{n} \hat{u}_t^2} \tag{17}$$

Although it is now used routinely, there are some important assumptions underlying the d statistic:

(a) The regression model includes an intercept term.

(b) The explanatory variables, the X's, are nonstochastic.

(c) The disturbances u_t are generated by the Markov first-order autoregressive scheme: $u_t = \rho u_{t-1} + \varepsilon_t$.

(d) The regression model does not include lagged value(s) of the dependent variable as one of the explanatory variables.

(e) There are no missing observations in the data.

The exact sampling or probability distribution of the d statistic given in (17) is difficult to derive because it depends, in a complicated way, on the X values present in a given sample. Therefore, there is no unique critical value that will lead to the rejection or nonrejection of the null hypothesis that there is no first-order serial correlation in the disturbances. However, Durbin and Watson derived a lower bound d_L and an upper bound d_U such that if the computed d from () lies outside these critical values, a decision can be made regarding the presence of positive or negative serial correlation.

From (17), one obtains

$$d \cong 2(1 - \hat{\rho}) \tag{18}$$

Since $-1 \leq \rho \leq 1$, (18) implies that

$$0 \leq d \leq 4$$

If there is no first-order serial correlation, d is expected to be about 2. The closer d is to 0, the greater the evidence of positive serial correlation. The closer d is to 4, the greater the evidence of negative serial correlation. Table 25 depicts the decision rules for the DW d test.

The d test has one important drawback in that if it falls in the indecisive zone, one cannot conclude whether autocorrelation does or does not exist. However, Hannan and Terrell (1966) show that the upper bound of the DW statistic is a good approximation to its distribution when the regressors are slowly changing. They argue that economic time series are slowly changing and, hence, one can use d_U as the correct significance point. Consequently, one can use the following modified d test procedure. Given the level of signifcance α,

(a) $H_0 : \rho = 0$ versus $H_1 : \rho > 0$: If the estimated $d < d_U$, reject the null hypothesis at level α; that is, there is statistically significant positive correlation.

(b) $H_0 : \rho = 0$ versus $H_1 : \rho < 0$: If the estimated $(4 - d) < d_U$, reject the null hypothesis at level α; there is statistically significant negative correlation.

(c) $H_0 : \rho = 0$ versus $H_1 : \rho \neq 0$: If the estimated $d < d_U$ or $(4 - d) < d_U$, reject the null hypothesis at level 2α; statistically there is significant evidence of autocorrelation, positive or negative.

Table 25

Durbin-Watson d test: Decision rules

Null hypothesis	Decision	If
No positive autocorrelation	Reject	$0 < d < d_L$
No positive autocorrelation	No decision	$d_L \le d \le d_U$
No negative autocorrelation	Reject	$4 - d_L \le d \le 4$
No negative autocorrelation	No decision	$4 - d_U \le d \le 4 - d_L$
No autocorrelation, positive or negative	Fail to reject	$d_U < d < 4 - d_U$

Another significant limitation of the d test is that, although $d \cong 2(1-\hat{\rho})$, this approximation is valid only in large samples. The mean of d when $\rho = 0$ has been shown to be given approximately by

$$E(d) \cong 2 + \frac{2(k-1)}{n-k}$$

where k is the number of regression parameters (including the constant term) and n is the sample size. Thus, even allowing for serial correlation, the statistic is biased upward from 2. For example, if k = 5 and n = 15, the bias is as large as 0.8.

4. Large-sample test

Under the null hypothesis that $\rho = 0$, and assuming that the sample size n is large, then $\sqrt{n} \cdot \hat{\rho}$ follows the normal distribution with mean zero and variance equal to unity. That is, asymptotically,

$$\sqrt{n} \cdot \hat{\rho} \sim N(0,1)$$

If the computed statistic exceeds the critical value(s) provided by the Z statistic, then one rejects the null hupothesis that $\rho = 0$.

5. Breusch-Godfrey (BG) test of higher-order autocorrelation

Assume that the disturbance term u_t is generated by the following pth-order autoregressive scheme:

$$u_t = \rho_1 u_{t-1} + \rho_2 u_{t-2} + \ldots + \rho_p u_{t-p} + \varepsilon_t \qquad (19)$$

where ε_t is a purely random disturbance term with zero mean and constant variance.

The null hypothesis is that all autoregressive coefficients are simultaneously equal to zero, that is, there is no autocorrelation of any order. Breusch (1978) and Godfrey (1978) showed that the null hypothesis can be tested as follows:

(a) Estimate the regression model by the usual OLS procedure and obtain the residuals $\hat{u}_t$.

(b) Regress $\hat{u}_t$ against all the regressors in the model plus the following additional regressors, $\hat{u}_{t-1}, \hat{u}_{t-2}, \ldots, \hat{u}_{t-p}$, where the latter are the lagged values of the estimated residuals in step (a). Then obtain the R^2 value from this regression, the auxiliary regression.

(c) If the sample size is large, Breusch and Godfrey show that $(n-p) \cdot R^2 \sim \chi^2_p$. That is, asymptotically, (n-p) times the R^2 obtained in step (b) follows the chi-square test with p degrees of freedom. If the computed statistic exceeds the critical chi-square value at the chosen level of significance, one can reject the null hypothesis, in which case at least one ρ is significantly different from zero.

The BG test has the following practical points:

(a) The regressors included in the regression model may contain lagged values of the regressand Y.

(b) The BG test is applicable even if the disturbance term follows a pth order moving-average (MA) process.

(c) If in (19) p = 1, then the BG test is known as Durbin's m test.

(d) The value of p, the lag length, cannot be specified ***a priori***. As shown later on, one can use the Akaike criterion or the Schwartz criterion to determine the lag length of a model.

Remedial measures

The remedies depend on the nature of interdependence among the disturbances. There are two situations: when the structure of autocorrelation is known and when it is not known. When the structure of autocorrelation is known one can resort to the use of the generalized difference equation. However, since ρ is rarely known in practice, this type of equation is difficult to run. Nevertheless, it will be briefly discussed in this paper because it is the basis for some of the methods that are used to estimate ρ.

1. Generalized difference equation

It is usually assumed that the u_t follow a first-order autoregressive scheme

$$u_t = \rho u_{t-1} + \varepsilon_t \qquad (20)$$

where $|\rho| < 1$ and where ε_t follow the OLS assumptions of zero expected value, constant variance and nonautocorrelation.

Then, the serial correlation problem can be resolved if ρ, the coefficient of autocorrelation, is known.

Assume the following two-variable model:

$$Y_t = \beta_1 + \beta_2 X_t + u_t \qquad (21)$$

If (21) holds tru at time t, it also holds true at time t-1. Hence,

$$Y_{t-1} = \beta_1 + \beta_2 X_{t-1} + u_{t-1} \qquad (22)$$

Multiplying (22) by ρ on both sides, gives

$$\rho Y_{t-1} = \rho \beta_1 + \rho \beta_2 X_{t-1} + \rho u_{t-1} \qquad (23)$$

Substracting (23) from (22) yields

$$\begin{aligned}(Y_t - \rho Y_{t-1}) &= \beta_1(1-\rho) + \beta_2 X_t - \rho \beta_2 X_{t-1} + (u_t - \rho u_{t-1}) \\ &= \beta_1(1-\rho) + \beta_2(X_t - \rho X_{t-1}) + \varepsilon_t\end{aligned} \qquad (24)$$

Equation (24) can be expressed as

$$Y_t^* = \beta_1^* + \beta_2 X_t^* + \varepsilon_t \qquad (25)$$

where $\beta_1^* = \beta_1(1-\rho)$, $Y_t^* = (Y_t - \rho Y_{t-1})$ and $X_t^* = (X_t - \rho X_{t-1})$.

Since ε_t satisfy all the OLS assumptions, one can apply OLS to the transformed variables Y^* and X^* and obtain BLUE estimators.

Regression (24) is known as the generalized difference equation. It involves regressing Y on X in the difference form, which is obtained by substracting a proportion ρ of the value of a variable in the previous time period from its value in the current time period. In the difference procedure one observation is lost. To avoid this loss of one observation, the first observation on Y and X can be transformed as follows: $Y_1\sqrt{1-\rho^2}$ and $X_1\sqrt{1-\rho^2}$. This is known as the Prais-Winsten transformation. The loss of one observation may not be very serious in a large sample but can make a substantial difference in the results in a small sample.

2. First-difference method

When a regression is run, one generally assumes that there is no autocorrelation and then through the various tests above show whether this assumption is justified. If, however, $\rho = +1$, the generalized difference equation (24) reduces to a first-difference equation as

$$\begin{aligned} Y_t - Y_{t-1} &= \beta_2(X_t - X_{t-1}) + (u_t - u_{t-1}) \\ &= \beta_2(X_t - X_{t-1}) + \varepsilon_t \end{aligned}$$

or

$$\Delta Y_t = \beta_2 \Delta X_t + \varepsilon_t$$

Since there is no intercept in the model, one uses the regression through the origin model. Assuming $\rho = -1$, the generalized difference equation (24) now becomes

$$Y_t + Y_{t-1} = 2\beta_1 + \beta_2(X_t + X_{t+1}) + \varepsilon_t$$

or

$$\frac{Y_t + Y_{t-1}}{2} = \beta_1 + \beta_2 \frac{X_t + X_{t+1}}{2} + \frac{\varepsilon_t}{2}$$

This model is known as the two-period moving average regression model.

The first-difference transformation rests on the assumption that $\rho = +1$. To find out whether the assumption of $\rho = +1$ is justifiable in a given situation, the Berenblutt-Webb test can be used. Berenblutt and Webb (1973) developed the following g statistic:

$$g = \frac{\sum_{t=2}^{n} \hat{e}_t^2}{\sum_{t=1}^{n} \hat{u}_t^2}$$

where $\hat{u}_t$ are the OLS residuals from the original model and $\hat{e}_t$ are the OLS residuals from the regression on the first difference of the regressand, ΔY, on the first difference of the regressors, ΔX's. The null hypothesis now is $\rho = 1$ rather than the Durvin-Watson hypothesis $\rho = 0$.

At this point, it is important to note that, when comparing equations in levels and first differences, one cannot compare the R^2's because the explained variables are different. However, one can compare the residual sum of squares after making a rough adjustment. Once the comparable residual sum of squares are computed, one can obtain the comparable R^2's as well. Without going into details the following formula can be used to compare the R^2's of equations in levels and first differences.

Let

$R_1^2 = R^2$ from the first difference equation

RSS_0 = residual sum of squares from the levels equation

RSS_1 = residual sum of squares from the first difference equation

R_D^2 = comparable R^2 from the levels equation

d = DW test statistic from the levels equation

Then

$$\frac{1-R_D^2}{1-R_1^2}=\frac{RSS_0}{RSS_1}\left(\frac{n-k-1}{n-k}d\right)$$

Usually, with time-series data, one gets high R^2 values if the regressions are estimated with levels but one gets low R^2 values if the regressions are estimated in first differences. Since a high R^2 is usually considered as proof of a strong relationship between the variables under investigation, there is a strong tendency to estimate the equations in levels rather than in first differences. This is sometimes called the "R^2 syndrome." However, if the DW statistic is very low, it often implies a misspecified equation, no matter what the value of the R^2 is. In such cases one should estimate the regression equation in first differences and if the R^2 is low, this merely indicates that the variables Y and X are not related to each other.

Granger and Newbold (1976) present some examples with artificially generated data where Y, X, and the error term are each generated independently so that there is no relationship between Y and X, but the correlations between Y_t and Y_{t-1}, X_t and X_{t-1}, and u_t and u_{t-1} are very high. Although there is no relationship between X and Y, the regression of Y on X gives a high R^2 but a low DW statistic. When the regression is run in first differences, the R^2 is close to zero and the DW statistic is close to 2, thus demonstrating that there is indeed no relationship between Y and X and that the R^2 obtained earlier is spurious. Thus, regressions in first differences might often reveal the true nature of the relationship between Y and X.

3. Durbin-Watson d

Since $d \cong 2(1-\hat{\rho})$, an estimate of ρ can be obtained from the estimated d statistic:

$$\hat{\rho} \cong 1 - \frac{d}{2} \tag{26}$$

However, this relation is only an approximate one and may not hold true for small samples. Once ρ is estimated from (26), one can transform the data as shown in (24) and employ the usual OLS estimation procedure.

4. Theil-Nagar modified d statistic

Theil and Nagar (1961) have suggested that in small samples instead of estimating ρ as in (26), it be estimated as

$$\hat{\rho} = \frac{n^2(1-d/2)+k^2}{n^2-k^2}$$

where n is the total number of observations, d is the DW d, and k is the number of coefficients (including the intercept) to be estimated.

5. Cochrane-Orcutt iterative procedure

Consider the following two-variable model:

$$Y_t = \beta_1 + \beta_2 X_t + u_t \tag{27}$$

and assume that u_t is generated by the AR(1) scheme

$$u_t = \rho u_{t-1} + \varepsilon_t \tag{28}$$

Cochrane and Orcutt (1949) recommend the following steps to estimate ρ.

Step 1. Estimate the two-variable model by the standard OLS routine and obtain the residuals, $\hat{u}_t$.

Step 2. Using the estimated residuals, run the following regression:

$$\hat{u}_t = \hat{\rho}\hat{u}_{t-1} + v_t \tag{29}$$

Step 3. Using $\hat{\rho}$ obtained from (29), run the generalized difference equation (24), namely,

$$(Y_t - \hat{\rho}Y_{t-1}) = \beta_1(1-\hat{\rho}) + \beta_2(X_t - \hat{\rho}X_{t-1}) + (u_t - \hat{\rho}u_{t-1})$$

or

$$Y_t^* = \beta_1^* + \beta_2 X_t^* + e_t^* \tag{30}$$

Step 4. Since a priori it is not known that the $\hat{\rho}$ obtained from (29) is the "best" estimate of ρ, substitute the values of $\hat{\beta}_1^* = \hat{\beta}_1(1-\hat{\rho})$ and $\hat{\beta}_2^*$ obtained from (30) into the original regression and obtain the new residuals, say $\hat{u}_t^{**}$, as

$$\hat{u}_t^{**} = Y_t - \hat{\beta}_1^* - \hat{\beta}_2^* X_t \tag{31}$$

Step 5. Estimate the following regression

$$\hat{u}_t^{**} = \hat{\hat{\rho}}\hat{u}_{t-1}^{**} + \omega_t \tag{32}$$

Since one does not know whether this second-round estimate of ρ is the best estimate of ρ, one goes into other rounds until the successive estimates of ρ differ by a very small amount.

6. Cochrane-Orcutt two-step procedure

This is a shortened version of the iterative procedure. In step 1, ρ is estimated from the first iteration, and in step 2 that estimate of ρ is used to run the generalized difference equation.

7. Durbin's two-step method

Consider the generalized difference equation (24) rewritten as follows:

$$Y_t = \rho Y_{t-1} + \beta_1(1-\rho) + \beta_2 X_t - \rho \beta_2 X_{t-1} + \varepsilon_t \qquad (33)$$

Durbin (1960) suggests the following two-step procedure.

Step 1. Treat the estimated value of the regression coefficient of Y_{t-1} as an estimate of ρ.

Step 2. Having obtained $\hat{\rho}$, transform the variables as $Y_t^* = (Y_t - \hat{\rho} Y_{t-1})$ and $X_t^* = (X_t - \hat{\rho} X_{t-1})$ and run the OLS regression on the transformed variables as in Equation (25).

In Equation (33) there are two estimates of ρ, one obtained from the lagged value of Y and one obtained from dividing the coefficient of the lagged value of X by the coefficient of X. There is no guarantee that the two estimates will be identical. The problem lies in the fact that the equation is intrinsically a nonlinear (in-parameter) regression model and should be estimated by nonlinear regression-estimating procedures.

Multicollinearity

Detection

In trying to detect multicollinearity it is useful to note the following warning by Kmenta (1986, p. 431):

> 1. Multicollinearity is a question of degree and not of kind. The meaningful distinction isnot between the presence and the absence of multicollinearity, but between its various degrees.
> 2. Since multicollinearity refers to the condition of the explanatory variables that are assumed to be nonstochastic, it is a fature of the sample and not of the population.
> Therefore, we do not "test for multicollinearity" but can, if we wish, measure its degree in any particular sample.

Since multicollinearity is essentially a sample phenomenon, there is not any unique method of detecting it or measuring its strength. However, there are several indicators of its presence.

1. The clearest sign of multicollinearity is when R^2 is very high but none of the regression coefficients is statistically significant on the basis of the conventional t test. The disadvantage of this test is that "... it is too strong in the sense that multicollinearity is considered as harmful only when all of the influences of the explanatory variables on Y cannot be disentangled." (Kmenta, 1986, p. 439).

2. High zero-order correlation correlations among regressors.

In models involving just two explanatory variables, if the zero-order correlation coefficient between two regressors is high, then multicollinearity is a serious problem. In models involving more than two regressors, it is possible to have low zero-order correlations and yet find high multicollinearity.

3. Partial correlation coefficients.

If R^2 is high but the partial correlations are low, multicollinearity is a possibility. But if R^2 is high and the partial correlations are also high, multicollinearity may not be easily detected.

4. Auxiliary regressions.

One may regress each of the X_i variables on the remaining X variables in the model and find out the corresponding coefficients of determination R_i^2. A high R_i^2 would suggest that X_i is highly correlated with the rest of the X's.

5. Eigenvalues and condition index.

From the eigenvalues one derives what is known as the condition number k defined as

$$k = \frac{Maximum\ eigenvalue}{Minimum\ eigenvalue}$$

The condition index (CI) is defined as

$$CI = \sqrt{\frac{Maximum\ eigenvalue}{Minimum\ eigenvalue}} = \sqrt{k}$$

If k is between 100 and 1000 there is moderate to strong multicollinearity, and if it exceeds 1000 there is severe multicollinearity. Alternatively, if CI is between 10 and 30, there is moderate to strong multicollinearity and if it exceeds 30 there is severe multicollinearity.

6. Tolerance and variance inflation factor.

For the k-variable regression model, the variance of a partial regression coefficient can be expressed as

$$\operatorname{var}(\hat{\beta}_j) = \frac{\sigma^2}{\sum x_j^2} \cdot \left(\frac{1}{1 - R_j^2} \right)$$
$$= \frac{\sigma^2}{\sum x_j^2} \cdot VIF_j$$

where β_j is the partial regression coefficient of the regressor X_j, R_j^2 is the R^2 in the auxiliary regression of X_j on the remaining (k-2) regressors and VIF_j is the variance-inflation factor. As a rule of thumb, if the VIF of a variable exceeds 10, that variable is said to be highly collinear.

Tolerance is defined as

$$TOL_j = (1 - R_j^2)$$
$$= (1 / VIF_j)$$

$TOL_j = 1$, if X_j is not correlated with the other regressors, whereas it is zero if it is perfectly related to the other regressors. However, a high VIF is neither necessary nor sufficient to obtain high variances and high standard errors. Therefore, high multicollinearity, as measured by a high VIF, may not necessarily cause high standard errors.

In summary, since multicollinearity is specific to a given sample, one cannot tell which of these methods will work in any particular application.

Remedial measures

As with detection, there are no sure methods, only a few rules of thumb. Some of these rules are: (1) using extraneous or prior information, (2) combining cross-sectional and time-series data, (3) omitting a highly collinear variable, (4) transforming data, (5) obtaining additional or new data. Which of these rules will work in practice will depend on the nature of the data and severity of the collinearity problem.

Equation specification errors

Detection and remedial measures

The equation specification errors treated are: (1) inclusion of irrelevant variable(s), (2) omission of relevant variable(s), and (3) adoption of the wrong functional form. In terms of errors of measurement, this paper assumes implicitly that the dependent variable Y and the explanatory variables, the X's, are measured without any errors. In terms of the three types of specification errors already mentioned, once it is found that such errors have been made, the remedies often suggest themselves. If, for example, it is showed that a variable is inappropriately omitted from a model, the obvious remedy is to include that variable in the analysis, assuming that data on that variable are available.

(I) Inclusion of irrelevant variable(s)

Detecting the presence of an irrelevant variable(s) is not a difficult task because the usual t tests and F tests can be used.

(II) Omission of relevant variable(s) and (III) wrong functional form

1. Examination of residuals

Residuals can be examined for model specification errors, such as omission of relevant variables or incorrect functional form. If, in fact, there are such errors, a plot of these residuals will exhibit a distinct pattern.

2. Durbin-Watson d statistic

The d statistic, apart from being used as a measure of serial correlation, can also reflect the fact that some variable(s) that belong in the model are included in the error term and should be "extracted" from it and introduced in their own right as explanatory variable(s).

The Durbin-Watson test for detecting specification error(s) runs as follows:

(a) From the assumed model, obtain the OLS residuals.

(b) If it is believed that the assumed model is mis-specified because it excludes a relevant explanatory variable, say Z, from the model, order the residuals obtained in (a) according to increasing values of Z. The Z variable could be one of the X variables included in the assumed model or it could be some function of that variable.

(c) Compute the d statistic from the residuals thus ordered by the usual d formula.

(d) If the estimated d is significant, then one fails to reject the hypothesis of model mis-specification. If that is the case, the remedial measures will suggest themselves.

3. Ramsey's RESET test

Ramsey (1969) proposed a general test of specification error called RESET (regression specification error test). Consider the following model:

$$Y_t = \beta_1 + \beta_2 X_t + u_t \tag{34}$$

The steps involved are as follows.

(a) From the chosen model (34), obtain the estimated Y values, that is, $\hat{Y}_t$.

(b) Rerun (34) introducing $\hat{Y}_t$ in some form as an additional regressor(s). Plotting $\hat{u}_t$ in (a) against $\hat{Y}_t$ can give an idea of the functional form of $\hat{Y}_t$ to be included as regressor(s). Call this new model (35).

(c) Let the R^2 obtained from (35) be R^2_{new} and that obtained from (34) be R^2_{old}. Then, one can use the F test as follows

$$F = \frac{(R^2_{new} - R^2_{old}) / \textit{number of new regressors}}{(1 - R^2_{new}) / (n - \textit{number of parameters in the new model})}$$

to find out if the increase in R^2 from using (35) is statistically significant.

(d) If the computed F value is significant at the chosen level of significance, one can fail to reject the hypothesis that the model (34) is mis-specified.

One advantage of the RESET is that it is easy to apply, for it does not require one to specify what the alternative model is. The main disadvantage lies in the fact that knowing that a model is mis-specified does not help necessarily in choosing a better laternative.

Normality

Detection

The Jarque-Bera (JB) test of normality. Jarque and Bera (1987) suggest a test of normality which is an asymptotic test and is based on the OLS residuals. This test first computes the skewness and kurtosis measures of the OLS residuals.

Skewness characterizes the degree of asymmetry of a distribution around its mean. Positive skewness indicates a distribution with an asymmetric tail extending towards more positive values. Negative skewness indicates a distribution with an asymmetric tail extending towards more negative values.

Skewness is defined as

$$S = \frac{n}{(n-1)(n-2)} \sum \left(\frac{\hat{u}_t - \bar{\hat{u}}}{\hat{\sigma}_u} \right)^3$$

where $\bar{\hat{u}}$ denotes the mean of the estimated residuals from a given regression equation and $\hat{\sigma}_u$ the estimated standard deviation of those residuals.

Kurtosis characterizes the relative peakedness or flatness of a distribution compared to the normal distribution. Positive kurtosis indicates a relatively peaked distribution (also called leptokurtic). Negative kurtosis indicates a relatively flat distribution (also called platykurtic).

Kurtosis is defined as

$$K = \left\{ \frac{n(n+1)}{(n-1)(n-2)(n-3)} \sum \left(\frac{\hat{u}_i - \bar{\hat{u}}}{\hat{\sigma}_u} \right)^4 \right\} - \frac{3(n-1)^2}{(n-2)(n-3)}$$

The JB test statistic is based on these two measures as follows:

$$JB = n\left[\frac{S^2}{6} + \frac{(K-3)^2}{24} \right]$$

Since for a normal distribution the value of skewness is zero and the value of kurtosis is 3, the term (K-3) represents excess kurtosis. Under the null hypothesis that the residuals are normally distributed, Jarque and Bera showed that, asymptotically, the JB statistic follows the chi-square distribution with 2 degrees of freedom. If the p value of the computed chi-square statistic in an application is sufficiently low, one can reject the hypothesis that the residuals are normally distributed. But if the p value is reasonably high, one fails to reject the normality assumption.

Summary

Testing and correcting for the violation of the aasumptions above involves numerous tests and methods. This research will use those already cited, for each industry regression equation. Table 26 summarizes the methods employed by type of assumption violation.

Table 26

Summary of Detection Tests and Remedial Measures Used to Address Violation of Assumptions in the CNLRM

Type of violation	Detection	Remedial measures
Heteroscedasticity	1. Graphical method 2. Park test 3. Glejser test 4. Goldfeld-Quandt test 5. BPG test 6. White's test	1. White's variances and standard errors 2. Data transformation
Autocorrelation	1. Graphical method 2. The runs test 3. Durbin-Watson d test 4. Large-sample test 5. BG test	1. Generalized difference equation 2. First-difference method 3. Durbin-Watson d 4. Theil-Nagar d 5. Cochrane-Orcutt iterative procedure 6. Cochrane-Orcutt two-step procedure 7. Durbin's two-step method
Multicollinearity	1. High R^2 and insignificant t ratios 2. High zero-order correlations 3. Partial correlation coefficients 4. Auxiliary regressions 5. Eigenvalues and CI 6. Tolerance and VIF	1. Prior information 2. Pooling cross-sectional and time-series data 3. Omitting highly collinear variable 4. Transforming data 5. Obtaining additional or new data
Specification errors	1. t and F tests 2. Examination of residuals 3. Durbin-Watson d statistic 4. Ramsey's RESET test	
Nonnormality	1. Jarque-Bera test of normality	

Functional Form and Structural Stability of Basic Models

Before proceeding to test a possible violation of the CNLRM assumptions, this paper shall first consider two initial aspects: (1) the functional form of the regression equations, and (2) the structutal stability of the regression equations. The reasons for this preliminary analysis are as follows:

1. The functional form of each industry equation will be used for the analysis of simultnaneous-equation models and cointegration. That is, once the functional form for each industry equation is established it will be carried through the paper unaltered –unless the Ramsey's test suggests any type of correction-. The comparison of models (single-equation, simultaneous, cointegration) will thus be easier and the implications for management clearer.

2. The use of a political instability indicator consisting of two different data sets calls for determining the appropriateness of combining them into a single data set and applying various statistical procedures. Once the structural stability of the political variable is initially tested, further analysis for single-equation models, simultaneous-equation models and cointegration can be carried out for each industry equation, adjusted for any changes that the political variable may initially need.

Functional form of the regression equation

The choice of the functional form of a regression equation is normally dictated by considerations like convenience in interpretation and some economic reasoning. One way of choosing the "appropriate" functional form is plotting the regressand against the regressor –in the case of two variables- and observe the pattern of the relationship. However, in the case –as in the present one- of an equation with more than two variables, choosing the "appropriate" functional form becomes difficult. Since *a priori* there is not a unique functional form that can be singled out to applied to a multiple regression equation, two competing models are considered: (1) the linear model and (2) the log-linear model. In the first model, the regressand is a linear function of the regressors; in the second model, the log of the regressand is a linear function of the logs of the regressors. Although there are alternative functional forms that could potentially be considered, the two models suggested constitute the backbone of empirical analysis. The linear model can be seen as the base model against which alternative models are derived and/or tested. The log-linear model has become very popular because the regression coefficient attached to the log of a regressor is interpreted as the elasticity of the regressand with respect to the regressor.; that is, that coefficient measures the percentage change in the regressand for a given (small) percentage change in the regressor.

Studies of the relationship between FDI and political instability show a mix of linear- and log-linear models. Therefore, testing for the appropriate functional form becomes necessary, especially when applied to a considerable number of industries.

Two tests will be used in this paper to choose between the two models.

1. MacKinnon, White, and Davidson (MWD) test

Assume the following null and alternative hypotheses:

H_o: Linear Model: Y is a linear function of regressors, the X's.

H_1: Log-linear Model: The log of Y is a linear function of logs of regressors, the logs of X's.

MacKinnon et al. (1983) suggest the following steps.

Step 1. Estimate the linear model and obtain the estimated Y values. Call them Yf (i.e., $\hat{Y}$).

Step 2. Estimate the log-linear model and obtain the estimated Y values. Call them lnf (i.e., lnY).

Step 3. Obtain Z_1 =(lnYf-lnf).

Step 4. Regress Y on X's and Z_1 obtained in step 3. Reject H_o if the coefficient of Z_1 is statistically significant by the usual t test.

Step 5. Obtain Z_2 =(antilog of lnf-Yf).

Step 6. Regress log of Y on the logs of X's and Z_2. Reject H_1 if the coefficient of Z_2 is statistically significant by the usual t test.

If the linear model is in fact the correct model, the constructed variable Z_1 should not be statistically significant in step 4, for in that case the estimated Y values from the linear model and those estimated from the log-linear model (after taking antilog values for comparative purposes) should not be different. The same logic applies to the alternative hypothesis H_1. One drawback of this test lies in the fact that it is quite possible that in a given situation one cannot reject either of the hypothesized specifications.

2. Bera-McAleer (BM) test

Assume the following null and laternative hypothesis:

H_0: Log-linear Model: The log of Y is a linear function of logs of regressors, the logs of X's.

H_1: Linear Model: Y is a linear function of regressors, the X's.

Bera and McAleer (1982) suggest the following steps.

Step 1. Obtain the predicted values of lnY from the log-linear model. Call them lnf (i.e., lnY).

Step 2. Obtain the predicted values of Y from the linear model. Call them Yf (i.e., $\hat{Y}$).

Step 3. Obtain the predicted values of Y from the log-linear equation. Call them antilog of lnf.

Step 4. Obtain the predicted values of lnY from the linear equation. Call them lnYf.

Step 5. Compute the artificial regressions:

antilog of lnf $= \beta_0 + \sum_{i=1} \beta_i \ln X_i + \nu_{1t}$

lnYf $= \beta_0 + \sum_{i=1} \beta_i X_i + \nu_{0t}$

Let the estimated residuals from these two regression equations be $\hat{\nu}_{1t}$ and $\hat{\nu}_{0t}$, respectively.

Step 6. The tests for H_0 and H_1 are based on θ_0 and θ_1 in the artificial regressions:

lnYf $= \beta_0 + \sum_{i=1} \beta_i \ln X_i + \theta_0 \hat{\nu}_{1t} + \varepsilon_t$

Yf $= \beta_0 + \sum_{i=1} \beta_i X_i + \theta_1 \nu_{0t} + \varepsilon_t$

If one fails to reject $\theta_0 = 0$, then one chooses the log-linear model. On the other hand, if one fails to reject $\theta_1 = 0$, then one chooses the linear model. As with the MWD test, a problem arises if both these hypotheses are both rejected or both fail to be rejected.

Structural stability of the regression equation

When estimating a multiple regression equation and using it for predictions at future points of time, one assumes that the parameters are constant over the entire time period of estimation and prediction. To test this hypothesis of parameter stability, this paper uses the dummy variable approach. The principal aim in using this approach is to determine the parameter stability of the political variable, since two different indices are used for two different periods. Complementary to this analysis will be the use of dummies for the other explanatory variables.

The two periods under consideration are: (1) Period A: 1948-1982 (which corresponds to the political instability index derived by Gupta(1990)), and (2) Period B: 1983-1991 (which corresponds to the IRIS series). The observations for the first period will be denoted by n_1 whereas those for the second period will be termed n_2. Using the appropriate functional form for each industry equation, the n_1 and n_2 observations are pooled together and the following regression is estimated for each of the industries, for the two countries:

$$Y_t = \alpha_1 + \alpha_2 D_t + \beta_1 X_{1t} + \beta_2 (D_t X_{1t}) + \sum_{i=1}^{6} \beta_{(i+2)} X_{(i+1)t} + u_t \tag{36}$$

where Y_t and X_{1t} are FDI and political instability, respectively; and where $D_t = 1$ for observations in the first period and zero for observations in the second period.

To see the implications of model (36), and assuming that $E(u_t) = 0$, we obtain

$$E(Y_t | D_t = 0, X_{1t}) = \alpha_1 + \beta_1 X_{1t} + \sum_{i=1}^{6} \beta_{(i+2)} X_{(i+1)t} \tag{37}$$

$$E(Y_t | D_t = 1, X_{1t}) = (\alpha_1 + \alpha_2) + (\beta_1 + \beta_2) X_{1t} + \sum_{i=1}^{6} \beta_{(i+2)} X_{(i+1)t} \tag{38}$$

which are, respectively, the mean FDI functions for the second and first periods.

In (36), α_2 is the differential intercept coefficient, indicating by how much the value of the intercept term of the category that receives the value of 1 differs from the intercept coefficient of the category; and β_2 is the differential slope coefficient, indicating by how much the slope coefficient of the first period's FDI function differs from the slope coefficient of the second period's FDI function. The introduction of the dummy variable D in the multiplicative form is used to differentiate between slope coefficients of the two periods, and the introduction of the dummy variable in the additive form is used to distinguish between the intercepts of the two periods.

Regression (36) presents the following four possibilities:

1. $\alpha_1 = (\alpha_1 + \alpha_2)$ and $\beta_1 = (\beta_1 + \beta_2)$; that is, the two regressions are identical. (Coincident regressions.)

2. $\alpha_1 \neq (\alpha_1 + \alpha_2)$ but $\beta_1 = (\beta_1 + \beta_2)$; that is, the two regressions differ only in their intercepts. (Parallel regressions.)

3. $\alpha_1 = (\alpha_1 + \alpha_2)$ but $\beta_1 \neq (\beta_1 + \beta_2)$; that is, the two regressions have the same intercepts but different slopes. (Concurrent regressions.)

4. $\alpha_1 \neq (\alpha_1 + \alpha_2)$ and $\beta_1 \neq (\beta_1 + \beta_2)$; that is, the two regressions are completely different. (Dissimilar regressions.)

The statistical significance of the dummy variable coefficients and of the entire regression can be tested by the usual t test and F test.

The dummy variable technique constitutes an improvement over the popular, alternative Chow (1960) test for the following reasons:

1. One needs to run only a single regression because the individual regressions can easily be deducted from it in the manner indicated by equations (37) and (38).

2. The single regression can be used to test a variety of hypothesis, pertaining to the four cases mentioned above that may arise from running regression (36).

3. The Chow test cannot identify which one of the four possibilities described above exists in a given instance. In this respect, the dummy variable approach has a distinct advantage, for it not only tells if two regressions are different but also indicates the source(s) of the difference – whether it is due to the intercept or the slope or both.-

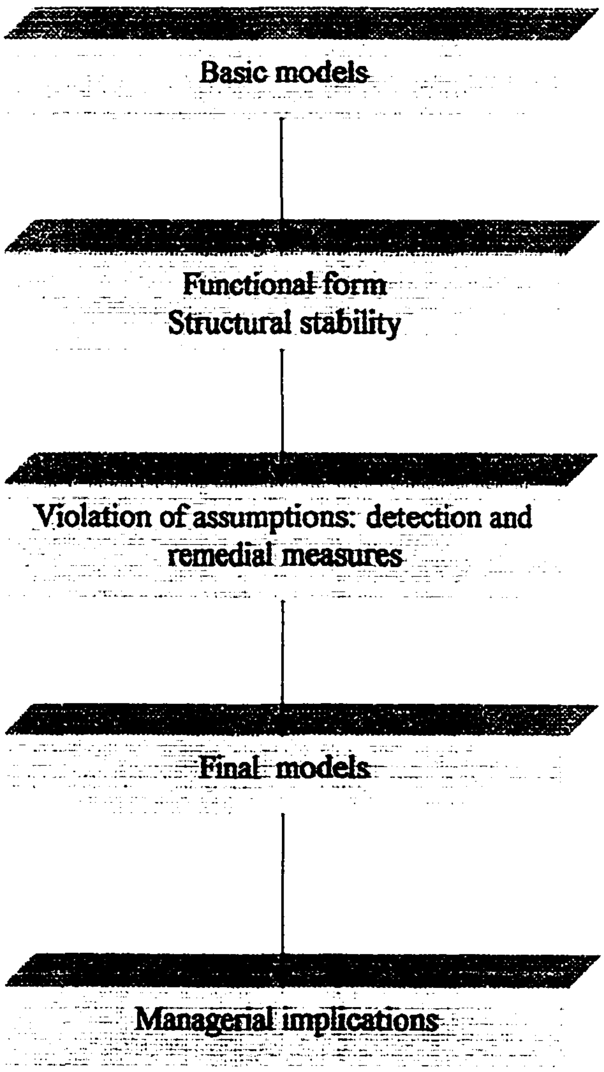
4. Finally, since pooling increases the degrees of freedom, it may improve the relative precision of the estimated parameters.[32]

Summary

The models hitherto considered are static, that is, no lagged values in either the dependent or independent variables. For clarification purposes, Figure 20 illustrates the estimation and testing procedure for such models.

Figure 20

Single-Equation Static Regression Models: Estimation and Testing Procedure



Single-Equation Dynamic Regression Models

This section discusses dynamic models. In regression analysis involving time-series data, if the regression model includes the current and ladded (past) values of the explanatory variables, it is called a distributed-lag model. If the model includes one or more lagged values of the dependent variable among its explanatory variables, it is called an autoregressive model.

The Partial Adjustment Autoregressive Model

The partial adjustment, or stock adjustment, model is based on Nerlove's (1958) work on the demand for agricultural commodities and has been applied to different strands of economic theory, most notably to the flexible accelerator model. The partial adjustment model starts from the premise that an equilinrium, optimal, desired, or long-run amount of a dependent variable is a function of some given explanatory variables. In terms of this study, there is a long-run, desired level of FDI - Y_t^* - that is a function of the explanatory variables described above:

$$Y_t^* = \beta_0 + \sum_{j=1}^{7} \beta_j X_{jt} + \mu_t \tag{39}$$

Since the desired level of FDI is not directly observable, Nerlove (1958) postulates the following hypothesis, known as the partial adjustment, or stock adjustment, hypothesis:

$$Y_t - Y_{t-1} = \delta(Y_t^* - Y_{t-1}) \tag{40}$$

where δ, such that $0 < \delta \leq 1$, is known as the coefficient of adjustment and where $Y_t - Y_{t-1}$ is the actual change and $(Y_t^* - Y_{t-1})$ is the desired change.

Equation (40) postulates that the actual change in FDI in any given time period t is some fraction δ of the desired change for that period. If $\delta = 1$, it means that the actual stock of FDI is equal to the desired stock; i.e., actual stock adjusts to the desired stock instantaneously. If $\delta = 0$, it means that nothing changes since actual stock at time t is the same as that observed in the previous time period. Typically, δ is expected to lie between those extremes since adjustment to the desired FDI stock is likely to be incomplete because of rigidities (technical and/or institutional), inertia, cost of change, etcetera.

Rewriting Equation (40) as

$$Y_t = \delta Y_t^* + (1-\delta)Y_{t-1} \tag{41}$$

shows that the observed FDI stock at time t is a weighted average of the desired FDI stock at that time and the FDI stock existing in the previous time priod, δ and (1-δ) being the weights. Substituting (39) into (41) gives

$$\begin{aligned} Y_t &= \delta(\beta_0 + \sum_{j=1}^{s} \beta_j X_{jt} + \mu_t) + (1-\delta)Y_{t-1} \\ &= \delta\beta_0 + \delta\sum_{j=1}^{t} \beta_j X_{jt} + (1-\delta)Y_{t-1} + \delta\mu_t \end{aligned} \tag{42}$$

This model is called the partial adjustment model.

Equation (39) represents the long-run, or equilibrium, demand for FDI stock, and Equation (42) can be called the short-run demand function for FDI stock since in the short run the exisiting capital stock may not necessarily be equal to its long-run level. Once the short-run function is estimated, the long-run function can be easily derived by simply dividing β_0 and β_j by δ and omitting the lagged Y term, which will then give Equation (39).

The partial adjustment model is one way of rationalizing the so-called Koyck geometric lag model, which assumes that the β coefficients are all of the same sign and decline geometrically indefinitely into the past. Hence, the partial adjustment model can be analyzed as a geometric-lag model. Assuming one independent variable, Equation (42) can then be rewritten as

$$[1-(1-\delta)L]Y_t = \delta\beta_0 + \delta\beta_1 X_t + \delta\mu_t$$

where L is the so-called lag operator represented as $L^j X_t = X_{t-j}$. Solving for Y_t we obtain the following geometric lag distribution:

$$\begin{aligned} Y_t &= \frac{\delta\beta_0}{1-(1-\delta)L} + \frac{\delta\beta_1}{1-(1-\delta)L}X_t + \frac{\delta}{1-(1-\delta)L}\mu_t \\ &= \delta\beta_0 \underbrace{\sum_{j=0}^{\infty}(1-\delta)^j}_{\gamma^*} + \delta\beta_1 \underbrace{\sum_{j=0}^{\infty}(1-\delta)^j X_{t-j}}_{X_t^*} + \delta \underbrace{\sum_{j=0}^{\infty}(1-\delta)^j \mu_{t-j}}_{\mu_t^*} \\ &= \delta\beta_0\gamma^* + \delta\beta_1 X_t^* + \delta\mu_t^* \end{aligned}$$

with (1-δ) near one, X_t has long-lasting effects on Y_t.

It is often argued that the partial adjustment hypothesis is rather *ad hoc*, but a justification can be provided in terms of a cost minimisation procedure. Assume that a firm selects the value of the variable Y_t so as to minimize the weighted sum of "disequilibrium" and "adjustment" costs:

$$C_t = \alpha_0 + \alpha_1(Y_t - Y_t^*)^2 + \alpha_2(Y_t - Y_{t-1})^2$$

The first bracketed term on the right-hand side represents the costs incurred by being away from the optimum or desired position Y_t^*, and the second bracketed term represents the costs of changing Y, for example, hiring and firing costs if Y represents the size of the firm's labor force. The cost function is quadratic, and implies that overshooting is as costly as undershooting, and that upward and downward adjustments are equally expensive. To find the value of Y_t that minimizes C_t we equate the first partial derivative to zero:

$$\frac{\partial C_t}{\partial Y_t} = 2\alpha_1(Y_t - Y_t^*) + 2\alpha_2(Y_t - Y_{t-1})$$

On rearranging, this gives

$$Y_t = \frac{\alpha_1}{\alpha_1 + \alpha_2} Y_t^* + \frac{\alpha_2}{\alpha_1 + \alpha_2} Y_{t-1}$$

And on setting $\delta = \alpha_2/(\alpha_1 + \alpha_2)$, so that $1 - \delta = \alpha_1/(\alpha_1 + \alpha_2)$, we have:

$$Y_t - Y_{t-1} = (1 - \delta)(Y_t^* - Y_{t-1})$$

the partial adjustment model. If adjustment costs are relatively important, the coefficient α_2 will be relatively large, which implies a value of δ close to 1 and relatively slow adjustment. Clearly, if $\alpha_2 = 0$ there are no costs of adjustment and the firm moves immediately to the desired position Y_t^*.

In the FDI literature, three studies have been identified as having used autoregressive models. Bajo-Rubio and Sosvilla-Rivero (1994) noted that the level of FDI in a period would be the result of accumulated past decisions to modify the desired capital stock K^*, so that, due to adjustment costs and operating lags, the model becomes

$$FDI_t = \sum_{i=0}^{n} \Lambda_i (K^*_{t-i} - K^*_{t-i-1}) + \delta K_{t-1}$$

where

$$\sum_{i=0}^{n} \Lambda_i = 1$$

For estimation purposes, the equation was rewritten using the Koyck transformation, assuming that the lags decline at a constant geometric rate:

$$\Lambda_i = \lambda (1-\lambda)^i$$

Hence,

$$FDI_t = \lambda K^*_t + (\delta - \lambda) K_{t-1}$$

where FDI would be a function of the determinants of K^*_t (aggregate demand, relative unit costs and level of trade barriers), as well as of the stock of foreign capital at the beginning of the period K_{t-1}.

Cushman (1985, 1987) assumes that each year firms formulate a desired stock of FDI (K^*_D) based on various factors. However, due to various constraints which prevent complete adjustment to this goal each year, FDI flow is given by the following partial adjustment model:

$$FDI_t = \alpha(K^{*}_{Dt} - K^{*}_{t-1})$$

where FDI_t is the current year's FDI flow, α is the adjustment coefficient lying between zero and one, and K^{*}_{t-1} is last year's actual stock of FDI. The term K^{*}_{Dt} is assumed to be determined by a number of factors, including, home and foreign income, home and foreign wage levels, expected change in the real exchange rate, real exchange rate risk, etcetera.

However, only Cushman (1985) applied the partial adjustment model to the analysis of the relationship between FDI and political instability.

The Almon Distributed Lag Polynomial

The partial adjustment model is based on the assumption that the β coefficients decline geometrically as the lag lengthens. However, in some situations, this assumption may be too restrictive. Hence, Almon (1965) suggested a way, known as the Almon polynomial lag, to express β_i as a function of i, the length of the lag, so as to fit suitable curves to reflect the functional relationship between the two.

The Almon polynomial lag imposes some form of polynomial on the β coefficients. For example, if the β_i initially increase, reach a peak and then decline, a quadratic polynomial could be imposed on β_i as follows:

$$\beta_i = a_0 + a_1 i + a_2 i^2 \qquad (43)$$

where a_0, a_1, a_2 are parameters to be estimated. More generally, one may write

$$\beta_i = a_0 + a_1 i + a_2 i^2 + \ldots + a_m i^m \tag{44}$$

which is an mth-degree polynomial in i. It is assumed that m (the degree of the polynomial) is less than k (the maximum length of the lag).

Consider the following finite distributed-lag model:

$$Y_t = \alpha + \beta_0 X_t + \beta_1 X_{t-1} + \beta_2 X_{t-2} + \ldots + \beta_k X_{t-k} + \mu_t \tag{45}$$

which may be written as

$$Y_t = \alpha + \sum_{i=0}^{k} \beta_i X_{t-i} + \mu_t \tag{46}$$

Substituing (43) into (46) gives

$$\begin{aligned} Y_t &= \alpha + \sum_{i=0}^{k} (a_0 + a_1 i + a_2 i^2) X_{t-i} + \mu_t \\ &= \alpha + a_0 \sum_{i=0}^{k} X_{t-i} + a_1 \sum_{i=0}^{k} i X_{t-i} + a_2 \sum_{i=0}^{k} i^2 X_{t-i} + \mu_t \end{aligned} \tag{47}$$

Collecting terms in each parameter yields

$$Y_t = \alpha + a_0 Z_{0t} + a_1 Z_{1t} + a_2 Z_{2t} + \mu_t \tag{48}$$

where

$$\begin{aligned} Z_{0t} &= \sum_{i=0}^{k} X_{t-i} \\ Z_{it} &= \sum_{i=0}^{k} i X_{t-i} \\ Z_{2t} &= \sum_{i=0}^{k} i^2 X_{t-i} \end{aligned} \tag{49}$$

In the Almon polynomial lag, Y is regressed on the constructed variables Z, not on the original X variables. Thus, Equation (48) can be estimated by OLS. The estimates of α and a_i will have all the desirable statistical properties provided the stochastic disturbance term μ satisfies the assumptions of the classical linear regression model.

Once the a_i are estimated, the original β's can be estimated from (43), or more generally from (44) as follows:

$$\hat{\beta}_0 = \hat{a}_0$$
$$\hat{\beta}_1 = \hat{a}_0 + \hat{a}_1 + \hat{a}_2$$
$$\hat{\beta}_2 = \hat{a}_0 + 2\hat{a}_1 + 4\hat{a}_2$$
$$\hat{\beta}_3 = \hat{a}_0 + 3\hat{a}_1 + 9\hat{a}_2$$
$$\vdots$$
$$\hat{\beta}_k = \hat{a}_0 + k\hat{a}_1 + k^2\hat{a}_2$$

Therefore, the Almon method obtains estimates of the (k+1) β's by estimating only three a's. Hence, it reduces the number of parameters estimated directly by k-2 and thereby reduces the multicollinearity problems. Also, this method does not induce autocorrelation: the error term in the estimating equation is the original μ_t.

However, in applying the Almon technique two practical problems must first be resolved.

1. The maximum length of the lag k must be specified in advance. Davidson and MacKinnon (1993, p. 675) recommend the following:

> The best approach is probably to settle the question of lag length first, by starting with a very large value of q [the lag length] and then seeing whether the fit of the model deteriorates significantly when it is

reduced without imposing any restrictions on the shape of the distributed lag.

The rationale for this approach is as follows: Supposing there is some "true" lag length, choosing more lags than necessary will lead to the "inclusion of irrelevant variable bias," whose consequences are less serious than choosing fewer lags, which would lead to the "omission of relevant variable bias," whose consequences can be very serious.[33]

A formal test of lag length was developed by Schwarz, known as the Schwarz criterion (SC). To determine the lag length in a distributed-lag model, Schwarz suggests that one minimize the following function:

$$SC = n \ln \hat{\sigma}_m^2 + m \ln n$$

where $\hat{\sigma}_m^2$ =(Residual sum of squares/(n-m)), m is the lag length, and n is the number of observations. Thus, one uses a regression model using several lagged values (=m) and chooses that value of m that minimizes the value of SC.

Another test of lag length is the Akaike criterion (AC). As with the Schwarz criterion, one should minimize the following function:

$$AC = n \ln \hat{\sigma}_m^2 + 2m$$

where the notation follows that of the SC.

2. The degree of the polynomial m must be specified. Generally speaking, the degree of the polynomial should be at least one more than the number of turning points in the curve relating β_i to i. In practice, it is difficult

to know the number of turning points, and therefore, the choice of m is largely subjective. A proposed method to cope with this problem is to choose a particular value of m, and then find out whether a higher-degree polynomial will give a better fit.

Thus, for example, assume one has to decide between a second- and third-degree polynomial. The second-degree polynomial is given by Equation (48). For the third-degree polynomial the corresponding equation is

$$Y_t = \alpha + a_0 Z_{0t} + a_1 Z_{1t} + a_2 Z_{2t} + a_2 Z_{3t} + \mu_t \qquad (50)$$

where $Z_{3t} = \sum_{i=0}^{k} i^3 X_{t,i}$. Equation (50) is estimated and if a_2 is statistically significant but a_3 is not, one can assume that the second-degree polynomial provides a reasonably good approximation.

In a like manner, Davidson and MacKinnon (1993, p. 676) suggest that, "... after q [the lag length] is determined, one can attempt to determine d [the degree of the polynomial] once again starting with a large value and then reducing it."

There are a few additional features of the Almon procedure that will be used in this dissertation.

1. The standard errors of the a coefficients are directly obtainable from the OLS regression Equation (48), but the standard errors of some of the $\hat{\beta}$ coefficients cannot be so obtained. These standard errors can be computed

from the standard errors of the estimated a coefficients.

Consider the following equation:

$$\beta_i = a_0 + a_1 i + a_2 i^2 + \ldots + a_m i^m$$

To obtain the variance of $\hat{\beta}_i$ from the varince of $\hat{a}$, the following formula is used:

$$\begin{aligned}\text{var}(\hat{\beta}_i) &= \text{var}(\hat{a}_0 + \hat{a}_1 i + \hat{a}_2 i^2 + \ldots + \hat{a}_m i^m) \\ &= \sum_{j=0}^{m} i^{2j}\,\text{var}(\hat{a}_j) + 2\sum_{j<p} i^{(j+p)}\,\text{cov}(\hat{a}_j \hat{a}_p)\end{aligned}$$

2. The reduction in parameters is equivalent to imposing linear restrictions. As stated above, in the quadratic polynomial considered the Almon method reduces the number of parameters to be estimated by k-2. It can be shown that the method is equivalent to imposing a certain set of k-2 linear restrictions on the equation. For example, assuming k=3 and a quadratic polynomial is imposed on β_i, then

$$\begin{aligned}Y_t &= \alpha + \beta_0 X_t + \beta_1 X_{t-1} + \beta_2 X_{t-2} + \beta_3 X_{t-3} + \mu_t \\ \beta_i &= a_0 + a_1 i + a_2 i^2\end{aligned}$$

Thus, the coefficients of X_t, X_{t-1}, and X_{t-2} are given by

$$\begin{aligned}\hat{\beta}_0 &= \hat{a}_0 \\ \hat{\beta}_1 &= \hat{a}_0 + \hat{a}_1 + \hat{a}_2 \\ \hat{\beta}_2 &= \hat{a}_0 + 2\hat{a}_1 + 4\hat{a}_2\end{aligned}$$

which yields a one-to-one relationship between $\hat{a}_0$, $\hat{a}_1$, $\hat{a}_2$ and $\hat{\beta}_0$, $\hat{\beta}_1$, $\hat{\beta}_2$. Therefore, the addition of the expression for the coefficient of X_{t-3},

$\hat{\beta}_3 = \hat{a}_0 + 3\hat{a}_1 + 9\hat{a}_2$

imposes a restriction on the relationship between $\hat{\beta}_3$ and $\hat{\beta}_0$, $\hat{\beta}_1$, $\hat{\beta}_2$.

Substituting the expressions for $\hat{a}_0$, $\hat{a}_1$, $\hat{a}_2$ shows that the restriction is

$\hat{\beta}_3 - 3\hat{\beta}_2 + 3\hat{\beta}_1 - \hat{\beta}_0 = 0$

Thus, in this particular case, estimation by the Almon technique is equivalent to estimation subject to this linear restriction. In general, estimation of an equation of lag length k by the Almon technique assuming a polynomial of degree m is equivalent to estimation subject to a set of (k-m) restrictions of this form.

3. Imposition of endpoint restrictions.

In some situations one may wish to impose some form of "endpoint" restrictions on the values of the β's. These usually take the form of zero restrictions, i.e. requiring that the polynomial reaches the horizontal axis at certain points. Thus, for example, one may assume that β_0 and β_k (the current and kth lagged coefficient) are zero. Because of psychological, institutional, or technological reasons, the value of the explanatory variable in the current period may not have any impact on the current value of the dependent variable, thereby justifying the zero value for β_0. Likewise, beyond a certain time period k the explanatory variable may not have any impact on the dependent variable, thus supporting the assumption that β_k is zero.

The following two examples give an idea of how the Almon technique works when two endpoint restrictions are imposed on the β's.

Example 1

This example considers the case above of zero restrictions at both ends of a quadratic polynomial, that is,

$$\beta_0 = \beta_2 = 0$$

and the quadratic form on the β's is given by

$$\beta_i = a_0 + a_1 i + a_2 i^2$$

where k (lag length) is assumed to be equal to 2.

Thus, the restrictions on the a's become

$$a_0 = 0$$
$$a_0 + 2a_1 + 4a_2 = 0$$

Solving for a_1 gives

$$a_1 = -2a_2$$

Substituing the two restrictions into the Almon equation yields

$$Y_t = \alpha - 2a_2 Z_{1t} + a_2 Z_{2t} + \mu_t$$

More compactly,

$$Y_t = \alpha + a_2 Z_t^* + \mu_t$$

where

$$Z_t^* = Z_{2t} - 2Z_{1t}$$
$$= \sum_{i=0}^{k} (i^2 - 2i) X_{t-i}$$

This equation gives the value of $\hat{a}_2$. The $\hat{a}_1$ coefficient is given by

$$\hat{a}_1 = -2\hat{a}_2$$

Example 2

In this example, the zero restrictions are

$$\beta_{-1} = \beta_{k+1} = 0$$

These coefficients do not actually appear in the model even if these restrictions are not imposed. Here, it is merely specified where the polynomial would, if extended, cut the horizontal axis. We still assume the quadratic polynomial with lag length equal to k:

$$\beta_i = a_0 + a_1 i + a_2 i^2; \qquad i=0,1, \ldots ,k$$

The restrictions to be imposed on the a's are:

$$a_0 - a_1 + a_2 = 0$$
$$a_0 + a_1(k+1) + a_2(k+1)^2 = 0$$

Substitution of a_1 from the first into the second gives

$$a_0 + (a_0 + a_2)(k+1) + a_2(k+1)^2 = 0$$

Solving by means of the quadratic formula:

$$\bar{x}_1, \bar{x}_2 = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

we obtain the following two roots for (k+1):

$k+1 = -1$ which implies $k = -2$; by definition this is not a feasible root.

$k+1 = -a_0/a_2$; or $a_0 = -a_2(k+1)$

Using the first restriction, we have

$$a_1 = -a_2 k$$

Imposition of these restrictions involves substituting them into the estimating equation. This gives

$$Y_t = \alpha - a_2(k+1)Z_{0t} - a_2 k Z_{1t} + a_2 Z_{2t} + \mu_t$$

Hence, the estimating equation would be

$$Y_t = \alpha + a_2 Z_t^{*} + \mu_t$$

where

$$\begin{aligned} Z_t^{*} &= Z_{2t} - kZ_{1t} - (k+1)Z_{0t} \\ &= \sum_{i=0}^{k}(i^2 - kj - k - 1)X_{t-i} \end{aligned}$$

Imposition of two end-point restrictions has reduced the number of coefficients estimated in the regression equation from three to one. Estimation of this equation gives $\hat{a}_2$. The remaining two coefficient values are then derived from the restrictions:

$$\begin{aligned} \hat{a}_0 &= -\hat{a}_2(k+1) \\ \hat{a}_1 &= -\hat{a}_2 m \end{aligned}$$

Estimates of the β's are then obtained from $\hat{a}_0$, $\hat{a}_1$, $\hat{a}_2$.

4. Imposition of a single endpoint restriction.

Assume the case where a third-degree polynomial for the β's has been used:

$$\beta_i = a_0 + a_1 i + a_2 i^2 + a_3 i^3; \qquad i=0,1, \ldots ,k$$

Without the endpoint restriction, the Almon technique would require estimation of

$$Y_t = \alpha + a_0 Z_{0t} + a_1 Z_{1t} + a_2 Z_{2t} + a_3 Z_{3t} + \mu_t$$

where

$$Z_{0t} = \sum_{i=0}^{k} X_{t-i}$$

$$Z_{1t} = \sum_{i=0}^{k} i X_{t-i}$$

$$Z_{2t} = \sum_{i=0}^{k} i^2 X_{t-i}$$

$$Z_{3t} = \sum_{i=0}^{k} i^3 X_{t-i}$$

To impose the endpoint restriction $\beta_{k+1} = 0$, the following restriction on the a's must be imposed:

$$a_0 + (k+1)a_1 + (k+1)^2 a_2 + (k+1)^3 a_3 = 0$$

Substituting for a_0 and rearranging yields the restricted estimating equation:

$$Y_t = \alpha + a_1 W_{1t} + a_2 W_{2t} + a_3 W_{3t} + \mu_t$$

where

$$W_{1t} = Z_{1t} - (k+1) Z_{0t}$$

$$W_{2t} = Z_{2t} - (k+1)^2 Z_{0t}$$

$$W_{3t} = Z_{3t} - (k+1)^3 Z_{0t}$$

Estimation of this equation gives $\hat{a}_1$, $\hat{a}_2$, and $\hat{a}_3$. From these $\hat{a}_0$ is then obtained as

$$\hat{a}_0 = -(k+1)\hat{a}_1 - (k+1)^2 \hat{a}_2 - (k+1)^3 \hat{a}_3$$

and thence the estimates of the β's.

5. Sometimes the β's are estimated with the restriction that the sum of all the β coefficients is equal to unity.

Consider the following finite distributed-lag model

$$Y_t = \alpha + \beta_0 X_t + \beta_1 X_{t-1} + \beta_2 X_{t-2} + \mu_t$$

subject to the restriction

$$\beta_0 + \beta_1 + \beta_2 = 0$$

Applying the Lagrange-multiplier method, we derive the Lagrangian function L, which is a modified version of the objective function, viz. the estimating regression, that incorporates the constraint as follows:

$$L = \alpha + \beta_0 X_t + \beta_1 X_{t-1} + \beta_2 X_{t-2} + \lambda(1 - \beta_0 - \beta_1 - \beta_2)$$

where λ is the Lagrange multiplier.

Treating λ as an additional variable, we have

$$L_\lambda \quad (\equiv \partial L/\partial\lambda) = 1 - \beta_0 - \beta_1 - \beta_2 = 0$$
$$L_{X_t} \quad (\equiv \partial L/\partial X_t) = \beta_0 - \lambda = 0$$
$$L_{X_{t-1}} (\equiv \partial L/\partial X_{t-1}) = \beta_1 - \lambda = 0$$
$$L_{X_{t-2}} (\equiv \partial L/\partial X_{t-2}) = \beta_2 - \lambda = 0$$

Therefore, $\beta_0 = \beta_1 = \beta_2$.

Solving for β_0 and substituting its value into the regression equation gives

$$Y_t = \alpha + (1 - \beta_1 - \beta_2) X_t + \beta_1 X_{t-1} + \beta_2 X_{t-2} + \mu_t$$

Rearranging the equation yields

$$Y_t = \alpha + X_t + \beta_1(X_{t-1} - X_t) + \beta_2(X_{t-2} - X_t) + \mu_t$$

The coefficient of X_t is equal to one which, in turn, is equal to the sum of the β coefficients. Hence,

$$Y_t = \alpha + (\beta_0 + \beta_1 + \beta_2)X_t + \beta_1(X_{t-1} - X_t) + \beta_2(X_{t-2} - X_t) + \mu_t$$

Defining $\gamma = \beta_0 + \beta_1 + \beta_2$, the equation can be reparametrized as

$$Y_t = \alpha + \gamma X_t + \beta_1(X_{t-1} - X_t) + \beta_2(X_{t-2} - X_t) + \mu_t$$

Thus, the null hypothesis becomes $H_0 : \gamma = 1$ versus the alternative hypothesis $H_1 : \gamma \neq 1$. To test the significance of this hypothesis, one can derive the unrestricted residual sum of squares (from the original equation) and the restricted residual sum of squares (from the constrained equation), and then use the F-test.

This paper shall estimate a quadratic Almon polynomial, such as that of Equation (48), with FDI and political instability as the only variables under study. For each industry, the Almon equation will be estimated in the following forms: (1) with no restrictions, (2) with endpoint restrictions at both ends of the quadratic polynomial, and (3) with the restriction that the sum of the β coefficients is equal to unity. The choice of a quadratic polynomial is due to the fact that, in the literature (e.g. Nigh, 1985; Schollhammer and Nigh, 1984), the political variable is incorporated in models involving 0, 1, and 2 lags.

Causality: The Granger Test

Because of the lags involved, distributed and/or autoregressive models raise the topic of causality in economic variables. Thus, although regression analysis deals with the dependence of one variable on other variables, it does not necessarily imply causation. The question is whether statistically one can detect the direction of causality when temporally there is a lead-lag relationship between two variables. The following Granger test will be considered to determine whether "causality" ("precedence" is more appropriate) exists between FDI and political instability for each of the industries studied for both the UK and the United States.

Granger (1969) starts from the premise that the future cannot cause the present or the past. If event A occurs after event B, one knows that A cannot cause B. At the same time, if A occurs before B, it does not necessarily imply that A causes B. In practice, one observes A and B as time series and would like to know whether A precedes B, or B precedes A, or they are contemporaneous. This is the purpose of Granger causality. The Granger causality test assumes that the information relevant to the prediction of two variables, say X and Y, is contained solely in the time series data on these variables. The test involves estimating the following regressions:

$$X_t = \sum_{i=1}^{n} \alpha_i Y_{t-i} + \sum_{j=1}^{n} \beta_j X_{t-j} + u_{1t} \qquad (51)$$

$$Y_t = \sum_{i=1}^{m} \lambda_i Y_{t-i} + \sum_{j=1}^{m} \delta_j X_{t-j} + u_{2t} \qquad (52)$$

where it is assumed that the disturbances in both equations are uncorrelated.

Equation (51) postulates that current X is related to past values of X itself as well as of Y, and (52) postulates a similar behavior for Y. Four cases can arise:

1. Unidirectional causality from Y to X is present if the estimated coefficients on the lagged Y in (51) are statistically different from zero as a group (i.e., $\sum \alpha_i \neq 0$) and the st of estimated coefficients on the lagged X in (52) is not statistically different from zero (i.e., $\sum \delta_j = 0$).

2. Unidirectional causality from X to Y exists if the set of lagged Y coefficients in (51) is not statistically different from zero (i.e., $\sum \alpha_i = 0$) and the set of the lagged X coefficients in (52) is statistically different from zero (i.e., $\sum \delta_j \neq 0$).

3. Bilateral causality is suggested when the sets of Y and X coefficients are statistically significantly different from zero in both regressions.

4. Independence is suggested when the two sets of Y and X coefficients are not statistically different from zero in both regressions.

More generally, since the future cannot predict the past, if variable X Granger-causes variable Y, then changes in X should precede changes in Y. Therefore, in a regression of Y on other variables (including its own past values) if lagged values of X are included and it significantly improves the prediction of Y, then one may say that X Granger-causes Y. A similar logic applies if Y Granger-causes X.

The steps involved in the Granger causality test are as follows with the example of Equation (51).

Step 1. Regress current X on all lagged X terms and other variables, if any, but do not include the lagged Y variables in this regression. From this regression obtain the restricted residual sum of squares, RSS_R.

Step 2. Run the regression including the lagged Y terms. From this regression obtain the unrestricted residual sum of squares, RSS_{UR}.

Step 3. The null hypothesis is $H_0 : \sum \alpha_i = 0$, that is, lagged Y terms do not belong in the regression.

Step 4. To test this hypothesis, use the F test

$$F = \frac{(RSS_R - RSS_{UR})/m}{RSS_{UR}/(n-k)}$$

which follows the F distribution with m and (n-k) degrees of freedom. The term m is equal to the number of lagged Y terms and k is the number of parameters estimated in the unrestricted regression.

Step 5. If the computed F value exceeds the critical F value at the chosen level of significance, one can reject the null hypothesis, in which case the lagged Y terms belong in the regression. That is, Y causes X.

Step 6. Steps 1 to 5 can be repeated to test the model (52), that is, whether X causes Y.

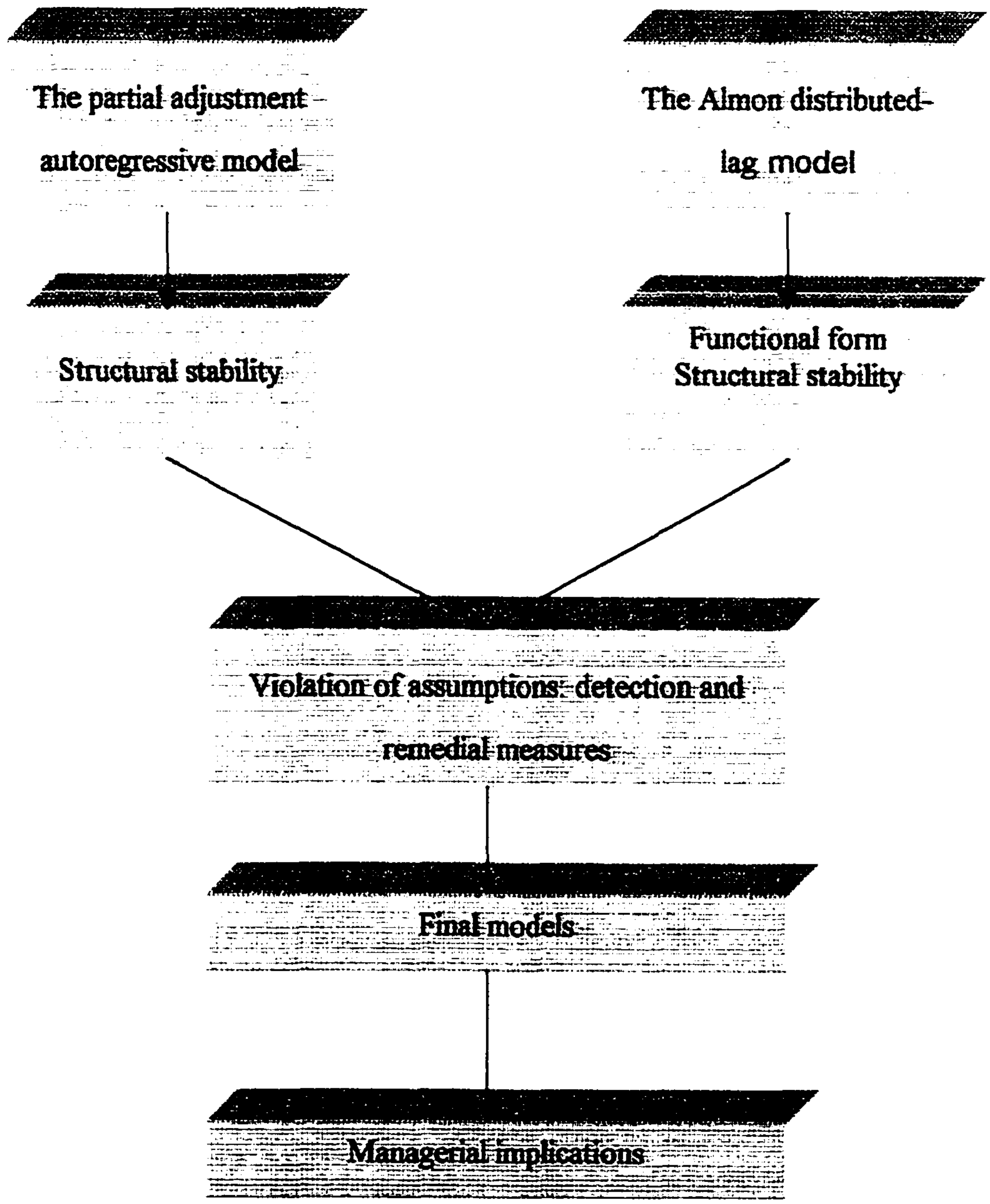
An important to note is that the Granger causality test is very sensitive to the number of lags used in the analysis. Thus, the direction of causality may depend critically on the number of lagged terms included. For the purpose of this paper, and following the reason cited for estimating the Almon quadratic polynomial, the lag length for the two variables, FDI and political instability, is equal to 2.

Summary

The estimation and testing procedure for these dynamic models is almost identical to that for static models; the only difference resides in the partial adjustment model, where the functional forms derived from the static models will remain the smae for each industry. Figure 21 summarizes the procedure used for the dynamic models.

Figure 21

Single-Equation Dynamic Regression Models: Estimation and Testing Procedure



Simultaneous-Equation Models

In the models previously considered an implicit assumption was that the cause-and-effect relationship, if any, between Y and the X's is unidirectional: the explanatory variables are the cause and the dependent variable is the effect.

However, there are situations –as in this paper- where there is a two-way, or simultaneous, flow of influence among the variables; that is, one variable affects another variable(s) and is, in turn, affected by it (them). This simultaneity makes the distinction between dependent and explanatory variables somewhat blurred. In simultaneous-equation models, a set of variables can be determined simultaneously by the remaining set of variables. In such models there is more than one equation; one for each of the jointly dependent or endogenous variables. The variables that can be regarded as nonstochastic are called the exogenous, or predetermined, variables.[34]

Unlike the single-equation models, in the simultaneous-equation models the parameters of a single equation may not be estimated without taking into account information provided by other equations in the system. It is common, in simultaneous-equation models, that the endogenous variable in one equation may appear as an explanatory variable in another equation of the system. Consequently, such an endogeneous explanatory variable becomes stochastic and is usually correlated with the disturbance term of the equation in which it appears as an explanatory variable. Therefore, the OLS method cannot be applied because the estimates thus obtained are not consistent, that is, they do not converge to their true population values no matter how large the sample size.

To illustrate a simultaneous-equation model consider the general M equations model in M endogenous variables:

$$
\begin{aligned}
Y_{1t} &= \beta_{12}Y_{2t} + \beta_{13}Y_{3t} + \ldots + \beta_{1M}Y_{Mt} + \gamma_{11}X_{1t} + \gamma_{12}X_{2t} + \ldots + \gamma_{1K}X_{Kt} + \mu_t \\
Y_{2t} &= \beta_{21}Y_{1t} + \beta_{23}Y_{3t} + \ldots + \beta_{2M}Y_{Mt} + \gamma_{21}X_{1t} + \gamma_{22}X_{2t} + \ldots + \gamma_{2K}X_{Kt} + \mu_t \\
Y_{3t} &= \beta_{31}Y_{1t} + \beta_{32}Y_{2t} + \ldots + \beta_{3M}Y_{Mt} + \gamma_{31}X_{1t} + \gamma_{32}X_{2t} + \ldots + \gamma_{3K}X_{Kt} + \mu_{3t} \qquad (53) \\
&\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\
Y_{MT} &= \beta_{M1}Y_{1t} + \beta_{M2}Y_{2t} + \ldots + \beta_{M,M-1}Y_{M-1,t} + \gamma_{M1}X_{1t} + \gamma_{M2}X_{2t} + \ldots + \gamma_{MK}X_{Kt} + \mu_{Mt}
\end{aligned}
$$

where the Y variables are regarded as endogenous variables; the X variables are predetermined; the μ's are the stochastic disturbances; the β's are the coefficients of the endogenous variables; and the γ's are the coefficients of the predetermined variables.

The equations above are known as the structural equations because they may show the structure of an economy or of an economic model. The β's and γ's are known as the structural coefficients. From these structural equations one can solve for the M endogenous variables and derive the reduced-form equations and the corresponding reduced-form coefficients. A reduced-form equation is one that expresses an endogenous variable solely in terms of the predetermined variables and the stochastic disturbances.

The Identification Problem

The identification problem asks whether one can obtain unique numerical estimates of the structural coefficients. If this can be done, an equation in a system of simultaneous equations is identified. If this cannot be done, that equation is unidentified or underidentified.

An identified equation may be either ***exactly identified*** or ***overidentified***. It is exactly identified if unique numerical values of the structural parameters can be obtained. It is overidentified if more than one numerical value can be obtained for some of the parameters of the structural equations. The identification problem takes place when the same set of data may be compatible with different sets of structural coefficients, that is, different models.

One way to assess the identifiability of a structural equation is to apply the technique of reduced-form equations, which expresses an endogenous variable solely as a function of predetermined variables. Another way is to use the order or rank condition of identification. These two conditions of identification are less time-consuming and laborious than the method of reduced-form equations; hence, the order and rank conditions of identification will be used for this research.

To illustrate both conditions, the following notation is used:

M = number of endogenous variables in the model

m = number of endogenous variables in a given equation

K = number of predetermined variables in the model

k = number of predetermined variables in a given equation.

The order condition of identifiability

This necessary, but not sufficient, condition can be stated in two different but equivalent ways:

(1) In a model of M simultaneous equations in order for an equation to be identified, it must exclude at least M-1 variables (endogenous as well as predetermined) appearing in the model. If it excludes exactly M-1 variables, the equation is just identified. If it excludes more than M-1 variables, it is overidentified.

(2) In a model of M simultaneous equations, in order for an equation to be identified, the number of predetermined variables excluded from the equation must not be less than the number of endogenous variables included in that equation less 1, that is, $K - k \geq m - 1$. If $K - k = m - 1$, the equation is just identified, but if $K - k > m - 1$, it is overidentified.

The rank condition of identifiability[35]

The order condition is a necessary but not sufficient condition for identification. Even if the order condition $K - k \geq m - 1$ is satisfied by an equation, it may be unidentified because the predetermined variables excluded from this equation, but present in the model, may not all be independent so that there may not be one-to-one correspondence between the structural coefficients (the β's) and the reduced-form coefficients (the Π's). That is, one may not be able to estimate the structural parameters from the reduced-form coefficients. The rank condition provides both a necessary and sufficient condition for identification.

In a model containing M equations in M endogenous variables, an equation is identified if, and only if, at least one nonzero determinant of order (M-1)(M-1) can be constructed from the coefficients of the variables (both endogenous and predetermined) excluded from that particular equation but included in other equations of the model.

For this paper, consider the following system of simultaneous equations in which the Y variables are endogenous and the X variables are predetermined. For the purpose of easier manipulation, the variables are not given in log-form and the X variables correspond to the explanatory variables considered in the study except for political instability which is treated as endogenous.

$$Y_{1t} = \beta_{10} + \beta_{12} Y_{2t} + \sum_{i=1}^{6} \gamma_{1i} X_{it} + \mu_{1t} \qquad (54)$$

$$Y_{2t} = \beta_{20} + \beta_{21} Y_{1t} + \mu_{2t} \qquad (55)$$

where political instability (Y_{2t}) is assumed both to influence FDI (Y_{1t}) and to be influenced by it.

This system of equations is modified below to allow for matrix manipulations:

$$Y_{1t} - \beta_{10} - \beta_{12}Y_{2t} - \gamma_{11}X_{1t} - \gamma_{12}X_{2t} - \ldots - \gamma_{16}X_{6t} = \mu_{1t}$$
$$Y_{2t} - \beta_{20} - \beta_{21}Y_{1t} = \mu_{2t}$$

Table 27 shows the preceding system in a convenient format.

Table 27

Matrix Format of System of Equations (54) and (55)

	Coefficients of the variables								
Equation no.	1	Y_1	Y_2	X_1	X_2	X_3	X_4	X_5	X_6
(54)	$-\alpha_0$	1	$-\alpha_1$	$-\gamma_1$	$-\gamma_2$	$-\gamma_3$	$-\gamma_4$	$-\gamma_5$	$-\gamma_6$
(55)	$-\beta_0$	$-\beta_1$	1	0	0	0	0	0	0

First applying the order condition of identification, as shown in Table 28, results in Equation (55) being overidentified and Equation (54) unknown. The problem with identifying the latter equation is due to the fact that the order condition only allows us to know whether a given equation is exactly identified or overidentified. However, the rank condition can tell whether an equation is identified or not.

To apply the rank condition the folllowing steps are followed.

1. Once the system of equations is given in tabular form, as in Table 27, we strike out the coefficients of the row in which the equation under consideration appears.

2. We strike out the columns corresponding to those coefficients in step 1 which are nonzero.

Tables 29 and 30 illustrate the outcome of applying these two steps. The entries left in each of the tables will give only the coefficients of the variables included in the system but not in the equation under consideration. From these entries one must form all possible matrices of order M-1 and obtain the corresponding determinants. If at least one nonvanishing determinant, e.g. A, can be found, the equation under consideration is just identified or overidentified. If all the possible (M-1)(M-1) determinants are zero, the rank of the matrix is less than M-1 and the given equation is not identified.

Table 28

Order Condition of System of Equations (54) and (55)

Equation no.	No. of predtermined variables excluded, (K-k)	No. of endogenous variables included less one, (m-1)	Identified?
(54)	0	1	?
(55)	6	1	Overidentified

Table 29

Rank Condition of Identification for System of Equations (54) and (55): Steps 1 and 2 Applied to Equation (54)

	Coefficients of the variables								
Equation no.	1	Y_1	Y_2	X_1	X_2	X_3	X_4	X_5	X_6
(54)	$-\alpha_0$	1	$-\alpha_1$	$-\gamma_1$	$-\gamma_2$	$-\gamma_3$	$-\gamma_4$	$-\gamma_5$	$-\gamma_6$
(55)	$-\beta_0$	$-\beta_1$	1	0	0	0	0	0	0

Table 30

Rank Condition of Identification for System of Equations (54) and (55): Steps 1 and 2 Applied to Equation (55)

	Coefficients of the variables								
Equation no.	1	Y_1	Y_2	X_1	X_2	X_3	X_4	X_5	X_6
(54)	$-\alpha_0$	1	$-\alpha_1$	$-\gamma_1$	$-\gamma_2$	$-\gamma_3$	$-\gamma_4$	$-\gamma_5$	$-\gamma_6$
(55)	$-\beta_0$	$-\beta_1$	1	0	0	0	0	0	0

The following are general principles of identifiability of a structural equation in a system of M simultaneous equations:

1. If $K - k > m - 1$ and the rank of matrix **A** is M-1, the equation is overidentified.

2. If $K - k = m - 1$ and the rank of the matrix **A** is M-1, the equation is exactly identified.

3. If $K - k \geq m - 1$ and the rank of the matrix **A** is less than M-1, the equation is underidentified.

4. If $K - k < m - 1$, the structural equation is unidentified. The rank of matrix A is likely to be less than M-1.

For Equation (54), there are no determinants that can be formed from the coefficients, and, hence, the rank is less than M-1(=2−1=1). For Equation (55), there are 21 possible determinants of order 2 that could be formed. The value of each determinant is equal to zero. Thus, for example,

$$|\mathbf{A}| = \begin{bmatrix} -\gamma_{11} & -\gamma_{12} \\ 0 & 0 \end{bmatrix} = -\gamma_{11} \times 0 - (-\gamma_{12} \times 0) = 0$$

However, there are 6 nonsingular determinants of order 1 that can be formed. Since M−1 =1, Equation (55) is identified. To find out whether it is just identified or overidentified, one must resort to the order condition, shown in the second line of Table 28; then, Equation (55) is overidentified.

In terms of estimation, nothing can be done about the unidentified equation except for changing the model specification. To estimate the overidentified equation use must be made of the two-stage least squares (2SLS) procedure. However, if one applies this alternative method (to that of OLS) when there is in fact no simultaneity, the method will yield estimators that are consistent but not efficient; consequently, one should test for simultaneity. The simultaneity problem arises because some of the regressors are endogenous and are, therefore, likely to be correlated with the disturbance term. A test of simultaneity is essentially a test of whether an endogenous regressor is correlated with the error term. If it is, there exists a simultaneity problem in which case 2SLS can be applied; if it is not, OLS can be used.

The proposed test is based on Hausman's (1978) specification error test. Consider the above system of simultaneous equations:

$$Y_{1t} = \alpha_0 + \alpha_1 Y_{2t} + \sum_{i=1}^{6} \gamma_{i1} X_{it} + \mu_{1t} \quad (56)$$

$$Y_{2t} = \beta_0 + \beta_1 Y_{1t} + \mu_{2t} \quad (57)$$

Assume that the X variables can be regarded as exogenous and the Y variables as endogenous. If there is no simultaneity problem, Y_{1t} and μ_{2t} should be uncorrelated. The Hausman test starts by first obtaining from (56) and (57) the corresponding reduced-form equations, as follows:

$$Y_{1t} = \Pi_0 + \sum_{i=1}^{6} \Pi_i X_{it} + v_t \quad (58)$$

$$Y_{2t} = \Pi_7 + \sum_{i=8}^{14} \Pi_i X_{(i-8)t} + \omega_t \quad (59)$$

where v and ω are the reduced-form error terms. Estimating (59) by OLS we obtain

$$\hat{Y}_{2t} = \hat{\Pi}_0 + \sum_{i=1}^{6} \hat{\Pi}_i X_{it} \qquad (60)$$

Therefore,

$$Y_{2t} = \hat{Y}_{2t} + \hat{\omega}_t \qquad (61)$$

where $\hat{Y}_{2t}$ are estimated Y_{2t} and $\hat{\omega}_t$ are the estimated residuals. Substituting (61) into (56) yields

$$Y_{1t} = \alpha_0 + \alpha_1 \hat{Y}_{2t} + \alpha_1 \hat{\omega}_t + \sum_{i=1}^{6} \gamma_i X_{it} + \mu_{1t} \qquad (62)$$

Under the null hypothesis that there is no simultaneity, the correlation between $\hat{\omega}_t$ and μ_{1t} should be zero, asymptotically. Thus, if one runs regression (60) and finds that the coefficient of $\hat{\omega}_t$ in (62) is statistically zero, one can conclude that there is no simultaneity problem.

Two-Stage Least Squares (2SLS)

After testing for simultaneity by means of the above-mentioned Hausman specification test, if it is found that there is simultaneity, the 2SLS procedure will be followed to estimate the overidentified equation, namely

$$Y_{2t} = \beta_0 + \beta_1 Y_{1t} + \mu_{2t}$$

which, for illustration purposes, will be called the political instability (PI) function; whereas the unidentified equation, namely

$$Y_{1t} = \alpha_0 + \alpha_1 Y_{2t} + \sum_{i=0}^{6} \gamma_i X_{it} + \mu_{1t}$$

will be termed the FDI function.

The FDI equation states that FDI is determined by political instability and the other explanatory variables identified in this paper. The PI function postulates that political instability is determined by the level of FDI. One may apply OLS to the PI equation, but the estimates so obtained will be inconsistent because of the likely correlation between the stochastic explanatory variable Y_1 and the stochastic disturbance term μ_2. However, if a "proxy" for Y_1 can be found that, although highly correlated with Y_1, is uncorrelated with μ_2. The 2SLS method, developed by Theil (1953) and Basmann (1957), can provide such a proxy using a two-stage procedure.

Stage 1. In order to get rid of the likely correlation between Y_1 and μ_2, Y_1 is first regressed on all the predetermined variables in the whole system, that is, regressing Y_1 on X_1 through X_7 as follows:

$$Y_{1t} = \hat{\Pi}_0 + \sum_{i=0}^{6} \hat{\Pi}_i X_{it} + \hat{\mu}_t \tag{63}$$

where $\hat{\mu}_t$ are the usual OLS residuals. From Equation (63) one obtains

$$\hat{Y}_{1t} = \hat{\Pi}_0 + \sum_{i=0}^{6} \hat{\Pi}_i X_{it} \tag{64}$$

where $\hat{Y}_{1t}$ is an estimate of the mean value of Y conditional upon the fixed X's. Equation (63) can then be expressed as

$$Y_{1t} = \hat{Y}_{1t} + \hat{\mu}_t \tag{65}$$

which shows that the stochastic Y_1 consists of two parts: $\hat{Y}_{1t}$, which is a linear combination of the nonstochastic X's, and a random component $\hat{\mu}_t$. Following OLS theory, $\hat{Y}_{1t}$ and $\hat{\mu}_t$ are uncorrelated.

Stage 2. Substituing (65) into the original PI equation gives

$$\begin{aligned} Y_{2t} &= \beta_0 + \beta_1(\hat{Y}_{1t} + \hat{\mu}_t) + \mu_{2t} \\ &= \beta_0 + \beta_1\hat{Y}_{1t} + (\mu_{2t} + \beta_1\hat{\mu}_t) \\ &= \beta_0 + \beta_1\hat{Y}_{1t} + \mu_t^{*} \end{aligned} \tag{66}$$

where $\mu_t^{*} = \mu_{2t} + \beta_1\hat{\mu}_t$.

Equation (66) shows that although Y_1 in the original PI equation is likely to be correlated with the disturbance term μ_2 (thereby rendering the OLS method inappropriate), $\hat{Y}_{1t}$ in Equation (66) is uncorrelated with μ_t^{*} asymptotically. As a result, the OLS procedure can be applied, which will then give consistent estimates of the parameters of the PI function.[36]

The idea behind 2SLS is to "clear" the stochastic explanatory variable Y_1 of the influence of the stochastic disturbance μ_2: Stage 1 of the procedure estimates the reduced-form regression of Y_1 on all the predetermined variables in the system; in stage 2, the estimated $\hat{Y}_{1t}$ replace Y_{1t} in the original equation, and OLS is applied to the transformed equation. The estimates obtained by using 2SLS are consistent.

However, the estimated standard errors in the second-stage regressions need to be modified because, as seen from Equation (66), the error term μ_t^{*} is the original error term μ_{2t} plus $\hat{\beta}_1\mu_t$. Hence, the variance of μ_t^* is not exactly equal to the variance of the original μ_{2t}. To correct the standard errors of the coefficients estimated in the second-stage regression, each of them is multiplied by $\hat{\sigma}_{\mu_2}/\hat{\sigma}_{\mu^*}$, where

$$\hat{\sigma}_{\mu_2} = \sqrt{\frac{\sum(\hat{\mu}_{2t})^2}{n-2}}$$

$$\hat{\sigma}_{\mu^*} = \sqrt{\frac{\sum(\hat{\mu}_t^*)^2}{n-2}}$$

Summary

The approach to simultaneous equations models discussed above is called the Cowles Foundation approach. Its name derives from the fact that it was developed during the late 1940s and early 1950s by the econometricians at the Cowles Foundation at the University of Chicago. The basic premise of this approach is that the data are assumed to have been generated by a system of simultaneous equations. The classification of variables into endogenous and exogenous, and the causal structure of the model are both given a priori and are untestable.

This approach has been criticized on several grounds.

1. The classification of variables into endogenous and exogenous is sometimes arbitrary.

2. There are usually many variables that should be included in the

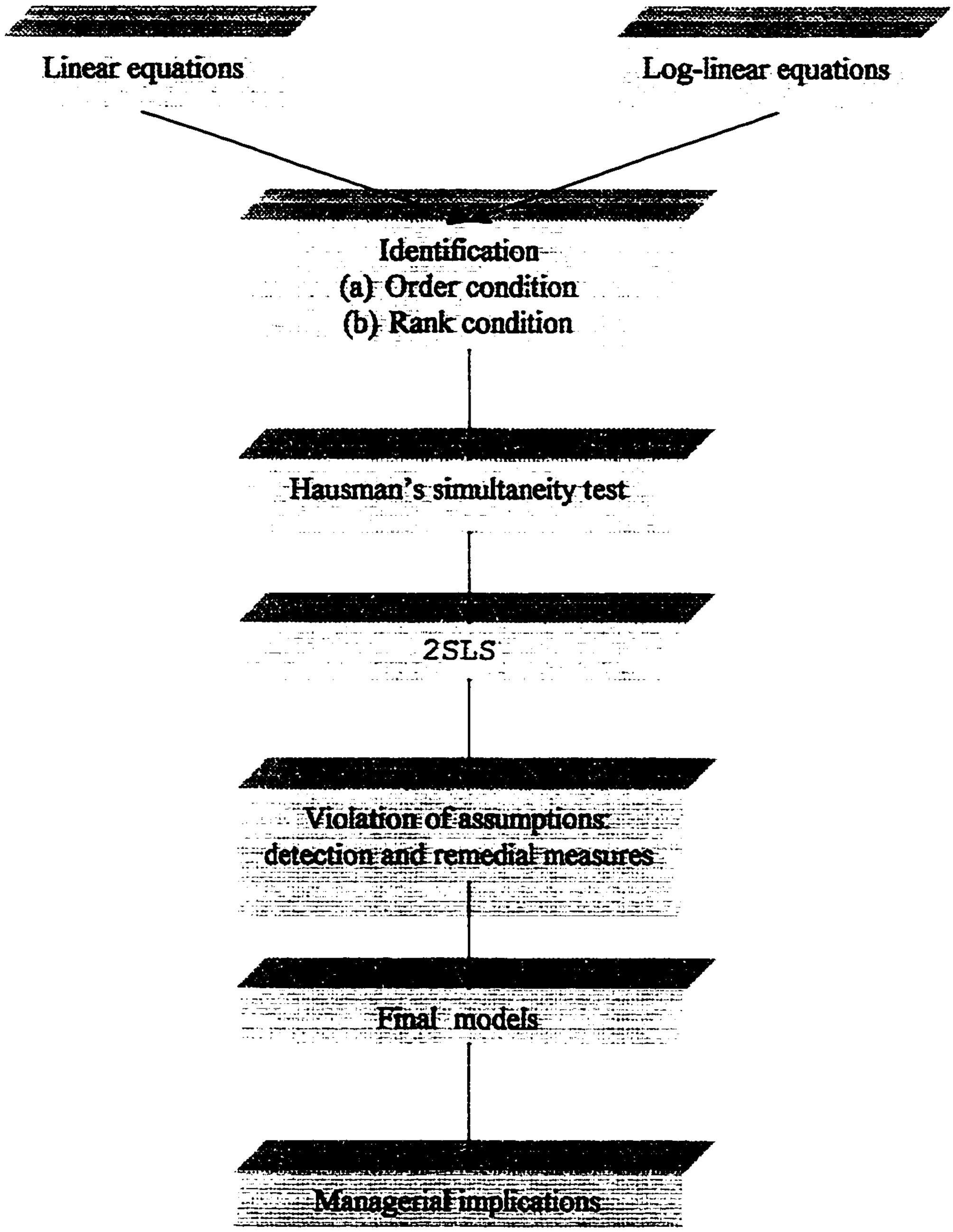
equation that are excluded to achieve identification. This is known as the Liu (1960) critique.

3. One of the main purposes of simultaneous equations estimation is to forecast the effect of changes in the exogenous variables on the endogenous variables. However, if the exogenous variables are changed and profit-maximizing agents see the change coming, they would modify their behavior accordingly. Thus, the coefficients in the simultaneous equations models cannot be assumed to be independent of changes in the exogenous variables. This is known as the Lucas (1976) critique. In other words, the parameters estimated from an econometric model are dependent on the policy prevailing at the time the model was estimated and will change if there is a policy change.

Notwithstanding these criticisms, this paper shall examine simultaneous-equation models of the type described by Equations (54) and (55). The procedure for estimating and testing these models is illustrated in Figure 22. As can be readily seen from this figure, there is a difference with respect to the procedure used for the single-equation regression models, namely, the models will not be tested for functional form nor for structural stability. Instead, each industry regression equation will be estimated separately in both the linear and log-linear forms. Moreover, the equations will not be tested for structural stability because the dummy variable approach involves the estimation of differential slope coefficients which relate a predetermined variable (the dummy) with an endogenous variable (political instability); hence, the method of 2SLS could not be applied.

Figure 22

Simultaneous-Equation Models: Estimation and Testing Procedure



Time-Series Econometrics

The aim of this section is to arrive at a testable model of cointegration for the relationship between FDI and political instability. To that end, the concept of stationarity and its related methods of estimation and tests are introduced first.

Stationarity

Any time series can be thought of as being generated by a stochastic or random process. One way of describing a stochastic process is to specify the joint distribution of the variables in question, say $\{Y_t\}$. Since, in practice, this is quite complicated only the first and second moments of the variables Y_t are defined. These are:

Mean: $E(Y_t) = \mu(t)$

Variance: $var(Y_t) = E(Y_t - \mu(t))^2 = \sigma^2(t)$

Autocovariance: $\gamma(t_1, t_2) = cov(Y_{t1}, Y_{t2})$

One important class of stochastic processes is that of stationary stochastic processes. A time series is said to be strictly stationary if the joint distribution of any set of n observations $Y(t_1), Y(t_2), \ldots, Y(t_n)$ is the same as the joint distribution of $Y(t_1 + k), Y(t_2 + k), \ldots, Y(t_n + k)$ for all n and k.Thus, for example, assuming $n=1$, we get $\mu(t) = \mu$, a constant, and $\sigma^2(t) = \sigma^2$, a constant for all t. Furthermore, if one substitutes for $n=2$, one can see that the joint distribution of $Y(t_1)$ and $Y(t_2)$ is the same as that of $Y(t_1+k)$ and $Y(t_2+k)$. Writing $t_1+k=t_2$, this is the same as the distribution of $Y(t_2)$ and $Y(t_2+k)$. Thus, it only depends on the difference (t_2-t_1), which is called the lag. Hence, one can write the autocovariance function $\gamma(t_1,t_2)$ as $\gamma(k)$ where $k=t_2-t_1$, the lag. Consequently, $\gamma(k)=\mathrm{cov}[Y(t),Y(t+k)]$ is the autocovariance coefficient at lag k; $\gamma(k)$ is called the autocovariance function, and $\gamma(0)$ is the variance σ^2.

For a time series to be strictly stationary, not only the mean and covariance of Y_t must be constant, but also all higher-order moments must be independent of t. So are all higher-order moments of the joint distribution of any combinations of the variables $Y(t_1),Y(t_2),\ldots,Y(t_n)$. In practice this is a very strong assumption; therefore, stationarity will only be considered in terms of first and second moments.

A time series is said to be weakly stationary if its mean and variance are constant over time and the value of the covariance between two time periods depends only on the distance or lag between the two time periods and not on the actual time at which the covariance is computed.

Mean: $E(Y_t)=\mu$

Variance: $\mathrm{var}(Y_t)=E(Y_t-\mu)^2=\sigma^2$

Covariance: $\gamma_k=E[(Y_t-\mu)(Y_{t+k}-\mu)]$

In short, if a time series is stationary, its mean, variance, and autocovariance (at various lags) remain the same no matter at what time one measures them. If a time series is not stationary in the sense just defined, it is called a nonstationary time series.

The correlogram test of stationariy

One simple test of stationarity is based on the so-called autocorrelation function (ACF). Since the autocovariance coefficients depend on the units of measurement of Y_t, it is convenient to consider the autocorrelations that are free from the units of measurement. Since $\text{var}(Y_t) = \text{var}(Y_{t+k}) = \sigma^2 = \gamma(0)$, the autocorrelation coefficient ρ_k at lag k is defined as

$$\rho_k = \frac{\gamma_k}{\gamma_0}$$

The value of ρ_k lies between -1 and $+1$. Plotting ρ_k against k gives what is known as the population correlogram. In practice, however, we only have a realization of a stochastic process, and therefore, can only compute the sample autocorrelation function, $\hat{\rho}_k$, as follows:

$$\hat{\rho}_k = \frac{\hat{\gamma}_k}{\hat{\gamma}_0}$$

which is the ratio of the sample covariance to sample variance. A plot of $\hat{\rho}_k$ against k gives the sample correlogram.

The statistical significance of any $\hat{\rho}_k$ is given by its standard error. Barlett (1946) shows that if a time series exhibits white noise, the sample autocorrelation coefficients are approximately normally distributed with zero mean and variance 1/n, where n is the sample size. Following the properties of the standard normal distribution, then, for example, the 95% confidence interval for any ρ_k will be ±1.96 times its standard error. Hence, if an estimated ρ_k falls inside the interval, the hypothesis that the true ρ_k is zero fails to be rejected. On the other hand, if it lies outside the confidence interval, then the hypothesis that the true ρ_k is zero can be rejected.

To test the hypothesis that all the ρ_k autocorrelation coefficients are simultaneously equal to zero, two statistics will be used.

1. The Q statistic is defined as

$$Q = n\sum_{k=1}^{m}\hat{\rho}_k^2$$

where n is the sample size and m is the lag length. The Q statistic is approximately distributed as the chi-square distribution with m degrees of freedom. If the computed Q exceeds the critical Q value from the chi-square table at the chosen level of significance, one can reject the null hypothesis that all ρ_k are all zero; that is, at least some of them must be non-zero.

2. The Ljung-Box (LB) statistic is defined as

$$LB = n(n+2)\sum_{k=1}^{m}\left(\frac{\hat{\rho}_k^2}{n-k}\right) \approx \chi_m^2$$

If the two statistics are both statistically significant for a given time series then, the said time series is not stationary.

The unit root test of stationarity

The topic in the 1980s that attracted the most attention from econometricians was that of testing for unit roots. Consider the following model:

$$Y_t = Y_{t-1} + u_t \tag{67}$$

where u_t is the stochastic error term with zero mean, constant variance σ^2, and is nonautocorrelated. This error term is also known as a white noise error term. If the coefficient of Y_{t-1} is equal to 1, one faces what is known as the unit root problem[37], that is, a nonstationary situation.

Therefore, if one runs the regression

$$Y_t = \rho Y_{t-1} + u_t \tag{68}$$

and finds that $\rho = 1$, then the stochastic variable Y_t has a unit root. In time-series econometrics, a time series that has a unit root is known as a random walk which, in turn, is an example of a nonstationary time series (shown in Appendix F).

The notions of stationarity and nonstationarity can be derived from mathematics by means of difference equations. Thus, we are seeking the solution to the first-order difference equation [Equation (68)]:

$$Y_t = \rho Y_{t-1} + u_t$$

or,

$$Y_t - \rho Y_{t-1} = u_t \tag{69}$$

The general solution to this equation will consist of the sum of two components: a particular integral Y_p, which is any solution of the complete nonhomogenous Equation (69), and a complementary function Y_c, which is the general solution of the reduced equation of (69)

$$Y_t - \rho Y_{t-1} = 0 \tag{70}$$

The Y_p component represents the intertemporal equilibrium level of Y, and the Y_c component, the deviations of the time path from that equilibrium. The sum of Y_p and Y_c constitutes the general solution, bacause of the presence of an arbitrary constant -the A term below-. For a definite solution, an initial condition is needed.

Starting with the complementary function, the solution of the homogeneous difference Equation (70) may be written as

$$Y_t = \rho^t Y_0$$

Letting $b = \rho$ and $A = Y_0$, the solution of the general homogeneous difference equation be in the form

$$Y_t = A\, b^t$$

and, hence,

$$Y_{t-1} = A\, b^{t-1}$$

If these values of Y_t and Y_{t-1} hold, the homogeneous Equation (70) becomes

$$A\, b^t - \rho\, A\, b^{t-1} = 0$$

which, upon canceling the nonzero common factor $A\,b^t$, yields

$$1-\rho\, b^{-1}=0$$
$$1-\frac{\rho}{b}=0$$
$$b=\rho$$

Therefore, the complementary function can be written as

$$Y_c=A\,\rho\, b^t$$

For the particular integral, Y_p, which has to do with the complete Equation (69), one can choose any solution of (69); thus, a trial solution of the simplest form $Y_t=k$ (a constant) can work out. If $Y_t=k$, then Y will maintain the same constant value over time, and hence, $Y_{t-1}=k$. Substituting these values into (69) yields

$$k-\rho\, k=u_t$$
$$k=\frac{u_t}{1-\rho}$$

Since this particular k value satisfies the equation, the particular integral can be written as

$$Y_p=\frac{u_t}{1-\rho} \qquad (\rho\neq 1)$$

Since by assumption u_t is stationary, a stationary equilibrium is present in this case. However, if $\rho=1$ (i.e. exhibits a unit root), the particular integral $u_t/(1-\rho)$ is not defined, and some other solution of the nonhomogeneous Equation (69) must be sought; for example, trying $Y_t=k\,t$. This implies that

$Y_{t-1} = k(t-1)$. Substituting these values into (69) gives

$$kt - \rho k(t-1) = u_t$$

$$k = \frac{u_t}{t - \rho t + \rho} = u_t$$

Therefore,

$$Y_p (= kt) = u_t t$$

This form of the particular integral is a nonconstant function of t; it represents a moving equilibrium, or nonstationarity.

Adding Y_c and Y_p together, one can write the general in one of the following two forms:

$$Y_t = A\rho^t + \frac{u_t}{1-\rho} \qquad [\textit{general solution}, \rho \neq 1] \qquad (71)$$

$$Y_t = A\rho^t + u_t t = A + u_t t \qquad [\textit{general solution}, \rho = 1] \qquad (72)$$

Neither of these equations is completely determinate, due to the presence of the arbitrary constant A. To eliminate this arbitrary constant, we assume the initial condition $Y_t = Y_0$ when t=0. Letting t=0 in (71), we have

$$Y_0 = A + \frac{u_t}{1-\rho}$$

$$A = Y_0 - \frac{u_t}{1-\rho}$$

Consequently, the definite version of (71) becomes

$$Y_t = \left(Y_0 - \frac{u_t}{1-\rho}\right)\rho^t + \frac{u_t}{1-\rho} \qquad [\textit{definite solution}, \rho \neq 1] \qquad (71a)$$

Letting t=0 in (7) gives $Y_0 = A$, so the definite version of (72) is

$$Y_t = Y_0 + u_t t \qquad [\textit{definite solution}, \rho = 1] \qquad (72a)$$

In period analysis, the dynamic stability of equilibrium depends on the Ab^t term in the complementary function. The equilibrium stability depends on whether or not the complementary function will tend to zero as t tends to infinity.

For Equation (71a),

$$Y_c = \left(Y_0 - \frac{u_t}{1-\rho}\right)\rho^t$$

Assuming Y_0 is nonzero and $|\rho| < 1$, then $\rho^t \to 0$ and so does Y_c.

For Equation (72a),

$$Y_c = A = Y_0$$

The complementary function will tend to zero only if Y_0 is zero.

When the Y_p term is included, it becomes a question of the convergence of the time path $Y_t = Y_c + Y_p$ to the equilibrium level Y_p.

For Equation (71a), Y_t converges to the equilibrium level Y_p since $|\rho| < 1$. However, the time path of (72a) is divergent because with a nonzero A, there will be a constant deviation from the moving equilibrium. Thus, the solution

$$Y_t = Ab^t + Y_p$$

is a convergent path if and only if $|b(=\rho)| < 1$.

To sum up, the time series Y_t converges (as $t \to \infty$) to a stationary time series if $|\rho| < 1$. If $|\rho| = 1$, the time series is not stationary and the variance of Y_t is $t\sigma^2$. If $|\rho| > 1$, the time series is not stationary and the variance of the time series grows exponentially as τ increases.

For the purpose of estimation, Equation (68) is usually expressed in the following form:

$$\begin{aligned} \Delta Y_t &= (\rho - 1) Y_{t-1} + u_t \\ &= \delta Y_{t-1} + u_t \end{aligned} \tag{73}$$

where $\delta = (\rho - 1)$ and Δ is the first-difference operator. The null hypothesis is now $\delta = 0$. If $\delta = 0$, then (73) can be written as

$$\Delta Y_t = u_t$$

That is, the first differences of a random walk time series are a stationary time series because by assumption u_t is purely random.

If a time series is differenced once and the differenced series is stationary, the original series is integrated of order 1, denoted as I(1). More generally, a time series Z_t is said to be integrated of order d –written as Z_t~I(d)- if the series can be detrended (i.e. rendered stationary) by differencing it d times. Letting Δ^b denote application of the difference operator b times, if Z_t~I(d) then the bth difference series $\Delta^b Z_t$ is I(d-b). Many macroeconomic series appear to be I(1). Granger (1986, p.214) notes the following differences between I(0) and I(1) series:

> An I(0) series has a mean and there is a tendency for the series to return to the mean, so that it tends to fluctuate aroundthe mean, crossing that value frequently and with rare extensive excursions. Autocorrelations decline rapidly as the lag increases and the process gives low weights to events in the medium to distant past, and thus effectively has a finite memory. An I(1) process without drift will be relatively smooth, will wander widely and will only rarely return to an earlier value. In fact, for a random walk and for a fixed arbitrary value, the expected time until the process again passses through this value is infinite. This does not mean that returns do not occur, but that the distribution of the time to returns is very long-tailed. Autocorrelations $\{\rho_k\}$ are all near one in magnitude even for large k; an innovation to the process affects all later values and so the process has indefinitely long memory.

Thus, if a series is I(0) the process represents a stationary time series. If it is integrated of a higher order, the series is nonstationary.

There are important differences between stationary and nonstationary time series. Shocks to a stationary time series are necessarily temporary; over time the effects of the shocks will dissipate and the series will revert to its long-run mean level. On the other hand, a nonstationary series necessarily has permanent components. The mean and/or variance of a nonstationary time series are time-dependent. At this point, it is important to discuss two types of nonstationary time series which have both economic and statistical implications.

Trend-stationary (TP) and difference-stationary (DS) processes.

As previously noted, many economic time series are clearly nonstationary in the sense that the mean and variance depend on time, and they tend to depart ever further from any given value as time goes on. If this movement is predominantly in one direction, then the series exhibits a trend.

Nonstationary time series are frequently detrended before any further analysis is carried out. There are two procedures used for de-trending: (1) estimating regressions on time, and (2) successive differencing.

Assume that the series Y_t is generated by the following mechanism:

$$Y_t = f(t) + u_t$$

where f(t) is the trend and u_t is a stationary series with mean zero and variance σ_u^2. Supposing that f(t) is linear, we have

$$Y_t = \alpha + \beta t + u_t \qquad (74)$$

If differencing is ude to eliminate the trend, we get

$$\Delta Y_t = Y_t - Y_{t-1} = \beta + u_t - u_{t-1}$$

To eliminate β, we take a first difference again resulting in the following de-trended series:

$$\Delta^2 Y_t = \Delta^2 u_t = u_t - 2u_{t-1} + u_{t-2}$$

On the other hand, assume that Y_t is generated by the following random walk model with drift:

$$Y_t - Y_{t-1} = \beta + \varepsilon_t \qquad (75)$$

where ε_t is a stationary series with mean zero and variance σ^2. In this case the first difference of Y_t is stationary with mean β. Accumulating Y_t with an initial value Y_0, we obtain from (75)

$$Y_t = Y_0 + \beta t + \sum_{j=1}^{t} \varepsilon_j \qquad (76)$$

which is of the same form as (74) except for the fact that the disturbance is not stationary and has variance $t\sigma^2$. Nelson and Plosser (1982) call model (74) a trend-stationary process (TSP) and model (75) a difference-stationary process (DSP). Both models exhibit a linear trend, but the method of eliminating the trend differs. To test the hypothesis that a time series belongs to the TS class against the alternative that it belongs to the DS class, Nelson and Plosser (1982) use a test developed by Dickey and Fuller (1979). This consists of estimating the model

$$Y_t = \alpha + \rho Y_{t-1} + \beta t + \varepsilon_t$$

which belongs to the DS class if $\rho = 1, \beta = 0$ and to the TS class if $|\rho| < 1$. The least-squares estimate of ρ is not distributed around unity under the DS hypothesis but rather around a value less than one. Dickey and Fuller (1979) tabulated the significance points for testing the hypothesis $\rho = 1$ against $|\rho| < 1$. In their study of a wide range of historical time series for the U.S. economy, Nelson and Plosser (1982, p.160) concluded that for most economic time series the DSP model is more appropriate, and that the TSP model would be the relevant one only if one assumes that the errors u_t in (74) are highly autocorrelated:

> Our test results are consistent with the latter hypothesis [non-stationarity arises from the accumulation over time of stationary

> invertible first differences] and would be consistent with the former [stationary fluctuations around a deterministic trend] only if the fluctuations around a deterministic trend are so highly autocorrelated as to be indistinguishable from non-stationary series themselves in realizations as long as one hundred years.

Supposing the true model is one with no trend in the mean but only a trend in the variance (i.e. a DSP), and one estimates a model with a trend in the mean but no trend in the variance (i.e. a TSP), then the trend in the variance will be transmitted to the mean and one shall find a significant coefficient for t even though in reality there is no trend in the mean. Appendix G shows Nelson and Kang's (1984) analysis of the problems encountered when estimating a TSP model when the true model is DSP.

In a nutshell, using a regression on time has serious consequences when, in fact, the time series is of the DSP type, and, hence, differencing is the appropriate method for trend elimination. Plosser and Schwert (1978) argue that with most economic time series it is always best to work with difference data rather than with data in levels. This is because if the data series are of the DSP type, the errors in the levels equation will have variances that increase over time, and therefore, many of the properties of the OLS estimators and the significance tests are invalid. On the other hand, assuming that the levels equation is correctly specified, then differencing will only produce a moving average error, and hence, the error term will not be serially independent. But estimating the first difference equation by OLS still gives consistent, although inefficient, estimators. Therefore, the consequences of differencing when it is not needed are less serious than those of failing to difference when it is appropriate (when the true model is of the DS type).

In practice, the Dickey-Fuller test, discussed below, will be used to test whether the data are of the DS type or of the TS type.

The issue of whether a time series is a TSP or a DSP is quite important. If a series is a DSP, the effect of any shock is permanent. For example, consider the following random walk without drift:

$$Y_t = Y_{t-1} + \varepsilon_t$$

where ε_t is a zero-mean stationary process. Assuming that in some time period, Y_T, there is a jump C in ε_T, then Y_T and the successive values of Y_T all increase by C. Thus, the effect of the shock is permanent.

On the other hand, if one has the following TSP model

$$Y_t = \alpha Y_{t-1} + \varepsilon_t \qquad |\alpha| < 1$$

then the effect of the shock dies out in the future. At time T, Y_T will jump by C, and the successive values will increase by $C\alpha, C\alpha^2, C\alpha^3$, etcetera. For example, if monetary shocks do not have a permanent effect on GNP, and if real GNP is a DSP, fluctuations in real GNP have to be explained by real shocks, not monetary shocks. Therefore, the issue of whether in the autoregression $Y_t = \alpha Y_{t-1} + \varepsilon_t$ there is a unit root, is important for macroeconomists. From the point of long-term forecasting, forecasts made from a TSP will be more realiable than those made from a DSP.

On the statistical side, there is the issue that spurious autocorrelation will arise when a DSP series is de-trended or a TSP series differenced.

In summary, a stationary time series can be modeled as a TSP process, whereas a nonstationary time series represents a DS process.

To find out if a time series is nonstationary, we run regression (73) and find out if $\hat{\delta} = 0$ on the basis of the t statistic. However, the t value thus obtained does not follow the Student's t distribution. The alternative computed t statistic is known as the τ (tau) statistic, whose critical values have been tabulated by Dickey and Fuller (1979). This tau test is known as the Dickey-Fuller (DF) test. If the computed absolute value of the τ statistic exceeds the DF absolute critical τ value, then one fails to reject the hypothesis that the given time series is stationary. If, on the other hand, it is less than the critical value, the time series is nonstationary. When running regression (73) the estimated τ statistic usually has a negative sign. Therefore, a large negative τ is generally an indication of stationarity.

The DF test will be applied to regressions in the following form:

$$\Delta Y_t = \delta Y_{t-1} + u_t \tag{77}$$

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + u_t \tag{78}$$

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + u_t \tag{79}$$

In each of these cases the nul hypothesis is $\delta = 0$, that is, there is a unit root.

If the error term u_t is autocorrelated, Equation (79) is modified as follows:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t \tag{80}$$

The number of lagged difference terms must be enough so that the error term in (80) is serially independent. When the DF test is applied to such models, it is called the augmented Dickey-Fuller (ADF) test.

The test involves estimating one, or more, of the equations above using OLS in order to obtain the estimated value of δ and the associated standard error. However, the critical values of the t-statistics depend on whether an intercept and/or time trend is included in the regression equation. In their Monte Carlo study, Dickey and Fuller (1979) found that the critical values for $\delta = 0$ depend on the form of the regression and the sample size. The statistics τ, τ_u, and τ_τ are the appropriate statistics to use for Equations (77), (78), and (79). The last tau statistic also applies for Equation (80).

Dickey and Fuller (1981) provide three additional F-statistics (called ϕ_1, ϕ_2 and ϕ_3) to test joint hypotheses on the coefficients. With (78), the null hypothesis $\delta = \beta_1 = 0$ is tested using the ϕ_1 statistic. Including a time trend in the regression –so that Equations (79) and (80) are estimated- the joint hypothesis $\beta_1 = \beta_2 = \delta = 0$ is tested using the ϕ_2 statistic; the joint hypothesis

$\delta = \beta_2 = 0$ is tested using the ϕ_3 statistic.

The ϕ_1, ϕ_2, and ϕ_3 statistics are constructed in exactly the same way as ordinary F-tests:

$$\phi_i = \frac{[RSS\,(restricted) - RSS\,(unrestricted)]/\,r}{RSS\,(unrestricted)/(T-k)}$$

where RSS (restricted) and RSS (unrestricted) are the sums of the squared residuals from the restricted and unrestricted models; r is the number of restrictions; T is the number of usable observations; and k is the number of parameters estimated in the unrestricted model.

The null hypothesis is that the data is generated by the restricted model, and the alternative hypothesis is that the data is generated by the unrestricted model. If the calculated value of ϕ_i is smaller than that reported by Dickey and Fuller, one can accept the restricted model (i.e., one fails to reject the null hypothesis that the restriction is not binding). If the calculated value of ϕ_i is larger than that reported by Dickey and Fuller, one can reject the null hypothesis and conclude that the restriction is binding.

The unit root issue arises in the context of the standard regression model. Consider the following regression:

$$Y_t = \alpha + \beta Z_t + e_t \tag{81}$$

where the notation e_t is used to highlight the fact that the residuals from such a regression will not generally be white-noise.

In working with nonstationary variables, there are four cases to consider in terms of Equation (81).

1. Both $\{Y_t\}$ and $\{Z_t\}$ are stationary. When both variables are stationary, the classical regression model is appropriate.

2. The $\{Y_t\}$ and $\{Z_t\}$ sequences are integrated of different orders. Regression equations using such variables are meaningless. It can be shown that a linear combination of and $I(d_1)$ and an $I(d_2)$ variable, where $d_1 > d_2$, must be integrated of order d_1. Thus, from (81) we solve for e_t giving

$$e_t = Y_t - \alpha - \beta Z_t$$

Since e_t is assumed to be I(0), Y_t and Z_t cannot be integrated of different orders. Likewise, it is also inappropriate to use one variable which is trend stationary and another which is difference stationary. In such cases, time can be included as an explanatory variable or the variable in question can be detrended.

3. The nonstationary $\{Y_t\}$ and $\{Z_t\}$ sequences are integrated of the same order and the residual sequence contains a stochastic trend. This is the case in which the regression is spurious.

Regresssions involving time series data include the possibility of obtaining spurious results in the sense that the results look good but they also look dubious. As Granger and Newbold (1974) have suggested, and $R^2 > DW$ (Durbin-Watson statistic) is a good rule of thumb to suspect that the estimated regression suffers from spurious regression. The results from such spurious regressions are meaningless in that all errors are permanent. In this case, it is often recommended that the regression equation be estimated in first differences. However, two pitfalls may arise. First, if one of the trends is deterministic and the other is stochastic, first-differencing each time series would not be appropriate. Second, in taking the first difference one may lose a valuable long-term relationship between the two series that is given by the levels (as against the first difference) of the two series; this is because most economic theory is stated as a long-term relationship between variables in level form and not in first-difference form.

4. The nonstationary $\{Y_t\}$ and $\{Z_t\}$ sequences are integrated of the same order and the residual sequence is stationary. In this case, $\{Y_t\}$ and $\{Z_t\}$ are cointegrated. Next section discusses cointegration and the importance of pretesting the variables in a regression for nonstationarity.

Cointegration

One drawback of the procedure of differencing is that it results in a loss of valuable long-run information in the data. Recently, the concept of cointegrated series has been suggested as one solution to this problem. Intuitively, Granger (1986, p. 213) introduces the concept of integration:

In some cases an economic theory involving equilibrium concepts might suggest close relations in the long-run, possibly with the addition of yet further variables. However, in each case the correctness of the beliefs about long-term relatedness is an empirical question. The idea underlying cointegration allows specification of models that capture part of such beliefs, at least for a particular type of variable that is frequently found to occur in macroeconomics.

Thus, the concept of cointegration applies to a wide variety of economic models. Any equilibrium relationship among a set of nonstationary variables implies that their stochastic trends must be linked. The equilibrium relationship means that the variables cannot move independently of each other. This linkage among the stochastic trends necessitates that the variables be cointegrated. Since the trends of cointegrated variables are linked, the dynamic paths of such variables must bear some relation to the current deviation from the equilibrium relationship.

Engle and Granger's (1987) formal analysis of cointegration begins by considering a set of economic variables in long-run equilibrium when:

$$\beta_1 x_{1t} + \beta_2 x_{2t} + \ldots + \beta_n x_{nt} = 0$$

Letting β and x_t denote the vectors $(\beta_1, \beta_2, \ldots, \beta_n)$ and $(x_{1t}, x_{2t}, \ldots, x_{nt})'$, respectively, the system is in long-run equilibrium when $\beta x_t = 0$. However, in most periods, x_t will not be in equilibrium and hence,

$$e_t = \beta x_t$$

where e_t represents the deviation from long-run equilibrium, also called the equilibrium error. If the equilibrium is meaningful, it must be the case that the equilibrium error process is stationary; that is, the economy is likely to prefer a small value of e_t rather than a large value.

Engle and Granger (1987) provide the following definition of cointegration.

The components of the vector $x_t = (x_{1t}, x_{2t}, \dots, x_{nt})'$ are said to be cointegrated of order d, b, denoted by $x_t \sim$ CI(d,b) if:

1. All components of x_t are integrated of order d.
2. There exists a vector $\beta = (\beta_1, \beta_2, \dots, \beta_n)$ such that the linear combination $\beta x_t = \beta_1 x_{1t} + \beta_2 x_{2t} + \dots + \beta_n x_{nt}$ is integrated of order (d-b), where b>0. The vector β is called the cointegrating vector. Considering the case of d=1, b=1, cointegration would mean that if the components of x_t were all I(1), then the equilibrium error would be I(0), and e_t will rarely drift far from zero if it has zero mean and e_t will often cross the zero line. This means, according to Engle and Granger (1987, p. 253) "...that equilibrium will occasionally occur, at least to a close approximation, whereas if x_t was not cointegrated, then $z_t\,[e_t]$ can wander widely and zero-crossings would be very rare, suggesting that in this case the equilibrium concept has no practical implications."

There are four important points about the definition of cointegration.

1. Cointegration refers to a linear combination of nonstationary

variables. Theoretically, it is possible that non-linear long-run relationships exist among a set of integrated variables. However, as already mentioned at the beginning of this chapter, regressions are estimated assuming linearity in the parameters. It is also worth noting that the cointegrating vector is not unique. If $(\beta_1, \beta_2, \ldots, \beta_n)$ is a cointegrating vector, then for any nonzero value of λ, $(\lambda\beta_1, \lambda\beta_2, \ldots, \lambda\beta_n)$ is a cointegrating vector. Typically, one of the variables is used to normalize the cointegrating vector by fixing its coeffcient at unity. For example, to normalize the cointegrating vector with respect to x_{1t}, one selects $\lambda = 1/\beta_1$.

2. All variables must be integrated of the same order. This does not imply that all integrated variables are cointegrated; ususally, a set of I(1) variables is not cointegrated. Such a lack of cointegration implies no long-run equilibrium among the variables so that they can wander arbitrarily far from each other.

3. If x_t has n components, there may be as many as n-1 linearly independent cointegrating vectors. Clearly, if x_t contains only two variables, there can be at most one independent cointegrating vector. The number of cointegrating vectors is called the cointegrating rank of x_t.

4. Most of the cointegration literature concentrates on the case in which each variable contains a single unit root. The reason is that traditional time-series analysis applies when variables are I(0) and few economic

variables are integrated of an order higher than unity.

Cointegration and error correction

A principal feature of cointegrated variables is that their time paths are influenced by the extent of any deviation from long-run equilibrium. Therefore, the short-run dynamics must be influenced by the deviation from the long-run relationship.

Formally, the (nx1) vector $x_t = (x_{1t}, x_{2t}, \ldots, x_{nt})'$ has an error-correction representation if it can be expressed in the following form:

$$\Delta x_t = \pi_0 - \pi x_{t-1} + \pi_1 \Delta x_{t-1} + \pi_2 \Delta x_{t-2} + \ldots + \pi_p \Delta x_{t-p} + \varepsilon_t \quad (82)$$

where π_0 is an (nx1) vector of intercept terms with elements π_{i0}; the π_i are (nxn) coefficient matrices with elements $\pi_{jk}(i)$; π is a matrix with elements π_{jk} such that one or more of the $\pi_{jk} \neq 0$; and ε_t is an (nxn) vector with elements ε_{it}.

Letting all variables in x_t be I(1), if there is an error-correction representation of these variables as in (82), then there is necessarily a linear combination of the I(1) variables that is stationary. Solving (82) for πx_{t-1} gives

$$\pi x_{t-1} = \Delta x_t - \pi_0 - \sum \pi_i \Delta x_{t-i} - \varepsilon_t \quad (83)$$

Since each expression on the right-hand side is stationary, πx_{t-1} must also be stationary. Since π contains only constants, each row of π is a cointegrating vector of x_t. For example, the first row can be written as $(\pi_{11} x_{1t-1} + \pi_{12} x_{2t-1} + \ldots + \pi_{1n} x_{nt-1})$. Since each series x_{it-1} is I(1), $(\pi_{11}, \pi_{12}, \ldots, \pi_{1n})$

must be a cointegrating vector for x_t. Thus, an error-correction model for I(1) variables necessarily implies cointegration. Also, cointegration implies error correction. This result is known as the Granger representation theorem stating that for any set of I(1) variables, error correction and cointegration are equivalent representations.

The key feature in (82) is the presence of the matrix π. There are two important points to note:

1. If all elements of π equal zero, (82) becomes a traditional VAR (vector autoregression) in first differences. In that case, there is no error-correction representation since Δx_t does not respond to the previous period's deviation from long-run equilibrium.

2. If one or more of the π_{jk} differs from zero, Δx_t responds to the previous period's devaiation from long-run equilibrium. Hence, estimating x_t as a VAR in first differences is inappropriate if x_t has an error-correction representation. The omission of the expression πx_{t-1} implies a specification error if x_t has an error-correction representation as in (82). In general, all variables in a cointegrated system will respond to a deviation from long-run equilibrium. However, it is possible that some of the adjustment parameters are zero so that only some of the variables do respond to the discrepancy from long-run equilibrium.

In summary, the Engle-Granger methodology seeks to determine whether the residuals of the equilibrium relationship are stationary.

The Engle-Granger methodology

This paper seeks to determine whether there exists an equilibrium relationship between FDI and political instability (in absolute and relative terms). Since *a priori* this long-run relationship may be different for each of the industries considered, the following Engle-Granger procedure will be used for each of them.

Denoting FDI as y_t and political instability as z_t, Engle and Granger (1987) propose the following test procedure to determine whether two I(1) variables are CI(1,1).

Step 1. Pretest the variables for their order of integration.

By definition, cointegration implies that the variables be integrated of the same order. Thus, the first step in the analysis is to pretest each variable to determine its order of integration. The DF and ADF tests, discussed above, are used to infer the number of unit roots, if any, in each of the variables. If all the variables are stationary, it is not necessary to proceed since standard time-series methods apply to stationary variables. If the variables are integrated of different orders, it is possible to conclude that they are not cointegrated.

Step 2. Estimate the long-run equilibrium relationship

If the results of step 1 indicate that both $\{y_t\}$ and $\{z_t\}$ are I(1), the next step is to estimate the long-run equilibrium relationship as follows:

$$y_t = \beta_0 + \beta_1 z_t + e_t \tag{84}$$

If the variables are cointegrated, an OLS regression yields a superconsistent estimator of the cointegrating parameters β_0 and β_1. Stock (1988) proves that the OLS estimates of β_0 and β_1 converge faster than in OLS models using stationary variables. In order to determine if the variables are actually cointegrated, denote the residual sequence from () by $\{\hat{e}_t\}$. Thus, $\{\hat{e}_t\}$ is the series of the estimated residuals of the long-run relationship. If these deviations from long-run equilibrium are found to be stationary, the $\{y_t\}$ and $\{z_t\}$ sequences are cointegrated of order (1,1). Thus, one could perform a DF test on these residuals to determine their order of integration.

Consider the autoregression of the residuals

$$\Delta\hat{e}_t = a_1 \hat{e}_{t-1} + \varepsilon_t \tag{85}$$

Since the $\{\hat{e}_t\}$ sequence is a residual from a regression equation, there is no need to include an intercept term. If one cannot reject the null hypothesis $a_1 = 0$, one can conclude that the residual series contains a unit root. Therefore, one can conclude that the $\{y_t\}$ and $\{z_t\}$ sequences are not cointegrated. More precisely, if it is not possible to reject the null hypothesis $a_1 = 0$, one cannot reject the hypothesis that the variables are not cointegrated. Conversely, the rejection of the null hypothesis implies that the residual sequence is stationary. Given that both $\{y_t\}$ and $\{z_t\}$ are found to be

I(1) and that the residuals are stationary, one can conclude that the series are cointegrated of order (1,1).

If the residuals of (85) do not appear to be white-noise, an ADF test can be used instead of (85). Supposing that the diagnostic checks indicate that the $\{\hat{e}_t\}$ sequence of (85) exhibits serial correlation, one can estimate the autoregression:

$$\Delta\hat{e}_t = a_1\hat{e}_{t-1} + \sum_i a_{i+1}\Delta\hat{e}_{t-i} + \varepsilon_t \tag{86}$$

If $a_1 = 0$, one can conclude that the residual sequence is nonstationary and that $\{y_t\}$ and $\{z_t\}$ are not CI(1,1).

However, in most applied studies it is not possible to use the Dickey-Fuller tables themselves. The problem is that the $\{\hat{e}_t\}$ sequence is generated from a regression equation; hence, the researcher does not know the actual error e_t, only the estimate of the error $\hat{e}_t$. Only if β_0 and β_1 were known in advance and were used to construct the true $\{e_t\}$ sequence, would an ordinary DF table be appropriate. Engle and Granger provide test statistics that can be used to test the hypothesis $a_1 = 0$. Thus, the DF and ADF tests in this context are known as Engle-Granger (EG) test and augmented Engle-Granger (AEG) test. If more than two variables appear in the equilibrium relationship, the appropriate table is provided by Engle and Yoo (1987). Appendix H shows the critical values for the modified DF and ADF tests at the 5% significance level for sample sizes of 50, 100, and 200 observations.

An alternative method of finding out whether $\{y_t\}$ and $\{z_t\}$ are cointegrated is the cintegrating regression Durbin-Watson (CRDW) test, whose critical values are also given in Appendix H. In CRDW one uses the DW d value obtained from the cointegrating regression (84). Now the null hypothesis is that d = 0 rather than the standard d = 2. If the computed d value is smaller than the critical value at the chosen significance level (in this case 5%), then one can reject the hypothesis of cointegration.

Step 3. Estimate the error-correction model

If the variables are cointegrated, the residuals from the equilibrium regression can be used to estimate the error-correction model. If $\{y_t\}$ and $\{z_t\}$ are CI(1,1), the variables have the error-correction form:

$$\Delta y_t = \alpha_1 + \alpha_y(y_{t-1} - \beta_1 z_{t-1}) + \sum_{i=1} \alpha_{11}(i)\Delta y_{t-i} + \sum_{i=1} \alpha_{12}(i)\Delta z_{t-i} + \varepsilon_{yt} \quad (87)$$

$$\Delta z_t = \alpha_2 + \alpha_z(y_{t-1} - \beta_1 z_{t-1}) + \sum_{i=1} \alpha_{21}(i)\Delta y_{t-i} + \sum_{i=1} \alpha_{22}(i)\Delta z_{t-i} + \varepsilon_{yt} \quad (88)$$

where β_1 is the parameter of the normalized cointegrating vector; ε_{yt} and ε_{zt} are white-noise disturbances (which may be correlated with each other); and $\alpha_1, \alpha_2, \alpha_y, \alpha_z, \alpha_{11}(i), \alpha_{12}(i), \alpha_{21}(i), \alpha_{22}(i)$ are all parameters.

Engle and Granger (1987) propose a way to circumvent the cross-equation restrictions involved in the direct estimation of (87) and (88). The value of the residual $\hat{e}_{t-1}$ estimates the deviation from long-run equilibrium in period (t-1). Hence, it is possible to use the saved residuals $\{\hat{e}_{t-1}\}$ obtained in step 2 as an instrument for the expression $y_{t-1} - \beta_1 z_{t-1}$ in (87) and (88). Thus, using the saved residuals from the estimation of the long-run equilibrium relationship, one can estimate the error-correction model as:

$$\Delta y_t = \alpha_1 + \alpha_y \hat{e}_{t-1} + \sum_{i=1} \alpha_{11}(i)\Delta y_{t-i} + \sum_{i=1} \alpha_{12}(i)\Delta z_{t-i} + \varepsilon_{yt} \qquad (89)$$

$$\Delta z_t = \alpha_2 + \alpha_z \hat{e}_{t-1} + \sum_{i=1} \alpha_{21}(i)\Delta y_{t-i} + \sum_{i=1} \alpha_{22}(i)\Delta z_{t-i} + \varepsilon_{yt} \qquad (90)$$

Other than the error-correction term $\hat{e}_{t-1}$, (89) and (90) constitute VAR in first differences. It is important to note the following:

1. OLS is an efficient estimation strategy since each equation contains the same set of regressors.

2. Since all terms in (89) and (90) are stationary [i.e. Δy_t and its lags, Δz_t and its lags, and $\hat{e}_{t-1}$ are I(0)] the test statistics used in traditional VAR analysis are appropriate. For example, lag lengths can be determined using a χ^2 test and the restriction that all $\alpha_{jk}(i) = 0$ can be checked using and F test.

Step 4. Assess model adequacy

1. Determine whether the residuals of the error-correction model approximate white-noise. If the residuals are serially correlated, lag lengths may be too short; hence, one should re-estimate the model using lag lengths that yield serially uncorrelated errors.

2. The speed of adjustment coefficients α_y and α_z are of particular interest in that they have important implications for the dynamics of the

system. For example, focusing on (90) it is clear that for any given value of $\hat{e}_{t-1}$, a large value of α_z is associated with a large value of Δz_t. If α_z is zero, the change in z_t does not at all respond to the deviation from long-run equilibrium in period (t-1). If α_z is zero and if all $\alpha_{21}(i) = 0$, then it can be said that $\{\Delta y_t\}$ does not Granger-cause $\{\Delta z_t\}$. The parameters α_y and/or α_z must be significantly different from zero if the variables are cointegrated. If both α_y and α_z are zero, there is no error correction and (89) and (90) constitute nothing more than a VAR in first differences. Moreover, the absolute values of these speed of adjustment coefficients must not be too large. The point estimates should imply that Δy_t and Δz_t converge to the long-run equilibrium relationship.

Summary

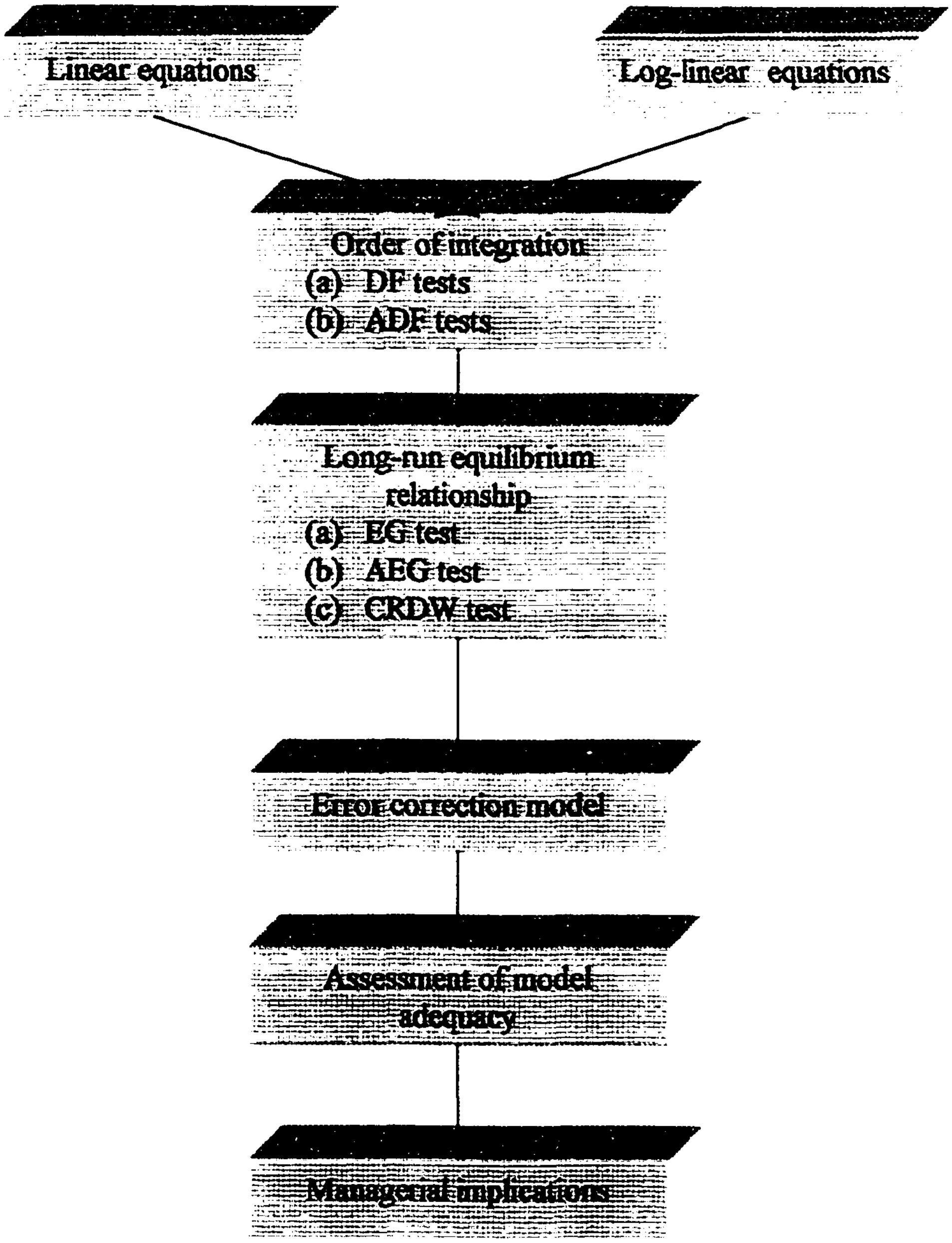
Figure 23 summarizes the procedure used in the cointegration analysis of the relationship between FDI and political instability. This type of analysis is particularly important because it determines whether there is a long-run equilibrium relationship between any two variables.

Summary

This chapter has discussed the sample data used for this research, the research hypotheses to be tested, and the various statistical and econometric methods that are employed in the analysis of the data. The next chapter examines both the statistical results obtained and the managerial implications that may be derived from these empirical results.

Figure 23

Cointegration Models: Estimation and Testing Procedure



CHAPTER IV

EMPIRICAL RESULTS

Introduction

This chapter empirically investigates the theoretical research issues dealt with in the previous chapter. In order to better illustrate the results obtained from this research, and in a manner quite similar to that displayed in Chapter 3, this section is divided into five parts, each of which supplemented with a figure of the procedures employed in that particular part. These parts are: (1) single-equation static regressions, (2) single-equation dynamic regressions (partial adjustment models), (3) single-equation dynamic regressions (Almon distributed-lag models), (4) simultaneous-equation models, and (5) cointegration models. Although all of them exhibit some unique features, the common denominator lies in the analysis and interpretation of results by country and between the two countries and the managerial implications thereof.

Before proceeding with the regression models, there are a few points that must be addressed beforehand since they will be carried out throughout this paper:

1. Because of methodological issues, the functional forms and structural stability political dummy variables first determined in the single-equation static models will remain the same for the partial adjustment models and simultaneous-equation models. Likewise, functional form and structural stability established for the Almon distributed-lag models will also apply to cointegration models. The reason for this procedure lies in the fact that, when the same explanatory variables appear in two or more regression models, the functional form and structural stability determined in any one of them instantly applies to the rest of the regressions.
2. As already discussed in the previos chapter, there are quite a number of tests/methods to detect possible violations of the CNLRM assumptions. To include the results of all tests for each industry, for each country will only complicate matters and will deviate attention from the more important issues at hand, namely arriving at the final models, and more significantly, discussing the managerial implications from those models. Therefore, when exploring the possible violation of the CNLRM assumptions, only the type of violation that has occurred will be mentioned (i.e. serial correlation, multicollinearity, heteroscedasticity, specification errors, and nonnormality). In a like manner, only those remedial

measures that are relevant to situation at hand will be discussed.

3. As mentioned above, the level of statistical significance chosen for this paper is initially set at 5%, thereby following other authors' choice in the literature of FDI and political instability. However, as it shall be explained later in this chapter, this level of significance might not be the appropriate one to use and, hence, a brief discussion ensues on nominal and true level of significance. The true significance levels will be shown for each regression equation, for each industry.

Single-Equation Static Regression Models

As the name implies, these regressions only take into accout the current values of the variables under study. Past and/or future behaviors are not incorporated and may, at first sight, invoke thoughts of irrelevance in introducing this set of models. However, two major reasons can be cited for the inclusion of those static models. First, *a priori*, one does not know whether there might be a relationship between political risk and FDI based on their current values. And secondly, the static regressions also serve the purpose of predetermining the functional form and structural stability for each industry regression –and for each version-, which can then be applied to the other two sets of models mentioned in the introductory notes.

Figure 24 illustrates the order of the steps followed in producing and interpreting the single-equation static regressions.

Functional Form

To test the functional form of each version (absolute and relative) for each industry, use is made of the MWD and BM tests discussed in the earlier chapter. These tests are performed on two competing functional forms: linear and log-linear.

United Kingdom

The results of applying the MWD and BM tests are shown in Table 31. Though no functional form clearly dominates over the other, for each version, it can be readily seen that the linear form appears more frequently than the log-linear form in the absolute version, whereas the opposite is true for the relative version.

United States

Table 32 shows the results for the United States. In both versions, the log-linear form is strongly favored against the alternative linear form.

Figure 24

Single-Equation Static Regression Models: Testing and Analysis Procedure

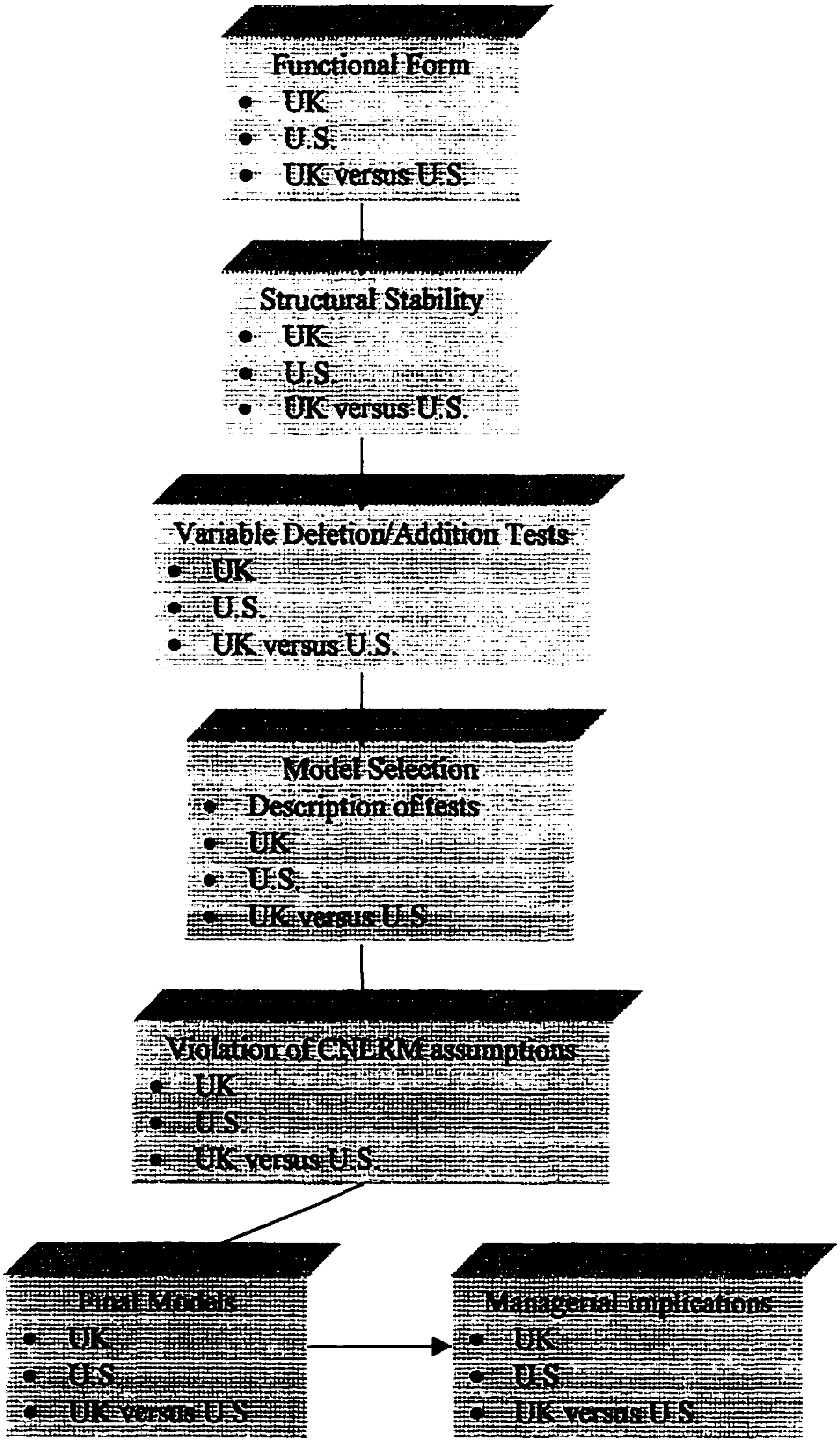


Table 31

Functional Form (UK): MWD and BM Tests

	Version	
Industry	*Absolute*	*Relative*
Vegetable products	Linear	Log-linear
Animal products	Log-linear	Log-linear
Textiles	Linear	Log-linear
Wood and paper products	Linear	Log-linear
Iron and products	Linear	Linear
Non-ferrous metals	Linear	Log-linear
Non-metallic minerals	Log-linear	Log-linear*
Chemical & allied products	Log-linear	Log-linear
Manufacturing	Log-linear	Log-linear
Petroleum and natural gas	Linear	Linear
Mining and smelting	Linear	Linear
Utilities	Linear	Linear
Merchandise	Linear	Linear
Finance	Log-linear	Log-linear
Total	Log-linear	Log-linear

* By assumption, since the two tests are not able to discriminate between the two fucntional forms. Thus, it is assumed that the relative version follows the same functional form as that of the absolute version.

Table 32

Functional Form (U.S.): MWD and BM Tests

	Version	
Industry	*Absolute*	*Relative*
Vegetable products	Linear	Linear
Animal products	Linear	Linear*
Textiles	Log-linear	Log-linear
Wood and paper products	Log-linear	Log-linear
Iron and products	Log-linear	Log-linear
Non-ferrous metals	Linear	Log-linear
Non-metallic minerals	Log-linear	Log-linear
Chemical & allied products	Linear	Log-linear
Manufacturing	Linear	Log-linear
Petroleum and natural gas	Log-linear	Linear
Mining and smelting	Linear	Log-linear
Utilities	Log-linear	Log-linear
Merchandise	Log-linear	Log-linear
Finance	Log-linear	Log-linear
Total	Log-linear	Log-linear

* By assumption, since the two tests are not able to discriminate between the two fucntional forms. Thus, it is assumed that the relative version follows the same functional form as that of the absolute version.

UK Versus U.S.

Table 33 compares the results obtained for the two countries. For both of them, the relative version exhibits a dominance of the log-linear form over the linear one. For the United States, the frequency of the log-linear functional form is higher than for the United Kingdom, for both versions.

Structural Stability

Since this paper uses two different political instability measures –one covering the period 1948 to 1982, the other covering 1983 to 1991-, the question arises as to the suitability of combining these two measures into one that encompasses the whole study period. In order to address this question, the dummy variable approach is employed. As explained above, this approach consists of introducing dummy variables that may allow for differences in the intercept term and slope coefficients of the political variable; the aim being to test for coefficient stability in the linear regression models. There is one intercept dummy common both to the two functional forms and to the two versions, but one slope dummy for each functional form and each version giving a total of four slope dummies.

Table 33

Functional Form (UK Versus U.S.): MWD and BM Tests

	Version	
Industry	*Absolute*	*Relative*
Vegetable products	UK: Linear U.S.: Linear	UK: Log-linear U.S.: Linear
Animal products	UK: Log-linear U.S.: Linear	UK: Log-linear U.S.: Linear
Textiles	UK: Linear U.S.: Log-linear	UK: Log-linear U.S.: Log-linear
Wood and paper products	UK: Linear U.S.: Log-linear	UK: Log-linear U.S.: Log-linear
Iron and products	UK: Linear U.S.: Log-linear	UK: Linear U.S.: Log-linear
Non-ferrous metals	UK: Linear U.S.: Linear	UK: Log-linear U.S.: Log-linear
Non-metallic minerals	UK: Log-linear U.S.: Log-linear	UK: Log-linear U.S.: Log-linear
Chemical & allied products	UK: Log-linear U.S.: Linear	UK: Log-linear U.S.: Log-linear
Manufacturing	UK: Log-linear U.S.: Linear	UK: Log-linear U.S.: Log-linear
Petroleum and natural gas	UK: Linear U.S.: Log-linear	UK: Linear U.S.: Linear
Mining and smelting	UK: Linear U.S.: Linear	UK: Linear U.S.: Log-linear
Utilities	UK: Linear U.S.: Log-linear	UK: Linear U.S.: Log-linear
Merchandise	UK: Linear U.S.: Log-linear	UK: Linear U.S.: Log-linear
Finance	UK: Log-linear U.S.: Log-linear	UK: Log-linear U.S.: Log-linear
Total	UK: Log-linear U.S.: Log-linear	UK: Log-linear U.S.: Log-linear

Broadly speaking, if both the slope and intercept dummies are found to be statistically significant in a regression equation, then, that implies that the intercept and slope coefficients are different for each of the two periods under study –in this paper, period A (1948-1982) and period B (1983-1991). This case corresponds to regressions known as dissimilar. The other three outcomes of applying the dummy-variable approach are: (1) coincident regressions (the two regressions are identical), (2) parallel regressions (the regressions differ only in their intercepts), and (3) concurrent regressions (the two regressions have the same intercepts but different slopes).

United Kingdom

Table 34 displays both the statistical significance of the slope and intercept dummies for each industry, for each version, and the regression type corresponding to the four outcomes discussed above. In the absolute version, there is a mix of statistical significance for both the slope dummy and the intercept dummy. However, in the relative version, the slope dummy is not statistically significant for all industries except for Mining. As with the absolute version, the intercept dummy in the relative version is statistically significant in some cases. Taking both versions together, four facts stand out: (1) except for Manufacturing and Finance (absolute version) and Mining (relative version), no other industry in either version shows dissimilarity for periods A and B; (2) in the absolute version, most of the regressions are either concurrent or parallel; (3) the relative version contains more coincident regressions than the absolute version; and (4) in thirteen of the fifteen industries, the intercept dummy follows the same pattern of statistical (in)significance for both the absolute and relative versions.

United States

The results are shown in Table 35. Except for Mining and Iron Products (absolute version), no other industry in either version shows dissimilarity. Indeed, most industry regressions are either parallel or coincident. The parallel regressions in the relative version outnumber those in the absolute version.

UK Versus U.S.

At this stage, it is difficult to draw any more inferences from the results of Tables 34 and 35. However, once the final models are arrived at, the conclusions in terms of structural stability will become clearer.

Table 34

Structural Stability of Political Instability Variable (UK)

	Version[a]					
	Absolute			*Relative*		
Industry	*Slope*	*Intercept*	*Type*	*Slope*	*Intercept*	*Type*
Vegetable products	NS	S	Parallel	NS	S	Parallel
Animal products	NS	NS	Coinci.	NS	NS	Coinci.
Textiles	S	NS	Concu.	NS	S	Parallel
Wood and paper products	NS	NS	Coinci.	NS	NS	Coinci.
Iron and products	NS	S	Parallel	NS	NS	Coinci.
Non-ferrous metals	NS	S	Parallel	NS	S	Parallel
Non-metallic minerals	S	NS	Concu.	NS	NS	Coinci.
Chemical & allied products	NS	S	Parallel	NS	S	Parallel
Manufacturing	S	S	Dissimi.	NS	S	Parallel
Petroleum and natural gas	S	NS	Concu.	NS	NS	Coinci.
Mining and smelting	NS	S	Parallel	S	S	Dissimi.
Utilities	NS	NS	Coinci.	NS	NS	Coinci.
Merchandise	NS	NS	Coinci.	NS	NS	Coinci.
Finance	S	S	Dissimi.	NS	S	Parallel
Total	NS	S	Parallel	NS	S	Parallel

[a] NS stands for Nonsignificant and S for Significant.

Table 35

Structural Stability of Political Instability Variable (U.S.)

	Version[a]					
	Absolute			*Relative*		
Industry	*Slope*	*Intercept*	*Type*	*Slope*	*Intercept*	*Type*
Vegetable products	NS	S	Parallel	NS	S	Parallel
Animal products	NS	S	Parallel	NS	S	Parallel
Textiles	NS	NS	Coinci.	NS	NS	Coinci.
Wood and paper products	NS	NS	Coinci.	NS	S	Parallel
Iron and products	S	S	Dissimi.	NS	S	Parallel
Non-ferrous metals	NS	S	Parallel	NS	S	Parallel
Non-metallic minerals	NS	NS	Coinci.	NS	NS	Coinci.
Chemical & allied products	NS	S	Parallel	NS	NS	Coinci.
Manufacturing	NS	S	Parallel	NS	S	Parallel
Petroleum and natural gas	NS	NS	Coinci.	NS	NS	Coinci.
Mining and smelting	S	S	Dissimi.	NS	S	Parallel
Utilities	NS	S	Parallel	NS	S	Parallel
Merchandise	NS	NS	Coinci.	NS	NS	Coinci.
Finance	NS	S	Parallel	NS	S	Parallel
Total	NS	NS	Coinci.	NS	S	Parallel

[a] NS stands for Nonsignificant and S for Significant.

Table 36

Structural Stability of Political Instability Variable (UK Versus U.S.)

	Version			
	Absolute (by type)		*Relative (by type)*	
Industry	*UK*	*U.S.*	*UK*	*U.S.*
Vegetable products	Parallel	Parallel	Parallel	Parallel
Animal products	Coincident	Parallel	Coincident	Parallel
Textiles	Concurrent	Coinci.	Parallel	Coinci.
Wood and paper products	Coincident	Coinci.	Coincident	Parallel
Iron and products	Parallel	Dissimi.	Coincident	Parallel
Non-ferrous metals	Parallel	Parallel	Parallel	Parallel
Non-metallic minerals	Concurrent	Coinci.	Coincident	Coinci.
Chemical & allied products	Parallel	Parallel	Parallel	Coinci.
Manufacturing	Dissimilar	Parallel	Parallel	Parallel
Petroleum and natural gas	Concurrent	Coinci.	Coincident	Coinci.
Mining and smelting	Parallel	Dissimi.	Dissimilar	Parallel
Utilities	Coincident	Parallel	Coincident	Parallel
Merchandise	Coincident	Coinci.	Coincident	Coinci.
Finance	Dissimilar	Parallel	Parallel	Parallel
Total	Parallel	Coinci.	Parallel	Parallel

Variable Deletion/Addition Tests

After testing for functional form and structural stability, the OLS method gives initial estimates of the coefficients and standard errors of all the explanatory variables under study. However, to arrive at some meaningful models of FDI, there needs to be some form of refining the initial models and deleting, or adding, those variables that are really contributing to explain variations in the dependent variable. To that end, three deletion/addition tests will be used. One, the F test has already been discussed in the previous chapter, but will be recalled in this section. The second test is the likelihood ratio test, which is based on the method of maximum likelihood; thus, for the sake of clarity, this latter method will be briefly outlined. The third test is the Lagrangian multiplier test.

The steps followed in this paper to test for variable deletion/addition are: (1) using the predetermined functional form and structural stability variable(s) for each industry regression and for each version, every explanatory variable will be tested for variable deletion; (2) having determined from (1) which explanatory variables are individually statistically insignificant, they will be tested jointly for variable deletion; (3) same as (1) and (2) applied to variable addition; and (4) incorporating the significant variables thus obtained into each industry regression and re-estimating by OLS.

The inclusion/exclusion of explanatory variables, after testing for variable deletion/addition, significantly affects the initial level of significance chosen, i.e. 5%. Therefore, in order to take into account the number of explanatory variables in a regression equation, this paper will briefly explore the difference between nominal and true significance level.

The F Test

This test is given by the following equation:

$$F = \frac{(RSS_R - RSS_{UR})/m}{RSS_{UR}/(n-k)} \tag{91}$$

where

$RSS_R = RSS$ *of the restricted regression*
$RSS_{UR} = RSS$ *of the unrestricted regression*
$m =$ *number of linear restrictions*
$k =$ *number of parameters in the unrestricted regression*
$n =$ *number of observations*

and (91) follows the F distribution with m, (n-k) degrees of freedom.

Maximum Likelihood (ML)

The ML method is based on the following intuitive idea: faced with several possible values for a parameter, one chooses that value under which the model would have been most likely to generate the observed sample. Such a criterion requires to state the probability of the observed sample being generated by the model, given a certain parameter value. Hence, unlike the OLS technique, in this approach one must specify a certain probability distribution for the population from which the sample is drawn.

Given the two-variable model $Y_i = \beta_1 + \beta_2 X_i + u_i$, where the Y_i are normally and independently distributed with mean equal to $\beta_1 + \beta_2 X_i$ and variance σ^2, the joint probability density function of $Y_1, Y_2, \ldots, Y_n$ can be written as

$$f\left(Y_1, Y_2, \ldots, Y_n \middle| \beta_1 + \beta_2 X_i, \sigma^2\right) = f(Y_1 | \beta_1 + \beta_2 X_i, \sigma^2) f(Y_2 | \beta_1 + \beta_2 X_i, \sigma^2) \ldots\ldots f(Y_n | \beta_1 + \beta_2 X_i, \sigma^2) \tag{92}$$

where

$$f(Y_i) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left\{ -\frac{1}{2} \times \frac{(Y_i - \beta_1 - \beta_2 X_i)^2}{\sigma^2} \right\} \tag{93}$$

which is the density function of a normally distributed variable with the given mean and variance. Substituting (93) for each Y_i into (92) yields

$$f(Y_1, Y_2, \ldots, Y_n | \beta_1 + \beta_2 X_i, \sigma^2) = \frac{1}{\sigma^n \left(\sqrt{2\pi}\right)^n} \exp\left\{ -\frac{1}{2} \times \sum \frac{(Y_i - \beta_1 - \beta_2 X_i)^2}{\sigma^2} \right\} \tag{94}$$

This is a function of the unknown parameters $\beta_1, \beta_2, \sigma^2$ as well as of $Y_1, Y_2, \ldots, Y_n$. As a function of the latter it is the joint probability density function, while as a function of the former it is called the likelihood function and written as

$$LF(\beta_1, \beta_2, \sigma^2) = \frac{1}{\sigma^n \left(\sqrt{2\pi}\right)^n} \exp\left\{ -\frac{1}{2} \times \sum \frac{(Y_i - \beta_1 - \beta_2 X_i)^2}{\sigma^2} \right\} \tag{95}$$

The method of maximum likelihood consists in estimating the unknown parameters in such a way that the probability of observing the given Y's is as high (or maximum) as possible. Therefore, one has to find the maximum of the function (95). Expressing Equation (95) in natural log-terms gives

$$\begin{aligned} \ln LF &= -n\ln\sigma - \frac{n}{2}\ln(2\pi) - \frac{1}{2}\sum\frac{(Y_i - \beta_1 - \beta_2 X_i)^2}{\sigma^2} \\ &= -\frac{n}{2}\ln\sigma^2 - \frac{n}{2}\ln(2\pi) - \frac{1}{2}\sum\frac{(Y_i - \beta_1 - \beta_2 X_i)^2}{\sigma^2} \end{aligned} \tag{96}$$

Differentiating (96) partially with respect to β_1, β_2 and σ^2, yields

$$\frac{\partial \ln LF}{\partial \beta_1} = -\frac{1}{\sigma^2}\sum(Y_i - \beta_1 - \beta_2 X_i)(-1) \tag{97}$$

$$\frac{\partial \ln LF}{\partial \beta_2} = -\frac{1}{\sigma^2}\sum(Y_i - \beta_1 - \beta_2 X_i)(-X_i) \tag{98}$$

$$\frac{\partial \ln LF}{\partial \sigma^2} = -\frac{n}{2\sigma^2} + \frac{1}{2\sigma^4}\sum(Y_i - \beta_1 - \beta_2 X_i)^2 \tag{99}$$

The ML estimates, denoted here by $\tilde{\beta}_1, \tilde{\beta}_2$, and $\tilde{\sigma}^2$, are obtained by setting Equations (97) through (99) equal to zero and solving. The first two equations simplify to

$$\sum Y_i = n\tilde{\beta}_1 + \tilde{\beta}_2\sum X_i \tag{100}$$

$$\sum Y_i X_i = \tilde{\beta}_1\sum X_i + \tilde{\beta}_2\sum X_i^2 \tag{101}$$

which are identical to the estimates obtained by OLS. The third equation gives the maximum likelihood estimate of the error variance as follows:

$$\begin{aligned}\tilde{\sigma}^2 &= \frac{1}{n}\sum(Y_i - \tilde{\beta}_1 - \tilde{\beta}_2 X_i)^2 \\ &= \frac{1}{n}\sum(Y_i - \hat{\beta}_1 - \hat{\beta}_2 X_i)^2 \\ &= \frac{1}{n}\sum \hat{u}_i^2\end{aligned} \tag{102}$$

This is different from the OLS unbiased estimator $\hat{\sigma}^2$ and will be biased downwards in small samples, the bias being

$$\begin{aligned}E(\hat{\sigma}^2) &= \frac{1}{n}E\left(\sum \hat{u}_i^2\right) \\ &= \left(\frac{n-2}{n}\right)\sigma^2 \\ &= \sigma^2 - \frac{2}{n}\sigma^2\end{aligned} \tag{103}$$

However, as n, the sample size increases indefinitely, the second term in (103), the bias factor, tends to be zero.

Likelihood Ratio (LR) Test

The LR test is based on the maximum likelihood method discussed above. Assuming a three-variable regression model, the log-likelihood function can be written as:

$$\ln LF = -\frac{n}{2}\sigma^2 - \frac{n}{2}\ln(2\pi) - \frac{1}{2}\sum\left(Y_i - \beta_1 - \beta_2 X_{2i} - \beta_3 X_{3i}\right)^2 \tag{104}$$

Supposing that the null hypothesis H_0 is that β_3 is zero (variable deletion test), the log-likelihood function in (104) will become

$$\ln LF = -\frac{n}{2}\sigma^2 - \frac{n}{2}\ln(2\pi) - \frac{1}{2}\sum(Y_t - \beta_1 - \beta_2 X_{2t})^2 \quad (105)$$

Equation (105) is known as the restricted log-likelihood function (RLLF) because it is estimated with the restriction that, *a priori*, β_3 is zero, whereas Equation (104) is known as the unrestricted log-likelihood function (ULLF) because, *a priori*, there are no restrictions placed on the parameters. To test the validity of the restriction, the LR test obtains the following test statistic:

$$\lambda = 2(ULLF - RLLF) \quad (106)$$

where ULLF and RLLF are, respectively, unrestricted log LF and restricted log LF. If the sample size is large, it can be shown that the test statistic λ given in (106) follows the chi-square (χ^2) distribution with degrees of freedom equal to the number of restrictions imposed by the null hypothesis -one in the present example.

If the *a priori* restriction(s) are valid, the restricted and unrestricted log LF should not be different, in which case λ in (106) will be zero. If that is not the case, the two LFs will diverge. Since λ, in a large sample, follows the chi-square distribution, one can find out if the divergence is statistically significant at the chosen level of significance.

Lagrange Multiplier (LM) Test

As with the LR test, the LM test is also based on the ML method. The

LM test proceeds as follows:

Step 1. Estimate the restricted regression by OLS and obtain the residuals.

Step 2. If the unrestricted regression is the true regression, the residuals obtained in Step 1 should be related to the variable(s) added/deleted.

Step 3. Regress the residuals obtained in Step 1 on all the regressors.

Step 4. For large-sample size, Engle (1982) has shown that n (the sample size) times the R^2, estimated from from the regression in Step 3, follows the chi-square distribution with degrees of freedom equal to the number of restrictions imposed by the restricted regression. Symbolically,

$$n \times R^2 \approx \chi^2_{(number of restrictions)} \tag{107}$$

Step 5. If the chi-square value obtained from (107) exceeds the critical value at the chosen level of significance, one rejects the restricted regression. Otherwise, one fails to reject it.

For the LR test one needs the ML estimates from both the restricted and unrestricted maximization of the likelihood function. For the LM test one needs only the restricted ML estimates.

It is true that for small, or finite, samples, the F test will suffice. Indeed, Davidson and MacKinnon (1993, p. 456) note:

> For linear regression models, with or without normal errors, there is of course no need to look at LM, W [Wald test] and LR at all, since no information is gained from doing so over and above what is already contained in F.

However, the LR and LM tests will be used in this paper to check the results obtained from the application of the F test.

Nominal Versus True Level of Significance

In this paper, to arrive at some meaningful and useful (for managers) models implies detecting both the presence of unnecessary variables and the absence of relevant variables. The disadvantage that arises from this approach is that the conventional levels of significance (α) such as 1, 5, or 10% are not the true levels of significance.

The problem with a preassigned significance level is that, if the sample size is large enough, one can reject every null hypothesis. Lindley (1957) argues that for large samples one should use lower significance levels and for smaller samples higher significance levels. Leamer (1978) derives significance levels in the case of regression models for different sample sizes that show how significance levels should be much higher than 5% for small sample sizes and much lower than 5% for large sample sizes.

Lovell (1983) has suggested that if there are c candidate regressors out of which k are finally selected ($k \le c$), then the true level of significance (α^*) is related to the nominal level of significance (α) as follows:

$$\alpha^{*} = 1 - (1 - \alpha)^{c/k} \quad (108)$$

or approximately as

$$\alpha^{*} = (c/k) \times \alpha \quad (109)$$

Equation (109) will be used in this paper to determine the true level of significance.

United Kingdom

Table 37 gives the regression models that result from applying the variable deletion/addition tests discussed above. Expected exchange rate is the variable that appears most frequently in the industry regressions, in any of the two versions. The wage variable follows in number of appearances. As for the political variables, the intercept dummy DPOLRISK is, by far, the one most frequently included in the regressions.

United States

The productivity variable is included in more regressions than any other variable followed by the wage variable and expected exchange rate (Table 38). It is worth noting that market size appears in every industry regression in the absolute version whereas its counterpart in the relative version, i.e. relative growth, fails to be included in any of the industry regressions. The intercept dummy DPOLRISK is the major political variable included in many of the industry regressions.

UK Versus U.S.

Common to both countries is the frequent appearance of the wage and expected exchange rate variables as regressors. Likewise, the relative growth variable is excluded from almost all of the regressions in the relative version, for both countries. Finally, the most important political variable is DPOLRISK, which appears in many of the regressions, for either version, and in both countries.

Table 37

Variable Deletion/Addition Tests of Initial Static Equations (UK)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Vegetable products	CONSTANT	99.8860	CONSTANT	20.8665	(A) 9%
	EER	-1.4905	LERRISK	-0.0749	(R) 7.5%
	GDPCAN	5.2240	LEER	2.0917	
	PRODCAN	-3.7471	LRELPROD	-2.7818	
	DPOLRISK	-41.3084	LRELWAGE	-2.7344	
			DPOLRISK	-0.8535	
Animal products	--------		--------		
Textiles	CONSTANT	50.2583	CONSTANT	21.0834	(A) 8.8%
	EER	-0.8907	LERL	-0.6153	(R) 7.5%
	GDPCAN	4.1883	LEER	1.7018	
	PRODCAN	-2.9537	LRELPROD	-2.1134	
			LRELWAGE	-2.5744	
			DPOLRISK	0.2394	
Wood and paper products	CONSTANT	-2.8021	CONSTANT	-12.9009	(A) 20%
	EER	1.0193	LEER	0.8664	(R) 10%
			LRELWAGE	1.1624	
			LRELPROD	1.7235	

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummies

Table 37 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Iron and products	CONSTANT ERRISK EER DPOLRISK	5.7935 -0.0510 0.8813 -14.5652	CONSTANT ERRISK EER RELPROD RELWAGE	115.8100 -0.0565 1.0804 -0.5393 -0.6706	(A) 11.3% (R) 8%
Non-ferrous metals	CONSTANT EER GDPCAN PRODCAN DPOLRISK	84.7074 -1.3878 4.4549 -2.9874 -37.2062	CONSTANT LEER LRELWAGE	10.3459 2.0858 -3.3121	(A) 9% (R) 15%
Non-metallic minerals	CONSTANT LERRISK LWAGECAN LPICAN DLPICAN	-8.8213 0.2762 2.6409 0.0736 -0.0853	CONSTANT LERRISK LEER	-2.3905 0.2147 1.3823	(A) 9% (R) 13.3%

(A) Absolute version; (R) Relative version
All variables are statistically significant at the true level of significance
L: Variables with letter L at the beginning denote log(natural)
D: Variables with letter D at the beginning denote dummies

Table 37 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Chemical & allied products	CONSTANT	-14.4664	CONSTANT	-9.1763	(A) 15%
	LWAGECAN	4.0628	LEER	0.7227	(R) 7.5%
	DPOLRISK	-0.5095	LRELGROW	-0.0471	
			LRELPROD	3.6425	
			LRELWAGE	-1.4019	
			DPOLRISK	-0.3471	
Manufacturing	CONSTANT	-0.9451	CONSTANT	7.0454	(A) 17%
	LGDPCAN	1.2259	LEER	1.4785	(R)11.3%
	DPOLRISK	-0.6389	LRELWAGE	-1.9326	
			DPOLRISK	-0.3132	
Petroleum and natural gas	CONSTANT	34.2357	CONSTANT	154.4843	(A) 15%
	GDPCAN	1.3911	EER	0.7355	(R)11.3%
	WAGECAN	-1.0841	RELPROD	-0.5147	
			RELWAGE	-1.0200	
Mining and smelting	CONSTANT	-43.0790	CONSTANT	-15.5298	(A) 9%
	ERRISK	0.1110	ERRISK	0.1022	(R) 10%
	GDPCAN	3.0286	EER	1.5111	
	PRODCAN	-1.7016	RELWAGE	-0.4624	
	DPOLRISK	32.3439	DPOLRISK	31.8936	

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummies

Table 37 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Utilities	CONSTANT	-145.1237	CONSTANT	296.1471	(A) 8%
	ERL	-1.7314	ERL	-2.1574	(R) 20%
	PRODCAN	-7.2044			
	WAGECAN	10.7169			
	PICAN	0.1854			
Merchandise	CONSTANT	-17.1113	CONSTANT	-17.1113	(A) 20%
	EER	1.3210	EER	1.3210	(R) 20%
Finance	CONSTANT	-16.4335	CONSTANT	-8.9858	(A) 8.3%
	LERL	0.9724	LEER	1.7426	(R) 7.5%
	LGDPCAN	1.0231	LRELGROW	-0.0390	
	LWAGECAN	2.6382	LRELPROD	3.3668	
	DLPICAN	-0.0226	LRELWAGE	-2.0477	
	DPOLRISK	-0.6162	DPOLRISK	-0.4322	
Total	CONSTANT	2.9261	CONSTANT	2.3527	(A) 15%
	LGDPCAN	1.6875	LEER	1.1580	(R) 7.5%
	DPOLRISK	-0.3979	LRELGROW	-0.0282	
			LRELPROD	2.4241	
			LRELWAGE	-1.9729	
			DPOLRISK	-0.3036	

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummy

Table 38

Variable Deletion/Addition Tests of Initial Static Equations (U.S.)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Vegetable products	CONSTANT	30.8342	CONSTANT	-49.3829	(A)11.3%
	GDPCAN	1.7633	RELPROD	0.8408	(R)11.3%
	PRODCAN	-1.1223	RELWAGE	0.5174	
	DPOLRISK	-27.6144	DPOLRISK	-43.6128	
Animal products	CONSTANT	346.2366	CONSTANT	-83.9833	(A) 7.5%
	ERL	8.3007	ERL	7.2836	(R) 7.5%
	EER	-14.8232	EER	-9.2737	
	GDPCAN	-6.1445	RELPROD	5.1887	
	WAGECAN	11.4007	RELPI	24.5273	
	DPOLRISK	142.7341	DPOLRISK	239.9764	
Textiles	CONSTANT	2.5537	CONSTANT	0.5771	(A)6.67%
	LEER	-2.3994	LEER	-3.3057	(R) 10%
	LERRISK	0.0551	LRELPROD	3.0269	
	LGDPCAN	0.8648	LRELWAGE	1.1577	
	LWAGECAN	1.9460			
	LPICAN	-0.0110			

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummies

Table 38 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Wood and paper products	CONSTANT	-8.3049	CONSTANT	-1.8984	(A) 9%
	LERL	-0.8068	LERL	-1.0803	(R) 11.3%
	LEER	2.4125	LRELPROD	2.4080	
	LGDPCAN	2.9877	DPOLRISK	-0.2933	
	LPRODCAN	-1.8487			
Iron and products	CONSTANT	-11.3936	CONSTANT	-3.6502	(A) 6.3%
	LERL	0.4561	LEER	-1.7671	(R) 11.3%
	LGDPCAN	2.0602	LRELPROD	3.5412	
	LPRODCAN	-1.2105	DPOLRISK	-0.3780	
	LWAGECAN	2.1574			
	LPICAN	0.0145			
	DLPICAN	-0.0199			
	DPOLRISK	-0.1148			

(A) Absolute version; (R) Relative version
All variables are statistically significant at the true level of significance
L: Variables with letter L at the beginning denote log(natural)
D: Variables with letter D at the beginning denote dummies

Table 38 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Non-ferrous metals	CONSTANT EER ERRISK GDPCAN PRODCAN DPOLRISK	-60.9186 0.7901 -0.0110 2.4014 -1.6294 -14.4056	CONSTANT LRELPROD DPOLRISK	-6.1284 2.2800 -0.4640	(A) 7.5% (R) 15%
Non-metallic minerals	CONSTANT LERRISK LGDPCAN	-4.2474 0.1245 1.7239	CONSTANT LEER LRELPROD LRELPI LRELWAGE	3.6838 -4.4707 1.7916 0.0504 2.8417	(A)13.3% (R) 8%
Chemical & allied products	CONSTANT ERL GDPCAN PRODCAN DPOLRISK	-17.1548 0.2310 2.2466 -1.3341 -8.3081	CONSTANT LERL LEER LRELPROD	4.6717 1.0850 -4.2982 3.1449	(A) 9% (R) 10%

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummies

Table 38 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Manufacturing	CONSTANT	16.0712	CONSTANT	690.6552	(A)11.3%
	GDPCAN	1.8815	LEER	-157.3178	(R)11.3%
	PRODCAN	-1.0903	LRELPROD	25.6194	
	DPOLRISK	-14.5815	DPOLRISK	-29.1666	
Petroleum and natural gas	CONSTANT	-16.8831	CONSTANT	90.2844	(A)5.71%
	LERL	1.6973	ERL	1.0168	(R)6.67%
	LERRISK	-0.0615	EER	-0.0144	
	LGDPCAN	1.8987	ERRISK	-2.4706	
	LWAGECAN	3.1739	RELPROD	0.8334	
	LPRODCAN	-0.0164	RELWAGE	0.7487	
	LPICAN	-2.0126			
Mining and smelting	CONSTANT	-210.4161	CONSTANT	-22.9423	(A)12.5%
	GDPCAN	-4.4095	LERL	1.0983	(R) 7.5%
	PRODCAN	7.7923	LEER	-0.0913	
	DPOLRISK	99.2241	LERRISK	2.1299	
			LRELPROD	2.8192	
			DPOLRISK	0.5419	

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummies

Table 38 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Utilities	CONSTANT	16.2665	CONSTANT	32.9504	(A) 7.5%
	LERL	-1.5897	LERL	-1.9729	(R) 6.43%
	LERRISK	0.0932	LEER	-3.4603	
	LGDPCAN	1.9117	LERRISK	0.1173	
	LWAGECAN	-2.8503	LRELPROD	0.6255	
	DPOLRISK	-0.3481	LRELWAGE	-1.3995	
			DPOLRISK	-0.5162	
Merchandise	CONSTANT	5.3572	CONSTANT	18.1286	(A) 10%
	LEER	-1.5320	LEER	-5.5456	(R) 13.3%
	LGDPCAN	2.8201	LRELPROD	2.6208	
	LPRODCAN	-1.3926			

(A) Absolute version; (R) Relative version
All variables are statistically significant at the true level of significance
L: Variables with letter L at the beginning denote log(natural)
D: Variables with letter D at the beginning denote dummies

Table 38 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Finance	CONSTANT	-12.1824	CONSTANT	-18.5167	(A) 9%
	LGDPCAN	2.3116	LRELPROD	4.0566	(R) 11.3%
	LPRODCAN	-2.5681	LRELWAGE	1.0130	
	LWAGECAN	3.9706	DPOLRISK	-0.6061	
	DPOLRISK	-0.4564			
Total	CONSTANT	-8.7868	CONSTANT	-2.2042	(A) 6.67%
	LERL	0.8472	LEER	-1.5719	(R) 11.3%
	LERRISK	-0.0356	LRELPROD	3.0697	
	LGDPCAN	2.4866	DPOLRISK	-0.2633	
	LPRODCAN	-1.8130			
	LWAGECAN	1.4546			

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummies

Model Selection: Absolute Versus Relative Version

In choosing among competing models, there are a number of diagnostic tests that have been developed, some of which will be used in this paper. These diagnostic tests normally fall into two categories: (1) tests of nested models/hypotheses and (2) tests of nonnested models/hypotheses.

Given the following models:

Model A: $Y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + u_t$

Model B: $Y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + u_t$

then, model B is nested within model A because it is a special case of model A. That is, the explanatory variables under one of the hypotheses are a subset of the explanatory variables in the other. The tests employed in this paper have already been discussed above: F-test (restricted least squares), RESET test, MWD test, and BM test. The last three tests will be used mainly for those competing regressions, nested or nonnested, that do not have the same dependent variable; that is, industry regressions that have different functional forms for each version. Though two competing models with different dependent variables could be compared on the basis of the R^2 statistic, this approach will not be dealt with here because one should be more concerned about the theoretical relevance of the explanatory variables to the dependent variable and their statistical significance. As Goldberger (1991, pp. 177-178) notes:

From our perspective, R^2 has a very modest role in regression analysis, being a measure of the goodness of fit of a sample LS [least squares] linear regression in a body of data. Nothing in the CR [CLRM] model requires that R^2 be high. Hence a high R^2 is not evidence in favor of the model and a low R^2 is not evidence against it. In fact the most important thing about R^2 is that it is not important in the CR model. The CR model is concerned with parameters in a population, not with goodness of fit in the sample ... If one insists on a measure of predictive success (or rather failure), then σ^2 might suffice: after all, the parameter σ^2 is the expected squared forecast error that would result if the population CEF [PRF] were used as the predictor. Alternatively, the squared standard error of forecast ... at relevant values of **x** [regressors] may be informative.

Given the following models:

Model C: $Y_t = \alpha_1 + \alpha_2 X_{2t} + u_t$

Model D: $Y_t = \beta_1 + \beta_2 Z_{2t} + v_t$

then, models C and D are nonnested because one cannot be derived as a special case of another. That is, the explanatory variables under one of the hypotheses are not a subset of the explanatory variables in the other. Below follows a brief discussion of the nonnested tests for this paper.

Nonnested F Test

Taking models C and D, one can test the following nested, or hybrid, model:

Model E: $Y_i = \lambda_1 + \lambda_2 X_{2i} + \lambda_3 Z_{2i} + u_i$

Model E nests or encompasses models C and D. If model C is correct,

$\lambda_3 = 0$, whereas if model D is correct, $\lambda_2 = 0$. Therefore, a simple test of the competing models is to run the nested model E and test for the statistical significance of λ_2 and λ_3 by the t test, or by the F test if more than one regressor is omitted from the competing models. However, there might be a few problems with this procedure. First, if X_2 and Z_2 are highly collinear, then it is quite likely that neither λ_2 nor λ_3 is significantly different from zero, although one can reject the hypothesis that $\lambda_2 = \lambda_3 = 0$. In this case, there is no way of deciding whether model C or model D is the correct model. Second, the choice of the reference hypothesis could determine the outcome of the choice of model, especially when severe multicollinearity is present in the competing regressors. Finally, the artificial model E may not have any economic reasoning. Because of these potential drawbacks, alternative tests will be added to the F test.

J Test

This test was suggested by Davidson and MacKinnon (1981). Assuming model C and model D are compared, the J test proceeds as follows.

Step 1. Estimate model D and from it obtain the estimated Y values, $\hat{Y}_t^D$.

Step 2. Add the predicted Y value in Step 1 as an additional regressor to model C and estimate the following model:

$$Y_t = \alpha_1 + \alpha_2 X_{2t} + \alpha_3 \hat{Y}_t^D + u_t \tag{110}$$

where the $\hat{Y}_t^D$ values are obtained from Step 1.

Step 3. Using the t test, test the hypothesis that $\alpha_3 = 0$.

Step 4. If the hypothesis that $\alpha_3 = 0$ fails to be rejected, one can fail to reject model C as the true model because $\hat{Y}_t^D$ included in (110), which represent the influence of variables not included in model C, have no additional explanatory power beyond that contributed by model C. That is, model C encompasses model D in the sense that the latter model does not contain any additional information that will improve the performance of model C. Likewise, if the null hypothesis is rejected, model C cannot be the true model.

Step 5. Estimate model C, use the estimated Y values from this model as regressor in (110), repeat Step 4, and decide whether to accept model D over model C. Estimate the following model:

$$Y_t = \beta_1 + \beta_2 Z_{2t} + \beta_3 \hat{Y}_t^C + v_t \tag{111}$$

where $\hat{Y}_t^C$ are the estimated Y values from model C. Test the hypothesis that $\beta_3 = 0$. If this hypothesis fails to be rejected, then choose model D over C. If the hypothesis that $\beta_3 = 0$ is rejected, choose C over D, as the latter model does not improve over the performance of C.

Though appealing, the *J* test has some limitations. The outcome of these two tests are summarized in Table 39.

Table 39

The *J* Test. Outcomes for Equations (110) and (111)

	Hypothesis: $\alpha_3 = 0$	
Hypothesis: $\beta_3 = 0$	Do not reject	Reject
Do not reject	Accept both C and	Accept D, reject C
Reject	Accept C, reject D	Reject both C and D

As this table shows, there is a problem if the *J* testing procedure leads to the acceptance or rejection of both models. In case both models are rejected, neither model helps to explain the behavior of Y. Similarly, if both models fail to be rejected then the data are not good enough to discriminate between the two models.

Another limitation is that the *J* test may not be very powerful (in the statistical sense) in small samples because it tends to reject the true hypothesis/model more frequently than it ought to.

A procedure to overcome these limitations is to embed the two models into a comprehensive model, in the following manner:

$$Y_t = \alpha_2 X_{2t} + \beta_2 Z_{2t} + v_t \qquad (112)$$

and testing model C by testing $\beta_2 = 0$ and testing model D by testing $\alpha_2 = 0$.

Encompassing Test

Mizon and Richard (1986) suggest a general test called the encompassing test of which the F test and J test are special cases. The encompassing principle is based on the idea that a model should be analyzed taking into account salient features of rival models. If a model is specified by H_0 (model C) and the rival model by H_1 (model D), a formal test of H_0 against H_1 is to compare $\hat{\beta}_2$ and $\hat{\sigma}_D^2$ obtained under H_1 from model D, with the probability limits of these parameters under hypothesis H_0. Comparing

$\hat{\beta}_2$ with $plim\hat{\beta}_2|H_0$ gives the mean encompassing test. Comparing $\hat{\sigma}_D^2$ with $plim\hat{\sigma}_D^2|H_0$ gives the variance encompassing test. The two authors show that the F test is a mean encompassing test and the J test is a variance encompassing test. The complete encompassing test (CET), suggested by the authors, is a joint test that compares $\hat{\beta}_2$ and $\hat{\sigma}_D^2$ with their probability limits under H_0.

The idea behind the encompassing test is to tackle the following major limitation of nonnested tests. The two hypotheses H_0 (model C) and H_1 (model D) specify two conditional distributions with different conditioning variables [e.g., $f(Y|X)$ and $g(Y|Z)$] and it does not really make sense to compare them. A proper way is to derive the conditional distributions $f(Y|X)$ and $g(Y|Z)$ under both H_0 and H_1 and compare them, that is, to have the same conditioning variables under both hypotheses. The encompassing test deals with this issue and it amounts to supplementing the J test with an F test based on a comprehensive model. Given models C and D, each of them is tested against the comprehensive model (112) by means of the F test for restricted and unrestricted residual sum of squares.

Finally, Akaike's information criterion and Schwarz's Bayesian information criterion –discussed in the previous chapter- will also be used to test nonnested models.

Such an array of tests is designed to give convincing evidence, if any, in favour of one model against the rival model.

United Kingdom

The models selected are presented in Table 40. Of the 15 industries, 13 are represented by either one of the two versions –for the remaining two, see Table notes-; and of these 13 industries, 9 favour the relative version over the absolute version, thus supporting the argument made by Culem (1986) that what matters most in a FDI decision are the host country's characteristics relative to those of the investing country.

United States

The absolute version is selected in 12 of the 15 industries (Table 41), thus suggesting that, for U.S. investors, only the host country's characteristics matter when determining the attractiveness of potential FDI locations.

UK Versus U.S.

From Table 42, one may conclude that UK investors, generally speaking, seek/analyze more information, both on their domestic environment and on the host-country environment, than U.S. investors do. This might be due to the fact that, despite UK's close background with Canada, the former country's geographical and cultural distance is greater than that of the United States with Canada.

Table 40

Selection of Regression Models Based on Model selection Tests (UK)

Industry	*Version*
Vegetable products	Relative
Animal products	NONE*
Textiles	Relative
Wood and paper products	Relative
Iron and products	Relative
Non-ferrous metals	Relative
Non-metallic minerals	Absolute
Chemical & allied products	Relative
Manufacturing	Relative
Petroleum and natural gas	Relative
Mining and smelting	Absolute
Utilities	Absolute
Merchandise	Absolute & Relative**
Finance	Absolute
Total	Relative

* No explanatory variables are deemed statistically significant for any of the two versions, probably suggesting that variables other than those under study here are more relevant towards explaining FDI in the Animal Products industry
** The same explantory variable appears in both versions.

Table 41

Selection of Regression Models Based on Model selection Tests (U.S.)

Industry	*Version*
Vegetable products	Absolute
Animal products	Absolute
Textiles	Absolute
Wood and paper products	Absolute
Iron and products	Absolute
Non-ferrous metals	Absolute
Non-metallic minerals	Relative
Chemical & allied products	Absolute
Manufacturing	Absolute
Petroleum and natural gas	Relative
Mining and smelting	Relative
Utilities	Absolute
Merchandise	Absolute
Finance	Absolute
Total	Absolute

Table 42

Selection of Regression Models Based on Model Selection Tests (UK Versus U.S.)

Industry	*Version (UK)*	*Version (U.S.)*
Vegetable products	Relative	Absolute
Animal products	NONE	Absolute
Textiles	Relative	Absolute
Wood and paper products	Relative	Absolute
Iron and products	Relative	Absolute
Non-ferrous metals	Relative	Absolute
Non-metallic minerals	Absolute	Relative
Chemical & allied products	Relative	Absolute
Manufacturing	Relative	Absolute
Petroleum and natural gas	Relative	Relative
Mining and smelting	Absolute	Relative
Utilities	Absolute	Absolute
Merchandise	Absolute & Relative	Absolute
Finance	Absolute	Absolute
Total	Relative	Absolute

Violation of CNLRM Assumptions

As noted earlier, only the assumptions that have been violated will be mentioned for each of the industry regressions; these regressions being based on the version selected (Tables 40 and 41).

United Kingdom

The most frequent violations are (1) autocorrelation of the error term, and (2) nonnormality (Table 43). This last type of violation may be quite serious in that, when present, the usual t and F tests may not be valid, or only so in large samples.

United States

The industry regressions suffer specially from autocorrelation, heteroscedasticity, and nonnormality (Table 44).

UK Versus U.S.

From table 45, it can be seen that the U.S. industry regressions exhibit more autocorrelation and nonnormality than UK regressions. Moreover, only in five industries is the type of violation(s) the same for both countries.

Table 43

Violation of CNLRM Assumptions (UK)

Industry	*Assumption(s) violated**
Vegetable products	H
Animal products	Not applicable
Textiles	AC, SE
Wood and paper products	NN
Iron and products	AC
Non-ferrous metals	AC, H
Non-metallic minerals	H, NN
Chemical & allied products	AC, H, SE
Manufacturing	AC, H, NN
Petroleum and natural gas	H, SE, NN
Mining and smelting	AC, NN
Utilities	AC
Merchandise	AC, H, NN
Finance	AC
Total	AC, SE

*AC: Autocorrelation; M: Multicollinearity; H: Heteroscedasticity; SE: Specification error; NN: Nonnormality

Table 44

Violation of CNLRM Assumptions (U.S.)

Industry	*Assumption(s) violated**
Vegetable products	H, NN
Animal products	AC, SE
Textiles	AC
Wood and paper products	AC, H, NN
Iron and products	AC
Non-ferrous metals	AC, SE
Non-metallic minerals	H, NN
Chemical & allied products	AC, H, NN
Manufacturing	AC, H, SE, NN
Petroleum and natural gas	AC
Mining and smelting	H, NN
Utilities	AC
Merchandise	AC, SE, NN
Finance	AC
Total	AC, SE

*AC: Autocorrelation; M: Multicollinearity; H: Heteroscedasticity; SE: Specification error; NN: Nonnormality

Table 45

Violation of CNLRM Assumptions (UK Versus U.S.)

Industry	*UK**	*U.S.**
Vegetable products	H	H, NN
Animal products	Not applicable	AC, SE
Textiles	AC, SE	AC
Wood and paper products	NN	AC, H, NN
Iron and products	AC	AC
Non-ferrous metals	AC, H	AC, SE
Non-metallic minerals	H, NN	H, NN
Chemical & allied products	AC, H, SE	AC, H, NN
Manufacturing	AC, H, NN	AC, H, SE, NN
Petroleum and natural gas	H, SE, NN	AC
Mining and smelting	AC, NN	H, NN
Utilities	AC	AC
Merchandise	AC, H, NN	AC, SE, NN
Finance	AC	AC
Total	AC, SE	AC, SE

*AC: Autocorrelation; M: Multicollinearity; H: Heteroscedasticity; SE: Specification error; NN: Nonnormality

Final Models

These models are final in that they have been "purged" of any assumption violation(s) listed in Tables 43 and 44.

United Kingdom

Four major results stand out from Table 46. First, with the exception of the market-size variable, none of the other explanatory variables exhibits a consistent, as hypothesized, coefficient sign. The most interesting examples of this sign inconsistency can be found in the labor variables, that is, wages and productivity. Whenever both variables appear in the same regression equation, they tend to show the same sign, either negative or positive. As already mentioned above, a sign different to that hypothesized can be due to the substitution effect between capital and labor, suggested by Cushman (1985, 1987). Thus, for example, an increase in the host-country's wage level may lead to a reduction in planned output and, ultimately, in FDI. However, that increase in the wage level is likely to result in an increase in the productivity of the capital employed and, hence, might increase the demand for FDI. This second outcome is more likely to occur in FDI that is not export-oriented, that is, FDI designed to produce and supply mainly to the host-country's market. The effects of an increase in the host-country's productivity level will be the opposite to those of the wage increase.

Apart from the substitution effect proposed by Cushman (1985,

1987) to account for the positive/negative sign of the wage/productivity variables, two other reasons can be cited which may help explain these "unusual" coefficient signs. One reason has to do with the notion, put forward by Graham (1998), that for a firm to become international, it is not strictly necessary for that firm to have lower costs than its rivals; furthermore, the author argues that, if a firm has lower costs than its rivals this is not a sufficient condition for that firm to become multinational. However, the author recognizes that a low-cost seller has advantages over its rivals which may cause the seller to be a "first-mover" into a foreign market, with a probable reaction from rival firms designed to keep the first-mover from gaining even more advantage, and this reaction can entail FDI. Therefore, in terms of countries, the fact that a host-country's wage level increases, in absolute terms or relative to the home-country's wage level, does not necessarily lead to a decrease of the home-country's FDI to the host country. Indeed, the wage increase may actually induce an increase in FDI to the host country.

The second reason for an alternative explanation of the sign inconsistency may be found in Caselli (1999), who analyzes wage inequalities and capital-output ratio differences within the framework of skill-biased and de-skilling technological revolutions. In the former type of revolutions, the new skills are more costly to acquire than the skills required by the older type of machines. In the latter type of revolutions, the new skills can be acquired at a lower cost than the skills associated with preexisting technologies. In a skill-biased revolution, workers with low learning costs start using the new, more productive machines, whereas high-learning cost individuals remain attached to older-type tools. Assuming diminishing marginal returns to capital, capital flows away from workers in low-skill technologies to those in the high-skill technology. With a lower capital-labor ratio, high learning-cost workers experience an absolute decline in their wages, whereas low learning-cost workers see their wages rise as a result of work with more productive machines and of a higher capital-labor ratio. Extending the analysis to include several industries and multiple revolutions, the author suggests that high-wage, high capital-labor ratio sectors are those with the highest concentration of low learning-cost workers. Hence, they will be the first to embrace a new revolution and, as a result, a further reallocation of capital in favor of these high-wage sectors will take place. Thus, capital flows from low-wage to high-wage industries.

A second major result from Table 46 is that, eight of the fourteen industry regressions show second-degree, or higher, polynomials in at least one of the regressors.

Third, in nine industry regressions a political risk variable is present, in most cases the intercept dummy DPOLRISK, and statistically significant at the 5% significance level. However, the sign of the coefficient accompanying the variable is not always negative, as hypothesized. To account for the positive influence of political risk on FDI, two explanations can be offered that are based on the theory of risk preferences and utility, whereby risk-averse entrepreneurs and managers often decide on investments that appear to be unfair gambles. The traditional explanation for these behaviors is that investors and managers overestimate the probability of success, or they get utility from the act of gambling itself. One more recent explanation for this anomalous behavior is based on the assumption that risk aversion is contextual and differs depending on the situation or on the subjective beliefs in self-competence. Krueger and Dickson (1994) argue that subjects who are led to believe they are very competent at decision-making see more opportunities in a risky choice and take more risks. On the other hand, those who are led to believe they are not very competent see more threats and take fewer risks. The authors further argue that the perceived likelihood of an event depends on whether the vent is a loss or a gain, that is, outcome expectations are not independent of outcome valuations.

The second explanation is offered by Prakash et al. (1996), who assume individuals have preference for positive skewness based on the observation that many decision-making processes involve payoffs that are skewed. The authors illustrate the preference for skewness in decision analysis with the example of the well-known two-moment capital asset pricing model (CAPM) used for capital budgeting purposes. In this model, it is assumed that the decision maker is risk-averse, and the probability distribution of the project's rate of return is symmetric, and can be approximated by the normal distribution. However, recent empirical evidence listed by the authors suggest that the distribution of returns is positively skewed rather than symmetrical. Thus, a manager might reject a project using the two-moment CAPM, whereas it could be acceptable if positive skewness of the return distribution is incorporated in the analysis. Thus, the manager will be erroneously classified as a risk lover, whereas, in fact, he/she is risk averse.

By considering positive skewness of the return distribution, Prakash et al. (1996, p. 250) note the following:

> ... a manager with preference for positive skewness will naturally have a lower minimum required return, or hurdle rate, for any type of project. Thus, even a rational, cautious, and risk-averse manager may have the incentive to invest in high-risk projects with skewed payoffs, and aggressively develop new products, adopt new technology, and consequently become more competitive. Similarly, a rational and risk-averse investor may have the incentive to gamble and buy insurance, both hedge and speculate, and is more likely to undertake projects with low or negative exante returns, but with a skewed distribution that has the potential to generate a high payoff.

United States

Table 47 shows a number of noteworthy facts. First, the market size variable is present in most of the regressions, though, in some of them, the sign of the coefficient is not as hypothesized. Second, except for the Finance industry, all other regressions have at least one of the three exchange rate variables included as a atatistically significant explanatory variable. Third, in eleven of the fifteen regressions at least one of the explanatory variables is powered to the order two, or higher. Fourth, a political risk variable is only present in four regressions, and its coefficient is statistically significant in two of them. Finally, either one of the two labor variables or both of them are included in twelve industry regressions, with most of the respective coefficients being statistically significant.

UK Versus U.S.

Both countries' industry regressions have a number of features in common. First, there is no consistent coefficient sign for the explanatory variables under study. Second, many of the regressions show polynomials of order two, or higher, in at least one of the regressors. Third, in practically all the industry regressions, there is at least one exchange-rate variable included. Fourth, the most frequently cited political variable is DPOLRISK, though its appearance as a regressor is much more frequent in UK industry regressions than in U.S. regressions. Finally, no industry regression in either country exhibits the same explanatory variables; each industry's FDI is determined by a specific set of variables, in a specific set of form.

Table 46

Final Models (UK)

Industry	*Regression Equation*
Vegetable products	LFDI=20.8665* − 0.0749* LERRISK + 2.0917* LEER − 2.7818* LRELPROD − 2.7344* LRELWAGE − 0.8535* DPOLRISK $R^2=0.9835$
Animal products	-- ------------------------------
Textiles	LFDI=−2855.6 − 0.3504* LERL + 1.4266* LEER + 20.4855* LRELPROD − 2.4086* $LRELPROD^2$ + 1842.1 LRELWAGE − 401.0716 $LRELWAGE^2$ + 29.0269 $LRELWAGE^3$ $R^2=0.9660$
Wood & paper products	LFDI=-81.2326 − 147.4540* LEER + 36.6384* $LEER^2$ − 3.0036* $LEER^3$ + 0.7259 LRELWAGE + 121.7283* LRELPROD − 13.3442* $LRELPROD^2$ $R^2=0.8740$
Iron and products	FDI=32.7691 + 1.0628 EER − 0.002747 ERRISK − 0.2193 RELWAGE − 0.2428 RELPROD $R^2=0.9606$

* Significant at the 5% level, one-tailed

Table 46 (continued)

Industry	*Regression Equation*
Non-ferrous metals	LFDI=-1020.7 + 1026.4 LEER − 371.3929 $LEER^2$ + 59.5687 $LEER^3$ − 3.5695 $LEER^4$ − 10.1842 LRELWAGE + 0.0205 $LRELWAGE^4$ − 0.7720* DPOLRISK R^2=0.9813
Non-metallic minerals	LFDI=- 8.8213* + 0.2762* LEERISK + 2.6409* LWAGECAN + 0.0736* LPICAN − 0.0853* DLPICAN R^2=0.8240
Chemical & allied products	LFDI=−6892.2* − 10.4536* LEER + 1.4482* $LEER^2$ + 4570.3* LRELPROD − 1007.1 * $LRELPROD^2$ + 73.9697* $LRELPROD^3$ − 0.2243 DPOLRISK R^2=0.9822
Manufacturing	LFDI=- 1036.1* + 1158.1* LEER − 429.7386* $LEER^2$ + 70.6027* $LEER^3$ - 4.3285* $LEER^4$ − 51.7727* LRELWAGE + 5.2559* $LRELWAGE^2$ − 0.2867* DPOLRISK R^2=0.9895
Petroleum and natural gas	FDI=5238.5* − 118.7132* RELWAGE + 0.9324* $RELWAGE^2$ − 0.002434* $RELWAGE^3$ R^2=0.9660

* Significant at the 5% level, one-tailed

Table 46 (continued)

Industry	*Regression Equation*
Mining and smelting	FDI = − 21.3614* + 8.0525* GDPCAN − 0.0265* $GDPCAN^2$ − 4.2059* PRODCAN R^2 = 0.9145
Utilities	FDI = − 315.2619 − 0.8865 ERL − 8.6213* PRODCAN + 13.3576* WAGECAN + 0.00834 PICAN R^2 = 0.6351
Merchandise	FDI = − 13. 4554 − 0.0901 ERL + 0.0710 EER + 0.00061 EER^2 + 2.0265* GDPCAN − 0.9382* PRODCAN + 25.5913* DPOLRISK R^2 = 0.9900
Finance	LFDI = − 10.8366* + 0.1674 LERL + 2.0683* LGDPCAN + 1.1414 LWAGECAN − 0.1676 DPOLRISK − 0.0102* DLPICAN R^2 = 0.9946
Total	LFDI = − 139.7578* + 109.7627* LEER − 26.1370* $LEER^2$ + 2.0999* $LEER^3$ − 1.0090* LRELPROD − 1.4744* LRELWAGE − 0.2711* DPOLRISK R^2 = 0.9962

* Significant at the 5% level, one-tailed

Table 47

Final Models (U.S.)

Industry	*Regression Equation*
Vegetable products	FDI=-27.8555 - 0.0155* ERRISK + 0.000057* $GDPCAN^3$ + 9.5784* PRODCAN - 0.1339* $PRODCAN^2$ + 0.000599* $PRODCAN^3$ - 0.0878* $WAGECAN^2$ + 0.000735* $WAGECAN^3$ $R^2=0.9853$
Animal products	FDI=489.1017 + 5.1550* ERL - 7.2735* EER + 28.8704* GDPCAN - 0.01674* $GDPCAN^3$ - 24.6205* PRODCAN + 0.1114* $PRODCAN^2$ $R^2=0.9495$
Textiles	LFDI=6.4607* - 2.7983* LEER + 0.0235 ERRISK + 0.9776* LGDPCAN + 1.4181 LWAGECAN - 0.003635 LPICAN $R^2=0.9954$
Wood & paper products	LFDI=0.8043* LERL - 0.0216* $LERL^3$ + 0.0288* $LGDPCAN^3$ $R^2=0.9832$
Iron and products	LFDI=-6.7394* + 0.1143 LERL + 2.0973* LGDPCAN - 0.5757* LPRODCAN + 0.8244* LWAGECAN + 0.0153* LPICAN - 0.0177* DLPICAN - 0.0995* DPOLRISK $R^2=0.9992$

* Significant at the 5% level, one-tailed

Table 47 (continued)

Industry	*Regression Equation*
Non-ferrous metals	FDI=60.4780* - 0.5664* EER - 0.0114* ERRISK + 1.8506* GDPCAN - 0.0370* $GDPCAN^2$ + 0.00028* $GDPCAN^3$ R^2=0.9879
Non-metallic minerals	LFDI=41.2162* - 9.3149* LEER + 1.3247 LWAGECAN + 0.0450 LRELPI R^2=0.7736
Chemical & allied products	FDI=-695.4601* - 0.000024* EER^3 - 0.0054 ERRISK + 0.000048* $GDPCAN^3$ + 29.6561* WAGECAN - 0.3914* $WAGECAN^2$ + 0.00172* $WAGECAN^3$ R^2=0.9916
Manufacturing	FDI=-499.1385* - 0.00778* ERRISK + 0.000072* $GDPCAN^3$ + 1.6624* PRODCAN - 0.0121* $PRODCAN^2$ + 21.0033* WAGECAN - 0.3099* $WAGECAN^2$ + 0.001481* $WAGECAN^3$ R^2=0.9970
Petroleum and natural gas	FDI=229.3214* + 0.003771* ERL^2 - 0.0170* EER^2 - 0.002504 ERRISK R^2=0.9750

* Significant at the 5% level, one-tailed

Table 47 (continued)

Industry	*Regression Equation*
Mining and smelting	LFDI=-46.0035* - 0.0677* LERRISK + 21.1112* LRELPROD - 2.1858* $LRELPROD^2$ + 0.5442* DPOLRISK R^2=0.9244
Utilities	LFDI=3.8706 - 1.0090* LERL + 0.0414 LERRISK + 1.2821* GDPCAN - 0.0802 LWAGECAN - 0.1275 DPOLRISK R^2=0.9710
Merchandise	LFDI=90.5425* - 11.4795* $LEER^2$ + 1.5636* $LEER^3$ + 0.2364* $LPRODCAN^2$ R^2=0.9920
Finance	LFDI=-121.0347* - 10.3454* LGDPCAN + 1.5337* $LGDPCAN^2$ + 63.1814* LWAGECAN - 7.0644* $LWAGECAN^2$ R^2=0.9934
Total	LFDI=-854.0438* - 0.0239* LERRISK - 3.2491* LGDPCAN + 0.6198* $LGDPCAN^2$ + 583.5945* LWAGECAN - 131.8132* $LWAGECAN^2$ + 9.9194* $LWAGECAN^3$ R^2=0.9987

* Significant at the 5% level, one-tailed

Managerial Implications

United Kingdom

With respect to political risk, UK managers should realice the importance of including some appropriate political factor that effectively measures the degree of political risk either at the macro level or, preferably, at the pertinent industry level. Though the most frequently cited political variable is DPOLRISK, managers should not jump to the conclusion that, including this variable in a decision-making model, would be pointless because it partially reflects a period (1948-1982) that is already well behind the current decision years. On the contrary, being an intercept dummy, the DPOLRISK variable encompasses two sets of values, 0 and 1, for two periods; the fact that DPOLRISK is statistically significant in many of the regression equations does not suggest that political risk has no influence on FDI for the period 1983 to 1991, rather, it implies that there is a structural instability of the regression for the two periods.

Managers should also note the importance of other, non-political, variables in this study: the exchange rate variables and the labor variables, which do not tend to show the usual coefficient signs hypothesized in the FDI literature.

United States

Managers from this country should be expected to incorporate market size as a decisive variable in the FDI decision-making process. This fact further supports the findings of previous studies on the statistical importance of a host-country's market size as a major determinant of FDI. Political risk, however, does not seem to be an influential variable, as evidenced from the results obtained above. Nevertheless, the value of political risk in decision-making models should not be underestimated, given the limitations of the variable used in this study. Finally, the exchange rate variables and the labor variables play an important role in the regressions examined, and, as such, should always be taken into account by managers wishing to establish those characteristics that may influence foreign investment behavior.

UK Versus U.S.

Both countries have two major managerial implications in common. First, the significance of non-political variables as the main determinants of FDI. And second, and most important, the fact that each industry exhibits a unique set of FDI determinants; no one industry is equal to another in the composition and form of the explanatory variables.

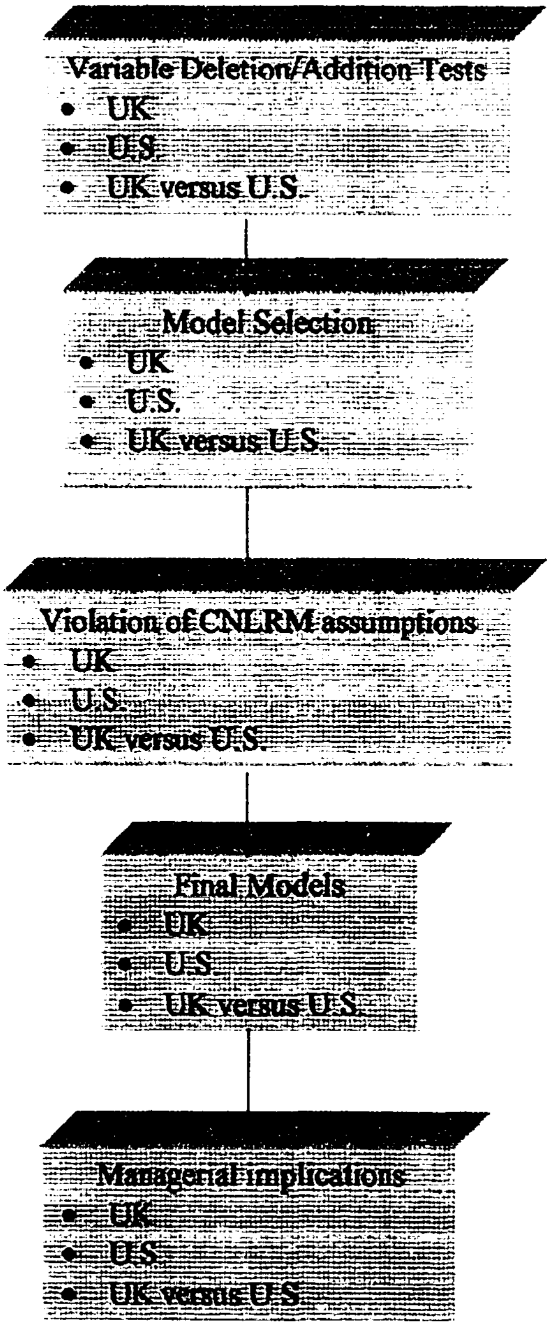
This second point has a fundamental implication for managers: they should decide which variables are most likely to affect FDI in a specific industry (ideally, supported by data that are specific to that particular industry) and in which form (linear, log-linear, polynomial, etcetera) are these variables most likely to resemble the pattern of past of FDI, in order to apply this knowledge to present/future decision-making models.

Single-Equation Dynamic Regression Models: Partial Adjustment Models

Unlike the static equations, the dynamic models take into account the role of time by introducing lags either in the dependent variable (partial adjustment model) or in the independent variable(s) (Almon distributed-lag model). The procedure employed to estimate the partial adjusment models is shown in Figure 25. As noted above, the same functional form and structural stability variables, predetermined in the static-model procedure, will be applied to the partial adjustment models. Hence, the first step in the procedure corresponds to the variable deletion/addition tests. The relevant equation for these models is (42), outlined in the previous chapter.

Figure 25

Single-Equation Dynamic Regression Models: Testing and Analysis Procedure for Partial Adjustment Models



Variable Deletion/Addition Tests

United Kingdom

Except for the absolute versions of Mining & Smelting and Vegetable Products, all other regressions include the lagged dependent variable (Table 48). Next, in terms of frequency, comes the expected exchange rate, followed by the productivity variable, the market size variable, and the intercept dummy DPOLRISK. It is worth noting that, in the relative version, the relative growth variable hardly appears in any of the regressions.

United States

The lagged dependent variable is present in all industry regressions, except for the relative versions of Non-Metallic Minerals and Mining & Smelting (Table 49). The labor variables, wages and productivity, frequently in the regressions, in both versions, and so does market size in the absolute version. Political risk is also included in many of the equations, especially in the form of the intercept dummy DPOLRISK.

UK Versus U.S.

In both countries, practically all the regression equations include lagged FDI as a significant explanatory variable, in both versions. Also, the political variable DPOLRISK is included in many of the regressions of both countries.

The two countries share the same pattern of the market size variable in their regressions: absolute market size is significant in the absolute version but relative growth is hardly present in the relative version.

The major difference between the two countries lies with the exchange rate variables: they are frequent in both versions of the UK industry regressions, whereas they are most frequent in the realtive version of the U.S. equations.

Table 48

Variable Deletion/Addition Tests of Initial Dynamic Equations: Partial Adjustment Models (UK)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Vegetable products	CONSTANT EER GDPCAN PRODCAN DPOLRISK	99.8860 -1.4905 5.2240 -3.7471 -41.3084	CONSTANT LEER DPOLRISK LFDI(-1)	-0.9513 0.5304 -0.4090 0.6870	(A) 10% (R)12.5%
Animal products	CONSTANT LFDI(-1)	-0.1968 0.5002	CONSTANT LFDI(-1)	-0.1968 0.5002	(A)22.5% (R)22.5%
Textiles	CONSTANT EER GDPCAN PRODCAN FDI(-1)	28.3943 -0.7978 2.4075 -1.5706 0.6955	CONSTANT LRELWAGE LFDI(-1)	3.8977 -0.7463 0.9241	(A) 10% (R) 17%
Wood and paper products	CONSTANT ERL WAGECAN FDI(-1)	-41.8492 0.3799 0.5222 0.4766	CONSTANT LRELPROD LFDI(-1)	-3.8446 1.1841 0.6245	(A)11.3% (R) 15%

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummies

FDI(-1)/LFDI(-1) denote industry FDI lagged one year in linear and log-linear forms, respectively

Table 48 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Iron and products	CONSTANT ERL FDI(-1)	-6.0474 0.1135 1.0006	CONSTANT EER FDI(-1)	-3.8187 0.1997 0.8709	(A) 17% (R) 15%
Non-ferrous metals	CONSTANT EER GDPCAN PRODCAN DPOLRISK FDI(-1)	45.2501 -0.7567 2.0469 -1.2977 -22.3107 0.5710	CONSTANT DPOLRISK FDI(-1)	0.6435 -0.3349 0.8878	(A)8.3% (R) 17%
Non-metallic minerals	CONSTANT LERRISK LWAGECAN LFDI(-1)	-6.0992 0.1844 1.7673 0.3927	CONSTANT LERRISK LEER LFDI(-1)	-1.3028 0.1705 0.7645 0.3941	(A)12.5% (R)11.3%

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummies

FDI(-1)/LFDI(-1) denote industry FDI lagged one year in linear and log-linear forms, respectively

Table 48 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Chemical & allied products	CONSTANT	0.3561	CONSTANT	0.5564	(A) 10%
	LERRISK	0.0920	LERRISK	0.0829	(R) 8.3%
	LPICAN	-0.0191	LRELGROW	-0.0175	
	DPOLRISK	-0.1965	LRELPI	-0.0138	
	LFDI(-1)	0.8553	DPOLRISK	-0.2609	
			LFDI(-1)	0.7997	
Manufacturing	CONSTANT	0.1028	CONSTANT	-0.2976	(A)13.8%
	LGDPCAN	0.1732	LEER	0.2749	(R)12.5%
	DPOLRISK	-0.1750	DPOLRISK	-0.1321	
	LFDI(-1)	0.8275	LFDI(-1)	0.8140	
Petroleum and natural gas	CONSTANT	-4.3941	CONSTANT	93.4420	(A) 17%
	GDPCAN	0.1718	EER	0.3401	(R) 9%
	FDI(-1)	0.8603	RELPROD	-0.3056	
			RELWAGE	-0.5977	
			FDI(-1)	0.5805	

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummies

FDI(-1)/LFDI(-1) denote industry FDI lagged one year in linear and log-linear forms, respectively

Table 48 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Mining and smelting	CONSTANT	-43.0790	CONSTANT	-13.3124	(A) 10%
	ERRISK	0.1110	EER	1.0184	(R)7.86%
	GDPCAN	3.0286	RELWAGE	-0.4843	
	PRODCAN	-1.7016	RELPI	20.3346	
	DPOLRISK	32.3439	DRELPI	-20.3324	
			DPOLRISK	49.4471	
			FDI(-1)	0.4068	
Utilities	CONSTANT	-180.0520	CONSTANT	-147.2739	(A)11.3%
	PRODCAN	-4.8261	RELWAGE	1.4626	(R) 15%
	WAGECAN	6.7724	FDI(-1)	0.7405	
	FDI(-1)	0.6202			
Merchandise	CONSTANT	-7.0094	CONSTANT	-78.3603	(A) 15%
	ERL	0.1773	ERL	0.2273	(R) 9%
	FDI(-1)	0.9150	RELPROD	0.3527	
			RELWAGE	0.3093	
			FDI(-1)	0.8686	

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummies

FDI(-1)/LFDI(-1) denote industry FDI lagged one year in linear and log-linear forms, respectively

Table 48 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Finance	CONSTANT	-10.9758	CONSTANT	0.1236	(A) 6.11%
	LERL	0.5787	LRELGROW	-0.0188	(R) 17%
	LEER	-0.6518	LFDI(-1)	1.0016	
	LGDPCAN	0.9943			
	LPRODCAN	-1.5486			
	LWAGECAN	3.3938			
	DLPICAN	-0.0133			
	DPOLRISK	-0.3258			
	LFDI(-1)	0.6557			
Total	CONSTANT	-0.1859	CONSTANT	-0.3027	(A) 10%
	LGDPCAN	0.1829	LEER	0.1538	(R) 17%
	DPOLRISK	-0.0724	LFDI(-1)	0.9328	
	LFDI(-1)	0.8818			

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummies

FDI(-1)/LFDI(-1) denote industry FDI lagged one year in linear and log-linear forms, respectively

Table 49

Variable Deletion/Addition Tests of Initial Dynamic Equations: Partial Adjustment Models (U.S.)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Vegetable products	CONSTANT	5.4362	CONSTANT	-18.2125	(A) 12.5%
	PRODCAN	0.1148	RELPROD	0.2085	(R) 10%
	DPOLRISK	-8.7101	RELWAGE	0.1733	
	FDI(-1)	0.8806	DPOLRISK	-9.4977	
			FDI(-1)	0.8448	
Animal products	CONSTANT	-195.3202	CONSTANT	-405.6555	(A) 12.5%
	GDPCAN	-3.0767	ERL	2.3701	(R) 10%
	WAGECAN	4.6361	RELPROD	1.6467	
	FDI(-1)	0.9528	DPOLRISK	82.4355	
			FDI(-1)	0.8474	
Textiles	CONSTANT	-1.5835	CONSTANT	-1.7145	(A) 15%
	LWAGECAN	0.4540	LRELPROD	0.5132	(R) 15%
	LFDI(-1)	0.8992	LFDI(-1)	0.8660	

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummies

FDI(-1)/LFDI(-1) denote industry FDI lagged one year in linear and log-linear forms, respectively

Table 49 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Wood and paper products	CONSTANT LERL LGDPCAN LFDI(-1)	1.7377 -0.4563 0.3321 0.7412	CONSTANT LERL LERRISK LRELWAGE DPOLRISK LFDI(-1)	4.8067 -0.5482 0.0322 -0.4648 -0.1205 0.9528	(A)11.3% (R)8.33%
Iron and products	CONSTANT LGDPCAN LWAGECAN DPOLRISK LFDI(-1)	-2.6101 0.5911 0.3669 -0.0772 0.6197	CONSTANT LRELGROW LRELPROD LRELWAGE DPOLRISK LFDI(-1)	-1.2041 0.0043 0.6118 -0.1714 -0.1006 0.8288	(A) 11% (R) 10%
Non-ferrous metals	CONSTANT ERRISK GDPCAN PRODCAN DPOLRISK FDI(-1)	17.2702 -0.0065 0.9910 -0.7503 -4.9819 0.5977	CONSTANT LEER LRELWAGE LFDI(-1)	9.4996 -1.5385 -0.3352 0.8072	(A)8.33% (R)12.5%

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letterD at the beginning denote dummies

FDI(-1)/LFDI(-1) denote industry FDI lagged one year in linear and log-linear forms, respectively

Table 49 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Non-metallic minerals	CONSTANT LGDPCAN LFDI(-1)	-1.2282 0.7453 0.4813	CONSTANT LEER LRELPROD LRELWAGE LRELPI	3.6838 -4.4707 1.7916 2.8417 0.0504	(A) 15% (R) 9%
Chemical & allied products	CONSTANT GDPCAN PRODCAN DPOLRISK FDI(-1)	-2.6360 0.5077 -0.3349 3.3081 0.9043	CONSTANT LERRISK LRELWAGE LRELPI LFDI(-1)	1.0935 0.0228 -0.2468 -0.0058 0.9940	(A) 10% (R) 9%
Manufacturing	CONSTANT GDPCAN DPOLRISK FDI(-1)	0.5587 0.0990 -2.1046 0.9430	CONSTANT LFDI(-1)	0.0359 1.0098	(A)12.5% (R) 25%
Petroleum and natural gas	CONSTANT LPICAN LFDI(-1)	0.2421 -0.0086 0.9591	CONSTANT FDI(-1)	1.1617 1.0104	(A) 15% (R)22.5%

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummies

FDI(-1)/LFDI(-1) denote industry FDI lagged one year in linear and log-linear forms, respectively

Table 49 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Mining and smelting	CONSTANT	-98.2050	CONSTANT	-22.9423	(A) 11%
	GDPCAN	-2.8735	LERL	1.0983	(R) 8.33%
	PRODCAN	4.3896	LEER	-0.0913	
	DPOLRISK	42.6277	LERRISK	2.1299	
	FDI(-1)	0.5260	LRELPROD	2.8192	
			DPOLRISK	0.5419	
Utilities	CONSTANT	0.2567	CONSTANT	0.2567	(A)16. 7%
	DPOLRISK	-0.1099	DPOLRISK	-0.1099	(R)16. 7%
	LFDI(-1)	0.9654	LFDI(-1)	0.9654	
Merchandise	CONSTANT	-1.2485	CONSTANT	4.1186	(A) 15%
	LGDPCAN	0.5986	LEER	-1.3156	(R) 11.3%
	LFDI(-1)	0.6946	LRELPROD	0.6920	
			LFDI(-1)	0.7443	

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummies

FDI(-1)/LFDI(-1) denote industry FDI lagged one year in linear and log-linear forms, respectively

Table 49 (continued)

	Version				
	Absolute		*Relative*		
Industry	*Variable*	*Coefficient*	*Variable*	*Coefficient*	*True α*
Finance	CONSTANT	-2.7616	CONSTANT	4.1280	(A) 10%
	LGDPCAN	0.9246	LEER	-0.8295	(R) 12.5%
	LPRODCAN	-1.4498	LRELPI	-0.0131	
	LWAGECAN	1.3113	LFDI(-1)	0.9514	
	LFDI(-1)	0.8398			
Total	CONSTANT	-0.2351	CONSTANT	3.4703	(A) 15%
	LGDPCAN	0.1912	LEER	-0.5005	(R) 10%
	LFDI(-1)	0.8744	LRELWAGE	-0.1830	
			LRELPI	-0.0028	
			LFDI(-1)	0.9400	

(A) Absolute version; (R) Relative version

All variables are statistically significant at the true level of significance

L: Variables with letter L at the beginning denote log(natural)

D: Variables with letter D at the beginning denote dummies

FDI(-1)/LFDI(-1) denote industry FDI lagged one year in linear and log-linear forms, respectively

Model Selection: Absolute Versus Relative Version

United Kingdom

There is almost an equal number of regressions favoring both versions (Table 50).

United States

There is exactly an equal number of regressions favoring both versions (Table 51).

UK Versus U.S.

In most of the industries, the version selected is different across the two countries (Table 52). Only in five cases is the version selected equal for both countries. This result implies that each industry is unique for each country and, thus, in most of the cases, cannot be compared (on the basis of the functional form) with its counterpart of the other country.

Table 50

Selection of Regression Models Based on Model Selection Tests (UK)

Industry	*Version*
Vegetable products	Absolute
Animal products	Absolute & Relative*
Textiles	Relative
Wood and paper products	Relative
Iron and products	Relative
Non-ferrous metals	Relative
Non-metallic minerals	Absolute
Chemical & allied products	Relative
Manufacturing	Relative
Petroleum and natural gas	Relative
Mining and smelting	Absolute
Utilities	Absolute
Merchandise	Relative
Finance	Absolute
Total	Absolute

* The same explanatory variable appears in both versions.

Table 51

Selection of Regression Models Based on Model Selection Tests (U.S.)

Industry	*Version*
Vegetable products	Relative
Animal products	Relative
Textiles	Relative
Wood and paper products	Absolute
Iron and products	Relative
Non-ferrous metals	Absolute
Non-metallic minerals	Relative
Chemical & allied products	Relative
Manufacturing	Absolute
Petroleum and natural gas	Absolute
Mining and smelting	Absolute
Utilities	Absolute & Relative*
Merchandise	Absolute
Finance	Absolute
Total	Relative

* The same explanatory variable appears in both versions.

Table 52

Selection of Regression Models Based on Model selection Tests (UK Versus U.S.)

Industry	*Version (UK)*	*Version (U.S.)*
Vegetable products	Absolute	Relative
Animal products	Absolute & Relative	Relative
Textiles	Relative	Relative
Wood and paper products	Relative	Absolute
Iron and products	Relative	Relative
Non-ferrous metals	Relative	Absolute
Non-metallic minerals	Absolute	Relative
Chemical & allied products	Relative	Relative
Manufacturing	Relative	Absolute
Petroleum and natural gas	Relative	Absolute
Mining and smelting	Absolute	Absolute
Utilities	Absolute	Absolute & Relative
Merchandise	Relative	Absolute
Finance	Absolute	Absolute
Total	Absolute	Relative

Violation of CNLRM Assumptions

United Kingdom

Nonnormality is by far the most frequently violated assumption; it is present in all but two industry regressions (Table 53). The second most-violated assumption is heteroscedasticity. It is also worth noting that the Finance industry regression does not exhibit any violation of assumptions.

United States

The assumption most violated is nonnormality, followed by heteroscedasticity (Table 54). In two industries only, Iron & Products and Chemical & Allied Products, there are no violations.

UK Versus U.S.

From Table 55, the assumptions most frequently violated, for both countries, are nonnormality and heteroscedasticity, in that order. Only in one industry, is the assumption violated the same for both countries.

Table 53

Violation of CNLRM Assumptions (UK)

Industry	*Assumption(s) violated**
Vegetable products	H, SE, NN
Animal products	AC, H, SE, NN
Textiles	AC, NN
Wood and paper products	NN
Iron and products	H, NN
Non-ferrous metals	SE
Non-metallic minerals	NN
Chemical & allied products	NN
Manufacturing	AC, H, NN
Petroleum and natural gas	AC, H, NN
Mining and smelting	AC, NN
Utilities	SE, NN
Merchandise	H, NN
Finance	-----
Total	H, NN

*AC: Autocorrelation; M: Multicollinearity; H: Heteroscedasticity; SE: Specification error; NN: Nonnormality

Table 54

Violation of CNLRM Assumptions (U.S.)

Industry	*Assumption(s) violated**
Vegetable products	AC, H, NN
Animal products	NN
Textiles	SE
Wood and paper products	NN
Iron and products	-----
Non-ferrous metals	NN
Non-metallic minerals	H, NN
Chemical & allied products	-----
Manufacturing	H, NN
Petroleum and natural gas	AC
Mining and smelting	H
Utilities	H
Merchandise	AC, SE, NN
Finance	NN
Total	NN

*AC: Autocorrelation; M: Multicollinearity; H: Heteroscedasticity; SE: Specification error; NN: Nonnormality

Table 55

Violation of CNLRM Assumptions (UK Versus U.S.)

Industry	*UK**	*U.S.**
Vegetable products	H, SE, NN	AC, H, NN
Animal products	AC, H, SE, NN	NN
Textiles	AC, NN	SE
Wood and paper products	NN	NN
Iron and products	H, NN	-----
Non-ferrous metals	SE	NN
Non-metallic minerals	NN	H, NN
Chemical & allied products	NN	-----
Manufacturing	AC, H, NN	H, NN
Petroleum and natural gas	AC, H, NN	AC
Mining and smelting	AC, NN	H
Utilities	SE, NN	H
Merchandise	H, NN	AC, SE, NN
Finance	-----	NN
Total	H, NN	NN

*AC: Autocorrelation; M: Multicollinearity; H: Heteroscedasticity; SE: Specification error; NN: Nonnormality

Final Models

United Kingdom

Only the exchange rate risk variable shows the hypothesized coefficient in those regressions where it is included (Table 56). In terms of statistical significance and appearances, the wage variable is present in most of the regressions, mostl with the "correct" coefficient sign. Again, as with the previous static final models, there is at least one exchange rate variable in all but three industry regressions. A political variable appears in six regressions, being statistically significant in four of them. Just as in the case of the static models, there are a number of regressions that have at least one regressor powered to at least the order two.

As for the lagged dependent variable, it is present in half of the industry equations and all the seven coefficients are (a) statistically significant and (b) lie between the hypothesized values of 0 and 1. Table 60 suggests a high speed of adjustment of the actual capital stock to the desired stock level, with all but one regressions having an adjustment value over 30%.

The long-run equations, reported in Table 58, are derived by dividing each of the regressors' coefficients by the value of the adjustment coefficient and dropping the lagged dependent variable. The higher the coefficient the smaller the increase in the value of the long-run coefficient, thus implying a closer gap between the short-run and long-run effects of the corresponding regression coefficients.

United States

Unlike the static models, a exchange rate variable is only present in seven of the fifteen industry equations (Table 57). A political variable appears in nine regressions, and statistically significant so in seven of them. The lagged dependent variable is included in eight equations and all coefficients are statistically significant.

The corresponding long-run equations are shown in Table 59, using the procedure described above. The resulting long-run coefficients are quite big relative to the short-run coefficients, since the the latter are relatively small (Table 60), that is, a slow adjustment of the actual capital stock to the desired capital stock.

UK Versus U.S.

The first major difference between the two countries is a much smaller significance and appearance of any exchange rate variable in the U.S. regresssions than in the UK regressions.

The second major difference lies in the short-run adjustment coefficients: comparing the five industries in which both countries have the lagged dependent variable as explantory variables suggests that, with the exception of one of those industries, the speed of adjustment is greater for the respective UK industries than for the U.S. industries.

In all other respects, both countries tend to show the same frequency of the market size, labor and political variables.

Table 56

Final Models (UK): Short-Run Equations

Industry	*Regression Equation*
Vegetable products	FDI=6.8158* - 0.000044* EER^3 + 0.000254* GDPCAN - 0.00011* PRODCAN R^2=0.9312
Animal products	
Textiles	LFDI=538.3430* - 273.6826* LERL + 61.2180* $LERL^2$ - 4.5554* $LERL^3$ + 4.6912* LEER - 0.5055* $LEER^2$ - 0.6142 LRELPROD - 42.3501* LRELWAGE + 0.5986* $LRELWAGE^3$ + 0.4049* LFDI(-1) R^2=0.9761
Wood & paper products	LFDI= -3.8193* + 1.2044* LRELPROD - 0.0487 DPOLRISK + 0.6038* LFDI(-1) R^2=0.8691
Iron and products	FDI= -3.8187* + 0.1997* EER + 0.8709* FDI(-1) R^2=0.9701

* Significant at the 5% level, one-tailed

Table 56 (continued)

Industry	*Regression Equation*
Non-ferrous metals	FDI=564.2082 + 0.3843 ERL - 0.00195 ERL^2 - 6.4310 RELWAGE + 0.025 $RELWAGE^2$ R^2=0.9486
Non-metallic minerals	LFDI=3.5293* + 0.2257* LERRISK - 0.3515 DPOLRISK R^2=0.7991
Chemical & allied products	LFDI=1.0907 + 0.5721* LEER + 0.6111* LERRISK - 0.0731* $LERRISK^2$ - 0.0337* LRELGROW + 0.00289 $LRELGROW^2$ - 0.6933* LRELWAGE + 0.6179* LFDI(-1) R^2=0.9834
Manufacturing	FDI= -2.1034* + 1.4461* LEER - 0.0112* LRELGROW + 0.001987 $LRELGROW^2$ - 0.2547* DPOLRISK R^2=0.9895
Petroleum and natural gas	FDI=5238.5* - 118.7132* RELWAGE + 0.9324* $RELWAGE^2$ - 0.00243* $RELWAGE^3$ R^2=0.9660

* Significant at the 5% level, one-tailed

Table 56 (continued)

Industry	*Regression Equation*
Mining and smelting	FDI= −38.0289* + 0.0906* ERRISK + 2.6880* GDPCAN − 1.5842* PRODCAN + 30.9663* DPOLRISK + 0.2005* FDI(-1) R^2=0.9730
Utilities	FDI= −521.3471* − 19.0508* EER + 0.0819 EER^2 − 15.7304 GDPCAN + 0.1168* $GDPCAN^2$ − 7.9476 PRODCAN + 29.1792* WAGECAN R^2=0.7141
Merchandise	FDI= −4101.4* − 0.0124* ERL − 15.2614* EER + 0.2615* EER^2 − 0.0013* EER^3 − 0.0421* ERRISK + 22.6530* RELPROD − 0.1229* $RELPROD^2$ + 85.8312* RELWAGE − 0.7202* $RELWAGE^2$ + 0.002* $RELWAGE^3$ −0.0045 RELPI R^2=0.9800
Finance	LFDI= −10.9758* + 0.5787* LERL − 0.6518* LEER + 0.9943 LGDPCAN − 1.5486* LPRODCAN + 3.3938* LWAGECAN − 0.3258* DPOLRISK − 0.0133* DLPICAN + 0.6557* LFDI(-1) R^2=0.9950
Total	LFDI= −915.8786* + 0.2071* LERRISK − 0.0235* $LERRISK^2$ + 0.8464* LGDPCAN + 638.3461* LWAGECAN − 148.3683* $LWAGECAN^2$ + 11.4679* $LWAGECAN^3$ + 0.6844* LFDI(-1) R^2=0.9978

* Significant at the 5% level, one-tailed

Table 57

Final Models (U.S.): Short-Run Equations

Industry	*Regression Equation*
Vegetable products	FDI=352.4064 + 1.6123* RELPI – 15.0744* DPOLRISK R^2=0.9810
Animal products	FDI=716.7780 + 4.2436* ERL – 5.1971 EER – 3.5126 RELPROD – 17.3074 DPOLRISK R^2=0.9084
Textiles	LFDI=13.3439* – 6.9740* LRELPROD + 0.9504* $LRELPROD^2$ + 0.7066* LFDI(-1) R^2=0.9979
Wood & paper products	LFDI=5.5246 – 1.0695* LERL + 1.3299 LEER – 0.008 LERRISK + 0.0398 LRELWAGE + 0.1904* DPOLRISK R^2=0.9810
Iron and products	LFDI=–1.2041 + 0.0043* LRELGROW + 0.6118* LRELPROD – 0.1714* LRELWAGE – 0.1006* DPOLRISK + 0.8288* LFDI(-1) R^2=0.9992

* Significant at the 5% level, one-tailed

Table 57 (continued)

Industry	*Regression Equation*
Non-ferrous metals	$FDI = 11.9566 - 0.0156^{*}\ ERRISK - 2.0627^{*}\ GDPCAN + 0.0246^{*}\ GDPCAN^2 + 1.6901^{*}\ PRODCAN - 0.0121^{*}\ PRODCAN^2$ $R^2 = 0.9859$
Non-metallic minerals	$LFDI = 404.5072^{*} - 10.0204^{*}\ LEER - 156.2167^{*}\ LRELWAGE + 17.2331^{*}\ LRELWAGE^2 + 0.0560^{*}\ LRELPI$ $R^2 = 0.8165$
Chemical & allied products	$LFDI = 1.0935^{*} + 0.0228^{*}\ LERRISK - 0.2468^{*}\ LRELWAGE - 0.0058^{*}\ LRELPI + 0.9940^{*}\ LFDI(-1)$ $R^2 = 0.9982$
Manufacturing	$FDI = 0.4091^{*} + 0.0017^{*}\ GDPCAN^2 + 0.8738^{*}\ FDI(-1)$ $R^2 = 0.9983$
Petroleum and natural gas	$LFDI = 0.2689^{*} - 0.0056^{*}\ LPICAN + 0.9494^{*}\ LFDI(-1)$ $R^2 = 0.9934$

* Significant at the 5% level, one-tailed

Table 57 (continued)

Industry	*Regression Equation*
Mining and smelting	FDI=−98.2050* − 2.8735* GDPCAN + 4.3896* PRODCAN + 42.6277* DPOLRISK + 0.5260* FDI(-1) R^2=0.9535
Utilities	LFDI=0.2567 − 0.1099 DPOLRISK + 0.9654* LFDI(-1) R^2=0.9554
Merchandise	LFDI=8.0030* − 1.7430* LEER + 0.2316* $LGDPCAN^2$ R^2=0.9939
Finance	LFDI=−4.0028* + 2.3924* LGDPCAN − 0.4850 LPRODCAN R^2=0.9915
Total	LFDI=1.7539* − 0.3922* LEER + 0.0298* $LRELPROD^2$ + 0.8860* LFDI(-1) R^2=0.9992

* Significant at the 5% level, one-tailed

Table 58

Final Models (UK): Long-Run Equations

Industry	*Regression Equation*
Vegetable products	
Animal products	
Textiles	LFDI = 904.6261 * − 459.8934 * LERL + 102.8701 * $LERL^2$ − 7.6548 * $LERL^3$ + 7.8830 * LEER − 0.8494 * $LEER^2$ − 1.0321 LRELPROD − 71.1647 * LRELWAGE + 1.0059 * $LRELWAGE^3$
Wood & paper products	LFDI = −9.6398 * + 3.0399 * LRELPROD − 0.1229 DPOLRISK
Iron and products	FDI = −29.5794 * + 1.5469 * EER

* Significant at the 5% level, one-tailed

Table 58 (continued)

Industry	*Regression Equation*
Non-ferrous metals	
Non-metallic minerals	
Chemical & allied products	$LFDI = 2.8545 + 1.4973^{*}\ LEER + 1.5993^{*}\ LERRISK - 0.1913^{*}\ LERRISK^2 - 0.0882^{*}\ LRELGROW + 0.00757\ LRELGROW^2 - 1.8144^{*}\ LRELWAGE$
Manufacturing	
Petroleum and natural gas	

* Significant at the 5% level, one-tailed

Table 58 (continued)

Industry	*Regression Equation*
Mining and smelting	FDI = −47.5659* + 0.1133* ERRISK + 3.3621* GDPCAN − 1.9815* PRODCAN + 38.7321* DPOLRISK
Utilities	
Merchandise	
Finance	LFDI = −31.8786 + 1.6808* LERL − 1.8931* LEER + 2.8879 LGDPCAN − 4.4978* LPRODCAN + 9.8571* LWAGECAN − 0.9463* DPOLRISK − 0.0386* DLPICAN
Total	LFDI = −2902.0234* + 0.6562* LERRISK − 0.0745* $LERRISK^2$ + 2.6819* LGDPCAN + 2022.2643* LWAGECAN − 470.1150* $LWAGECAN^2$ + 36.3368* $LWAGECAN^3$

* Significant at the 5% level, one-tailed

Table 59

Final Models (U.S.): Long-Run Equations

Industry	*Regression Equation*
Vegetable products	
Animal products	
Textiles	LFDI=45.4802* − 23.7696* LRELPROD + 3.2393*LRELPROD^2
Wood & paper products	
Iron and products	LFDI=−7.0333 + 0.0025* LRELGROW + 3.5734* LRELPROD − 1.0011* LRELWAGE − 0.5876* DPOLRISK

* Significant at the 5% level, one-tailed

Table 59 (continued)

Industry	*Regression Equation*
Non-ferrous metals	
Non-metallic minerals	
Chemical & allied products	LFDI = 182.25* + 3.8000* LERRISK − 41.1333* LRELWAGE − 0.9667* LRELPI
Manufacturing	FDI = 3.2417* + 0.0013* $GDPCAN^2$
Petroleum and natural gas	LFDI = 5.3142* − 0.1107* LPICAN

* Significant at the 5% level, one-tailed

Table 59 (continued)

Industry	*Regression Equation*
Mining and smelting	FDI=-207.1835* - 6.0622* GDPCAN + 9.2608* PRODCAN + 89.9319* DPOLRISK
Utilities	LFDI=7.4191 - 3.1763 DPOLRISK
Merchandise	
Finance	
Total	LFDI=15.3851* - 3.4404* LEER + 0.2614* $LRELPROD^2$

* Significant at the 5% level, one-tailed

Table 60

Final Models (UK Versus U.S.): Short-Run (Partial Adjustment) Coefficients

	Partial Adjustment Coefficients	
Industry	*UK*	*U.S.*
Vegetable products		
Animal products		
Textiles	0.5951	0.2934
Wood and paper products	0.3962	
Iron and products	0.1291	0.1712
Non-ferrous metals		
Non-metallic minerals		
Chemical & allied products	0.3821	0.0060
Manufacturing		0.1262
Petroleum and natural gas		0.0506
Mining and smelting	0.7995	0.4740
Utilities		0.0346
Merchandise		
Finance	0.3443	
Total	0.3156	0.1140

Managerial Implications

United Kingdom

Probably the most important managerial implication of the results obtained is the possible link between lagged FDI and political risk. As shown above, the speed of adjustment for UK industries is relatively high which suggests (a) a firm decision to finalize the FDI move once the decision has been adopted and/or (b) a probable quick reaction to FDI moves made by potential/actual rival firms. However, when this fact is combined with the presence of a negatively-signed political risk variable, the high speed of adjustment may become a drawback in that it could be difficult to divest if the political circumstances required such a move.

Thus, UK managers should carefully weight the merits and disadvantages of historical high speed-of-adjustment coefficients in their respective industries.

United States

For U.S. managers, the major managerial implication is, again the link between lagged FDI and political risk. The slow speed of adjustment in many industries has the advantage of reducing the potential losses or increasing the likelihood of divestment successful moves due to an unfavourable political climate in the host country.

However, there is always the possible disadvantage of a correspondingly slow adjustment to FDI behavior by competing firms.

UK Versus U.S.

Both countries have pros and cons derived from their respetive speed-of-adjustment coefficients. U.S. managers could profit from this knowledge by increasing their speed of adjustment relative to the average speed for the respective industry as a whole, and, hence, achieve a quicker reaction to potential or actual FDI decisions made by rival firms. But, again, this reaction should be balanced against the increasing possibility of more difficult divestment decisions if so required by adverse changes in the political climate of the host nation.

The opposite case applies to UK managers. Reducing their already-high speed of adjustment, greatly enhances the probability of successful divestments in the presence of an adverse political climate. However, the capacity to respond to potential moves is also greatly dimished due to the lower-than-average speed of adjustment.

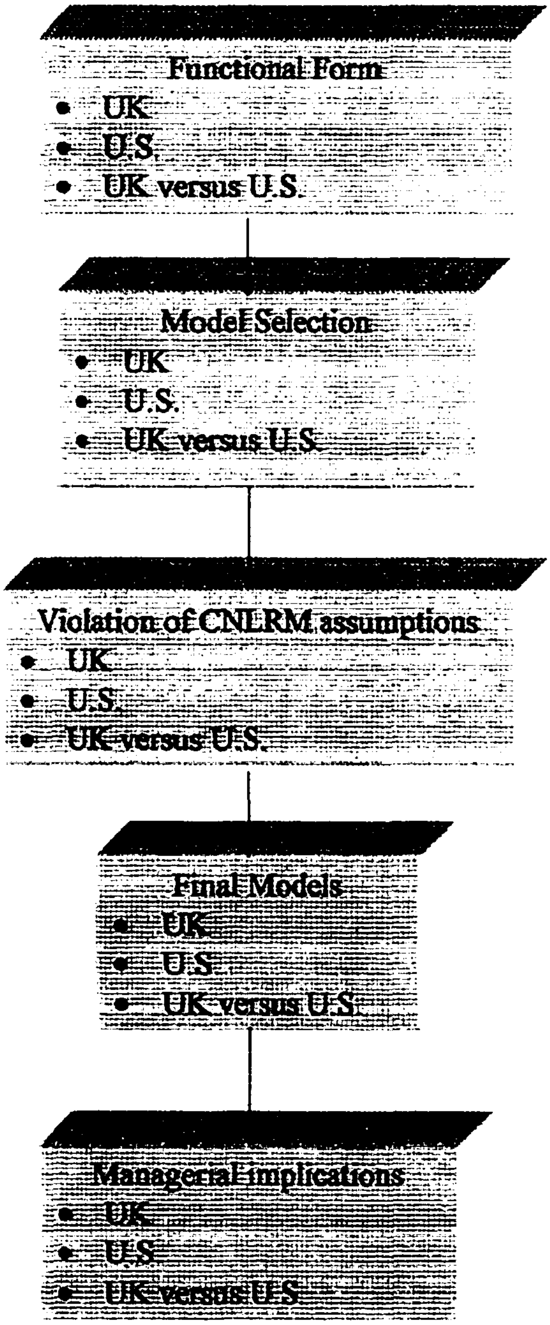
In summary, managers from both countries should (1) determine the average speed of adjustment for their respective industries, (2) work out the existing FDI made by competing firms –and their corresponding speed of adjustment-, and (3) develop scenarios with alternative speeds of adjustments, finally deciding which course to take.

Single-Equation Dynamic Regression Models: Almon Distributed-Lag Models

The procedure followed in this type of models is illustrated in Figure 26. The models will be first tested for functional form and then subjected to the model selection tests. No variable deletion/addition tests will be carried out for these models because they involve both a two-year lag and a second-degree polynomial (for a single explanatory variable), from which the Z, proxy, variables are constructed. Likewise, structural stability tests are omitted because they involve the use of dummy variables, which cannot be effectively built in Almon distributed-lag models. Three versions will be studied in the paper, in accordance with the type of restrictions placed on the paameters of the Z variables: (1) Model 1 (no endpoint restrictions), (2) Model 2 (restrictions at both ends of the quadratic polynomial), and (3) Model 3 (sum of the coefficients is equal to unity).

Figure 26

Single-Equation Dynamic Regression Models: Testing and Analysis Procedure for Almon Distributed-Lag Models



Functional Form

United Kingdom

For the absolute version, the most common functional form is the log-linear form, whereas for the relative version the linear form is present in all but one industries (Table 61).

United States

In both versions, 14 out of the 15 industries exhibit the log-linear form (Table 62).

UK Versus U.S.

In the absolute version, in both countries, there is a clear dominance of the log-linear form over the linear one, whereas in the relative version, U.S. industries are still favored by the log-linear form and UK industries are favored by the linear form (Table 63).

Table 61

Functional Form (UK): MWD and BM Tests

	Version	
Industry	*Absolute*	*Relative*
Vegetable products	Log-linear	Linear
Animal products	Linear	Log-linear
Textiles	Log-linear	Linear
Wood and paper products	Log-linear	Linear
Iron and products	Log-linear	Linear
Non-ferrous metals	Log-linear	Linear
Non-metallic minerals	Log-linear	Linear
Chemical & allied products	Log-linear	Linear
Manufacturing	Log-linear	Linear
Petroleum and natural gas	Log-linear	Linear
Mining and smelting	Log-linear	Linear
Utilities	Linear	Linear
Merchandise	Log-linear	Linear
Finance	Log-linear	Linear
Total	Log-linear	Linear

Table 62

Functional Form (U.S.): MWD and BM Tests

	Version	
Industry	*Absolute*	*Relative*
Vegetable products	Log-linear	Log-linear
Animal products	Linear	Log-linear
Textiles	Log-linear	Log-linear
Wood and paper products	Log-linear	Log-linear
Iron and products	Log-linear	Log-linear
Non-ferrous metals	Log-linear	Log-linear
Non-metallic minerals	Log-linear	Log-linear
Chemical & allied products	Log-linear	Log-linear
Manufacturing	Log-linear	Log-linear
Petroleum and natural gas	Log-linear	Log-linear
Mining and smelting	Log-linear	Linear
Utilities	Log-linear	Log-linear
Merchandise	Log-linear	Log-linear
Finance	Log-linear	Log-linear
Total	Log-linear	Log-linear

Table 63

Functional Form (UK Versus U.S.): MWD and BM Tests

	Version	
Industry	*Absolute*	*Relative*
Vegetable products	UK: Log-linear U.S.: Log-linear	UK: Linear U.S.: Log-linear
Animal products	UK: Linear U.S.: Linear	UK: Log-linear U.S.: Log-linear
Textiles	UK: Log-linear U.S.: Log-linear	UK: Linear U.S.: Log-linear
Wood and paper products	UK: Log-linear U.S.: Log-linear	UK: Linear U.S.: Log-linear
Iron and products	UK: Log-linear U.S.: Log-linear	UK: Linear U.S.: Log-linear
Non-ferrous metals	UK: Log-linear U.S.: Log-linear	UK: Linear U.S.: Log-linear
Non-metallic minerals	UK: Log-linear U.S.: Log-linear	UK: Linear U.S.: Log-linear
Chemical & allied products	UK: Log-linear U.S.: Log-linear	UK: Linear U.S.: Log-linear
Manufacturing	UK: Log-linear U.S.: Log-linear	UK: Linear U.S.: Log-linear
Petroleum and natural gas	UK: Log-linear U.S.: Log-linear	UK: Linear U.S.: Log-linear
Mining and smelting	UK: Log-linear U.S.: Log-linear	UK: Linear U.S.: Linear
Utilities	UK: Linear U.S.: Log-linear	UK: Linear U.S.: Log-linear
Merchandise	UK: Log-linear U.S.: Log-linear	UK: Linear U.S.: Log-linear
Finance	UK: Log-linear U.S.: Log-linear	UK: Linear U.S.: Log-linear
Total	UK: Log-linear U.S.: Log-linear	UK: Linear U.S.: Log-linear

Model Selection: Absolute Versus Relative Version

United Kingdom

Except for Animal Products, all other industries have the absolute version as the chosen one for the three models considered (Table 64).

United States

Except for Mining and Smelting, the selected version is the relative one for the three models under study (Table 65).

UK Versus U.S.

Two points are worth noting when comparingthe outcomes of model selection for the two countries (Table 66). First, with the exception of one industry in each country, the absolute version is chosen for the remaining UK industries, and the relative version for the U.S. industries. And second, the resulting functional form underlying each of the two versions is the same for both countries, namely, the log-linear form.

Table 64

Selection of Regression Models Based on Model Selection Tests (UK)

Industry	*Model Type**	*Version*
Vegetable products	Model 1	Absolute
	Model 2	Absolute
	Model 3	Absolute
Animal products	Model 1	Relative
	Model 2	Relative
	Model 3	Relative
Textiles	Model 1	Absolute
	Model 2	Absolute
	Model 3	Absolute
Wood and paper products	Model 1	Absolute
	Model 2	Absolute
	Model 3	Absolute
Iron and products	Model 1	Absolute
	Model 2	Absolute
	Model 3	Absolute
Non-ferrous metals	Model 1	Absolute
	Model 2	Absolute
	Model 3	Absolute
Non-metallic minerals	Model 1	Absolute
	Model 2	Absolute
	Model 3	Absolute
Chemical & allied products	Model 1	Absolute
	Model 2	Absolute
	Model 3	Absolute
Manufacturing	Model 1	Absolute
	Model 2	Absolute
	Model 3	Absolute
Petroleum and natural gas	Model 1	Absolute
	Model 2	Absolute
	Model 3	Absolute

*Model 1: No restrictions on the coefficients
Model 2: Endpoint restrictions at both ends of the quadratic polynomial
Model 3: Sum of the coefficients is equal to one.

Table 64 (continued)

Industry	*Model Type**	*Version*
Mining and smelting	Model 1	Absolute
	Model 2	Absolute
	Model 3	Absolute
Utilities	Model 1	Absolute
	Model 2	Absolute
	Model 3	Absolute
Merchandise	Model 1	Absolute
	Model 2	Absolute
	Model 3	Absolute
Finance	Model 1	Absolute
	Model 2	Absolute
	Model 3	Absolute
Total	Model 1	Absolute
	Model 2	Absolute
	Model 3	Absolute

*Model 1: No restrictions on the coefficients
Model 2: Endpoint restrictions at both ends of the quadratic polynomial
Model 3: Sum of the coefficients is equal to one.

Table 65

Selection of Regression Models Based on Model Selection Tests (U.S.)

Industry	*Model Type**	*Version*
Vegetable products	Model 1	Relative
	Model 2	Relative
	Model 3	Relative
Animal products	Model 1	Relative
	Model 2	Relative
	Model 3	Relative
Textiles	Model 1	Relative
	Model 2	Relative
	Model 3	Relative
Wood and paper products	Model 1	Relative
	Model 2	Relative
	Model 3	Relative
Iron and products	Model 1	Relative
	Model 2	Relative
	Model 3	Relative
Non-ferrous metals	Model 1	Relative
	Model 2	Relative
	Model 3	Relative
Non-metallic minerals	Model 1	Relative
	Model 2	Relative
	Model 3	Relative
Chemical & allied products	Model 1	Relative
	Model 2	Relative
	Model 3	Relative
Manufacturing	Model 1	Relative
	Model 2	Relative
	Model 3	Relative
Petroleum and natural gas	Model 1	Relative
	Model 2	Relative
	Model 3	Relative

*Model 1: No restrictions on the coefficients
Model 2: Endpoint restrictions at both ends of the quadratic polynomial
Model 3: Sum of the coefficients is equal to one.

Table 65 (continued)

Industry	*Model Type**	*Version*
Mining and smelting	Model 1	Absolute
	Model 2	Absolute
	Model 3	Absolute
Utilities	Model 1	Relative
	Model 2	Relative
	Model 3	Relative
Merchandise	Model 1	Relative
	Model 2	Relative
	Model 3	Relative
Finance	Model 1	Relative
	Model 2	Relative
	Model 3	Relative
Total	Model 1	Relative
	Model 2	Relative
	Model 3	Relative

*Model 1: No restrictions on the coefficients
Model 2: Endpoint restrictions at both ends of the quadratic polynomial
Model 3: Sum of the coefficients is equal to one.

Table 66

Selection of Regression Models Based on Model selection Tests (UK Versus U.S.)

Industry	*Model Type**	*UK*	*U.S.*
Vegetable products	Model 1	Absolute	Relative
	Model 2	Absolute	Relative
	Model 3	Absolute	Relative
Animal products	Model 1	Relative	Relative
	Model 2	Relative	Relative
	Model 3	Relative	Relative
Textiles	Model 1	Absolute	Relative
	Model 2	Absolute	Relative
	Model 3	Absolute	Relative
Wood and paper products	Model 1	Absolute	Relative
	Model 2	Absolute	Relative
	Model 3	Absolute	Relative
Iron and products	Model 1	Absolute	Relative
	Model 2	Absolute	Relative
	Model 3	Absolute	Relative
Non-ferrous metals	Model 1	Absolute	Relative
	Model 2	Absolute	Relative
	Model 3	Absolute	Relative
Non-metallic minerals	Model 1	Absolute	Relative
	Model 2	Absolute	Relative
	Model 3	Absolute	Relative
Chemical & allied products	Model 1	Absolute	Relative
	Model 2	Absolute	Relative
	Model 3	Absolute	Relative
Manufacturing	Model 1	Absolute	Relative
	Model 2	Absolute	Relative
	Model 3	Absolute	Relative
Petroleum and natural gas	Model 1	Absolute	Relative
	Model 2	Absolute	Relative
	Model 3	Absolute	Relative

*Model 1: No restrictions on the coefficients
Model 2: Endpoint restrictions at both ends of the quadratic polynomial
Model 3: Sum of the coefficients is equal to one.

Table 66 (continued)

Industry	*Model Type**	*UK*	*U.S.*
Mining and smelting	Model 1	Absolute	Absolute
	Model 2	Absolute	Absolute
	Model 3	Absolute	Absolute
Utilities	Model 1	Absolute	Relative
	Model 2	Absolute	Relative
	Model 3	Absolute	Relative
Merchandise	Model 1	Absolute	Relative
	Model 2	Absolute	Relative
	Model 3	Absolute	Relative
Finance	Model 1	Absolute	Relative
	Model 2	Absolute	Relative
	Model 3	Absolute	Relative
Total	Model 1	Absolute	Relative
	Model 2	Absolute	Relative
	Model 3	Absolute	Relative

*Model 1: No restrictions on the coefficients
Model 2: Endpoint restrictions at both ends of the quadratic polynomial
Model 3: Sum of the coefficients is equal to one.

Violation of CNLRM Assumptions

United Kingdom

The only violation that is present in all industries is autocorrelation (Table 67).

United States

Likewise, autocorrelation is the only type of violation affecting U.S. industries (Table 68).

UK Versus U.S.

All industry regressions from both countries suffer from the same type of violation due to the inclusion of lags for the one and only explanatory variable considered (Table 69). However, in this case, correcting for autocorrelation by the Cochrane-Orcutt method is likely to result in a specification bias, in terms of omitted variables.

Table 67

Violation of CNLRM Assumptions (UK)

Industry	*Assumption(s) violated**
Vegetable products	AC
Animal products	AC
Textiles	AC
Wood and paper products	AC
Iron and products	AC
Non-ferrous metals	AC
Non-metallic minerals	AC
Chemical & allied products	AC
Manufacturing	AC
Petroleum and natural gas	AC
Mining and smelting	AC
Utilities	AC
Merchandise	AC
Finance	AC
Total	AC

*AC: Autocorrelation; M: Multicollinearity; H: Heteroscedasticity; SE: Specification error; NN: Nonnormality

Table 68

Violation of CNLRM Assumptions (U.S.)

Industry	*Assumption(s) violated**
Vegetable products	AC
Animal products	AC
Textiles	AC
Wood and paper products	AC
Iron and products	AC
Non-ferrous metals	AC
Non-metallic minerals	AC
Chemical & allied products	AC
Manufacturing	AC
Petroleum and natural gas	AC
Mining and smelting	AC
Utilities	AC
Merchandise	AC
Finance	AC
Total	AC

*AC: Autocorrelation; M: Multicollinearity; H: Heteroscedasticity; SE: Specification error; NN: Nonnormality

Table 69

Violation of CNLRM Assumptions (UK Versus U.S.)

Industry	*UK**	*U.S.**
Vegetable products	AC	AC
Animal products	AC	AC
Textiles	AC	AC
Wood and paper products	AC	AC
Iron and products	AC	AC
Non-ferrous metals	AC	AC
Non-metallic minerals	AC	AC
Chemical & allied products	AC	AC
Manufacturing	AC	AC
Petroleum and natural gas	AC	AC
Mining and smelting	AC	AC
Utilities	AC	AC
Merchandise	AC	AC
Finance	AC	AC
Total	AC	AC

*AC: Autocorrelation; M: Multicollinearity; H: Heteroscedasticity; SE: Specification error; NN: Nonnormality

Final Models

United Kingdom

More than half of the industry regressions for Model 1 exhibit the following pattern: the coefficients first increase and then decrease with lag length; the turning point obviously being at lag 1 (Table 70). This result implies that, for the said industry regressions, FDI at time t is mostly affected by political instability (absolute or relative) at time t-1. The other regressions can be categorized into continuously decreasing or increasing coefficients, thus sggesting that the effect of political instability on FDI tapers off or increases with lag length.

However, there is one case –the Petroleum industry- where the coefficient of the political variable first decreases and then increases with lag length, that is, the effect of the political variable is at a minimum at the one-year lag.

In Model 2, the coefficient of the one-year lagged political variable is, in all industries, higher than the corresponding coefficient in Model 1, and statistically significant in most of the regressions. This suggests, comparing both models, that political instability at t-1 is a significant determinant of FDI at time t.

The regressions obtained for Model 3 are equal to those of Model 1, except for the coefficient of current political instability, which is the sum of the three coefficients obtained in Model 1. In all the regression equations, the coefficient of current political instability is statistically, significantly different from zero and from unity. This implies that other, longer, lags should be included in the regressions in order to (a) fully account for the effect of past values of political instability on current FDI and (b) determine which lag coefficients, apart from the one-year lagged coefficient, significantly affect current FDI.

United States

In eleven of the fifteen regression equations for Model 1, the pattern followed by the coefficients with respect to lag length is as follows: they first increase and then decrease (Table 71). In three of the remaining four regressions, the pattern of the coefficients is opposite that followed by the majority of the equations: they first decrease and then decrease. The one industry left shows a continuous increase in the coefficient with the lag length.

In Model 2, the coefficient of the one-year lagged political instability variable is statistically significant in all but one regressions, and its value is higher than the corresponding value of the variable in Model 1 in all but two regressions.

Except for two cases, the coefficient in Model 3 to be tested –that of current political instability- is statistically different from zero. In all regressions, that coefficient is also significantly different from unity.

UK Versus U.S.

In Model 1, the U.S. coefficients are higher than their UK counterparts in all but four industries, thus suggesting the propensity of U.S. investors to use short-run information on political instability in order to analyze the latter's effect on FDI (Table 72). However, this difference between the two countries is less pronounced in terms of Model 2 (Table 73), where, in six of the industries, the UK coefficient of the one-year lagged explanatory variable is higher than its U.S. counterpart.

Similarly, in Model 3, the value of the tested coefficient in five of the UK industry regressions than in the respective U.S. industry regressions (Table 74).

Table 70

Final Models (UK)

Industry	*Model 1*	*Coefficient*	*Model 2*	*Coefficient*	*Model 3*[a]	*Coefficient*
Vegetable products	CONSTANT	1.7080*	CONSTANT	2.1132*	CONSTANT	1.7084*
	LPICAN	0.0881	LPICAN(-1)	0.1049*	LPICAN	0.2487*
	LPICAN(-1)	0.0874			LPICAND1	0.0874
	LPICAN(-2)	0.0732			LPICAND2	0.0732
Animal products	CONSTANT	-0.4927	CONSTANT	-0.3150	CONSTANT	-0.4927
	LRELPI	-0.0663	LRELPI(-1)	-0.0749	LRELPI	-0.1765
	LRELPI(-1)	-0.0542			LRELPID1	-0.0542
	LRELPI(-2)	-0.0560			LRELPID2	-0.0560
Textiles	CONSTANT	3.1144*	CONSTANT	3.2883*	CONSTANT	3.1144*
	LPICAN	0.0299	LPICAN(-1)	0.0412	LPICAN	0.1036*
	LPICAN(-1)	0.0337			LPICAND1	0.0337
	LPICAN(-2)	0.0400			LPICAND2	0.0400
Wood & paper products	CONSTANT	3.6458*	CONSTANT	3.7725*	CONSTANT	3.6458*
	LPICAN	0.0259	LPICAN(-1)	0.0341	LPICAN	0.0792*
	LPICAN(-1)	0.0286			LPICAND1	0.0286
	LPICAN(-2)	0.0246			LPICAND2	0.0246
Iron and products	CONSTANT	2.8435*	CONSTANT	3.1552*	CONSTANT	2.8435*
	LPICAN	0.0699	LPICAN(-1)	0.0692	LPICAN	0.1797*
	LPICAN(-1)	0.0557			LPICAND1	0.0557
	LPICAN(-2)	0.0541			LPICAND2	0.0541

[a] LPICAND1 = LPICAN(-1) - LPICAN; LPID2 = LPICAN(-2)–LPICAN; the same applies to LRELPID1 and LRELPID2

* Significant at 5%, one-tailed level

Table 70 (continued)

Industry	*Model 1*	*Coefficient*	*Model 2*	*Coefficient*	*Model 3[a]*	*Coefficient*
Non-ferrous metals	CONSTANT	1.9846*	CONSTANT	2.3184*	CONSTANT	1.9846*
	LPICAN	0.0682	LPICAN(-1)	0.1030*	LPICAN	0.2218*
	LPICAN(-1)	0.0885			LPICAND1	0.0885
	LPICAN(-2)	0.0651			LPICAND2	0.0651
Non-metallic minerals	CONSTANT	3.4956*	CONSTANT	3.7193*	CONSTANT	3.4956*
	LPICAN	0.0532	LPICAN(-1)	0.0595	LPICAN	0.1385*
	LPICAN(-1)	0.0498			LPICAND1	0.0498
	LPICAN(-2)	0.0356			LPICAND2	0.0356
Chemical & allied products	CONSTANT	2.3936*	CONSTANT	2.6870*	CONSTANT	2.3936*
	LPICAN	0.0445	LPICAN(-1)	0.0887*	LPICAN	0.1945*
	LPICAN(-1)	0.0761			LPICAND1	0.0761
	LPICAN(-2)	0.0739			LPICAND2	0.0739
Manufacturing	CONSTANT	2.7925*	CONSTANT	3.0908*	CONSTANT	2.7925*
	LPICAN	0.0606	LPICAN(-1)	0.0794*	LPICAN	0.1856*
	LPICAN(-1)	0.0665			LPICAND1	0.0665
	LPICAN(-2)	0.0586			LPICAND2	0.0586
Petroleum and natural gas	CONSTANT	2.4007*	CONSTANT	3.1270*	CONSTANT	2.4007*
	LPICAN	0.1831*	LPICAN(-1)	0.1419*	LPICAN	0.3964*
	LPICAN(-1)	0.0983			LPICAND1	0.0983
	LPICAN(-2)	0.1151			LPICAND2	0.1151

[a] LPICAND1 = LPICAN(-1) - LPICAN; LPICAND2 = LPICAN(-2) - LPICAN

* Significant at 5%, one-tailed level

Table 70 (continued)

Industry	*Model 1*	*Coefficient*	*Model 2*	*Coefficient*	*Model 3*[a]	*Coefficient*
Mining and smelting	CONSTANT	3.0845*	CONSTANT	3.4743*	CONSTANT	3.0845*
	LPICAN	0.0756	LPICAN(-1)	0.1067*	LPICAN	0.2458*
	LPICAN(-1)	0.0898			LPICAND1	0.0898
	LPICAN(-2)	0.0804			LPICAND2	0.0804
Utilities	CONSTANT	110.7410*	CONSTANT	123.3405	CONSTANT	110.7410*
	LPICAN	0.2478*	LPICAN(-1)	*	LPICAN	0.3006*
	LPICAN(-1)	0.1496		0.1596*	LPICAND1	0.1496
	LPICAN(-2)	-0.0968			LPICAND2	-0.0968
Merchandise	CONSTANT	3.3339*	CONSTANT	3.5698*	CONSTANT	3.3339*
	LPICAN	0.0506	LPICAN(-1)	0.0673*	LPICAN	0.1511*
	LPICAN(-1)	0.0571*			LPICAND1	0.0571*
	LPICAN(-2)	0.0434			LPICAND2	0.0434
Finance	CONSTANT	1.7525*	CONSTANT	2.3029*	CONSTANT	1.7525*
	LPICAN	0.0969	LPICAN(-1)	0.1445*	LPICAN	0.3419*
	LPICAN(-1)	0.1208			LPICAND1	0.1208
	LPICAN(-2)	0.1242*			LPICAND2	0.1242*
Total	CONSTANT	2.6109*	CONSTANT	3.0061*	CONSTANT	2.6109*
	LPICAN	0.0756	LPICAN(-1)	0.1045*	LPICAN	0.2456*
	LPICAN(-1)	0.0874*			LPICAND1	0.0874*
	LPICAN(-2)	0.0826			LPICAND2	0.0826

[a] LPICAND1 = LPICAN(-1) – LPICAN; LPICAND2 = LPICAN(-2) – LPICAN

* Significant at 5%, one-tailed level

Table 71

Final Models (U.S.)

Industry	*Model 1*	*Coefficient*	*Model 2*	*Coefficient*	*Model 3*[a]	*Coefficient*
Vegetable	CONSTANT	3.7777*	CONSTANT	3.3228*	CONSTANT	3.7777*
products	LRELPI	0.1143*	LRELPI(-1)	0.1386*	LRELPI	0.3147*
	LRELPI(-1)	0.1175*			LRELPID1	0.1174*
	LRELPI(-2)	0.0833*			LRELPID2	0.0831*
Animal	CONSTANT	5.4122*	CONSTANT	5.3711*	CONSTANT	5.4122*
products	LRELPI	0.0212	LRELPI(-1)	0.0309	LRELPI	0.0474
	LRELPI(-1)	0.0280			LRELPID1	0.0280
	LRELPI(-2)	-0.0022			LRELPID2	-0.0017
Textiles	CONSTANT	4.0448*	CONSTANT	3.6602*	CONSTANT	4.0448*
	LRELPI	0.0957*	LRELPI(-1)	0.1163*	LRELPI	0.2652*
	LRELPI(-1)	0.0985*			LRELPID1	0.0985*
	LRELPI(-2)	0.0709			LRELPID2	0.0710
Wood &	CONSTANT	3.7756*	CONSTANT	3.5199*	CONSTANT	3.7756*
paper	LRELPI	0.0574	LRELPI(-1)	0.0851*	LRELPI	0.1838*
products	LRELPI(-1)	0.0739*			LRELPID1	0.0739*
	LRELPI(-2)	0.0524			LRELPID2	0.0525
Iron and	CONSTANT	3.8912*	CONSTANT	3.4474*	CONSTANT	3.8912*
products	LRELPI	0.1104*	LRELPI(-1)	0.0569*	LRELPI	0.3121*
	LRELPI(-1)	0.1197*			LRELPID1	0.1198*
	LRELPI(-2)	0.0818			LRELPID2	0.0819

[a] LRELPID1 = LRELPI(-1) - LRELPI; LRELPID2 = LRELPI(-2) - LRELPI

* Significant at 5%, one-tailed level

Table 71 (continued)

Industry	*Model 1*	*Coefficient*	*Model 2*	*Coefficient*	*Model 3[a]*	*Coefficient*
Non-ferrous metals	CONSTANT LRELPI LRELPI(-1) LRELPI(-2)	3.9236* 0.0683* 0.0755* 0.0487	CONSTANT LRELPI(-1)	3.6543* 0.0881*	CONSTANT LRELPI LRELPID1 LRELPID2	3.9236* 0.1924* 0.0755* 0.0486
Non-metallic minerals	CONSTANT LRELPI LRELPI(-1) LRELPI(-2)	3.9061* 0.1332* 0.0765* 0.1257*	CONSTANT LRELPI(-1)	3.3581* 0.1016*	CONSTANT LRELPI LRELPID1 LRELPID2	3.9061* 0.3136* 0.0766* 0.1038*
Chemical & allied products	CONSTANT LRELPI LRELPI(-1) LRELPI(-2)	3.8479* 0.1071* 0.1165* 0.0767	CONSTANT LRELPI(-1)	3.4249* 0.1362*	CONSTANT LRELPI LRELPID1 LRELPID2	3.8479* 0.3001* 0.1165* 0.0765
Manufacturing	CONSTANT LRELPI LRELPI(-1) LRELPI(-2)	4.1178* 0.0963* 0.1005* 0.0729*	CONSTANT LRELPI(-1)	3.7271* 0.1185*	CONSTANT LRELPI LRELPID1 LRELPID2	4.1178* 0.2697* 0.1005* 0.0729
Petroleum and natural gas	CONSTANT LRELPI LRELPI(-1) LRELPI(-2)	4.3067* 0.1027* 0.0567 0.0617	CONSTANT LRELPI(-1)	3.9478* 0.0861*	CONSTANT LRELPI LRELPID1 LRELPID2	4.3067* 0.2209* 0.0566 0.0615

[a] LRELPID1 = LRELPI(-1) − LRELPI; LRELPID2 = LRELPI(-2) − LRELPI

* Significant at 5%, one-tailed level

Table 71 (continued)

Industry	*Model 1*	*Coefficient*	*Model 2*	*Coefficient*	*Model 3*^a^	*Coefficient*
Mining and smelting	CONSTANT	4.0523*	CONSTANT	4.2482*	CONSTANT	4.0523*
	LPICAN	0.0279	LPICAN(-1)	0.0531*	LPICAN	0.1239*
	LPICAN(-1)	0.0447			LPICAND1	0.0447
	LPICAN(-2)	0.0512*			LPICAND2	0.0513*
Utilities	CONSTANT	4.5842*	CONSTANT	4.2421*	CONSTANT	4.5842*
	LRELPI	0.0729*	LRELPI(-1)	0.0822*	LRELPI	0.2140*
	LRELPI(-1)	0.0675*			LRELPID1	0.0676*
	LRELPI(-2)	0.0734*			LRELPID2	0.0735*
Merchandise	CONSTANT	4.0984*	CONSTANT	3.6646*	CONSTANT	4.0984*
	LRELPI	0.1099*	LRELPI(-1)	0.1359*	LRELPI	0.3039*
	LRELPI(-1)	0.1156*			LRELPID1	0.1156*
	LRELPI(-2)	0.0785			LRELPID2	0.0784
Finance	CONSTANT	4.0568*	CONSTANT	3.6040*	CONSTANT	4.0568*
	LRELPI	0.1140*	LRELPI(-1)	0.1435*	LRELPI	0.3188*
	LRELPI(-1)	0.1224*			LRELPID1	0.1224*
	LRELPI(-2)	0.0824			LRELPID2	0.0825
Total	CONSTANT	4.1436*	CONSTANT	3.7984*	CONSTANT	4.1436*
	LRELPI	0.0862*	LRELPI(-1)	0.1149*	LRELPI	0.2486*
	LRELPI(-1)	0.0989*			LRELPID1	0.0989*
	LRELPI(-2)	0.0634			LRELPID2	0.0635

^a^LRELPID1 = LRELPI(-1) - LRELPI; LRELPID2 = LRELPI(-2)-LRELPI ; the same applies to LPICAND1 and LPICAND2

* Significant at 5%, one-tailed level

Table 72

Final Models (UK Versus U.S.): Model 1

Industry	*Model 1 (UK)*	*Coefficient (UK)*	*Model 1 (U.S.)*	*Coefficient (U.S.)*
Vegetable products	CONSTANT	1.7080*	CONSTANT	3.7777*
	LPICAN	0.0881	LRELPI	0.1143*
	LPICAN(-1)	0.0874	LRELPI(-1)	0.1175*
	LPICAN(-2)	0.0732	LRELPI(-2)	0.0833*
Animal products	CONSTANT	-0.4927	CONSTANT	5.4122*
	LRELPI	-0.0663	LRELPI	0.0212
	LRELPI(-1)	-0.0542	LRELPI(-1)	0.0280
	LRELPI(-2)	-0.0560	LRELPI(-2)	-0.0022
Textiles	CONSTANT	3.1144*	CONSTANT	4.0448*
	LPICAN	0.0299	LRELPI	0.0957*
	LPICAN(-1)	0.0337	LRELPI(-1)	0.0985*
	LPICAN(-2)	0.0400	LRELPI(-2)	0.0709
Wood & paper products	CONSTANT	3.6458*	CONSTANT	3.7756*
	LPICAN	0.0259	LRELPI	0.0574
	LPICAN(-1)	0.0286	LRELPI(-1)	0.0739*
	LPICAN(-2)	0.0246	LRELPI(-2)	0.0524
Iron and products	CONSTANT	2.8435*	CONSTANT	3.8912*
	LPICAN	0.0699	LRELPI	0.1104*
	LPICAN(-1)	0.0557	LRELPI(-1)	0.1197*
	LPICAN(-2)	0.0541	LRELPI(-2)	0.0818

* Significant at the 5% level, one-tailed

Table 72 (continued)

Industry	*Model 1 (UK)*	*Coefficient (UK)*	*Model 1 (U.S.)*	*Coefficient (U.S.)*
Non-ferrous metals	CONSTANT	1.9846*	CONSTANT	3.9236*
	LPICAN	0.0682	LRELPI	0.0683*
	LPICAN(-1)	0.0885	LRELPI(-1)	0.0755*
	LPICAN(-2)	0.0651	LRELPI(-2)	0.0487
Non-metallic minerals	CONSTANT	3.4956*	CONSTANT	3.9061*
	LPICAN	0.0532	LRELPI	0.1332*
	LPICAN(-1)	0.0498	LRELPI(-1)	0.0765*
	LPICAN(-2)	0.0356	LRELPI(-2)	0.1257*
Chemical & allied products	CONSTANT	2.3936*	CONSTANT	3.8479*
	LPICAN	0.0445	LRELPI	0.1071*
	LPICAN(-1)	0.0761	LRELPI(-1)	0.1165*
	LPICAN(-2)	0.0739	LRELPI(-2)	0.0767
Manufacturing	CONSTANT	2.7925*	CONSTANT	4.1178*
	LPICAN	0.0606	LRELPI	0.0963*
	LPICAN(-1)	0.0665	LRELPI(-1)	0.1005*
	LPICAN(-2)	0.0586	LRELPI(-2)	0.0729*
Petroleum and natural gas	CONSTANT	2.4007*	CONSTANT	4.3067*
	LPICAN	0.1831*	LRELPI	0.1027*
	LPICAN(-1)	0.0983	LRELPI(-1)	0.0567
	LPICAN(-2)	0.1151	LRELPI(-2)	0.0617

* Significant at the 5% level, one-tailed

Table 72 (continued)

Industry	*Model 1 (UK)*	*Coefficient (UK)*	*Model 1 (U.S.)*	*Coefficient (U.S.)*
Mining and smelting	CONSTANT	3.0845*	CONSTANT	4.0523*
	LPICAN	0.0756	LPICAN	0.0279
	LPICAN(-1)	0.0898	LPICAN(-1)	0.0447
	LPICAN(-2)	0.0804	LPICAN(-2)	0.0512*
Utilities	CONSTANT	110.7410*	CONSTANT	4.5842*
	LPICAN	0.2478*	LRELPI	0.0729*
	LPICAN(-1)	0.1496	LRELPI(-1)	0.0675*
	LPICAN(-2)	-0.0968	LRELPI(-2)	0.0734*
Merchandise	CONSTANT	3.3339*	CONSTANT	4.0984*
	LPICAN	0.0506	LRELPI	0.1099*
	LPICAN(-1)	0.0571*	LRELPI(-1)	0.1156*
	LPICAN(-2)	0.0434	LRELPI(-2)	0.0785
Finance	CONSTANT	1.7525*	CONSTANT	4.0568*
	LPICAN	0.0969	LRELPI	0.1140*
	LPICAN(-1)	0.1208	LRELPI(-1)	0.1224*
	LPICAN(-2)	0.1242*	LRELPI(-2)	0.0824
Total	CONSTANT	2.6109*	CONSTANT	4.1436*
	LPICAN	0.0756	LRELPI	0.0862*
	LPICAN(-1)	0.0874*	LRELPI(-1)	0.0989*
	LPICAN(-2)	0.0826	LRELPI(-2)	0.0634

* Significant at the 5% level, one-tailed

Table 73

Final Models (UK Versus U.S.): Model 2

Industry	*Model 2 (UK)*	*Coefficient (UK)*	*Model 2 (U.S.)*	*Coefficient (U.S.)*
Vegetable products	CONSTANT LPICAN(-1)	2.1132* 0.1049*	CONSTANT LRELPI(-1)	3.3228* 0.1386*
Animal products	CONSTANT LRELPI(-1)	-0.3150 -0.0749	CONSTANT LRELPI(-1)	5.3711* 0.0309
Textiles	CONSTANT LPICAN(-1)	3.2883* 0.0412	CONSTANT LRELPI(-1)	3.6602* 0.1163*
Wood & paper products	CONSTANT LPICAN(-1)	3.7725* 0.0341	CONSTANT LRELPI(-1)	3.5199* 0.0851*
Iron and products	CONSTANT LPICAN(-1)	3.1552* 0.0692	CONSTANT LRELPI(-1)	3.4474* 0.0569*

* Significant at the 5% level, one-tailed

Table 73 (continued)

Industry	*Model 2 (UK)*	*Coefficient (UK)*	*Model 2 (U.S.)*	*Coefficient (U.S.)*
Non-ferrous metals	CONSTANT LPICAN(-1)	2.3184* 0.1030*	CONSTANT LRELPI(-1)	3.6543* 0.0881*
Non-metallic minerals	CONSTANT LPICAN(-1)	3.7193* 0.0595	CONSTANT LRELPI(-1)	3.3581* 0.1016*
Chemical & allied products	CONSTANT LPICAN(-1)	2.6870* 0.0887*	CONSTANT LRELPI(-1)	3.4249* 0.1362*
Manufacturing	CONSTANT LPICAN(-1)	3.0908* 0.0794*	CONSTANT LRELPI(-1)	3.7271* 0.1185*
Petroleum and natural gas	CONSTANT LPICAN(-1)	3.1270* 0.1419*	CONSTANT LRELPI(-1)	3.9478* 0.0861*

* Significant at the 5% level, one-tailed

Table 73 (continued)

Industry	*Model 2 (UK)*	*Coefficient (UK)*	*Model 2 (U.S.)*	*Coefficient (U.S.)*
Mining and smelting	CONSTANT LPICAN(-1)	3.4743* 0.1067*	CONSTANT LPICAN(-1)	4.2482* 0.0531*
Utilities	CONSTANT LPICAN(-1)	123.3405* 0.1596*	CONSTANT LRELPI(-1)	4.2421* 0.0822*
Merchandise	CONSTANT LPICAN(-1)	3.5698* 0.0673*	CONSTANT LRELPI(-1)	3.6646* 0.1359*
Finance	CONSTANT LPICAN(-1)	2.3029* 0.1445*	CONSTANT LRELPI(-1)	3.6040* 0.1435*
Total	CONSTANT LPICAN(-1)	3.0061* 0.1045*	CONSTANT LRELPI(-1)	3.7984* 0.1149*

* Significant at the 5% level, one-tailed

Table 74

Final Models (UK Versus U.S.): Model 3

Industry	*Model 3[a] (UK)*	*Coefficient (UK)*	*Model 3[a] (U.S.)*	*Coefficient (U.S.)*
Vegetable products	CONSTANT	1.7084*	CONSTANT	3.7777*
	LPICAN	0.2487*	LRELPI	0.3147*
	LPICAND1	0.0874	LRELPID1	0.1174*
	LPICAND2	0.0732	LRELPID2	0.0831*
Animal products	CONSTANT	-0.4927	CONSTANT	5.4122*
	LRELPI	-0.1765	LRELPI	0.0474
	LRELPID1	-0.0542	LRELPID1	0.0280
	LRELPID2	-0.0560	LRELPID2	-0.0017
Textiles	CONSTANT	3.1144*	CONSTANT	4.0448*
	LPICAN	0.1036*	LRELPI	0.2652*
	LPICAND1	0.0337	LRELPID1	0.0985*
	LPICAND2	0.0400	LRELPID2	0.0710
Wood & paper products	CONSTANT	3.6458*	CONSTANT	3.7756*
	LPICAN	0.0792*	LRELPI	0.1838*
	LPICAND1	0.0286	LRELPID1	0.0739*
	LPICAND2	0.0246	LRELPID2	0.0525
Iron and products	CONSTANT	2.8435*	CONSTANT	3.8912*
	LPICAN	0.1797*	LRELPI	0.3121*
	LPICAND1	0.0557	LRELPID1	0.1198*
	LPICAND2	0.0541	LRELPID2	0.0819

[a] LRELPID1 = LRELPI(-1) - LRELPI; LRELPID2 = LRELPI(-2) - LRELPI ; the same applies to LPICAND1 and LPICAND2

* Significant at 5%, one-tailed level

Table 74 (continued)

Industry	*Model 3[a] (UK)*	*Coefficient (UK)*	*Model 3[a] (U.S.)*	*Coefficient (U.S.)*
Non-ferrous metals	CONSTANT	1.9846*	CONSTANT	3.9236*
	LPICAN	0.2218*	LRELPI	0.1924*
	LPICAND1	0.0885	LRELPID1	0.0755*
	LPICAND2	0.0651	LRELPID2	0.0486
Non-metallic minerals	CONSTANT	3.4956*	CONSTANT	3.9061*
	LPICAN	0.1385*	LRELPI	0.3136*
	LPICAND1	0.0498	LRELPID1	0.0766*
	LPICAND2	0.0356	LRELPID2	0.1038*
Chemical & allied products	CONSTANT	2.3936*	CONSTANT	3.8479*
	LPICAN	0.1945*	LRELPI	0.3001*
	LPICAND1	0.0761	LRELPID1	0.1165*
	LPICAND2	0.0739	LRELPID2	0.0765
Manufacturing	CONSTANT	2.7925*	CONSTANT	4.1178*
	LPICAN	0.1856*	LRELPI	0.2697*
	LPICAND1	0.0665	LRELPID1	0.1005*
	LPICAND2	0.0586	LRELPID2	0.0729
Petroleum and natural gas	CONSTANT	2.4007*	CONSTANT	4.3067*
	LPICAN	0.3964*	LRELPI	0.2209*
	LPICAND1	0.0983	LRELPID1	0.0566
	LPICAND2	0.1151	LRELPID2	0.0615

[a] LRELPID1 = LRELPI(-1) – LRELPI; LRELPID2 = LRELPI(-2) – LRELPI ; the same applies to LPICAND1 and LPICAND2

* Significant at 5%, one-tailed level

Table 74 (continued)

Industry	*Model 3[a] (UK)*	*Coefficient (UK)*	*Model 3[a] (U.S.)*	*Coefficient (U.S.)*
Mining and smelting	CONSTANT	3.0845*	CONSTANT	4.0523*
	LPICAN	0.2458*	LPICAN	0.1239*
	LPICAND1	0.0898	LPICAND1	0.0447
	LPICAND2	0.0804	LPICAND2	0.0513*
Utilities	CONSTANT	110.7410*	CONSTANT	4.5842*
	LPICAN	0.3006*	LRELPI	0.2140*
	LPICAND1	0.1496	LRELPID1	0.0676*
	LPICAND2	-0.0968	LRELPID2	0.0735*
Merchandise	CONSTANT	3.3339*	CONSTANT	4.0984*
	LPICAN	0.1511*	LRELPI	0.3039*
	LPICAND1	0.0571*	LRELPID1	0.1156*
	LPICAND2	0.0434	LRELPID2	0.0784
Finance	CONSTANT	1.7525*	CONSTANT	4.0568*
	LPICAN	0.3419*	LRELPI	0.3188*
	LPICAND1	0.1208	LRELPID1	0.1224*
	LPICAND2	0.1242*	LRELPID2	0.0825
Total	CONSTANT	2.6109*	CONSTANT	4.1436*
	LPICAN	0.2456*	LRELPI	0.2486*
	LPICAND1	0.0874*	LRELPID1	0.0989*
	LPICAND2	0.0826	LRELPID2	0.0635

[a] LRELPID1 = LRELPI(-1) – LRELPI; LRELPID2 = LRELPI(-2) – LRELPI ; the same applies to LPICAND1 and LPICAND2

* Significant at 5%, one-tailed level

Managerial Implications

United Kingdom

UK managers should note the major advantage and major drawback of the long-distributed impact of past political instability on current FDI. The advantage lies in the comprehensive perspective that might come from using far-fetched data on political instability and the latter's effect on FDI. However, the implicit drawback in this approach is the probable inability to quickly respond to any positive/negative changes in the political situation in the host country. Thus, there is a need to careful weight the effects of these two opposing forces.

United States

For U.S. managers the advantage of their shorter-distributed impact of past political instability on current FDI comes in the form of a quick-response ability to any changes in the political climate of the host country. However, the major disadvantage is the lack of a long, extensive picture on the effect of past political instability on FDI.

UK Versus U.S.

The advantage and disadvantage of each country's approach –as suggested by the findings obtained- calls for a close monitoring of (a) the difference between a firm's time needed to carry out FDI moves and the relevant industry's average (e.g. as suggested for the partial adjustment models) and (b) the relevant industry's theoretical lag length of the political instability variable (using Model 3 and increase lag length until the tested coefficient shows statistical significance not different from unity). The first step should give a reaction-time coefficient and the second step would yield the appropriate informative model to use.

Granger Causality

Because of the lags involved, distributed and/or autoregressive models raise the topic of causality in economic variables. Granger's causality test has received considerable attention in applied work and, hence, it is employed in this paper to test for the direction, or lack, of causality for FDI and political instability. The procedure used follows that explained in the previous chapter and involves a lag length of two periods for both variables. The choice of the lag length is based on mainstream applied FDI work – discussed in Chapter 3- which assumes a maximum of two-period lags in empirical analysis. The test will be conducted for all industries, for both countries, for each version and for each functional form.

United Kingdom

In the absolute version, the following conclusions can be drawn from Table 75. Firstly, independence between FDI and political instability is only present, except for one case, in the linear functional form. Secondly, wherever there is a unilateral causality, it usually flows from FDI to political instability, and normally corresponds to the log-linear functional form. Thirdly, there are seven cases of bilateral causality between the two variables, all cases being in the log-linear functional form. Finally, for each industry, there is a least one case of non-independence between FDI and political instability.

In the relative version (Table 76), there is a greater number of independence cases than in the absolute version, and from the six cases of unilateral causality, five now flow from political instability to FDI. Furthermore, there is just one case of bilateral causality compared to the seven cases in the absolute version.

For managers, the Granger causality test may be helpful in determining which version, absolute or/and relative, they should employ when incorporating political instability into their decision-making models. Thus, for example, if a manager from the Textiles industry wishes to introduce a political instability factor in an assessment model of FDI viability, then, according to the results obtained here, the most appropriate functional form would be the log-linear one, for both versions. Furthermore, in the case of this industry in the absolute version, the fact that there is a bilateral causality between the two variables might initially suggest the use of a simultaneous-equation model, where the effects of the two variables on each other can be taken into account.

Table 75

Granger Causality Test (UK): Absolute Version

Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Vegetable products	Linear	PI → FDI FDI → PI	0.578 0.460	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	0.887 7.417	Reject Fail to reject	LFDI→LPI
Animal products	Linear	PI → FDI FDI → PI	5.040 1.223	Fail to reject Reject	PI→FDI
	Log-linear	LPI → LFDI LFDI → LPI	0.541 0.109	Reject Reject	Independence
Textiles	Linear	PI → FDI FDI → PI	2.441 1.339	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	3.435 6.894	Fail to reject Fail to reject	Bilateral causality
Wood & paper products	Linear	PI → FDI FDI → PI	0.444 1.542	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	10.851 6.583	Fail to reject Fail to reject	Bilateral causality

Table 75 (continued)

Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Iron and products	Linear	PI → FDI FDI → PI	0.186 3.088	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	5.848 7.845	Fail to reject Fail to reject	Bilateral causality
Non-ferrous metals	Linear	PI → FDI FDI → PI	0.829 0.595	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	1.558 8.168	Reject Fail to reject	LFDI→LPI
Non-metallic minerals	Linear	PI → FDI FDI → PI	0.386 0.703	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	3.734 7.019	Fail to reject Fail to reject	Bilateral causality
Chemical & allied products	Linear	PI → FDI FDI → PI	0.386 2.204	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	1.942 8.592	Reject Fail to reject	LFDI→LPI

Table 75 (continued)

Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Manufacturing	Linear	PI → FDI FDI → PI	0.189 1.013	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	4.274 8.192	Fail to reject Fail to reject	Bilateral causality
Petroleum and natural gas	Linear	PI → FDI FDI → PI	0.899 1.494	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	3.2751 13.818	Fail to reject Fail to reject	Bilateral causality
Mining and smelting	Linear	PI → FDI FDI → PI	2.185 0.757	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	0.834 7.214	Reject Fail to reject	LFDI→LPI
Utilities	Linear	PI → FDI FDI → PI	1.446 4.826	Reject Fail to reject	FDI→PI
	Log-linear	LPI → LFDI LFDI → LPI	0.691 6.105	Reject Fail to reject	LFDI→LPI

Table 75 (continued)

Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Merchandise	Linear	PI → FDI FDI → PI	0.519 2.081	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	2.584 7.667	Reject Fail to reject	LFDI→LPI
Finance	Linear	PI → FDI FDI → PI	1.123 0.506	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	13.212 6.747	Fail to reject Fail to reject	Bilateral causality
Total	Linear	PI → FDI FDI → PI	0.775 1.065	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	0.228 8.798	Reject Fail to reject	LFDI→LPI

United States

In the absolute version, except for Non-Ferrous Metals, all other industries display independence of the two variables in the linear form, and unilateral causality from FDI to political instability in the log-linear form (Table 77). No bilateral causality is present in any of the industries, in either of the two functional forms.

In the relative version, the most important aspect to note is the presence of only five cases of independence, all in the log-linear form, between the two variables (Table 78). The major part of the remaining cases reflect unilateral causality from FDI to political instability, mostly in the linear form. Bilateral causality is present in only three cases.

One major conclusion from the results above is the high number of industries exhibiting unilateral causality from FDI to political instability, thus suggesting the need to reassess the traditional relationship between the two variables in such a way as to take into account the possibility that FDI precedes, Granger-causes, political instability –a fact that has rarely been proposed in the empirical studies of the two variables.

For managers, the results would indicate the need to employ models that would also reflect the possible influence of FDI on political instability, that is, the political consequences in the host nation and/or home country of FDI strategies. For, then, those political reactions might revert back to a firm's present and future FDI behavior.

UK Versus U.S.

Comparing the two countries, the following facts stand out. Firstly, the absolute version shows quite similar patterns of independence of the two variables in the linear form and unilateral causality from FDI to political instability in the log-linear form. Secondly, in the absolute version, the number of cases of unilateral causality from FDI to political instability in the U.S. is double the number of cases in the UK. Thirdly, in the relative version, the number of cases of unilateral causality from political instability to FDI in the U.S. is about the same as those in the UK. Fourthly, whereas for the UK in the relative version, there is only one case of unilateral causality from FDI to political instability, in the U.S. the number of such cases rises up to seventeen. Finally, the number of bilateral causality cases in the absolute version in the UK is greater than in the U.S., whereas the opposite is true in the relative version.

For managers of both countries, the major point to note, and to act upon, is the extensive presence of cases of unilateral causality from FDI to political instability, that is, the recognition that, contrary to what is normally believed, FDI can, indeed does, impact political instability, which, in turn, can affect FDI. Managers should realize the possibility of a two-way relationship between the two variables.

Table 76

Granger Causality Test (UK): Relative Version

Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Vegetable products	Linear	PI → FDI FDI → PI	0.001 0.009	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	1.278 0.039	Reject Reject	Independence
Animal products	Linear	PI → FDI FDI → PI	0.056 0.149	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	0.301 0.025	Reject Reject	Independence
Textiles	Linear	PI → FDI FDI → PI	0.198 0.235	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	3.915 1.870	Fail to reject Reject	LPI→LFDI
Wood & paper products	Linear	PI → FDI FDI → PI	0.368 0.178	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	12.809 1.824	Fail to reject Reject	LPI→LFDI

Table 76 (continued)

Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Iron and products	Linear	PI → FDI FDI → PI	2.344 0.490	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	11.048 2.270	Fail to reject Reject	LPI→LFDI
Non-ferrous metals	Linear	PI → FDI FDI → PI	0.014 0.004	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	1.500 3.289	Reject Fail to reject	LFDI→LPI
Non-metallic minerals	Linear	PI → FDI FDI → PI	0.026 0.044	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	4.317 2.481	Fail to reject Reject	LPI→LFDI
Chemical & allied products	Linear	PI → FDI FDI → PI	0.435 0.021	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	1.244 1.941	Reject Reject	Independence

Table 76 (continued)

Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Manufacturing	Linear	PI → FDI FDI → PI	0.046 0.032	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	3.424 1.667	Fail to reject Reject	LPI→LFDI
Petroleum and natural gas	Linear	PI → FDI FDI → PI	0.008 0.001	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	3.906 7.807	Fail to reject Fail to reject	Bilateral causality
Mining and smelting	Linear	PI → FDI FDI → PI	0.035 0.006	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	1.835 2.433	Reject Reject	Independence
Utilities	Linear	PI → FDI FDI → PI	1.398 0.791	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	0.083 2.523	Reject Reject	Independence

Table 76 (continued)

Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Merchandise	Linear	PI → FDI FDI → PI	0.115 0.843	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	0.686 2.174	Reject Reject	Independence
Finance	Linear	PI → FDI FDI → PI	0.156 0.001	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	8.218 2.457	Fail to reject Reject	LPI→LFDI
Total	Linear	PI → FDI FDI → PI	0.021 0.012	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	0.228 1.867	Reject Reject	Independence

Table 77

Granger Causality Test (U.S.): Absolute Version

Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Vegetable products	Linear	PI → FDI	0.322	Reject	Independence
		FDI → PI	1.057	Reject	
	Log-linear	LPI → LFDI	1.532	Reject	LFDI→LPI
		LFDI → LPI	7.657	Fail to reject	
Animal products	Linear	PI → FDI	0.954	Reject	Independence
		FDI → PI	1.616	Reject	
	Log-linear	LPI → LFDI	0.624	Reject	LFDI→LPI
		LFDI → LPI	7.259	Fail to reject	
Textiles	Linear	PI → FDI	0.141	Reject	Independence
		FDI → PI	1.819	Reject	
	Log-linear	LPI → LFDI	0.394	Reject	LFDI→LPI
		LFDI → LPI	8.060	Fail to reject	
Wood & paper products	Linear	PI → FDI	0.579	Reject	Independence
		FDI → PI	1.278	Reject	
	Log-linear	LPI → LFDI	0.505	Reject	LFDI→LPI
		LFDI → LPI	7.688	Fail to reject	

Table 77 (continued)

Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Iron and products	Linear	PI → FDI FDI → PI	0.023 2.935	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	1.370 7.502	Reject Fail to reject	LFDI→LPI
Non-ferrous metals	Linear	PI → FDI FDI → PI	2.162 3.974	Reject Fail to reject	FDI→PI
	Log-linear	LPI → LFDI LFDI → LPI	1.485 8.180	Reject Fail to reject	LFDI→LPI
Non-metallic minerals	Linear	PI → FDI FDI → PI	0.664 1.417	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	2.588 8.082	Reject Fail to reject	LFDI→LPI
Chemical & allied products	Linear	PI → FDI FDI → PI	0.282 1.084	Reject Reject	Indpendence
	Log-linear	LPI → LFDI LFDI → LPI	0.614 7.062	Reject Fail to reject	LFDI→LPI

Table 77 (continued)

Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Manufacturing	Linear	PI → FDI FDI → PI	0.444 1.341	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	3.132 7.564	Reject Fail to reject	LFDI→LPI
Petroleum and natural gas	Linear	PI → FDI FDI → PI	0.246 1.656	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	0.013 13.036	Reject Fail to reject	LFDI→LPI
Mining and smelting	Linear	PI → FDI FDI → PI	1.187 2.157	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	1.085 7.349	Reject Fail to reject	LFDI→LPI
Utilities	Linear	PI → FDI FDI → PI	1.672 1.216	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	3.042 7.655	Reject Fail to reject	LFDI→LPI

Table 77 (continued)

Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Merchandise	Linear	PI → FDI FDI → PI	0.409 0.954	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	0.218 6.675	Reject Fail to reject	LFDI→LPI
Finance	Linear	PI → FDI FDI → PI	0.346 1.088	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	1.083 7.554	Reject Fail to reject	LFDI→LPI
Total	Linear	PI → FDI FDI → PI	0.324 1.352	Reject Reject	Independence
	Log-linear	LPI → LFDI LFDI → LPI	1.259 7.599	Reject Fail to reject	LFDI→LPI

Table 78

Granger Causality Test (U.S.): Relative Version

Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Vegetable products	Linear	PI → FDI	4.173	Fail to reject	Bilateral causality
		FDI → PI	7.825	Fail to reject	
	Log-linear	LPI → LFDI	6.752	Fail to reject	LPI→LFDI
		LFDI → LPI	2.921	Reject	
Animal products	Linear	PI → FDI	2.827	Reject	FDI→PI
		FDI → PI	3.591	Fail to reject	
	Log-linear	LPI → LFDI	2.268	Reject	LFDI→LPI
		LFDI → LPI	3.717	Fail to reject	
Textiles	Linear	PI → FDI	0.319	Reject	FDI→PI
		FDI → PI	5.957	Fail to reject	
	Log-linear	LPI → LFDI	1.178	Reject	Independence
		LFDI → LPI	1.840	Reject	
Wood & paper products	Linear	PI → FDI	1.968	Reject	FDI→PI
		FDI → PI	3.280	Fail to reject	
	Log-linear	LPI → LFDI	0.892	Reject	Independence
		LFDI → LPI	2.794	Reject	

Table 78 (continued)

Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Iron and products	Linear	PI → FDI FDI → PI	0.133 7.601	Reject Fail to reject	FDI→PI
	Log-linear	LPI → LFDI LFDI → LPI	3.997 5.316	Fail to reject Fail to reject	Bilateral causality
Non-ferrous metals	Linear	PI → FDI FDI → PI	1.474 5.315	Reject Fail to reject	FDI→PI
	Log-linear	LPI → LFDI LFDI → LPI	1.274 2.382	Reject Reject	Independence
Non-metallic minerals	Linear	PI → FDI FDI → PI	3.417 9.939	Fail to reject Fail to reject	Bilateral causality
	Log-linear	LPI → LFDI LFDI → LPI	2.530 2.409	Reject Reject	Independence
Chemical & allied products	Linear	PI → FDI FDI → PI	0.316 6.833	Reject Fail to reject	FDI→PI
	Log-linear	LPI → LFDI LFDI → LPI	5.013 2.756	Fail to reject Reject	LPI→LFDI

Table 78 (continued)

Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Manufacturing	Linear	PI → FDI FDI → PI	1.744 6.140	Reject Fail to reject	FDI→PI
	Log-linear	LPI → LFDI LFDI → LPI	7.625 2.007	Fail to reject Reject	LPI→LFDI
Petroleum and natural gas	Linear	PI → FDI FDI → PI	1.011 14.406	Reject Fail to reject	FDI→PI
	Log-linear	LPI → LFDI LFDI → LPI	2.673 11.649	Reject Fail to reject	LFDI→LPI
Mining and smelting	Linear	PI → FDI FDI → PI	0.110 11.834	Reject Fail to reject	FDI→PI
	Log-linear	LPI → LFDI LFDI → LPI	2.989 3.706	Reject Fail to reject	LFDI→LPI
Utilities	Linear	PI → FDI FDI → PI	4.129 3.204	Fail to reject Reject	PI→FDI
	Log-linear	LPI → LFDI LFDI → LPI	2.049 3.921	Reject Fail to reject	LFDI→LPI

Table 78 (continued)

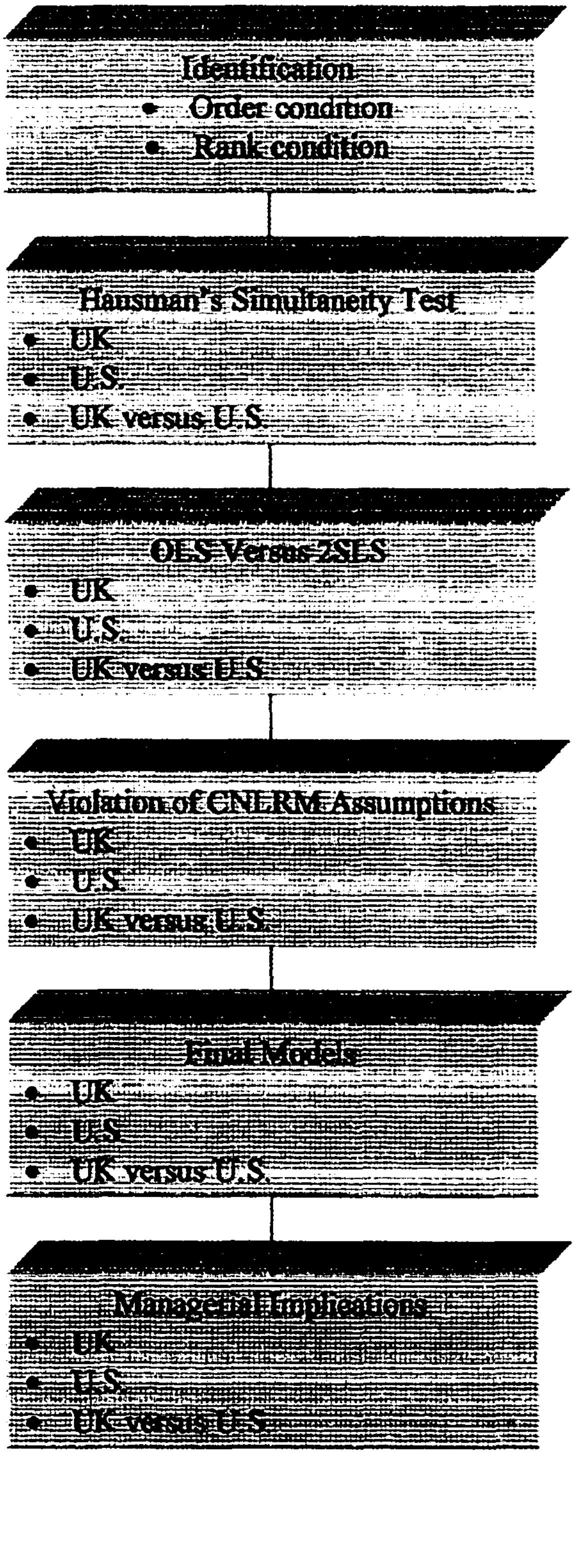
Industry	*Functional Form*	*Direction of Causality*	*F value*	*Decision*	*Conclusion*
Merchandise	Linear	PI → FDI FDI → PI	0.040 6.685	Reject Fail to reject	FDI→PI
	Log-linear	LPI → LFDI LFDI → LPI	3.686 2.004	Fail to reject Reject	LPI→LFDI
Finance	Linear	PI → FDI FDI → PI	0.518 7.332	Reject Fail to reject	FDI→PI
	Log-linear	LPI → LFDI LFDI → LPI	2.922 2.349	Reject Reject	Independence
Total	Linear	PI → FDI FDI → PI	0.090 14.551	Reject Fail to reject	FDI→PI
	Log-linear	LPI → LFDI LFDI → LPI	2.604 9.140	Reject Fail to reject	LFDI→LPI

Simultaneous-Equation Regression Models

In contrast to single-equation models, in simultaneous-equation models more than one dependent (endogeneous) variable is involved, requiring as many equations as number of endogeneous variables. In this type of models, the endogeneous variable in one equation may appear as an explanatory variable in another equation of the system. This is the case of the system of equations represented by Equations (54) and (55) of Chapter 3, where FDI is treated as an endogeneous explanatory variable and, thus, likely to be correlated with the disturbance term of the equation in which it appears as an explanatory variable. In this situation, the classical OLS method may not be applied because the estimators obtained are not consistent. Figure 27 illustrates the procedure used in estimating and testing the hypothesized simultaneous-equation system.

Figure 27

Simultaneous-Equation Regression Models: Testing and Analysis Procedure



Identification

Before a simultaneous-equation model is estimated, each equation must be tested for identification. In linear simultaneous-equation systems, a necessary –but not sufficient- condition for the identification of an equation is the order condition. On the other hand, the rank condition is both a ncessary and sufficient condition for identification. It is customary to classify an equation into the over-identified, exactly identified, and under-identified categories according to whether the number of variables missing from the equation is, respectively, greater than, equal to, or less than the number of endogenous variables minus one.

As already noted in the earlier chapter, both the order and rank conditions indicate –for both countries, for all industry equations- that: (1) the FDI equation is under-identified, and (2) the political equation is over-identified. Short of changing the model specification of the FDI equation, it is not possible to obtain consistent estimates of the parameters. For the over-identified political equation, the method of 2SLS will be applied, if necessary.

Hausman's Simultaneity Test

Before trying to apply the 2SLS method, the system of equations is tested for simultaneity. As explained above, the simultaneity problem arises because some of the regressors are endogenous and are likely to be correlated with the disturbance term. If there is no simultaneity, the OLS estimators produce consistent and efficient estimators. If there is simultaneity, the OLS estimators are not even consistent. Moreover, if 2SLS is applied when, in fact, there is no simultaneity, it will yield estimators that are consistent but not efficient. The Hausman specification test discussed above will be used to test for simultaneity. The functional form for each industry regression, of each of the two countries, will be that determined in Table 43.

United Kingdom

Table 79 shows the results of the test for the UK. For three industries, there exists the problem of simultaneity. A priori, there is no reason why FDI and political instability should be mutually dependent in these three industries.

United States

The outcomes of Table 80 indicate simultaneity problem for three industries, thus suggesting that, for most of the industries, FDI and political instability are not mutually dependent.

UK Versus U.S.

A comparison of the simultaneity test for both countries is given in Table 81. For both countries, the majority of the industries do not suffer from simultaneity. The number of industries affected by the simultaneity problem is three in each country; however, the industries under this effect are different across the two countries.

Table 79

Hausman Test of Simultaneity Between Political Instability and Industry FDI (UK)

Industry	*Conclusion*
Vegetable products	Simultaneity
Animal products	NONE
Textiles	No simultaneity
Wood & paper products	No simultaneity
Iron and products	No simultaneity
Non-ferrous metals	No simultaneity
Non-metallic minerals	No simultaneity
Chemical & allied products	No simultaneity
Manufacturing	No simultaneity
Petroleum and natural gas	No simultaneity
Mining and smelting	Simultaneity
Utilities	Simultaneity
Merchandise	No simultaneity
Finance	No simultaneity
Total	No simultaneity

Table 80

Hausman Test of Simultaneity Between Political Instability and Industry FDI (U.S.)

Industry	*Conclusion*
Vegetable products	No simultaneity
Animal products	No simultaneity
Textiles	Simultaneity
Wood & paper products	No simultaneity
Iron and products	No simultaneity
Non-ferrous metals	No simultaneity
Non-metallic minerals	Simultaneity
Chemical & allied products	No simultaneity
Manufacturing	No simultaneity
Petroleum and natural gas	No simultaneity
Mining and smelting	No simultaneity
Utilities	No simultaneity
Merchandise	No simultaneity
Finance	No simultaneity
Total	Simultaneity

Table 81

Hausman Test of Simultaneity Between Political Instability and Industry FDI (UK Versus U.S.)

Industry	*Conclusion (UK)*	*Conclusion (U.S.)*
Vegetable products	Simultaneity	No simultaneity
Animal products	NONE	No simultaneity
Textiles	No simultaneity	Simultaneity
Wood & paper products	No simultaneity	No simultaneity
Iron and products	No simultaneity	No simultaneity
Non-ferrous metals	No simultaneity	No simultaneity
Non-metallic minerals	No simultaneity	Simultaneity
Chemical & allied products	No simultaneity	No simultaneity
Manufacturing	No simultaneity	No simultaneity
Petroleum and natural gas	No simultaneity	No simultaneity
Mining and smelting	Simultaneity	No simultaneity
Utilities	Simultaneity	No simultaneity
Merchandise	No simultaneity	No simultaneity
Finance	No simultaneity	No simultaneity
Total	No simultaneity	Simultaneity

OLS Versus 2SLS

Those industry equations showing simultaneity are run through the 2SLS method, whereas those that are free from the simultaneity problem are run through the usual OLS method.

United Kingdom

In most of the industries the coefficient of the FDI variable (either log-linear or linear) is negative (Table 82), suggesting that the higher the level of FDI from the UK to Canada the lower the political instability in the latter country. The reason behind this negative relationship could lie in the fact that FDI levels indicate the presence of foreign involvement, for the better, in the national economy and provides a sense of security (and hence, stability), in that investors follow one another, which attracts more FDI flows, so that new and/or old investors engage in this self-fulfilling game of investment and stability perceptions. Moreover, the negative relationship also implies that the greater the dependence of an economy on FDI the lower is the likelihood of a nation acting in ways that may negatively affect this flow of FDI.

United States

In all industry regressions, the coefficient of the FDI variable is positive (Table 83), implying that the greater the level of FDI from the United States to Canada, the greater the political instability in the latter country.

This is normally the case of nationalist sentiment that arises from the fact that the national economy is being owned by foreigners, a situation that has occurred in Canada quite frequently over the past two decades.

UK Versus U.S.

From the comments above, FDI from the United Kingdom seems to be subject, or at least more so than the United States, to what may be termed the security (or dependence) effect. On the other hand, FDI from the United States is, more likely than not, under the nationalist effect.

As to the reason why the situation differs for both countries, it could be due to the higher, than the UK, growth rates of FDI flows from the United States to Canada, over the past three decades, and the higher share of U.S. FDI in total FDI, compared to that of the UK.

Table 82

OLS Versus 2SLS (UK)

Industry	*Regressor*	*OLS**	*2SLS**
Vegetable products	CONSTANT		-1.7389
	LFDI		-0.0161
Animal products	--------	--------	--------
Textiles	CONSTANT	0.7691	
	LFDI	-0.7346	
Wood & paper products	CONSTANT	4.2596	
	LFDI	-1.5684	
Iron and products	CONSTANT	261.0390*	
	FDI	-4.1506*	
Non-ferrous metals	CONSTANT	-1.0476	
	LFDI	-0.2635	
Non-metallic minerals	CONSTANT	-0.7543	
	LFDI	0.9230*	
Chemical & allied products	CONSTANT	-0.2007	
	LFDI	-0.5322	
Manufacturing	CONSTANT	-0.6276	
	LFDI	-0.3330	
Petroleum and natural gas	CONSTANT	194.3607*	
	FDI	-4.2285	
Mining and smelting	CONSTANT		72.0903*
	FDI		0.3396
Utilities	CONSTANT		16.5808
	FDI		0.5117
Merchandise	CONSTANT	55.0179	
	FDI	0.5088	
Finance	CONSTANT	1.3297	
	LFDI	0.5529*	
Total	CONSTANT	-0.1792	
	LFDI	-0.4759	

*** Significant at the 5% level, one-tailed test**

Table 83

OLS Versus 2SLS (U.S.)

Industry	*Regressor*	*OLS**	*2SLS**
Vegetable products	CONSTANT	67.4622*	
	FDI	0.5078	
Animal products	CONSTANT	62.3521*	
	FDI	0.0871	
Textiles	CONSTANT		0.2185
	LFDI		0.7877
Wood & paper products	CONSTANT	-1.1027	
	LFDI	1.1991*	
Iron and products	CONSTANT	0.5151	
	LFDI	0.7591*	
Non-ferrous metals	CONSTANT	54.9513*	
	FDI	0.7655	
Non-metallic minerals	CONSTANT		-5.8318*
	LFDI		1.0655*
Chemical & allied products	CONSTANT	66.0496*	
	FDI	0.4955	
Manufacturing	CONSTANT	64.3709*	
	FDI	0.5411	
Petroleum and natural gas	CONSTANT	-0.0683	
	FDI	0.0099*	
Mining and smelting	CONSTANT	-3.2262	
	LFDI	0.1548	
Utilities	CONSTANT	-2.3769	
	LFDI	1.2836	
Merchandise	CONSTANT	0.4487	
	LFDI	0.7238*	
Finance	CONSTANT	0.6321	
	LFDI	0.6865*	
Total	CONSTANT		-0.5364
	LFDI		0.9641*

* Significant at the 5% level, one-tailed test

Table 84

OLS Versus 2SLS (UK Versus U.S.)

Industry	*UK*	*UK**	*U.S.*	*U.S.**
Vegetable products	CONSTANT	-1.7389	CONSTANT	67.4622*
	LFDI	-0.0161	FDI	0.5078
Animal products	--------	--------	CONSTANT	62.3521*
			FDI	0.0871
Textiles	CONSTANT	0.7691	CONSTANT	0.2185
	LFDI	-0.7346	LFDI	0.7877
Wood & paper products	CONSTANT	4.2596	CONSTANT	-1.1027
	LFDI	-1.5684	LFDI	1.1991*
Iron and products	CONSTANT	261.0390*	CONSTANT	0.5151
	FDI	-4.1506*	LFDI	0.7591*
Non-ferrous metals	CONSTANT	-1.0476	CONSTANT	54.9513*
	LFDI	-0.2635	FDI	0.7655
Non-metallic minerals	CONSTANT	-0.7543	CONSTANT	-5.8318*
	LFDI	0.9230*	LFDI	1.0655*
Chemical & allied products	CONSTANT	-0.2007	CONSTANT	66.0496*
	LFDI	-0.5322	FDI	0.4955
Manufacturing	CONSTANT	-0.6276	CONSTANT	64.3709*
	LFDI	-0.3330	FDI	0.5411
Petroleum and natural gas	CONSTANT	194.3607*	CONSTANT	-0.0683
	FDI	-4.2285	FDI	0.0099*
Mining and smelting	CONSTANT	72.0903*	CONSTANT	-3.2262
	FDI	0.3396	LFDI	0.1548
Utilities	CONSTANT	16.5808	CONSTANT	-2.3769
	FDI	0.5117	LFDI	1.2836
Merchandise	CONSTANT	55.0179	CONSTANT	0.4487
	FDI	0.5088	LFDI	0.7238*
Finance	CONSTANT	1.3297	CONSTANT	0.6321
	LFDI	0.5529*	LFDI	0.6865*
Total	CONSTANT	-0.1792	CONSTANT	-0.5364
	LFDI	-0.4759	LFDI	0.9641*

* Significant at the 5% level, one-tailed test

Violation of CNLRM Assumptions

United Kingdom

The industry regressions suffer from nonnormality and heteroscedasticity (Table 85).

United States

Nonnormality is, with the exception of the Petroleum industry, the only violation that is present in the industry regressions (Table 86).

UK Versus U.S.

Table 87 shows nonnormality as the most common type of violation across both countries, followed by heteroscedasticity for the UK alone.

Table 85

Violation of CNLRM Assumptions (UK)

Industry	*Assumption(s) violated**
Vegetable products	SE
Animal products	Not applicable
Textiles	SE
Wood and paper products	-----
Iron and products	H, NN
Non-ferrous metals	SE
Non-metallic minerals	NN
Chemical & allied products	-----
Manufacturing	SE
Petroleum and natural gas	NN
Mining and smelting	SE, NN
Utilities	H, NN
Merchandise	NN
Finance	NN
Total	SE

*AC: Autocorrelation; M: Multicollinearity; H: Heteroscedasticity; SE: Specification error; NN: Nonnormality

Table 86

Violation of CNLRM Assumptions (U.S.)

Industry	*Assumption(s) violated**
Vegetable products	NN
Animal products	NN
Textiles	NN
Wood and paper products	NN
Iron and products	NN
Non-ferrous metals	NN
Non-metallic minerals	NN
Chemical & allied products	NN
Manufacturing	NN
Petroleum and natural gas	SE, NN
Mining and smelting	NN
Utilities	NN
Merchandise	NN
Finance	NN
Total	NN

*AC: Autocorrelation; M: Multicollinearity; H: Heteroscedasticity; SE: Specification error; NN: Nonnormality

Table 87

Violation of CNLRM Assumptions (UK Versus U.S.)

Industry	*UK**	*U.S.**
Vegetable products	SE	NN
Animal products	Not applicable	NN
Textiles	SE	NN
Wood and paper products	-----	NN
Iron and products	H, NN	NN
Non-ferrous metals	SE	NN
Non-metallic minerals	NN	NN
Chemical & allied products	-----	NN
Manufacturing	SE	NN
Petroleum and natural gas	NN	SE, NN
Mining and smelting	SE, NN	NN
Utilities	H, NN	NN
Merchandise	NN	NN
Finance	NN	NN
Total	SE	NN

*AC: Autocorrelation; M: Multicollinearity; H: Heteroscedasticity; SE: Specification error; NN: Nonnormality

Final Models

Since practically all of the industry regressions suffer from nonnormality, it will be difficult to correct for this violation without introducing other variables in the regressions, which will alter the purpose of this section, viz. the estimation of a possible relationship between FDI and political instability. In the presence of nonnormality, the usual test procedures (the t and F tests) are only valid asymptotically, that is, in large samples, but not in the finite or small samples. Given that this study's sample is finite, no hypothesis testing procedures can be applied to the regressions and, therefore, no statisitical inferences can be made about the regression coefficients. However, estimation is still possible, hence, the final models are the same as those given in Tables 82 and 83. In light of the problem in applying the usual hypothesis testing procedures, the inferences made below about the sign and size of the regressor coefficient are tentative and should be taken with a grain of salt.

United Kigdom

As mentioned above, UK FDI into Canada seems, in most cases, to negatively influence the political instability of Canada, in other words, the higher the FDI levels in Canada, the lower the political instability in that country (Table 88). The biggest impact of FDI on political instability in the log-linear form, as measured by the FDI regressor coefficient, comes from

Woods & Paper Products; whereas, in the linear form, the biggest impact comes from Petroleum & Natural Gas. It is striking that such a relationship, through the security/dependence effect mentioned above, might be stronger, and negatively so, in two such natural resource-based industries. One explanation might lie in the fact that UK FDI, with its low growth rate and with its small share in the FDI total, is preferred to U.S. FDI, with its high growth rate and with its big share in the FDI total.

United States

The positive relationship between FDI and political instability seems to be stronger, for the log-linear coefficients, in Utilities and Wood & Paper Products (Table 89). For the linear coefficients, Non-Ferrous Metals and Manufacturing exhibit the highest-valued coefficients of FDI. Surprisingly enough, the Petroleum industry shows the lowest FDI coefficient of all linear coefficients. Due to the nature of this industry (i.e. its sensitiveness to some sort of nationalist effect), one might have expected its coefficient to be among the highest ones.

UK Versus U.S.

All FDI regressor coefficients in the U.S. are positive whereas most of the coefficients in the UK are negative. The reasons for this difference in signs have already been suggested above.

Table 88

Final Models (UK)

Industry	*Regressor*	*OLS**	*2SLS**
Vegetable products	CONSTANT		-1.7389
	LFDI		-0.0161
Animal products	--------	--------	--------
Textiles	CONSTANT	0.7691	
	LFDI	-0.7346	
Wood & paper products	CONSTANT	4.2596	
	LFDI	-1.5684	
Iron and products	CONSTANT	261.0390*	
	FDI	-4.1506*	
Non-ferrous metals	CONSTANT	-1.0476	
	LFDI	-0.2635	
Non-metallic minerals	CONSTANT	-0.7543	
	LFDI	0.9230*	
Chemical & allied products	CONSTANT	-0.2007	
	LFDI	-0.5322	
Manufacturing	CONSTANT	-0.6276	
	LFDI	-0.3330	
Petroleum and natural gas	CONSTANT	194.3607*	
	FDI	-4.2285	
Mining and smelting	CONSTANT		72.0903*
	FDI		0.3396
Utilities	CONSTANT		16.5808
	FDI		0.5117
Merchandise	CONSTANT	55.0179	
	FDI	0.5088	
Finance	CONSTANT	1.3297	
	LFDI	0.5529*	
Total	CONSTANT	-0.1792	
	LFDI	-0.4759	

* Significant at the 5% level, one-tailed

Table 89

Final Models (U.S.)

Industry	*Regressor*	*OLS**	*2SLS**
Vegetable products	CONSTANT	67.4622*	
	FDI	0.5078	
Animal products	CONSTANT	62.3521*	
	FDI	0.0871	
Textiles	CONSTANT		0.2185
	LFDI		0.7877
Wood & paper products	CONSTANT	-1.1027	
	LFDI	1.1991*	
Iron and products	CONSTANT	0.5151	
	LFDI	0.7591*	
Non-ferrous metals	CONSTANT	54.9513*	
	FDI	0.7655	
Non-metallic minerals	CONSTANT		-5.8318*
	LFDI		1.0655*
Chemical & allied products	CONSTANT	66.0496*	
	FDI	0.4955	
Manufacturing	CONSTANT	64.3709*	
	FDI	0.5411	
Petroleum and natural gas	CONSTANT	-0.0683	
	FDI	0.0099*	
Mining and smelting	CONSTANT	-3.2262	
	LFDI	0.1548	
Utilities	CONSTANT	-2.3769	
	LFDI	1.2836	
Merchandise	CONSTANT	0.4487	
	LFDI	0.7238*	
Finance	CONSTANT	0.6321	
	LFDI	0.6865*	
Total	CONSTANT		-0.5364
	LFDI		0.9641*

* Significant at the 5% level, one-tailed

Table 90

Final Models (UK Versus U.S.)

Industry	*UK**		*U.S.**	
Vegetable products	CONSTANT	-1.7389	CONSTANT	67.4622*
	LFDI	-0.0161	FDI	0.5078
Animal products	--------	--------	CONSTANT	62.3521*
			FDI	0.0871
Textiles	CONSTANT	0.7691	CONSTANT	0.2185
	LFDI	-0.7346	LFDI	0.7877
Wood & paper products	CONSTANT	4.2596	CONSTANT	-1.1027
	LFDI	-1.5684	LFDI	1.1991*
Iron and products	CONSTANT	261.0390*	CONSTANT	0.5151
	FDI	-4.1506*	LFDI	0.7591*
Non-ferrous metals	CONSTANT	-1.0476	CONSTANT	54.9513*
	LFDI	-0.2635	FDI	0.7655
Non-metallic minerals	CONSTANT	-0.7543	CONSTANT	-5.8318*
	LFDI	0.9230*	LFDI	1.0655*
Chemical & allied Products	CONSTANT	-0.2007	CONSTANT	66.0496*
	LFDI	-0.5322	FDI	0.4955
Manufacturing	CONSTANT	-0.6276	CONSTANT	64.3709*
	LFDI	-0.3330	FDI	0.5411
Petroleum and natural gas	CONSTANT	194.3607*	CONSTANT	-0.0683
	FDI	-4.2285	FDI	0.0099*
Mining and smelting	CONSTANT	72.0903*	CONSTANT	-3.2262
	FDI	0.3396	LFDI	0.1548
Utilities	CONSTANT	16.5808	CONSTANT	-2.3769
	FDI	0.5117	LFDI	1.2836
Merchandise	CONSTANT	55.0179	CONSTANT	0.4487
	FDI	0.5088	LFDI	0.7238*
Finance	CONSTANT	1.3297	CONSTANT	0.6321
	LFDI	0.5529*	LFDI	0.6865*
Total	CONSTANT	-0.1792	CONSTANT	-0.5364
	LFDI	-0.4759	LFDI	0.9641*

* Significant at the 5% level, one-tailed

Managerial Implications

United Kingdom

For UK managers the most important point to bear in mind is the negative effect of FDI on political instability, for most industries (Table 88). That is, for these industries, higher levels of FDI flows into Canada can be seen as a stabilizing factor in the domestic political attitude towards FDI flows. Thus, generally speaking, FDI flows from the UK are, more likely than not, to be welcomed by Canada. Furthermore, UK managers could go one step further and note that, given an initial level of political instability in Canada, which may initially deter FDI flows into that country, higher UK FDI flows are likely to reduce that initial political instability, thus further encouraging FDI to flow from the UK to Canada.

United States

As for U.S. managers, higher FDI flows to Canada are likely to give rise to nationalist sentiments regarding the foreign ownership of sensitive Canadian industries (Table 89). One obvious way to avoid this issue would be to direct FDI to those industries where the positive effect on political instability is smaller. However, this might not address the problem encountered by those companies that cannot divest or direct their investment into other industries. For these companies, one feasible way out would be either to join with local Canadian companies in order to keep a low profile or to partner up with UK companies in order to benefit from the latter's overall negative effect of FDI on political instability.

UK Versus U.S.

Generally speaking, it looks as if Canada prefers, at least political wise, UK FDI to U.S. FDI. (Table 90). As noted above, the higher growth rates of U.S. FDI and the bigger share of U.S. FDI in the FDI total, may account for the differences in the political sensitiveness to FDI between the two countries. UK FDI is perceived as a stabilizing element in the Canadian political attitude towards FDI, whereas U.S. FDI is seen as a destabilizing force.

Cointegration Models

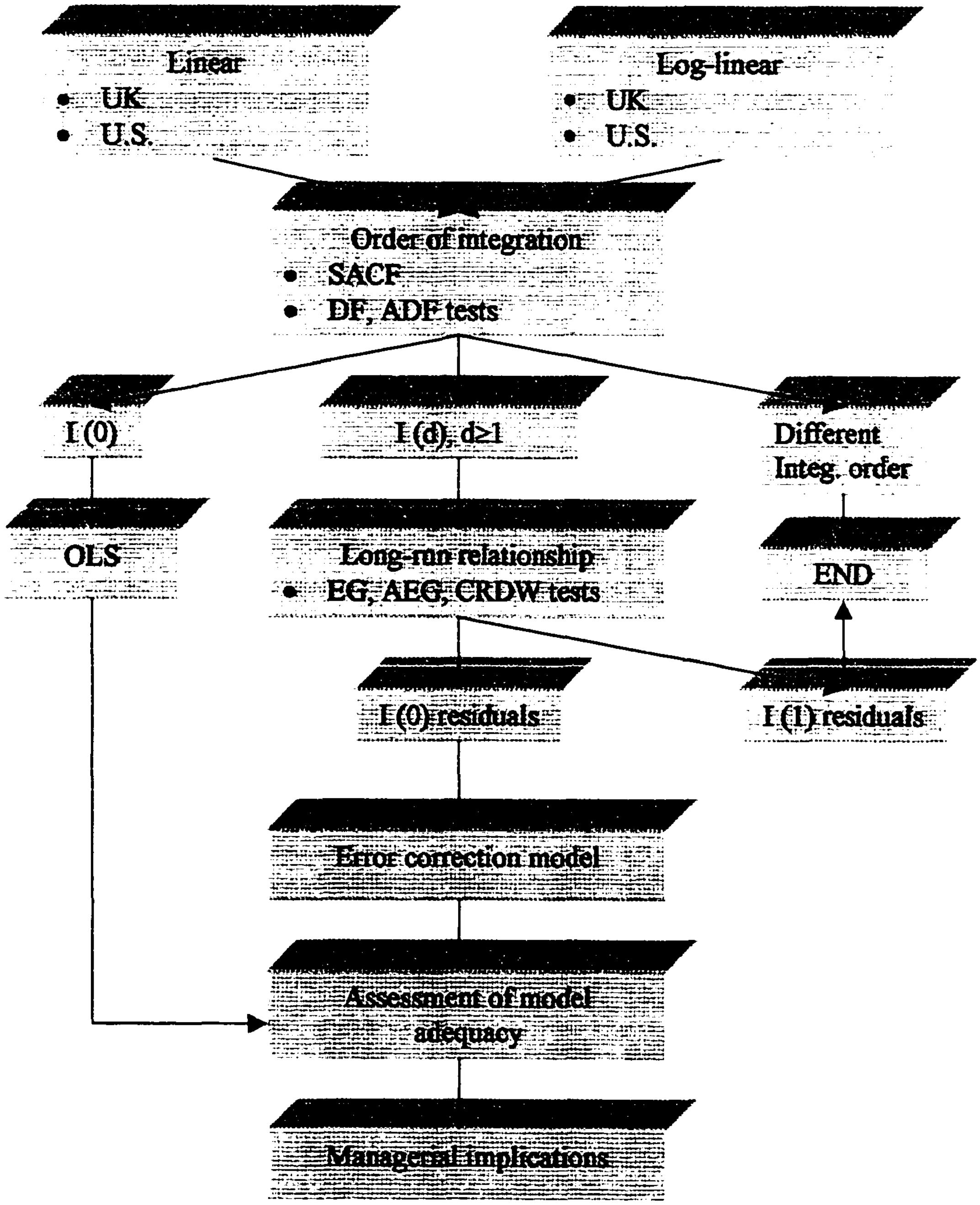
Cointegration of two (or more) time series suggests that there is a long-run, or equlibrium, relationship between them. Moreover, cointegration means that, despite being individually nonstationary, a linear combination of two or more time series can be stationary. However, regression analysis based on time series data implicitly assumes that the underlying time series are stationary. The usual t tests, F tests, etc. are based on this assumption.

Thus, in order to be able to apply cointegration procedures, the variables under study must be nonstationary and a linear combination of them must be stationary. The first step, therefore, is to test for stationarity of the variables. As already explained above, there are several informal and formal procedures to perform the stationarity tests, which include correlograms, sample autocorrelation function (SACF), and DF and ADF tests. The variables used in the paper are FDI and political instability, the two main ones in this research. The FDI variable will be tested for each industry, for each country, and for each functional form. The political variable will be tested for each country, for each version, for each functional form. The equations involved are (77) through (80).

The procedure employed is depicted in Figure 28.

Figure 28

Cointegration Models: Testing and Analysis Procedure



Order of Integration: FDI Variable

United Kingdom

In practically all the industries, and regardless of the functional form, the FDI variable is integrated of order one, I(1) (Tables 91 and 93). The exceptions, that is, the industries exihibiting stationarity, are: (1) Animal Products (log-linear version) and (2) Non-Metallic Minerals (both versions).

United States

Mining and Smelting (linear version) is the only industry exhibiting stationarity in the FDI variable (Tables 92 and 94).

UK Versus U.S.

The only commonality between the two countries is the nonstationarity of the FDI variable in all but three industry regressions.

Table 91

Tests for Stationarity of FDI (UK)

	Functional Form							
	*Linear**				*Log-linear**			
Industry	*SACF*	*DF*	*ADF*	*First Diffe.*	*SACF*	*DF*	*ADF*	*First Diffe.*
Vegetable products	NS	(1) NS (2) NS (3) NS	NS	S	NS	(1) S (2) NS (3) NS	NS	S
Animal products	NS	(1) NS (2) NS (3) NS	NS	S	NS	(1) S (2) S (3) S	N/A	N/A
Textiles	NS	(1) S (2) NS (3) NS	NS	S	NS	(1) S (2) NS (3) NS	NS	S
Wood & paper products	NS	(1) NS (2) NS (3) NS	N/A	S	NS	(1) NS (2) NS (3) S	N/A	S
Iron and products	NS	(1) S (2) NS (3) NS	N/A	S	NS	(1) NS (2) S (3) NS	N/A	S

* SACF: Sample autocorrelation fucntion; DF: Dickey-Fuller test; ADF: Augmented Dickey-Fuller test

S: Stationary; NS: Nonstationary; N/A: Not applicable

Table 91 (continued)

	Functional Form							
	Linear				*Log-linear*			
Industry	*SACF*	*DF*	*ADF*	*First Diffe.*	*SACF*	*DF*	*ADF*	*First Diffe.*
Non-ferrous metals	NS	(1) S (2) NS (3) NS	N/A	S	NS	(1) S (2) NS (3) NS	N/A	S
Non-metallic minerals	NS	(1) S (2) S (3) S	N/A	N/A	NS	(1) NS (2) NS (3) S	N/A	N/A
Chemical & allied products	NS	(1) S (2) NS (3) NS	N/A	S	NS	(1) S (2) NS (3) NS	N/A	S
Manufacturing	NS	(1) S (2) NS (3) NS	N/A	S	NS	(1) S (2) NS (3) NS	N/A	S
Petroleum and natural gas	NS	(1) S (2) NS (3) NS	NS	S	NS	(1) NS (2) S (3) NS	NS	S

* SACF: Sample autocorrelation fucntion; DF: Dickey-Fuller test; ADF: Augmented Dickey-Fuller test
S: Stationary; NS: Nonstationary; N/A: Not applicable

Table 91 (continued)

	Functional Form							
	Linear				*Log-linear*			
Industry	*SACF*	*DF*	*ADF*	*First Diffe.*	*SACF*	*DF*	*ADF*	*First Diffe.*
Mining and smelting	NS	(1) NS (2) NS (3) NS	N/A	S	NS	(1) NS (2) NS (3) NS	N/A	S
Utilities	NS	(1) NS (2) NS (3) NS	N/A	S	NS	(1) NS (2) S (3) NS	N/A	S
Merchandise	NS	(1) NS (2) NS (3) NS	NS	S	NS	(1) NS (2) S (3) NS	N/A	S
Finance	NS	(1) S (2) NS (3) NS	NS	S	NS	(1) S (2) NS (3) S	NS	S
Total	NS	(1) S (2) S (3) NS	N/A	S	NS	(1) S (2) NS (3) NS	N/A	S

* SACF: Sample autocorrelation fucntion; DF: Dickey-Fuller test; ADF: Augmented Dickey-Fuller test

S: Stationary; NS: Nonstationary; N/A: Not applicable

Table 92

Tests for Stationarity of FDI (U.S.)

	Functional Form							
	*Linear**				*Log-linear**			
Industry	*SACF*	*DF*	*ADF*	*First Diffe.*	*SACF*	*DF*	*ADF*	*First Diffe.*
Vegetable products	NS	(1) S (2) S (3) NS	NS	S	NS	(1) S (2) NS (3) NS	NS	S
Animal products	NS	(1) NS (2) NS (3) NS	NS	S	NS	(1) NS (2) NS (3) NS	N/A	S
Textiles	NS	(1) S (2) NS (3) NS	N/A	S	NS	(1) S (2) NS (3) NS	S	S
Wood & paper products	NS	(1) S (2) NS (3) NS	N/A	S	NS	(1) S (2) NS (3) NS	N/A	S
Iron and products	NS	(1) S (2) S (3) NS	NS	S	NS	(1) S (2) NS (3) NS	NS	S

* SACF: Sample autocorrelation fucntion; DF: Dickey-Fuller test; ADF: Augmented Dickey-Fuller test

S: Stationary; NS: Nonstationary; N/A: Not applicable

Table 92 (continued)

	Functional Form							
	Linear				*Log-linear*			
Industry	*SACF*	*DF*	*ADF*	*First Diffe.*	*SACF*	*DF*	*ADF*	*First Diffe.*
Non-ferrous metals	NS	(1) S (2) NS (3) NS	NS	S	NS	(1) S (2) NS (3) NS	N/A	S
Non-metallic minerals	NS	(1) NS (2) NS (3) NS	NS	S	NS	(1) NS (2) NS (3) S	NS	S
Chemical & allied products	NS	(1) S (2) S (3) NS	N/A	S	NS	(1) S (2) NS (3) NS	N/A	S
Manufacturing	NS	(1) S (2) S (3) NS	N/A	S	NS	(1) S (2) NS (3) S	NS	S
Petroleum and natural gas	NS	(1) NS (2) NS (3) NS	NS	S	NS	(1) S (2) S (3) NS	NS	S

* SACF: Sample autocorrelation fucntion; DF: Dickey-Fuller test; ADF: Augmented Dickey-Fuller test
S: Stationary; NS: Nonstationary; N/A: Not applicable

Table 92 (continued)

	Functional Form							
	Linear				*Log-linear*			
Industry	*SACF*	*DF*	*ADF*	*First Diffe.*	*SACF*	*DF*	*ADF*	*First Diffe.*
Mining and smelting	NS	(1) S (2) S (3) S	N/A	N/A	NS	(1) NS (2) S (3) NS	NS	S
Utilities	NS	(1) NS (2) NS (3) NS	N/A	S	NS	(1) NS (2) NS (3) NS	N/A	S
Merchandise	NS	(1) S (2) NS (3) NS	NS	S	NS	(1) S (2) NS (3) NS	N/A	S
Finance	NS	(1) S (2) NS (3) NS	NS	S	NS	(1) S (2) NS (3) NS	N/A	S
Total	NS	(1) S (2) S (3) NS	N/A	S	NS	(1) S (2) S (3) NS	NS	S

* SACF: Sample autocorrelation fucntion; DF: Dickey-Fuller test; ADF: Augmented Dickey-Fuller test

S: Stationary; NS: Nonstationary; N/A: Not applicable

Table 93

Order of Integration of FDI (UK)

	Functional Form	
Industry	*Linear**	*Log-linear**
Vegetable products	I (1)	I (1)
Animal products	I (1)	I (0)
Textiles	I (1)	I (1)
Wood & paper products	I (1)	I (1)
Iron and products	I (1)	I (1)
Non-ferrous metals	I (1)	I (1)
Non-metallic minerals	I (0)	I (0)
Chemical & allied products	I (1)	I (1)
Manufacturing	I (1)	I (1)
Petroleum and natural gas	I (1)	I (1)
Mining and smelting	I (1)	I (1)
Utilities	I (1)	I (1)
Merchandise	I (1)	I (1)
Finance	I (1)	I (1)
Total	I (1)	I (1)

*** I (0) implies stationarity; I (1) implies nonstationarity**

Table 94

Order of Integration of FDI (U.S.)

	Functional Form	
Industry	*Linear**	*Log-linear**
Vegetable products	I (1)	I (1)
Animal products	I (1)	I (1)
Textiles	I (1)	I (1)
Wood & paper products	I (1)	I (1)
Iron and products	I (1)	I (1)
Non-ferrous metals	I (1)	I (1)
Non-metallic minerals	I (1)	I (1)
Chemical & allied products	I (1)	I (1)
Manufacturing	I (1)	I (1)
Petroleum and natural gas	I (1)	I (1)
Mining and smelting	I (0)	I (1)
Utilities	I (1)	I (1)
Merchandise	I (1)	I (1)
Finance	I (1)	I (1)
Total	I (1)	I (1)

* I (0) implies stationarity; I (1) implies nonstationarity

Order of Integration: Political Instability Variable

The political variable, in its relative version, is stationary for both functional forms, for both countries (Tables 95 and 96). The same is true for the political variable in its absolute form, that is, the political instability of the host country (Canada).

Therefore, the FDI variable from those industries showing stationarity will be regressed, using OLS (see Figure 28), against the relevant absolute and relative versions of the political instability variable.

Table 95

Tests for Stationarity of Political Instability Variable

	Functional Form							
	*Linear**				*Log-linear**			
Version	*SACF*	*DF*	*ADF*	*First Diffe.*	*SACF*	*DF*	*ADF*	*First Diffe.*
Absolute	S	(1) S (2) S (3) S	NS	S	S	(1) S (2) S (3) S	S	S
Relative (UK)	S	(1) S (2) S (3) S	NS	S	S	(1) S (2) S (3) S	N/A	S
Relative (U.S.)	S	(1) S (2) S (3) S	N/A	S	S	(1) S (2) S (3) S	N/A	S

* SACF: Sample autocorrelation fucntion; DF: Dickey-Fuller test; ADF: Augmented Dickey-Fuller test

S: Stationary; NS: Nonstationary; N/A: Not applicable

Table 96

Order of Integration of Political Instability Variable

	Functional Form	
Version	*Linear**	*Log-linear**
Absolute	I (0)	I (0)
Relative (UK)	I (0)	I (0)
Relative (U.S.)	I (0)	I (0)

* I (0) implies stationarity; I (1) implies nonstationarity

Final Models

Since all versions of the political instability variable are integrated of order zero, that is, they are stationary, only those industries integrated of order zero will be paired with the corresponding versions of the political instability variable, and their relationship estimated by the usual OLS procedure. In those cases where either autocorrelation or heteroscedasticity is present, the models given will be corrected for such violations. The tables below indicate which, if any, violations are present in the regressions.

United Kingdom

The results shown in Table 97 indicate that there is not a statistically significant long-run relationship between FDI and political instability for the two industries under study. Moreover, the coefficients of the political variable are negative, as hypothesized, only in Animal Products.

In terms of the absolute value of the coefficients, those of the political variable in Animal Products, for both versions, are much greater than those of Non-Metallic Minerals. This may suggest that, regardless of the direction of the impact of political instability on FDI, the extent to which the latter is impacted upon by political instability is greater in the case of Animal Products.

United States

The coefficients of the the political variable for both versions are positive, the value of the coefficient in the absolute version being quite low relative to the value of the coefficient in the relative version (Table 98).

UK Versus U.S.

Comparing the coefficients of the U.S. Mining and Smelting with those of Non-Metallic Minerals, in the linear version, yields the following two points: (1) there is hardly any difference between the two coefficients for the absolute version, and (2) there is a huge difference between the two coefficients for the relative version. However, no other conclusions could be drawn from this comparison, since the industries compared are not the same.

The lack of any statistically significant long-run relationship between the two variables may be due to a number of resons. Firstly, political instability, per se, may fail to capture the effects of other explanatory variables which, when added to the political variable, may make the latter statistically significant. Secondly, political instability, as used in this study, takes into account either the host country's political instability or the political instability of the host country relative to that of the home country. In neither case does the variable solely represent the political instability of the home (investing) country. Thirdly, both FDI and political instability are analyzed within a static framework, with no allowance made for any lags in the political instability variable. Finally, there is always the possibility that both variables do not relaistically measure what they are supposed to measure; moreover, the political variable represents a combination of two indices, covering two different time periods. Regressing each index on FDI might yield a statistically significant long-run relationship between the two variables.

Table 97

Final Models (UK)

Industry	*Regressor*	*Coefficient**	*Violation(s)***
Animal products	CONSTANT	-0.1518	AC, NN
	LPICAN	-0.0318	
Animal products	CONSTANT	-0.3351	AC, NN
	LRELPI	-0.0571	
Non-metallic minerals	CONSTANT	58.3276*	AC, SE, NN
	PICAN	0.0908	
Non-metallic minerals	CONSTANT	73.6142*	AC, NN
	RELPI	-0.0030	
Non-metallic minerals	CONSTANT	4.3624*	AC
	LPICAN	0.0124	
Non-metallic minerals	CONSTANT	4.4385*	AC
	LRELPI	0.0108	

* Significant at the 5% level, one-tailed

** AC: Autocorrelation; M: Multicollinearity; H: Heteroscedasticity; SE: Specification error; NN: Nonnormality

Table 98

Final Models (U.S.)

Industry	*Regressor*	*Coefficient**	*Violation(s)***
Mining and smelting	CONSTANT	124.7121*	AC, H
	PICAN	0.1075	
Mining and smelting	CONSTANT	155.1741*	AC
	RELPI	4.1473	

* Significant at the 5% level, one-tailed

** AC: Autocorrelation; M: Multicollinearity; H: Heteroscedasticity; SE: Specification error; NN: Nonnormality

Managerial Implications

There are three major managerial implications for both countries.

First, there is no log-run relationship between political instability and FDI, at the static level. Therefore, managers should consider employing decision-making models that allow for lags in the political instability variable in order to allow for a response time between a change in political instability and the corresponding reaction of FDI. The number of lags might, at first, be subjectively determined by the time a usual project takes from its conception to its implementation.

Second, models that only incorporate a political instability variable are likely to yield statistically insignificant results which could mislead managers into adopting FDI strategies that may not be appropriate in light of the usual significance of other, non-political, explanatory variables.

Finally, as with the other types of models previously considered, each industry behaves in a unique way, in terms of the variables, and the form they take, that affect its FDI patterns. Thus, managers should be able to sort out between the variables that are common to all industries and those that are typical of their industry.

Summary

All of the five models examined have shown a different degree of support for the statistical significance of political instability and its impact on FDI.

The static and partial adjustment models include a significant political instability variable in many of the industry regressions, for both countries. However, the sign of the coefficient does not accord, in some cases, the hypothesized negative sign.

In the Almon distributed-lag models, the emphasis was placed on determining, if any, the possible distribution of political instability lags with respect to time, in order to determine the form through which FDI is impacted by past political instability. The results obtained indicate a major presence of a pattern whereby the political instability coefficients generally increase and then decrease with the lag length.

The objective of the use of simultaneous-equation models was to investigate a, hitherto neglected, phenomenon, namely the likely, simultaneous effect between political instability and FDI. Though the findings hardly show any support for this effect, Granger-causality tests previously explored suggest an important and frequent relationship that -in most industries, for both countries and for both versions- flows from FDI to political instability, accompanied by a lesser number of cases exhibiting bilateral causality between the two variables.

The cointegration models employed aimed at finding whether there is a significant long-run relationship between political instability and FDI. The results showed, with the exception of three industries, no such long-run relationship.

Overall, the implications for managers, drawn from the findings above, were somewhat specific to the models examined. However, the one major and common implication is the unique behavior of FDI with respect to the political and non-political variables examined; in that sense, each industry behaves differently from the others.

CHAPTER V

CONCLUSION

Introduction

This chapter concludes the paper with a brief discussion of the following: (1) the results obtained, (2) the managerial implications of the research, (3) the limitations of the research, and (4) the suggestions for further research.

Research Results

This paper has examined the relationship between political instability and FDI, among three industrialized countries, for fifteen industries and over time. The five models studied were: (1) single-equation static models, (2) partial adjustment models, (3) Almon distributed-lag models, (4) simultaneous-equation models, and (5) cointegration models.

There are quite a number of inferences that can be drawn from the results obtained using those five models.

First, the findings from the static models and partial adjustment models indicate a statistically significant political instability variable, viz. the intercept dummy DPOLRISK, in many of the industry regressions, though "incorrectly" signed in a few cases.

Second, the major determinants of FDI, for most of the industries, are (a) at least one of the three exchange rate variables and (b) the labor variables. However, in most of the cases, the coefficients of those variables do not show the expected, hypothesized sign.

Third, the market size variable, in its relative form, hardly appears in any of the industry regressions, in either of models (1) and (2). The opposite is true for the market size variable in its absolute version, which frequently appears, and statistically significantly so, in many of the static and partial adjustment regression equations.

Fourth, the majority of Almon distributed-lag regressions suggests and inverted-U distribution of the coefficients of lagged political instability with respect to the lag length, thus indicating a maximum impact of political instability on FDI at time t-1.

Fifth, evidence from the simultaneous-equation models does not, at first sight, support the notion of a two-way effect between FDI and political instability. However, previous Granger-causality tests conducted suggest otherwise; moreover, regardless of the version and country examined, in many industries there is a dominant causality that flows from FDI to political instability.

Sixth, except for three industries (two in the UK and one in the U.S.), stationarity tests in the cointegration models do not fail to reject the existence of a long-run relationship between political instability and FDI.

Seventh, in quite a number of the static and partial adjustment regressions, there is at least one regressor that takes the form of a polynomial of second, or higher, power.

Finally, each industry regression from the static and partial adjustment models has its own, unique set of explanatory variables.

Managerial Implications from this Research

There are a number of major managerial implications derived from the results obtained above.

First, the partial adjustment models show different speeds of adjustment of actual FDI to the desired FDI stock, between the two countries and across industries. The higher adjustment coefficients of Uk industries with respect to their U.S. counterparts imply an advantage for UK managers in that they can quickly respond to any FDI moves made by potential/current rival firms and, hence, eliminate or reduce a competing firm's first-mover advantage. However, these higher coefficients also imply a quicker and higher commitment of funds which may not be easily recovered or divested in case of any adverse changes in the political climate of the host country.

Second, the Almon distributed-lag regressions indicate an information-gathering behavior, to analyze the effects of past political instability on current FDI, that is more extensive in time for UK industries than for U.S. industries. The advantage of a more comprehensive analysis of past political instability lies in a more complete picture of the likely effects of past political instability on current FDI. There is, however, the drawback of a slow reaction to potential firms entering the host country.

Third, the Granger-causality tests for all industries, for both countries, forboth versions, suggest (a) a significant causality flow from FDI to political instability in the majority of the industries and (b) bilateral causality between the two variables in a lesser number of industries. The results call for the incorporation of this simultaneous effect into relevant decision-making models.

Fourth, at first sight, there does not seem to be any long-run relationship between FDI and political instability. Nevertheless, this result should not lead to the exclusion of political instability as a determinant of FDI flows, given the limitations of the political measure employed.

Finally, in terms of the static and partial adjustment models, it is very significant, as would be expected, that each of the industry regressions exhibits a different set of regressors. For managers, the implication is not to generalize and apply variables that are significant in other industries, or at the national economy level, but rather focus on variables that have been/are significant in the relevant industry. Furthermore, ideally data specific to the industry should be collected and used in decision-making models

Research Limitations

The major limitation of this research lies with the political instability variable. The variable constructed specifically for this paper is a combination of two political instability indices, each of which being based on a unique methodology. Though the paper tried to mitigate this anomaly through the use of dummy variables, this approach does not provide the continuity and solidity that would result from employing a single index for the whole study period. However, it is worth pointing out that, as has been noted above, there is no single index available that covers the post World War II period.

Another potential limitation might be the use of the stock measure of FDI as opposed to the flow measure. The pros and cons of both measures were mentioned above, finally deciding that, since the stock measure tends to reflect the long-term FDI decisions better than the flow measure, the former would be employed in the paper, with the added argument that FDI flow data covering the study period was not available.

A third limitation is the number of secondary (importance) explanatory variables studied. These variables may not be as representative as any other group of variables in explaining the variations in FDI. However, the secondary explanatory variables were only included in order to elucidate the role of political instability in determining FDI behavior.

Another limitation is the number of countries examined. The objective of this paper was to analyze the relationship between political instability and FDI across industrialized countries. The availability of data determined the choice of the three countries studied, for which data was also available at the industry level for quite a number of industries.

A final limitation is the type of models considered. Although they included a number of the most familiar regression models, they may not clearly reflect the relationship that could actually exist between political instability and FDI. Furthermore, the following are a number of the likely drawbacks from using the models above: (1) the models are all linear in the parameters, (2) the lag length and degree of polynomials used for Almon distributed-lag models may not be adequate, (3) only one type of simultaneous-equation model was considered, and (4) cointegration models were analyzed taking into account only the two major variables (FDI and political instability).

Suggestions for Further Research

Based on the limitations above, the following are a number of suggestions made to address the said limitations.

Firstly, reducing the study period to match the time period covered by either of the two indices will avoid the problems that result from using two indices. However, the resultant study period could be too small to be able to draw any statisitical inferences about the relationship between political instability and FDI.

Secondly, in order to compare the results obtained from using the stock measure of FDI, one could employ flow data and analyze how the relationship between political instability and FDI fares under both measures. Moreover, since FDI has three components -viz. new equity, reinvested earnings, and intra-firm flows-, it might be more relevant to examine the relationship using measures for those three components.

Thirdly, other secondary explanatory variables that have been examined in the literature could be incorporated in regression models. These variables include, among others, cultural distance, geographical distance, industry concentration ratios, etcetera.

Fourthly, the study could be extended to include other industrialized countries and, thus, obtain a better view of the behavior of FDI and political instability. Furthermore, given enough and high-quality data are available, the pattern of FDI and political instability could be investigated for specific regions containing specific countries (e.g. the European Union, Eastern and Central Europe, South America).

Finally, it may be appropriate to include a number of non-linear (in parameters) models, especially in light of the results obtained in this paper, whereby quite a number of industry regressions include statistically significant non-linear variables.

APPENDIX A

Measures of Financial Integration

Panel A: France, Germany, U.K., U.S.		
	1876-1914	1925-1938
(1) Nominal short rates	0.54***	0.56***
(2) First differences	0.11**	0.15*
(3) Central bank discount rates	0.56***	0.56***
(4) Nominal long rates	0.65	--
(5) Yield curve	0.71**	0.53
(6) Stock price first differences	0.17***	0.12
(7) Phase of business cycle	0.76***	0.64

Panel B: West Germany, Japan, U.K., U.S.			
	1960-1970	1971-1980	1981-1987
(8) Nominal short rates	0.15	0.59*	0.78**
(9) First differences	0.01	0.66**	0.05
(10) Real short rates	-0.04	0.34	-0.10
(11) First differences	0.06	0.18	0.22
(12) Nominal long-term government bond yields	0.19	0.41	0.91***
(13) First differences	0.25	0.63*	0.58
(14) Yield curve	-0.10	0.53	0.03
(15) Stock-market change	0.35	0.44	0.39
(16) Change in GDP	0.15	0.75***	0.49
(17) Industrial production	0.21	0.80***	0.72*

Source: Zevin (1992), Table 3.1, p. 49.

***, **, and * indicate significance at the 1%, 5%, and 10% levels respectively.

APPENDIX B

Types of Headquarters Orientation Toward Subsidiaries

Organization Design	**Ethnocentric**	**Polycentric**	**Geocentric**
Complexity of organization	Complex in home country, simple in subsidiaries	Varied and independent	Increasingly complex and interdependent
Authority; decision making	High in headquarters	Relatively low in headquarters	Aim for a collaborative approach between headquarters and subsidiaries
Evaluation and control	Home standards applied for persons and performance	Determined locally	Find standards which are universal and local
Rewards and punishments; incentives	High in headquarters; low in subsidiaries	Wide variation; can be high or low rewards for subsidiary performance	International and local executives rewarded for reaching local and worldwide objectives
Communication; information flow	High volume to subsidiaries; orders, commands, advice	Little to and from headquarters. Little between subsidiaries	Both ways and between subsidiaries. Heads of subsidiaries part of management team
Identification	Nationality of owner	Nationality of host country	Truly international company but identifying with national interests
Perpetuation (recruiting, staffing, development)	Recruit and develop people of home country for key positions everywhere in the world	Develop people of local nationality for key positions in their own country	Develop best men everywhere in the world for key positions everywhere in the world

Source: Perlmutter (1969), p. 12.

APPENDIX C

International Executives View of Forces and Obstacles Toward Geocentrism in their Firms

Forces toward Geocentrism		Obstacles toward Geocentrism	
Environmental	**Intra-Organizational**	**Environmental**	**Intra-Organizational**
1. Technological and managerial know-how increasing in availability in different countries	1. Desire to use human vs. material resources optimally	1. Economic nationalism in host and home countries	1. Management inexperience in overseas markets
2. International customers	2. Observed lowering of morale in affiliates of an ethnocentric company	2. Political nationalism in host & home countries	2. Nation-centered reward and punishment structure
3. Local customers demand for best product at fair price	3. Evidence of waste and duplication in polycentrism	3. Military secrecy associated with research in home country	3. Mutual distrust between home country people and foreign executives
4. Host country's desire to increase balance of payments	4. Increasing awareness and respect for good men of other than home nationality	4. Distrust of big international firms by host country political leaders	4. Resistance to letting foreigners into the power structure
5. Growing world markets	5. Risk diversification in having a worldwide production & distribution system	5. Lack of international monetary system	5. Anticipated costs and risks of geocentrism
6. Global competition among international firms for scarce human and material resources	6. Need for recruitment of good men on a worldwide basis	6. Growing differences between the rich and poor countries	6. Nationalistic tendencies in staff
7. Major advances in integration of international transport & telecommunications	7. Need for worldwide information system	7. Host country belief that home countries get disproportionate benefits of international firm profits	7. Increasing immobility of staff
8. Regional supranational economic & political communities	8. Worldwide appeal of products	8. Home country political leaders' attempts to control firm's policy	8. Linguistic problems & different cultural backgrounds
	9. Senior management's commitment to geocentrism		9. Centralization tendencies in headquarters

Source: Perlmutter (1969), p. 15.

APPENDIX D

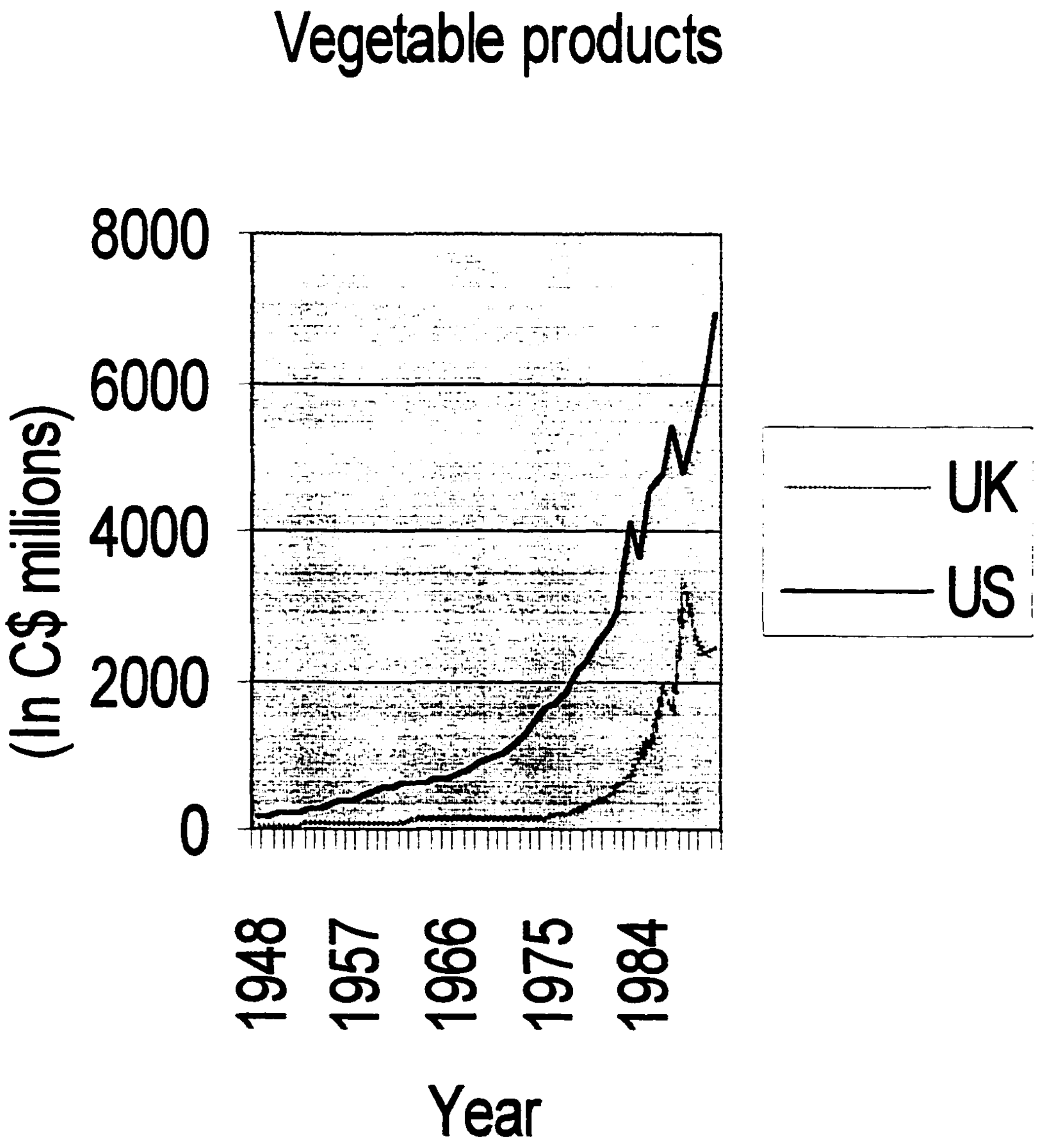
Sources of Change in the Global System

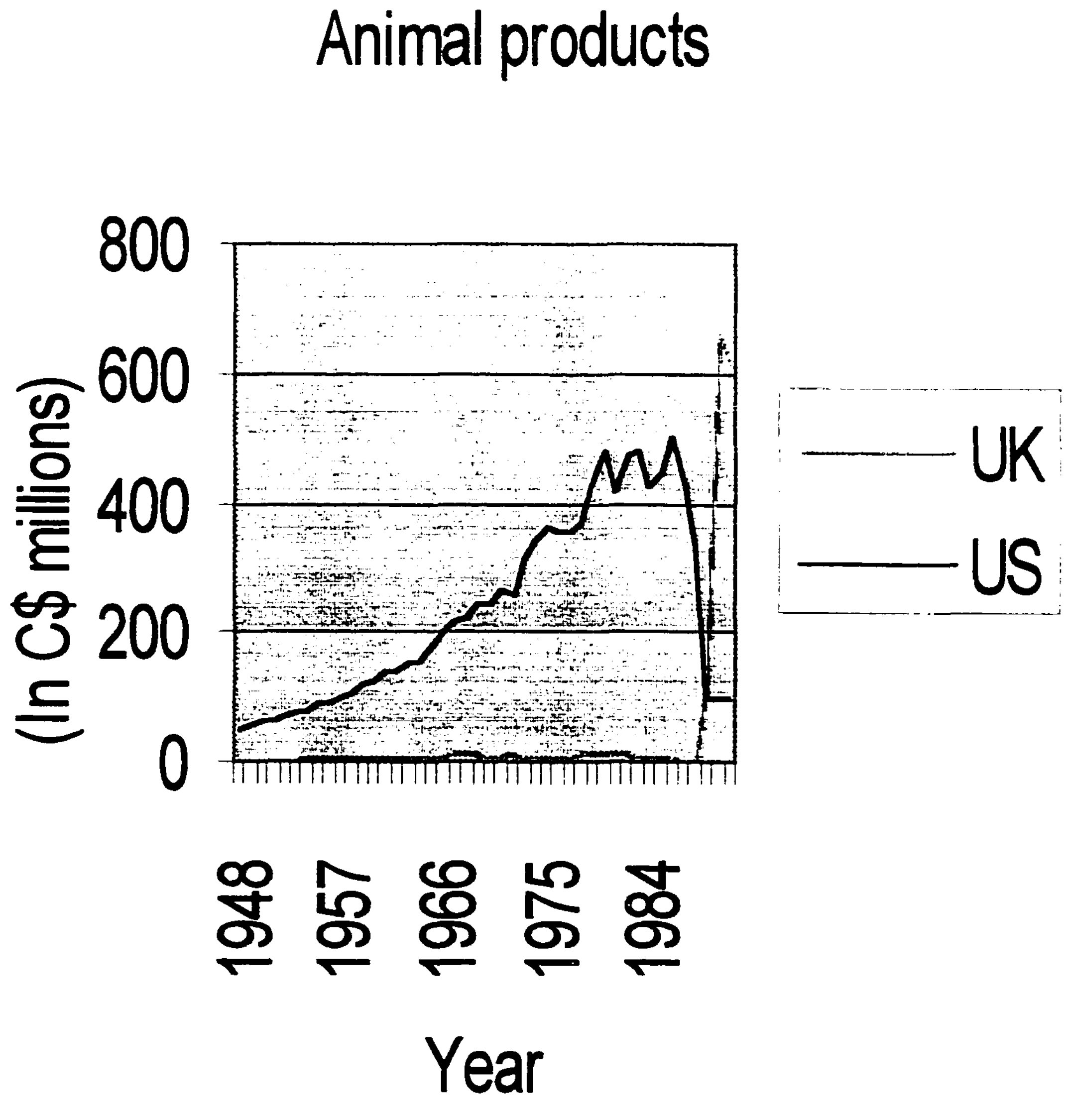
Process, Condition, Trend, or Event	Consequences for Patterns of Interaction, Stratification, or Rules
1. Virulent growth of ethnic nationalism	1. Fragmentation of international system into ever-increasing number of small and conditionally viable states. Terrorism increases.
2. Increase in number of small, weak states, liberation movements, etc.	2. Expanding possibilities for violence and international conflict; some conflicts could have major consequences in terms of power alignments.
3. Development of China's economic and military strength	3. Breaks down postwar power structure; Chinese participation in global issues.
4. Depletion of resources by industrialized countries	4. Increases power of scarce-resource-producing states; reversal of traditional dependence between rich and poor
5. Growth of important nonstate actors	5. Demands for new rules to regulate nonstate actors and to enhance sovereignty of state; decisions having great economic consequences on weaker states are made by nonstate actors.
6. Growth of Brazil as a major power	6. Decline of U.S. hegemony in Latin America; new leadership patterns appear in Western Hemisphere.
7. Revolutionary ideologies and technological developments	7. Increasing vulnerability of states to outside penetration; virtual demise of rule against interference in internal affairs.
8. Nuclear proliferation	8. Destroys effective U.S.-Soviet nuclear monopoly; possibility of local nuclear wars and escalation.
9. Growing collaboration of developing countries, demand for reform of international economic system	9. Declining economic hegemony of industrial countries; eventually, reduction of North-South cleavage in the system.

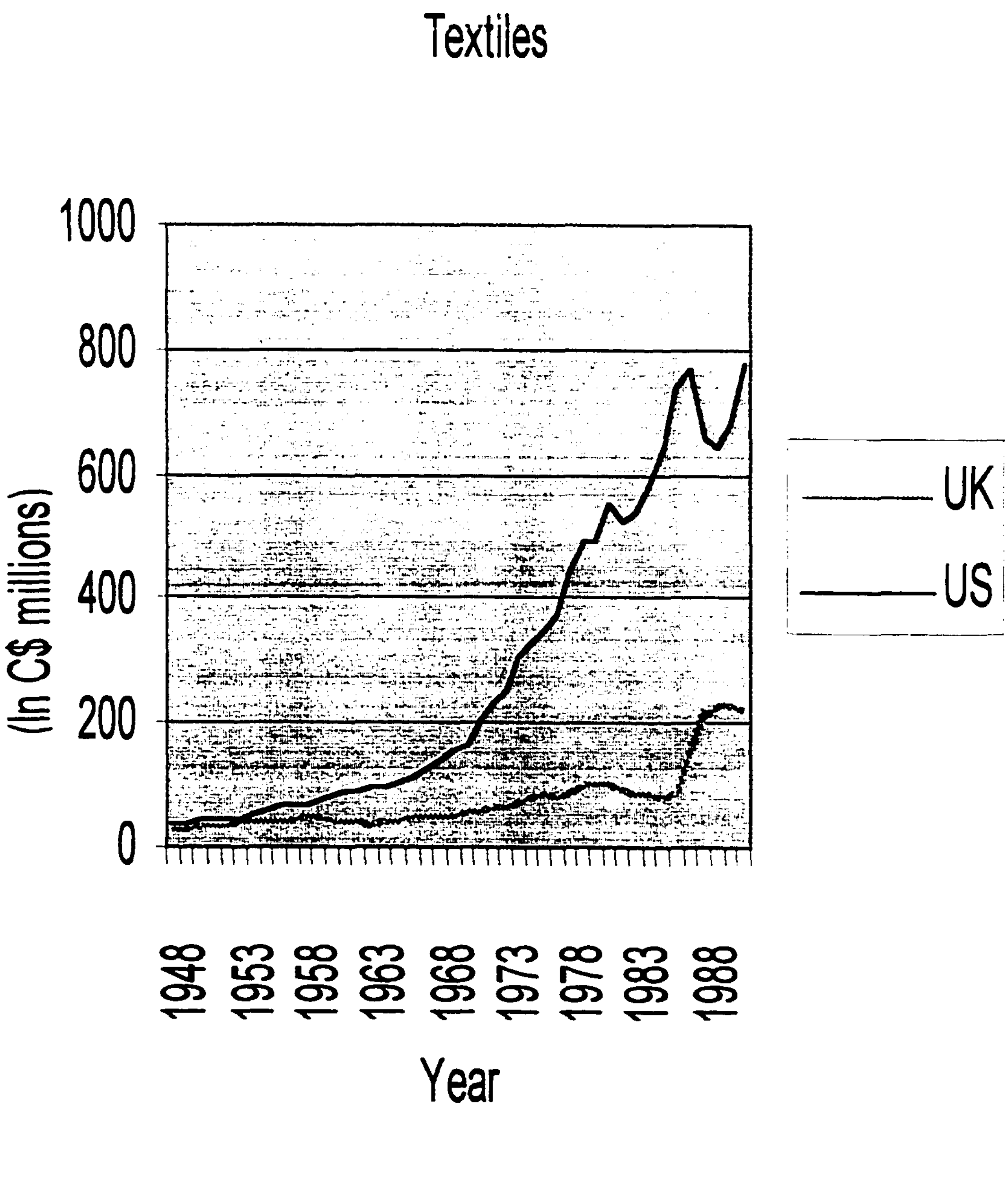
Source: Holsti (1988), p. 84.

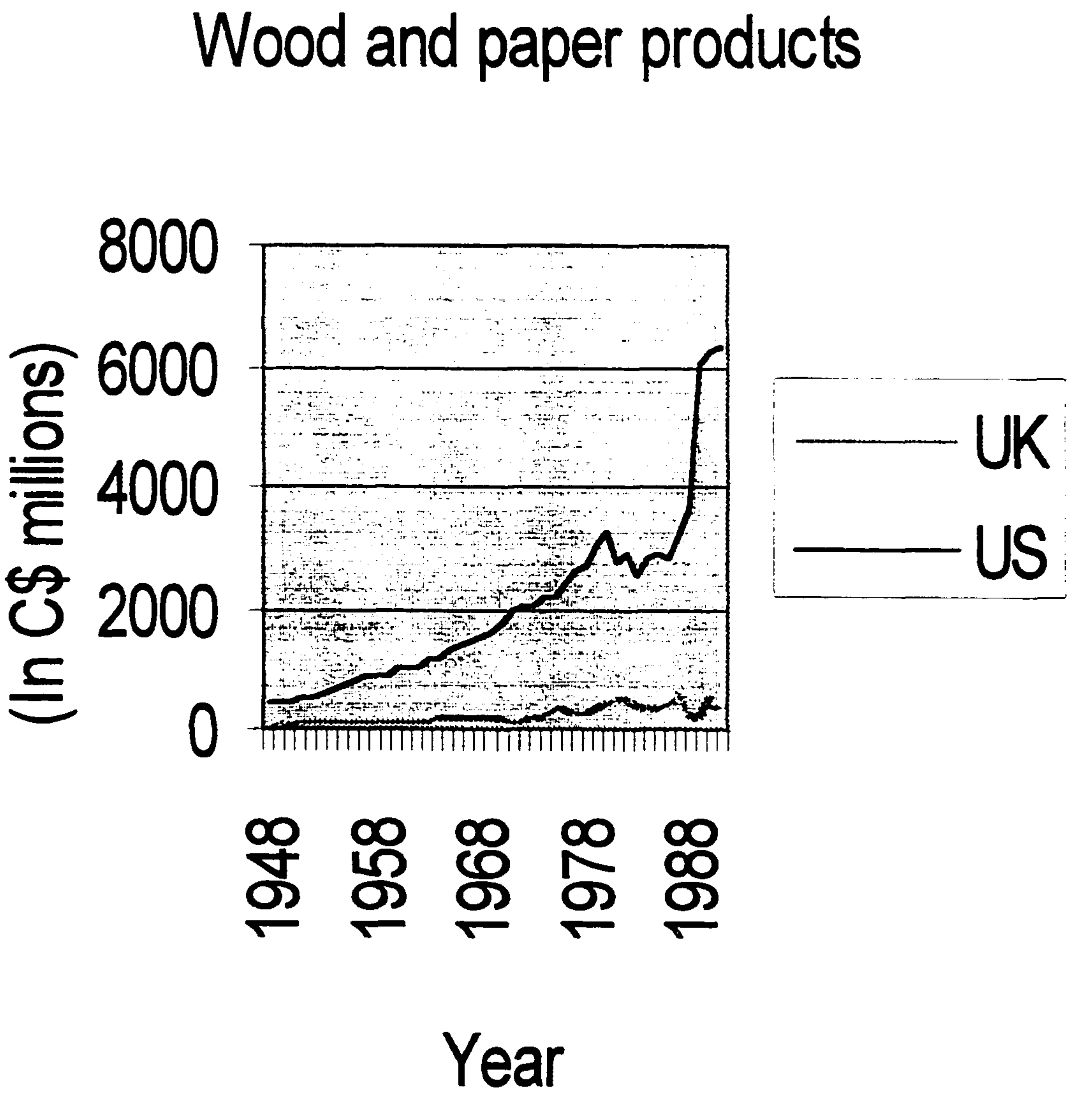
APPENDIX E

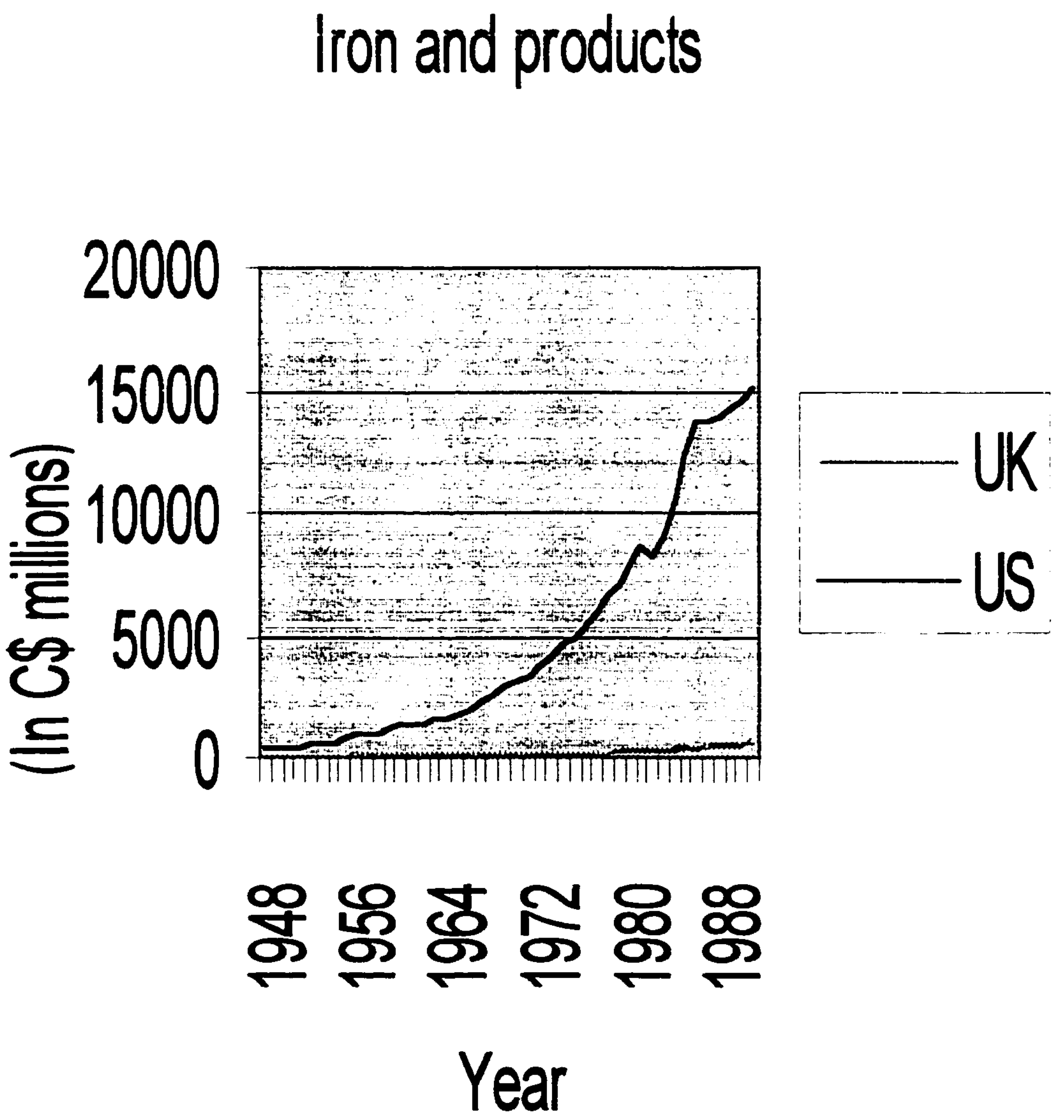
Cross-Country Comparisons of FDI Stock Levels By Industry

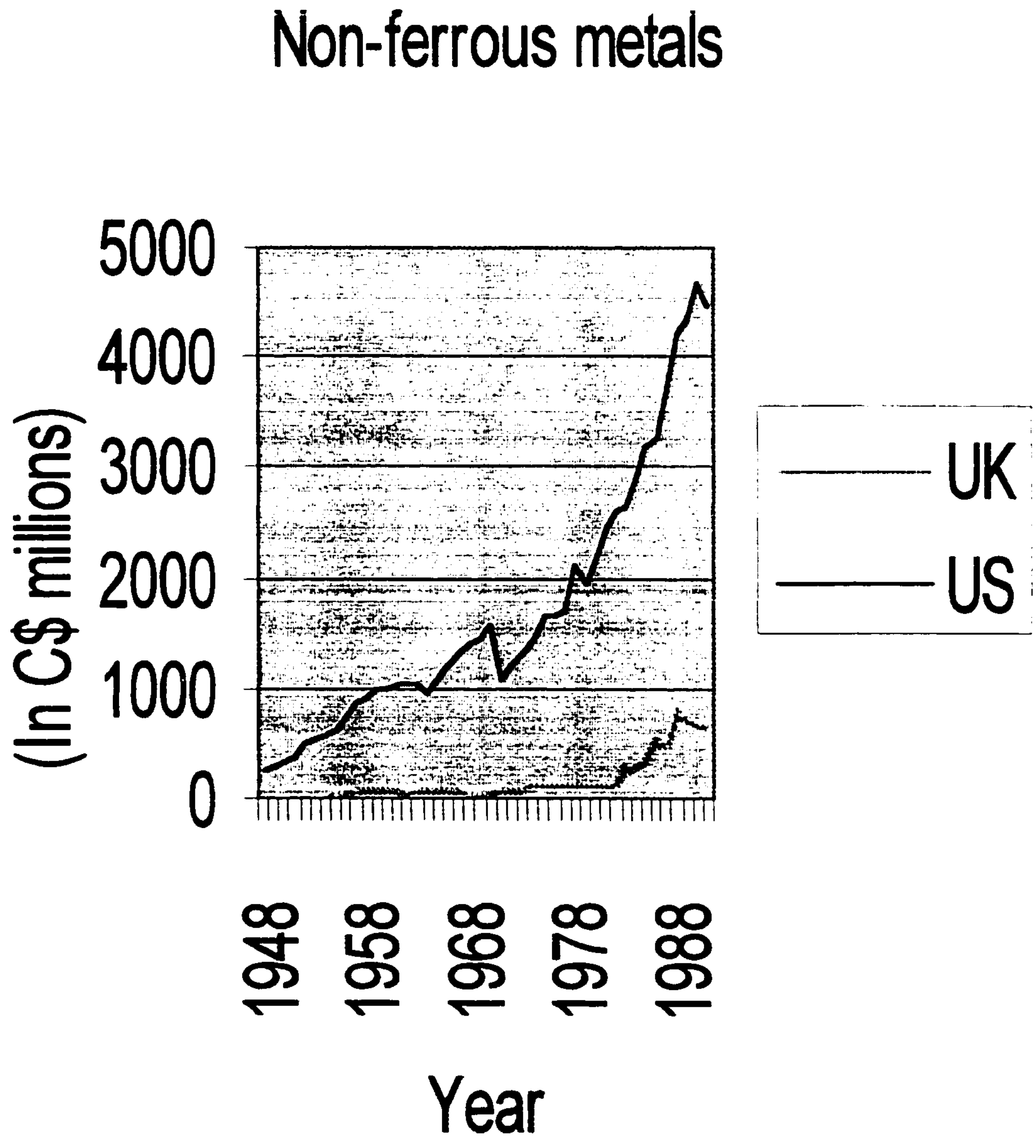

Vegetable products
8000
6000
4000
2000
0
(In C$ millions)
1948
1957
1966
1975
1984
Year
UK
US

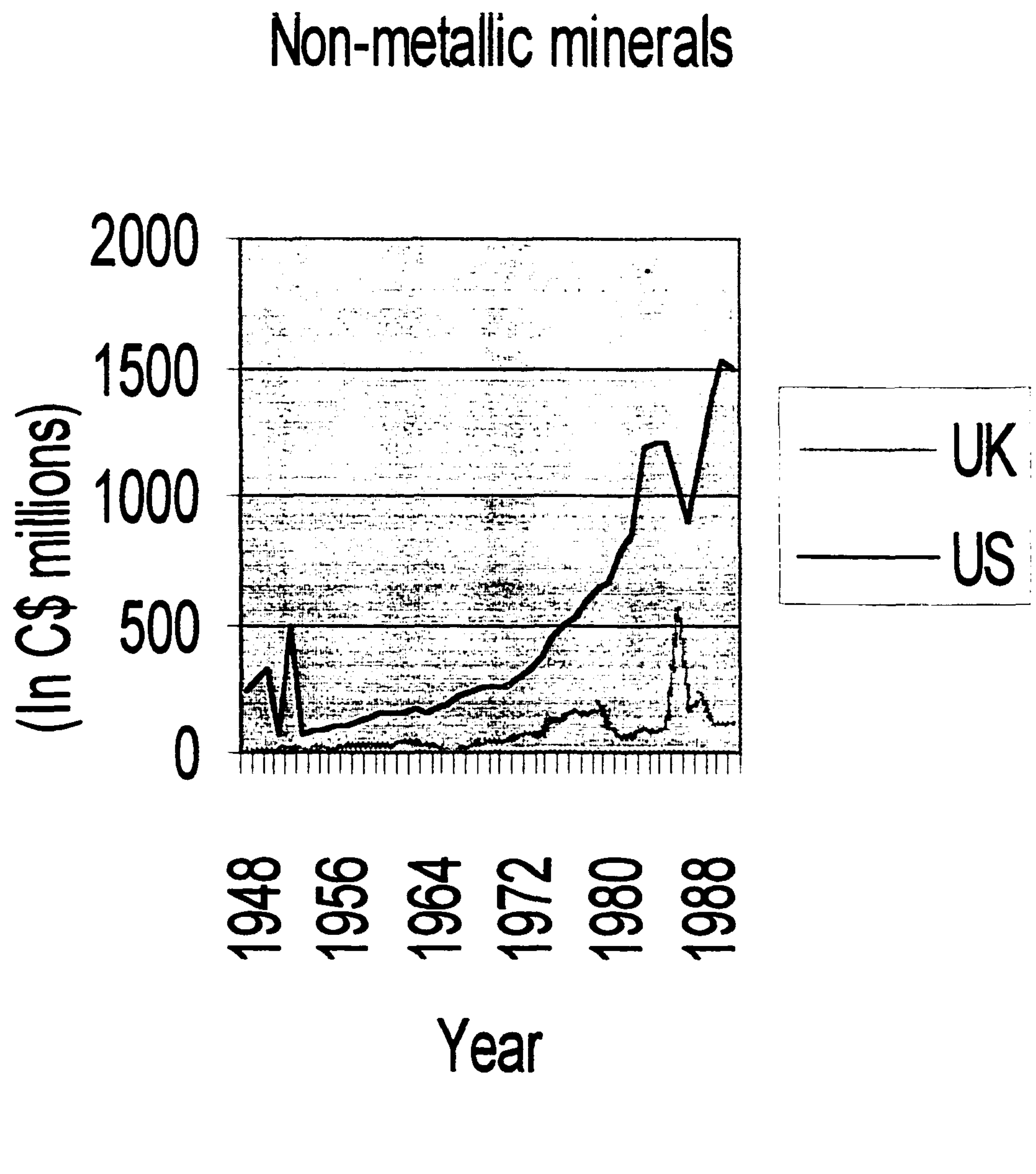

Animal products
800
600
400
200
0
(In C$ millions)
1948
1957
1966
1975
1984
Year
UK
US

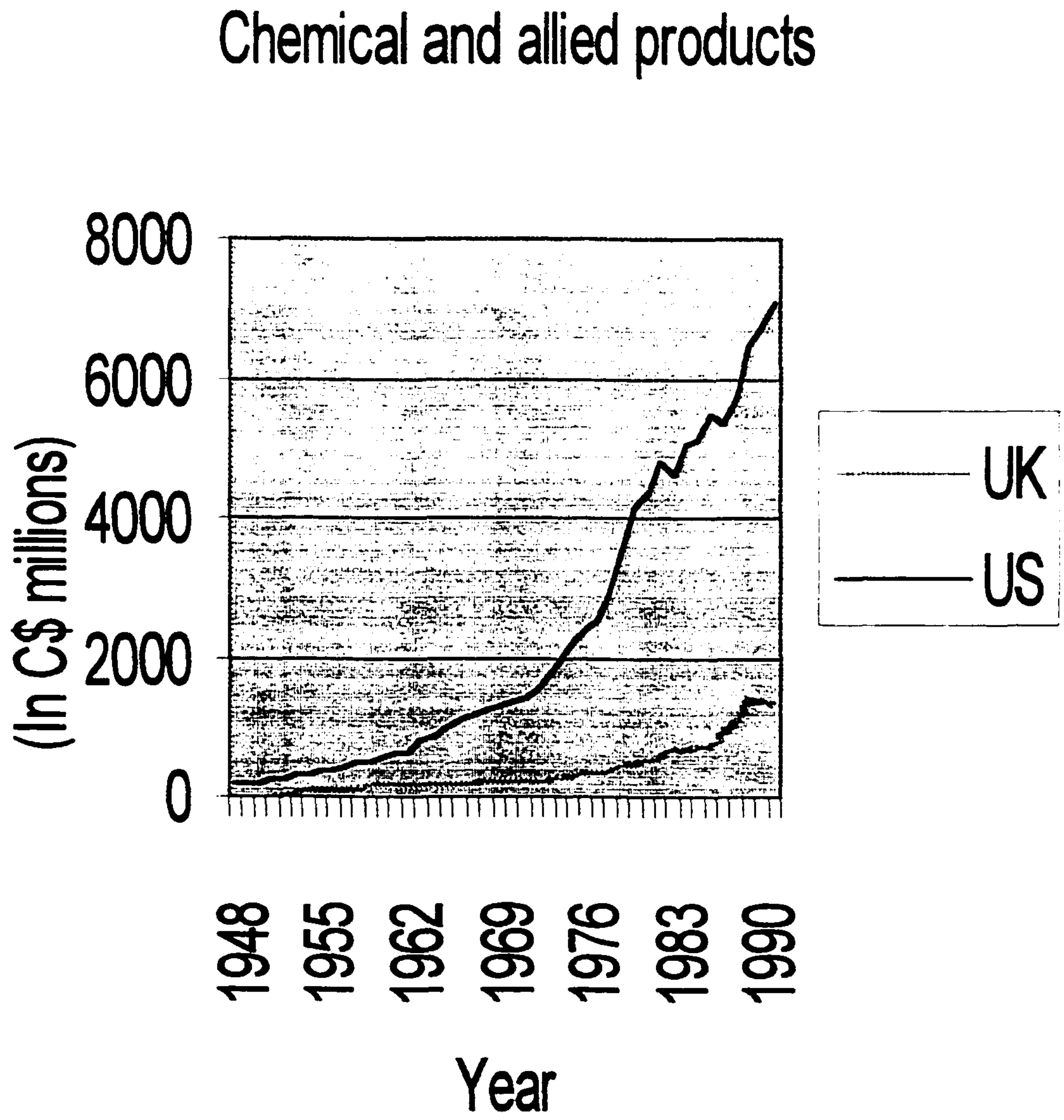

Textiles
1000
800
600
400
200
0
(In C$ millions)
UK
US
1948
1953
1958
1963
1968
1973
1978
1983
1988
Year

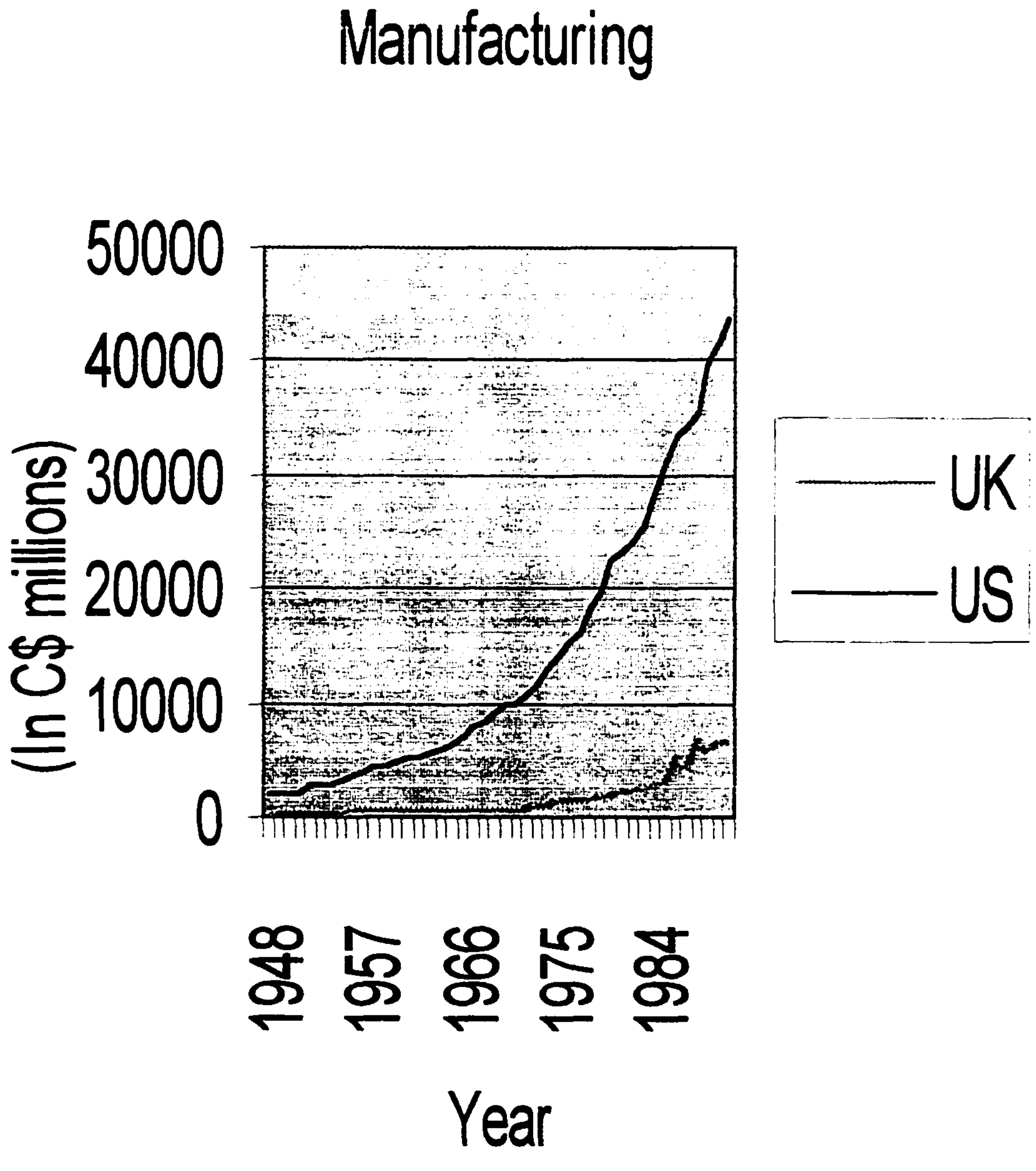

Wood and paper products
8000
6000
4000
2000
0
(In C$ millions)
1948
1958
1968
1978
1988
Year
UK
US

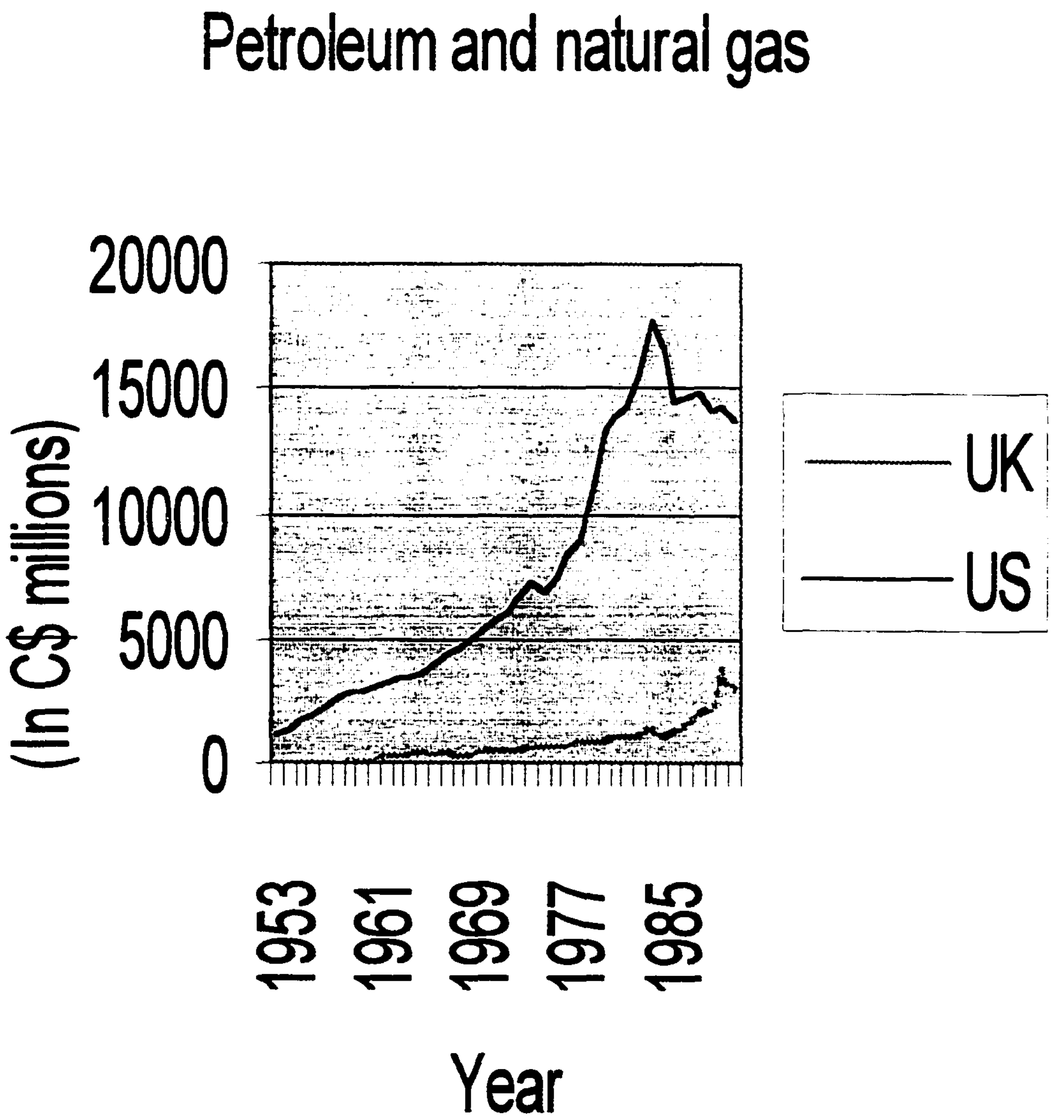

Iron and products
(In C$ millions)
20000
15000
10000
5000
0
1948
1956
1964
1972
1980
1988
Year
UK
US

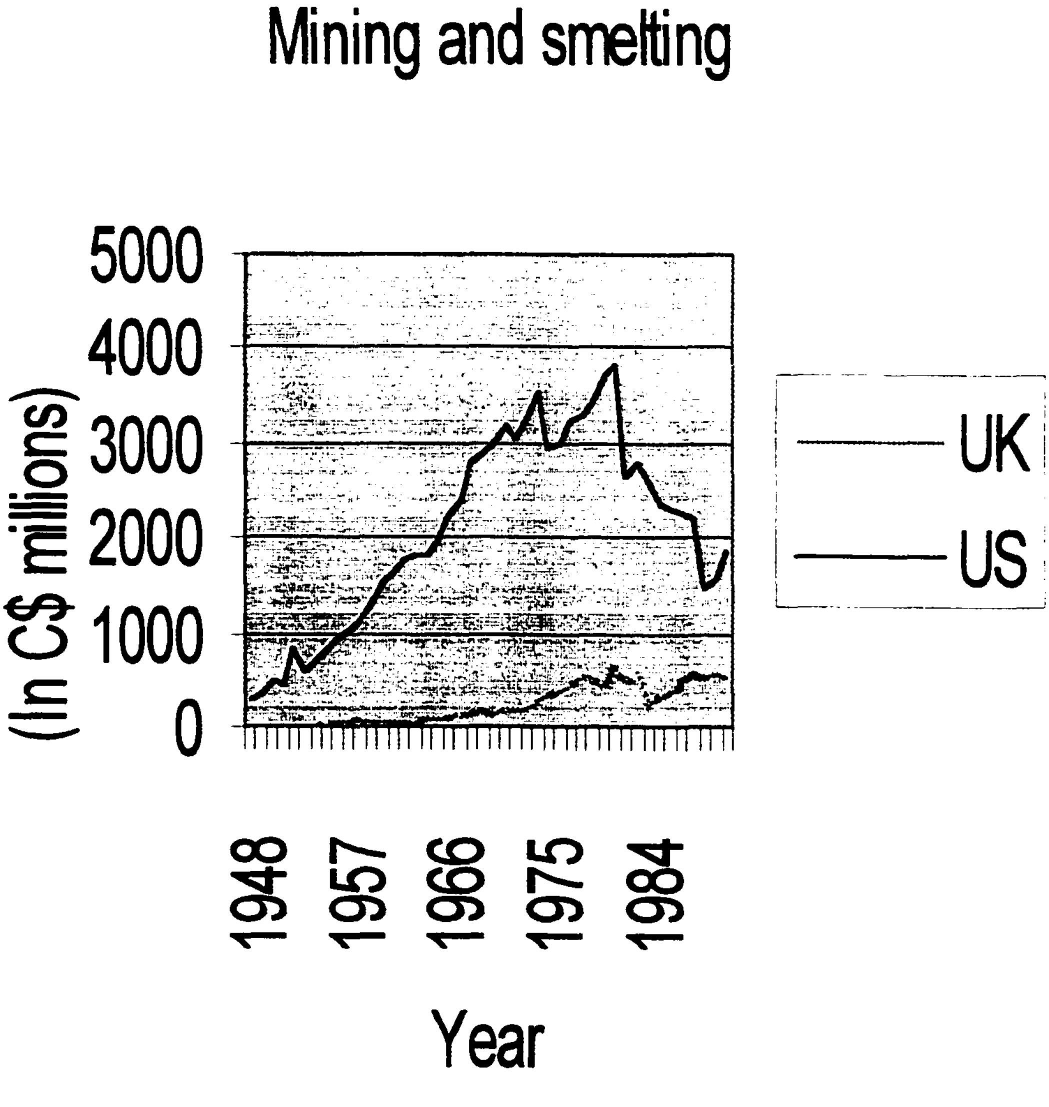

Non-ferrous metals
5000
4000
3000
2000
1000
0
(In C$ millions)
1948
1958
1968
1978
1988
Year
UK
US

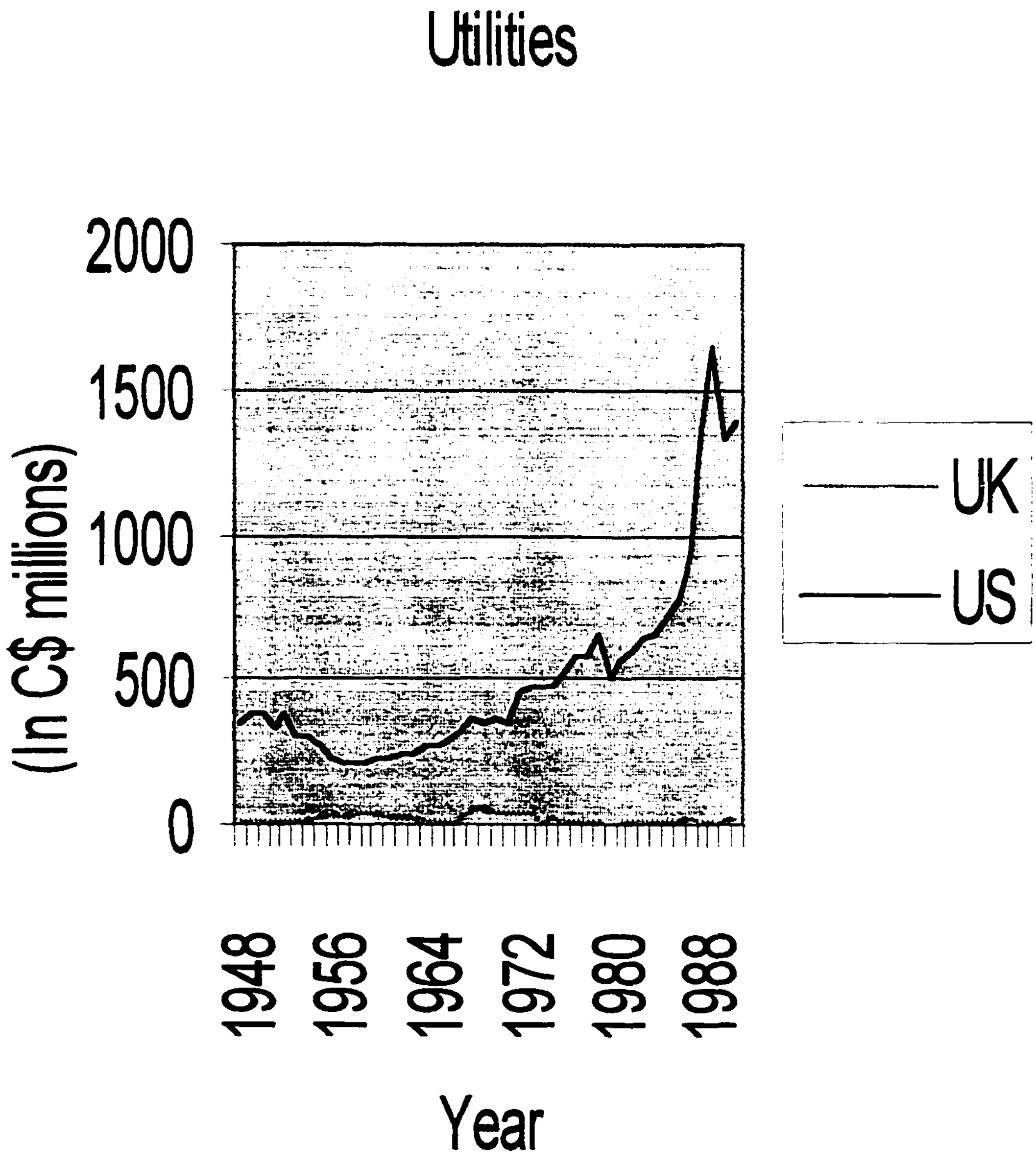

Non-metallic minerals
2000
1500
1000
500
0
(In C$ millions)
UK
US
1948
1956
1964
1972
1980
1988
Year

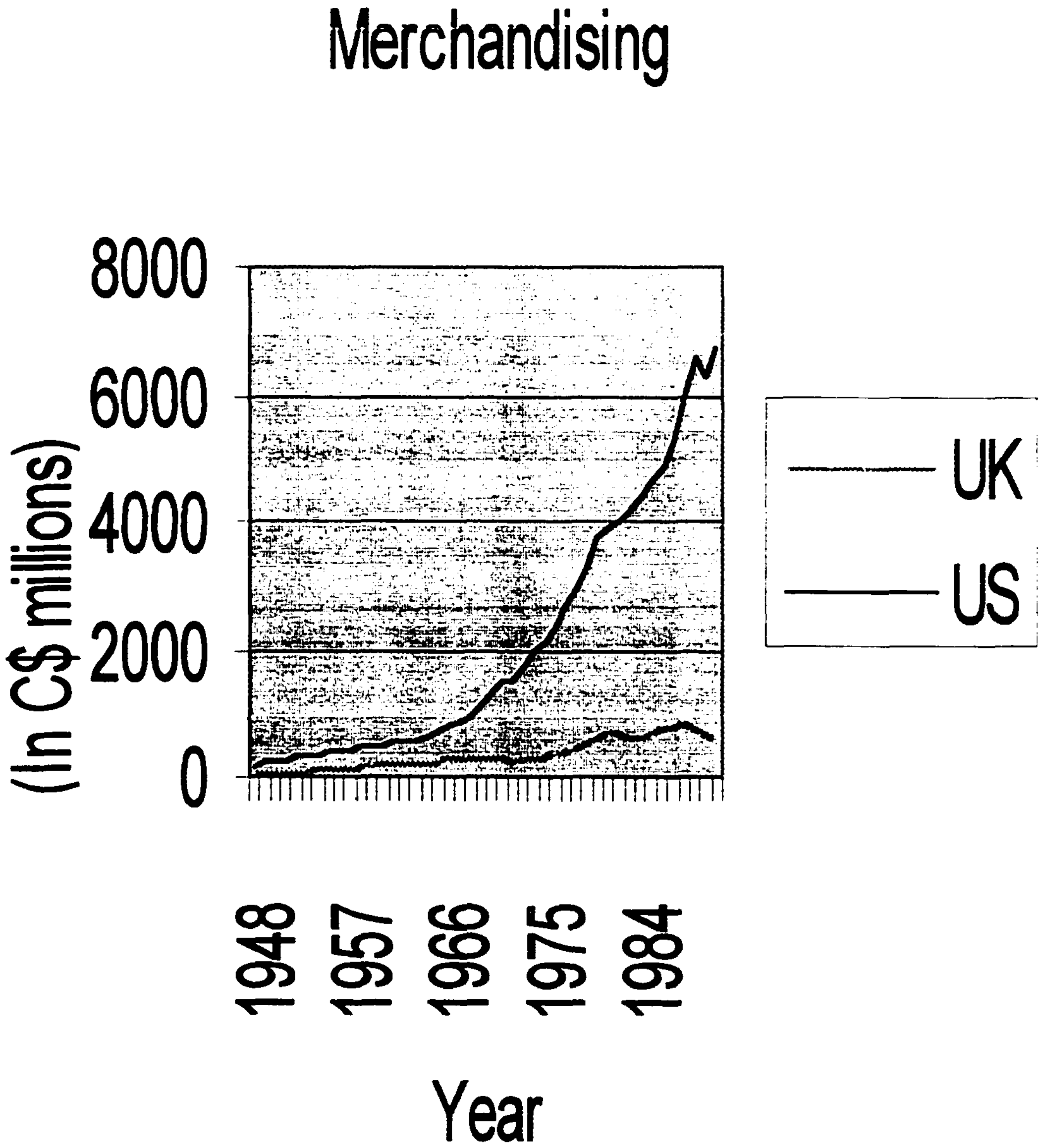

Chemical and allied products
8000
6000
4000
2000
0
(In C$ millions)
1948
1955
1962
1969
1976
1983
1990
Year
UK
US

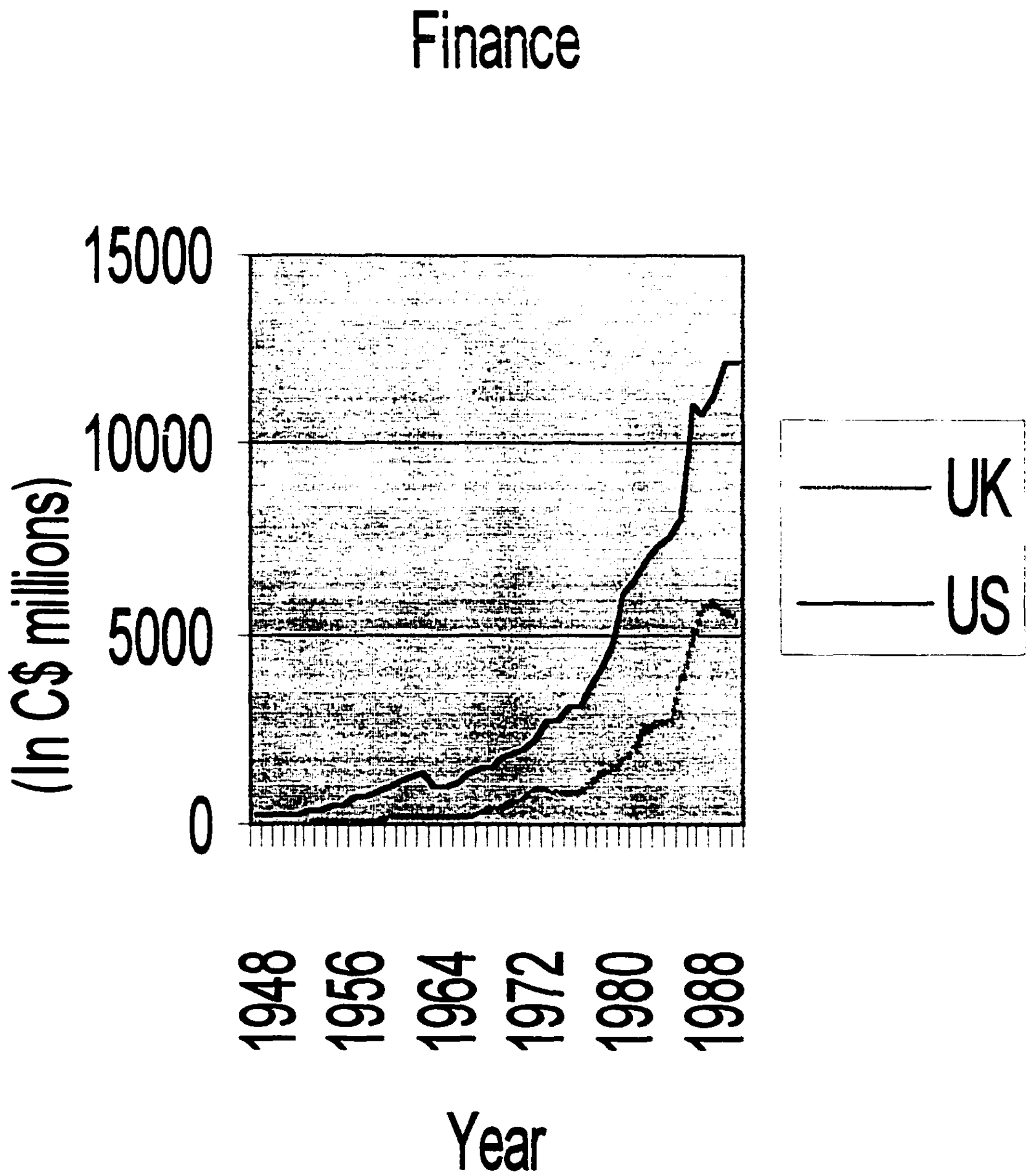

Manufacturing
50000
40000
30000
20000
10000
0
(In C$ millions)
1948
1957
1966
1975
1984
Year
UK
US

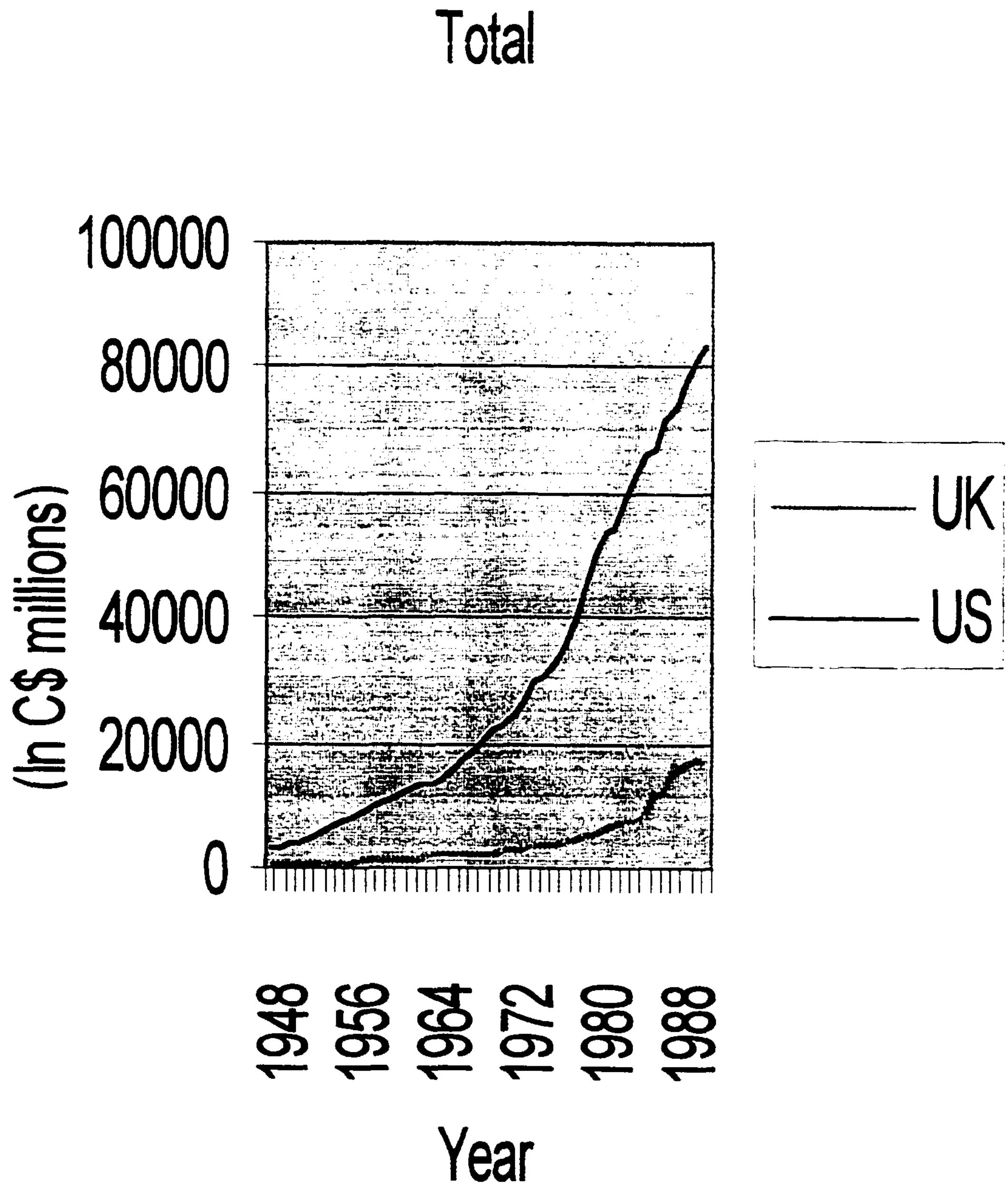

Petroleum and natural gas
20000
15000
10000
5000
0
(In C$ millions)
1953
1961
1969
1977
1985
Year
UK
US


Mining and smelting
5000
4000
3000
2000
1000
0
(In C$ millions)
1948
1957
1966
1975
1984
Year
UK
US


Utilities
2000
1500
1000
500
0
(In C$ millions)
UK
US
1948
1956
1964
1972
1980
1988
Year


Merchandising
8000
6000
4000
2000
0
(In C$ millions)
1948
1957
1966
1975
1984
Year
UK
US


Finance
15000
10000
5000
0
(In C$ millions)
UK
US
1948
1956
1964
1972
1980
1988
Year


Total
100000
80000
60000
40000
20000
0
(In C$ millions)
UK
US
1948
1956
1964
1972
1980
1988
Year

APPENDIX F

A Random Walk Model

Suppose $\{u_t\}$ is a random series with mean μ and a constant variance σ^2 and it is serially uncorrelated. Then, the series $\{Y_t\}$ is said to be a random walk if

$$Y_t = Y_{t-1} + u_t \tag{1}$$

In the random walk model, the value of Y at time t is equal to its value at time (t-1) plus a random shock. Assuming $Y_0 = 0$ at t=0, then

$$Y_1 = Y_0 + u_1 = u_1$$
$$Y_2 = Y_1 + u_2 = u_1 + u_2$$
$$Y_3 = Y_2 + u_3 = u_1 + u_2 + u_3$$

and, in general,

$$Y_t = \sum u_t$$

Therefore,

$$E(Y_t) = E(\sum u_t) = t \times \mu \tag{2}$$

$$\mathrm{var}(Y_t) = t \times \sigma^2 \tag{3}$$

Equations (2) and (3) show that both the mean and variance of Y_t change with time t; hence, the process is nonstationary.

However,

$$Y_t - Y_{t-1} = u_t$$

is a purely random process. That is, the first differences of a random walk time series are stationary

APPENDIX G

Nelson and Kang's (1984) Comments on the Explanatory Variable Time

1. Regression of a random walk on time by least squares will produce R^2 values of around 0.44 regardless of sample size when, in fact, the mean of the variable has no relationship.
2. In the case of random walks with drift, that is $\beta \neq 0$, the R^2 will be higher and will increase with the sample size, reaching one in the limit regardless of the value of β.
3. The residual from the regression on time which is taken as the de-trended series, has on the average only about 14% of the true stochastic variance of the original series.
4. The residuals from the regression on time are also autocorrelated being roughly (1-10/N) at lag one, where N is the sample size.
5. Conventional t tests to test the significance of some of the regressors are not valid. They tend to reject the null hypothesis of no dependence on time, with very high frequency.
6. Regression of one random walk on another, with time included for trend, is strongly subject to the spurious regression phenomenon. That is, the conventional t test will tend to indicate a relationship between the variables when none is present.

APPENDIX H

Critical Values (5%) for the Cointegration Tests

n	T	CRDW	DF	ADF
2	50	0.78	-3.67	-3.29
	100	0.39	-3.37	-3.17
	200	0.20	-3.37	-3.25
3	50	0.99	-4.11	-3.75
	100	0.55	-3.93	-3.62
	200	0.39	-3.78	-3.78
4	50	1.10	-4.35	-3.98
	100	0.65	-4.22	-4.02
	200	0.48	-4.18	-4.13
5	50	1.28	-4.76	-4.15
	100	0.76	-4.58	-4.36
	200	0.57	-4.48	-4.43

CRDW $= \sum(\hat{u}_t - \hat{u}_{t-1})^2 / \sum \hat{u}_t^2$, CRDW is the cointegrating regression Durbin-Watson statistic; DF is the t test for $\alpha = 0$ in $\Delta\hat{u}_t = \alpha\hat{u}_{t-1} + \eta_t$; ADF is the t test for $\alpha = 0$ in $\Delta\hat{u}_t = \alpha\hat{u}_{t-1} + \sum_1^p \phi_t \Delta\hat{u}_{t-1} + \eta_t$. In all these tests $\hat{u}_t$ is the residual from the cointegrating relationship, and n is the number of cointegrating variables.

Source: Engle and Yoo (1987)

REFERENCES CITED

Adler, M. (1981). Investor recognition of corporate international diversification: Comment. Journal of Finance, 36, 187-192.

Ady, P. (1972). Private foreign investment and the developing world. New York: Praeger.

Agarwal, J. P. (1978). Zur Struktur der westdeutschen Direktinvestitionen in Entwicklungsländer. Einfluß von Außenhandelsverflechtung and relativen Lohnkosten [On the structure of West German foreign direct investment in developing countries. Impact of trade barriers and relative labor costs]. Die Weltwirtschaft, 1, 114-132.

Agarwal, J. P. (1980). Determinants of foreign direct investment: A survey. Weltwirtschaftliches Archiv, 116(4), 739-773.

Agmon, T. B., & Lessard, D. R. (1977). Investor recognition of corporate international diversification. Journal of Finance, 32, 1049-1055.

Agmon, T. B., & Lessard, D. R. (1981). Investor recognition of corporate international diversification: Reply. Journal of Finance, 36.

Aharoni, Y. (1966). The foreign investment decision process. Boston: Division of Research, Graduate School of Business Administration, Harvard University.

Ahrens, R. (1996). Going global. International Business, 9(7), 26-30.

Aliber, R. A. (1975). Exchange risk, political risk and investor demands for external currency deposits. Journal of Money, Credit and Banking, 7, 161-179.

Aliber, R. Z. (1970). A theory of direct foreign investment. In C. P. Kindleberger (Ed.), The international corporation: A symposium (Chapter 1). Cambridge, MA: MIT Press.

Aliber, R. Z. (1971). The multinational enterprise in a multiple currency world. In J. H. Dunning (Ed.), The multinational enterprise (pp. 49-56). Cambridge, MA.

Allen, A. M. (1973). Guide for investment in developing countries. London: Brown, Knight and Truscott Ltd.

Almon, S. (1965). The distributed lag between capital appropriations and expenditures. Econometrica, 33, 178-196.

Azar, E. E. (1980). The conflict and peace data bank (COPDAB) project. Journal of Conflict Resolution, 24, 143-152.

Bajo-Rubio, O., & Sosvilla-Rivero, S. (1994). An econometric analysis of foreign direct investment in Spain, 1964-89. Southern Economic Journal, 61, 104-120.

Ball, G. W. (1975). Global companies: The political economy of world business. Englewood Cliffs, New Jersey: Prentice-Hall.

Banks, A. S., & Textor, R. B. (1963). A cross-polity survey. Cambridge, Mass.: M.I.T. Press.

Barlett, M. . (1946). On the theoretical specification of sampling properties of autocorrelated time series. Journal of the Royal Statistical Society, Series B, 27, 27-41.

Basi, R. S. (1963). Determinants of United States private direct investment in foreign countries. Kent, Ohio: Kent State University Press.

Basmann, R. L. (1957). A generalized classical method of linear estimation of coefficients in a structural equation. Econometrica, 25, 77-83.

Baumol, W. J. (1959). Business behavior, value and growth. New York: Macmillan.

Bera, A. K., & McAleer, M. (1982). Further results on testing linear and log-linear regression models. Paper presented at the SSRC Econometric Group Conference on Model Specification and Testing, Warwick, England.

Berenblutt, I. I., & Webb, G. I. (1973). A new test for autocorrelated errors in the linear regression model. Journal of the Royal Statistical Society, Series B, 35(1), 33-50.

Bhagwati, J. N. (1958). Immiserizing growth: A geometrical note. Review of Economic Studies, 25, 201-205.

Blake, D., & Walters, R. (1987). The politics of global economic relations (3rd ed.). Englewood Cliffs, New Jersey: Prentice-Hall.

Boddewyn, J. J. (1979a). Foreign divestment: Magnitude and factors. Journal of International Business Studies, 10, 21-26.

Boddewyn, J. J. (1979b). Divestment: Local vs. Foreign, and U.S. vs. European approaches. Management International Review, 19, 21-28.

Boddewyn, J. J. (1983). Foreign direct divestment theory: Is it the reverse of FDI theory?. Weltwirtschaftliches Archiv, 119(2), 345-355.

Boddewyn, J. J. (1985). Theories of foreign direct investment and divestment: A classificatory note. Management International Review, 25(1), 57-65.

Boddewyn, J. J. (1988). Political aspects of MNE theory. Journal of International Business Studies, 19, 341-363.

Boxx, W. R, & Dant, R. P. (1990). Assessing political risk in international business: A dynamic time-variant model. The Southern Business and Economic Journal, April, 210-226.

Breusch, T. S. (1978). Testing for autocorrelation in dynamic linear models. Australian Economic Papers, 17, 334-355.

Breusch, T., & Pagan, A. (1979). A simple test for heteroscedasticity and random coefficient variation. Econometrica, 47, 1287-1294.

Brewer, T. L. (1993). Government policies, market imperfections, and foreign direct investment. Journal of International Business Studies, 24, 101-120.

Brown, W. R. (1976). Islands of conscious power: MNCs in the theories of the firm. MSU Business Topics, 37-54.

Buckley, P. J. (1988). The limits of explanation: Testing the internalization theory of the multinational enterprise. Journal of International Business Studies, 19(2), 181-193.

Buckley, P. J., & Casson, M. (1976). The future of the multinational enterprise. London: Macmillan.

Buckley, P. J., & Casson, M. (1981). The optimal timing of a foreign direct Investment. Economic Journal, 94, 75-87.

Calvet, A. L. (1984). A synthesis of foreign direct investment theories and theories of the multinational enterprise. Journal of International Business Studies, 12(1), 43-59.

Campa, J. M. (1993). Entry by foreign firms in the United States under exchange rate uncertainty. Review of Economics and Statistics, 75, 614-622.

Caselli, F. (1999). Technological revolutions. American Economic Review, 89(1), 78-102.

Casson, M. (1983). The growth of international business. London: George Allen and Unwin.

Casson, M. (1987). The firm and the market. Oxford, U.K.: Basil Blackwell.

Caves, R. (1988). Exchange-rate movements and foreign direct investment in the United States. Harvard Institute of Economic Research.

Caves, R. E. (1971). International corporations: The industrial economics of foreign investment. Economica, 38, 1-27.

Caves, R. E. (1974). Causes of direct investment: Foreign firms' shares in Canadian and United Kingdom manufacturing industries. Review of Economics and Statistics, 56, 279-293.

Chase, C. D., Kuhle, J. L. & Walther, C. H. (1988). The relevance of political risk in direct foreign investment. Management International Review, 28(3), 31-8.

Choi, S.-R., Tschoegl, A. E., & Yu, C.-M. (1986). Banks and the world's major financial centers, 1970-1980. Weltwirtschaftliches Archiv, 122, 48-64.

Chou, T.-C. (1988). American and Japanese direct foreign investment in Taiwan: A comparative study. Hitotsubashi Journal of Economics, 29.

Chow, G. C. (1960). Tests of equality between sets of coefficients in two linear regressions. Econometrica, 28(3), 591-605.

Clague, C., Keefer, P., Knack, S., & Olson, M. (1995, March). Property and contract rights under democracy and dictatorship. Presented at the CREI Conference on Growth, Barcelona, Spain.

Coase, R. H. (1937). The nature of the firm. Economica, 4, 386-405.

Cochrane, D., & Orcutt, G. H. (1949). Application of least squares regressions to relationships containing autocorrelated error terms. Journal of the American Statistical Association, 44, 32-61.

Cook, N. (1980). Stability and flexibility: An analysis of natural systems. Oxford: Pergammon Press.

Countries in trouble. (1986, December). The Economist, 25-28.

Culem, C. G. (1988). The locational determinants of direct investments among industrialized countries. European Economic Review, April, 885-904.

Cushman, D. O. (1985). Real exchange rate risk, expectations, and the level of direct investment. Review of Economics and Statistics, 67, 297-308.

Cushman, D. O. (1987). The effects of real wages and labor productivity on foreign direct investment. Southern Economic Journal, July, 174-185.

Cushman, D. O. (1988). Exchange rate uncertainty and foreign direct investment in the United States. Welwirtschaftliches Archiv, 124, 323-335.

Cyert, R. M., & March, J. G. (1963). A behavioral theory of the firm. Englewood Cliffs: Prentice-Hall.

Davidson, R., & MacKinnon, J. G. (1981). Several tests for model specification in the presence of alternative hypotheses. Econometrica, 49, 781-793.

Davidson, R., & MacKinnon, J. G. (1993). Estimation and inference in econometrics. New York: Oxford University Press.

Denton, F. H. (1969). Factors in international system violence: 1750 to 1960. Santa Monica: The Rand Corporation.

Denton, F. H., & Phillips, W. (1968). Some patterns in the history of violence. Journal of Conflict Resolution, 12(2), 182-195.

Desta, A. (1985). Assessing political risk in less developed countries. Journal of Business Strategy, 5(5), 40-53.

Dewenter, K. L. (1995). Do exchange rate changes drive foreign direct investment?. Journal of Business, 68(3), 405-433.

Dicken, P. (1992). Global shift: The internationalization of economic activity (2nd ed.). New York: The Guilford Press.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. Journal of the American Statistical Association, 74, 427-431.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. Econometrica, 49, 1057-1072.

Dill, W. R. (1957). Environment as an influence on managerial autonomy. Administrative Science Quarterly, 2, 409-443.

Dixit, A. (1989a). Hysteresis, import penetration, and exchange rate pass-through. Quarterly Journal of Economics, 104, 205-228.

Dixit, A. (1989b). Entry and exit decisions under uncertainty. Journal of Political Economy, 97(3), 621-638.

Drake, R. L., & Prager, A. J. (1977). Floundering with foreign investment planning. Columbia Journal of World Business, 12, 66-77.

Drysdale, P. (1972). Direct foreign investment in Asia and the Pacific. Camberra, Australia: Australian National University Press.

Dunning, J. H. (1971). The multinational enterprise. London: Allen and Unwin.

Dunning, J. H. (1973). The determinants of international production. Oxford Economic Papers, 25, 289-336.

Dunning, J. H. (1977). Trade, location of economic activity and the MNE: A search for an eclectic approach. In B. Ohlin, P.-O. Hesselborn, & P.M. Wijkman (Eds.), The international allocation of economic activity: Proceedings of a Nobel Symposium held at Stockholm (pp. 395-418). London: Macmillan.

Dunning, J. H. (1979). Explaining changing patterns of international production: In defense of the eclectic theory. Oxford Bulletin of Economics and Statistics, 41, 269-295.

Dunning, J. H. (1980). Toward an eclectic theory of international production. Journal of International Business Studies, 11, 9-31.

Dunning, J. H. (1981). Explaining the international direct investment position of countries: Towards a dynamic or developmental approach. Weltwirtschaftliches Archiv, 117(1), 30-64.

Dunning, J. H. (1988a). The eclectic paradigm of international production: A restatement and some possible extensions. Journal of International Business Studies, 19, 1-31.

Dunning, J. H. (1988b). Explaining international production. London: Unwin Hyman.

Durbin, J. (1960). Estimation of parameters in time-series regression models. Journal of the Royal Statistical Society, Series B, 22, 139-153.

Durbin, J., & Watson, G. S. (1951). Testing for serial correlation in least-squares regression. Biometrika, 38, 159-171.

Dymsza, W. A. (1972). Multinational business strategy. New York: McGraw-Hill.

Eiteman, D. K., Stonehill, A. I., & Moffet, M. H. (1995). Multinational business finance (7th ed.). New York: Addison-Wesley Publishing Company, Inc.

Engle, R. F. (1982). Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. Econometrica, 50(1), 987-1007.

Engle, R. F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation and testing. Econometrica, 55, 251-276.

Engle, R. F., & Yoo, B. S. (1987). Forecasting and testing in cointegrating systems. Journal of Econometrics, 35, 143-159.

Errunza, V. R., & Senbet, L. W. (1981). The effects of international operations on the market value of the firm: Theory and evidence. Journal of Finance, 36, 401-417.

Fatehi, K. & Safizadeh, M. H. (1994). The effect of sociopolitical instability on the flow of different types of foreign direct investment. Journal of Business Research, 31, 65-73.

Fatehi-Sedech, K. & Satizadech, M. H. (1988). Sociopolitical events and foreign direct investment: American investments in South and Central American countries, 1950-1982. Journal of Management, 14, 93-107.

Fatehi-Sedeh, K. & Safizadeh, M. H. (1989). The association between political instability and flow of foreign direct investment. Management International Review, 29(4), 4-13.

Fayerweather, J. (1969). International business management-A conceptual framework. New York: McGraw-Hill.

Feierabend, I. K., & Feierabend, R. L. (1966). Aggressive behaviors within polities, 1948-1962: A cross-national study. Journal of Conflict Resolution, 10(3), 249-271.

Fitzpatrick, M. (1983). The definition and assessment of political risk in international business: A review of the literature. Academy of Management Review, 8(2), 249-254.

Flowers, E. (1976). Oligopolistic reaction in European and Canadian direct investment in the United States. Journal of International Business Studies, 7, 43-55.

Froot, K. A. & Stein, J. C. (1991). Exchange rates and foreign direct investment: An imperfect capital markets approach. Quarterly Journal of Economics, 106, 1191-1217.

Geary, R. C. (1970). Relative efficiency of count of sign changes for assessing residual autoregression in least squares. Biometrika, 57, 123-127.

Ghoshal, S. (1987). Global strategy: An organizing framework. Strategic Management Journal, 8, 425-440.

Gilpin, R. (1975). Three models of the future. International Organization, 29, 37-60.

Gladwin, T., & Walter, I. (1980). Multinationals under fire. Wiley.

Glejser, H. (1969). A new test for heteroscedasticity. Journal of the American Statistical Association, 64, 316-323.

Godfrey, L. (1978a). Testing for multiplicative heteroscedasticity. Journal of Econometrics, 8, 227-236.

Godfrey, L. G. (1978b). Testing against general autoregressive and moving average error models when the regressors include lagged dependent variables. Econometrica, 46, 1293-1302.

Goldberg, M. A. (1972). The determinants of U.S. direct investment in the E.E.C.: Comment. American Economic Review, 62, 692-699.

Goldberger, A. S. (1991). A course in econometrics. Cambridge, MA: Harvard University Press.

Goldfeld, M. G., & Quandt, R. E. (1972). Nonlinear methods in econometrics. Amsterdam: North Holland.

Graham, E. M. (1998). Market structure and the multinational enterprise: A game-theoretic approach. Journal of International Business Studies, 29(1), 67-83.

Graham, E. M. (1996). Global corporations and national governments. Washington, DC: Institute for International Economics.

Granger, C. W. J. (1969). Investigating causal relations by econometric models and cross-spectral methods. Econometrica, 37, 424-438.

Granger, C. W. J. (1986). Developments in the study of co-integrated economic variables. Oxford Bulletin of Economics and Statistics, 48, 213-228.

Granger, C. W. J., & Newbold, P. (1974). Spurious regressions in econometrics. Journal of Econometrics, 2, 111-120.

Gray, P. H. (1980). The theory of international trade among industrialized nations. Weltwirtschaftliches Archiv, 116, 447-470.

Green, R. T. (1972). Political instability as a determinant of U.S. foreign investment. Austin: Bureau of Business Research, University of Texas.

Green, R. T., & Cunningham, W. H. (1975). The determinants of U.S. Foreign investment: An empirical examination. Management International Review, 15, 113-120.

Green, R. T., & Korth, C. M. (1974). Political instability and the foreign investor. California Management Review, 17(1), 23-31.

Green, R. T., & Smith, C. H. (1972). Multinational profitability as a function of political instability. Management International Review, 12(6), 23-29.

Grosse, R. (1981). The theory of foreign direct investment (Essays in International Business, No. 3). Columbia, SC: University of South Carolina, College of Business Administration, Center for International Business Studies.

Grosse, R. (1985). An imperfect competition theory of the MNE. Journal of International Business Studies, 16, 57-80.

Grosse, R., & Behrman, J. N. (1992). Theory in international business. Transnational Corporations, 1(1), 93-126.

Grosse, R., & Trevino, L. J. (1996). Foreign direct investment in the United States: An analysis by country of origin. Journal of International Business Studies, 27, 139-155.

Grubel, H. G. (1968). International diversified portfolios: Welfare gains and capital flows. American Economic Review, 58, 1299-1314.

Gruber, W., Metha, D., & Vernon, R. (1967). The R&D factor in international trade and international investment of U.S. industries. Journal of Political Economy, February, 20-37.

Gujarati, D. N. (1988). Basic econometrics (2nd edition). New York: McGrawHill.

Gujarati, D. N. (1995). Basic econometrics (3rd edition). New York: McGrawHill.

Gupta, D. K. (1990). The economics of political violence. The effect of political instability on economic growth. New York: Praeger.

Gurr, T. (1968). A causal model of civil strife: A comparative analysis using new indices. The American Political Science Review, 4, 1104-1124.

Haendel, D. H., West, G. T., & Meadow, R. G. (1975). Overseas investment and political risk. Philadelphia: Foreign Policy and Research Institute.

Haner, F. T. (1979). Rating investment risks abroad. Business Horizons, 22(2), 18-23.

Hausman, J. A. (1978). Specification tests in econometrics. Econometrica, 46, 1251-1271.

Hennart, J.-F. (1982). A theory of multinational enterprise. Ann Arbor: University of Michigan.

Hennart, J.-F. (1986). What is internalization?. Welwirtschaftliches Archiv, 122, 790-803.

Hofer, C. W., & Haller, T. P. (1980). Globescan: A way to better international risk assessment. Journal of Business Strategy, 1(2), 41-55.

Holsti, K. J. (1988). International politics: A framework for analysis (5th ed.). Englewood Cliffs, New York: Prentice-Hall.

Horst, T. (1972). Firm and industry determinants of the decision to invest abroad: An empirical study. Review of Economics and Statistics, 54, 258-266.

Horst, T. (1979). The industrialized composition of U.S. exports and subsidiary sales to the Canadian market. American Economic Review, 62(1), 37-45.

Hufbauer, G. C. (1975). The multinational corporation and direct investment. In P. B. Kenen (Ed.), International trade and finance (pp. 253-319). Cambridge, England: Cambridge University Press.

Hymer, S. H. (1976). The international operations of national firms: A study of direct foreign investment. Cambridge, MA: MIT Press.

International Bank for Reconstruction and Development & International Chamber of Commerce, Commission on Foreign Investments. (1962). International investment insurance: Analysis of replies received (Document No. 109, 12.11.1962-mtp). Washington, DC: Author.

Itagaki, T. (1981). The theory of the multinational firm under exchange rate uncertainty. Canadian Journal of Economics, 14(2), 276-297.

Jacquillat, B., & Solnik, B. (1978). Multinationals are poor tools for diversification. Journal of Portfolio Management, Winter, 8-12.

Jarque, C. M., & Bera, A. K. (1987). A test for normality of observations and regression residuals. International Statistical Review, 55, 163-172.

Johnson, H. G. (1970). The efficiency and welfare implications of the international corporation. In C. P. Kindleberger (Ed.), The international corporation (pp. 35-56). Cambridge, MA: MIT Press.

Judge, G. G., Hill, R. C., Griffiths, W. E., Lütkepohl, H., & Lee, T.-C. (1982). Introduction to the theory and practice of econometrics. New York: John Wiley & Sons.

Juhl, P. G. (1979). On the sectoral patterns of West German manufacturing investment in less developed countries: The impact of firm size, factor intensities and protection. Weltwirtschaftliches Archiv, 115, 508-521.

Kazmier, L. J., & Pohl, N. F. (1987). Basic statistics for business and economics (2nd edition). Singapore: McGrawHill.

Keegan, W. J. (1974). Multinational scanning: A study of the information sources utilized by headquarters executives in multinational companies. Administrative Science Quarterly, 19, 411-421.

Kennedy, C. (1984). The external environment-strategic planning interface: US multinational corporate practices in the 1980s. Journal of International Business Studies, Fall, 99-108.

Kennedy, P. (1985). A guide to econometrics (2nd edition). Cambridge, Mass.: M.I.T. Press.

Kindleberger, C. P. (1969). American business abroad: Six lectures on direct investment. New Haven: Yale University Press.

Kissinger, H. (1994). Diplomacy. London: Simon & Schuster.

Kmenta, J. (1986). Elements of econometrics (2nd edition). New York: Macmillan.

Knack, S., & Keefer, P. (1995). Institutions and economic performance: empirical tests using alternative measures of institutions (Working Paper No. 109). Maryland: University of Maryland, IRIS Center.

Knickerbocker, F. T. (1973). Oligopolistic reaction and multinational enterprise. Boston: Division of Research, Harvard University Graduate School of Business Administration.

Kobrin, S. J. (1976). The environmental determinants of foreign direct manufacturing investment: An ex post empirical analysis. Journal of International Business Studies, 7, 29-42.

Kobrin, S. J. (1978). When does political instability result in increased investment risk?. Columbia Journal of World Business, 13, 113-122.

Kobrin, S. J. (1979). Political risk: A review and reconsideration. Journal of International Business Studies, 10(1), 67-80.

Kobrin, S. J. (1982). Managing political risk assessment: Strategic response to environmental change. Berkeley, CA: University of California Press.

Kobrin, S. J., Basek, J., Blank, S., & La Palombara, J. (1980). The assessment and evaluation of noneconomic environments by American firms: A preliminary report. Journal of International Business Studies, 11, 33-47.

Koechlin, T. (1992). The determinants of the location of USA direct foreign investment. International Review of Applied Economics, 6(2), 203-216.

Kogut, B. (1985). Designing global strategies: Corporate and competitive value added chain. Sloan Management Review, 25, 15-28.

Kohlhagen, S. W. (1977). Exchange rate changes, profitability, and direct foreign investment. Southern Economic Journal, 44, 43-52.

Kojima, K. (1973). A macroeconomic approach to foreign direct investment. Hitotsubashi Journal of Economics, 14, 1-21.

Kojima, K. (1975). International trade and foreign investment-Substitutes or complements. Hitotsubashi Journal of Economics, 16, 1-12.

Kojima, K. (1985). Japanese and American direct investment in Asia: A comparative analysis. Hitotsubashi Journal of Economics, 26, 1-35.

Kojima, K., & Ozawa, T. (1984). Micro and macroeconomic models of direct foreign investment: Towards a synthesis. Hitotsubashi Journal of Economics, 25(2), 1-20.

Kravis, I. B., & Lipsey, R. E. (1982). The location of overseas production and production for export by U.S. Multinational firms. Journal of International Economics, 12(3), 201-223.

Kronfol, Z. A. (1972). Protection of foreign investment. Netherlands: A. W. Sijthoff Leiden.

Krueger, N., Jr., & Dickson, P. R. (1994). How believing in ourselves increases risk taking: Perceived. Decision Sciences, 25(3), 385-401.

LaPalombara, J., & Blank, S. (1977). Multinational corporations in comparative perspective. New York: National Industrial Conference Board, Public Affairs Research Division.

Leamer, E. E. (1978). Specification searches: ad hoc inference with nonexperimental data. New York: John Wiley & Sons.

Lee, C. H. (1983). International production of the United States and Japan in Korean manufacturing industries: A comparative study. Weltwirtschaftliches Archiv, 119.

Lee, C. H. (1984). On Japanese macroeconomic theories of direct foreign investment. Economic Development and Cultural Change, 32, 713-723.

Levis, M. (1979). Does political instability in developing countries affect foreign investment flow?. Management International Review, 19(3), 59-68.

Lindley, D. V. (1957). A statistical paradox. Biometrika, 44, 187-192.

Little, J. S. (1978). Locational decisions of direct foreign investors in the U.S. New England Economic Review, July/August, 43-63.

Liu, T. C. (1960). Under-identification, structural estimation, and forecasting. Econometrica, 28, 855-865.

Ljung, G. M., & Box, G. P. E. (1978). On a measure of lack of fit in time series models. Biometrika, 66, 66-72.

Logue, D. E., & Willett, T. D. (1977). The effects of exchange rate adjustment on international investment. In P. B. Clark, D. E. Logue, & R. J. Sweeney (Eds.), The effects of exchange rate adjustments (pp. 137-150). Washington, DC: Government Printing Office.

Lucas, R. E. (1976). Econometric policy evaluation: A critique. In K. L. Brunner (Ed.), The Phillips curve and labor markets (supplement to the Journal of Monetary Economics) (pp. 10-46).

MacKinnon, J., White, H., & Davidson, R. (1983). Tests for model specification in the presence of alternative hypothesis: some further results. Journal of Econometrics, 21, 53-70.

Maddala, G. S. (1992). Introduction to econometrics (2nd edition). New York: Macmillan.

Magee, S. P. (1976). An appropriability theory of the multinational corporation. In J. Bhagwati (Ed.), The new international economic order: The North-South debate (pp. 317-340). Cambridge, MA: MIT Press.

Magee, S. P. (1981). The appropriability theory of the multinational corporation. Annals of the American Academy of Political and Social Science, 458, 123-135.

Magee, S. P., & Young, L. (1982). Multinationals, tariffs, and capital flows with endogenous politicians. In C. P. Kindleberger & D. B. Audretsch (Eds.), The multinational cooperation in the 1980s (pp. 21-38). Cambridge, MA: MIT Press.

Marris, R. (1963). A model of the managerial enterprise. Quarterly Journal of Economics, 78.

Mason, R. H. (1980). A comment on Professor Kojima's 'Japanese type versus American type of technology transfer'. Hitotsubashi Journal of Economics, 20.

McClintock, B. (1988). Recent theories of foreign direct investment: An institutionalist perspective. Journal of Economic Issues, 22, 477-484.

McManus, J. C. (1972). The theory of the international firm. In G. Paquet (Ed.), The multinational firm and the nation state (pp. 66-93). New York: Macmillan.

Meredith, L. (1984). U.S. Multinational investment in Canadian manufacturing industries. Review of Economics and Statistics, February, 66, 111-119.

Mirer, T. W. (1988). Economic statistics and econometrics (2nd edition). New York: Macmillan.

Mizon, G. E., & Richard, J. F. (1986). The encompassing principle and its application to testing non-nested hypotheses. Econometrica, 54, 657-678.

Moran, T. (1974). Multinational corporations and the politics of dependence. Princeton, New Jersey: Princeton University Press.

Moran, T. (Ed.). (1985). Multinational corporations. Lexington, MA: Lexington Books.

Nehrt, L. C. (1972). International finance for multinational business. Scranton, Pa.: Intext Educational.

Nelson, C. R., & Kang, H. (1984). Pitfalls in the use of time as an explanatory variable in regression. Journal of Business and Economic Statistics, 2, 73-82.

Nelson, C. R., & Plosser, C. I. (1982). Trends and random walks in macroeconomic time series: Some evidence and implications. Journal of Monetary Economics, 10, 139-162.

Nerlove, M. (1958). Distributed lags and demand analysis for agricultural and other commodities (Agricultural Handbook No. 141). Washington, DC: U.S. Department of Agriculture.

Nigh, D. (1985). The effect of political events on United States direct foreign investment: A pooled time-series cross-sectional analysis. Journal of International Business Studies, 16, 1-17.

Ning, Y., & Reed, M. R. (1995). Locational determinants of the US direct foreign investment in food and kindred products. Agribusiness, 11(1), 77-85.

One world?. (1997, October). The Economist, p. 79.

Otero, J. M. (1993). Econometría. Series temporales y predicción. Madrid, Spain: Editorial AC.

Park, R. E. (1966). Estimation with heteroscedastic errors. Econometrica, 34(4), 888.

Parry, T. G. (1980). The multinational enterprise: International investment and host-country impacts. Greenwich, Connecticut: JAI Press.

Parry, T. G. (1985). Internalization as a general theory of foreign direct investment: A critique. Weltwirtschaftliches Archiv, 121(3), 564-569.

Perlmutter, H. V. (1969). The tortuous evolution of the multinational corporation. Columbia Journal of World Business, 4, 9-18.

Piper, Jr., J. R. (1971). How U.S. firms evaluate foreign investment opportunities. MSU Business Topics, 19(3), 11-20.

Plosser, C. I., & Schwert, G. W. (1978). Money, income and sunspots: Measuring economic relationships and the effects of differencing. Journal of Monetary Economics, 4, 637-660.

Pomper, C. L. (1976). International investment planning: An integrated approach. Amsterdam: North-Holland Publishing Co.

Porter, M. E. (1976). Please note location of nearest exit: Exit barriers and planning. California Management Review, 19, 2-33.

Porter, M. E. (1990). The competitive advantage of nations. New York: The Free Press.

Posner, M. V. (1961). International trade and technical change. Oxford Economic Papers, 13, 323-341.

Poynter, T. A. (1985). Multinational enterprises and government intervention. New York: Saint Martin's Press, Inc.

Prakash, A. J., Chang, C-H., Hamid, S., & Smyser, M. W. (1996). Why a decision maker may prefer a seemingly unfair gamble. Decision Sciences, 27(2), 239-252.

Pyndick, R. (1988). Irreversible investment, capacity choice, and the value of the firm. American Economic Review, 78, 969-985.

Ragazzi, G. (1973). Theories of the determinants of direct foreign investment. International Monetary Fund Staff Papers, 20, 471-498.

Ramsey, J. B. (1969). Tests for specification errors in classical linear least squares regression analysis. Journal of the Royal Statistical Society, Series B, 31, 350-371.

Rao, C. R. (1965). Linear statistical inference and its applications. New York: John Wiley & Sons.

Reuber, G. L. (1973). Private foreign investment in development. Oxford: Clarendon Press.

Riedel, J. (1975). The nature and determinants of export-oriented direct foreign investment in a developing country: A case study of Taiwan. Weltwirtschaftliches Archiv, 111(3), 505-528.

Robinson, R. (1964). International business policy. New York: Holt, Rinehart and Winston.

Robock, S. H. (1971). Political risk: Identification and assessment. Columbia Journal of World Business, 6(4), 6-20.

Root, F. R. (1968). U.S. business abroad and the political risks. MSU Business Topics, Winter, 73-80.

Root, F. R. (1972). Analyzing political risks in international business. In A. Kapoor & P. Grub (Eds.), The multinational enterprise in transition (pp. 354-365). Princeton, NJ: Darwin Press.

Root, F. R. (1988). Environmental risks and the bargaining power of multinational corporations. International Trade Journal, 3(1), 111-124.

Root, F. R., & Ahmed, A. A. (1979). Empirical determinants of manufacturing direct foreign investment in developing countries. Economic Development and Cultural Change, July, 751-767.

Rugman, A. M. (1980). Internalization as a general theory of foreign direct investment: A re-appraisal of the literature. Weltwirtschaftliches Archiv, 116, 365-379.

Rugman, A. M. (1981). Inside the multinationals: The economics of internal markets. New York: Columbia University Press.

Rugman, A. M. (1986). New theories of multinational enterprises: An assessment of internalization theory. Bulletin of Economic Research, 38, 101-118.

Rummel, R. J., & Heenan, D. A. How multinationals analyze political risk. Harvard Business Review, Winter, 67-76.

Russett, B. R: (1964). World handbook of social and political indicators. New Haven: Yale University Press.

Scaperlanda, A. E. (1974). Trends, composition and determinants of United States direct investment in Canada. Washington, DC: U.S. Department of Commerce, Office of Foreign Direct Investments.

Schneider, F., & Frey, B. S. (1985). Economic and political determinants of foreign direct investment. World Development, 13(2), 161-175.

Schollhammer, H. (1978). Identification, evaluation, and prediction of political risks from an international business perspective. In M. Ghertman & J. Leontiades (Eds.), European research in international business (pp. 91-109). Amsterdam: North-Holland.

Schollhammer, H., & Nigh, D. (1984). The effect of political events on foreign direct investments by German multinational corporations. Management International Review, 24(1), 18-40.

Schollhammer, H., & Nigh, D. (1986). The effects of political events on Japanese foreign direct investments. Asia Pacific Journal of Management, 3, 133-156.

Sethi, S. P., & Luther, K. A. N. (1986). Political risk analysis and direct foreign investment: Some problems of definition and measurement. California Management Review, 28(2), 57-68.

Shapiro, A. C. (1981). Managing political risk: A policy approach. Columbia Journal of World Business, 16, 63-69.

Simon, H. A. (1955). A behavioral model of rational choice. Quarterly Journal of Economics, 70, 99-118.

Simon, H. A. (1959). Theories of decision-making in economics and behavioral science. American Economic Review, 49, 253-283.

Simon, J. D. (1982). Political risk assessment: Past trends and future prospects. Columbia Journal of World Business, 17, 62-71.

Simon, J. D. (1984). A theoretical perspective on political risk. Journal of International Business Studies, 15(3), 123-143.

Smith, C. N. (1971). Predicting the political environment in international business. Long Range Planning, 4, 7-14.

Spanhel, C. L., & Boddewyn, J. J. (1982, August). The foreign divestment decision process: A descriptive model. Paper presented at the Annual Meeting of the Academy of Management, New York.

Stapenhurst, F. (1992). The rise and fall of political risk assessment?. Management Decision, 30(5), 54-57.

Statistics Canada (1993). Canadian Economic Observer (Cat. No. 11-010).

Statistics Canada (1995). Canada's international investment position, Historical Statistics, 1926 to 1992 (Cat. No. 67-202).

Stevens, G. V. (1977). Comment on 'The effects of exchange rate adjustment on international investment'. In P. B. Clark, D. E. Logue, & R. J. Sweeney (Eds.), The effects of exchange rate adjustments (pp. 183-188). Washington, DC: Government Printing Office.

Stewart, M. B., & Wallis, K. F. (1981). Introductory econometrics. Oxford: Basil Blackwell.

Stobaugh, Jr., R. B. (1969). How to analyze foreign investment climates. Harvard Business Review, 47(5), 100-108.

Stock, J. (1987). Asymptotic properties of least-squares estimators of cointegrating vectors. Econometrica, 55, 1035-1056.

Studenmund, A. H. (1992). Using econometrics: A practical guide (2nd edition). New York: HarperCollins Publishers.

Summary, R. M., & Summary, L. J. (1995). The political economy of United States foreign direct investment in developing countries: An empirical analysis. Quarterly Journal of Business and Economics, 34(3), 80-92.

Swamidass, P. M. (1990). A comparison of the plant location strategies of foreign and domestic manufacturers in the U.S. Journal of International Business Studies, 21, 301-317.

Tallman, S. B. (1988). Home country political risk and foreign direct investment in the United States. Journal of International Business Studies, 19(2), 219-234.

Tallman, S. B. (1992). A strategic management perspective on host country structure of multinational enterprises. Journal of Management, 18(3), 455-471.

Teece, D. J. (1976). The multinational corporation and the resource cost of international technology transfer. Cambridge, MA: Ballinger.

Teece, D. J. (1981). The multinational enterprise: Market failure and market power considerations. Sloan Management Review, 22, 3-17.

Teece, D. J. (1986). Transactions cost economics and the multinational enterprise: An assessment. Journal of Economic Behavior and Organization, 7, 21-45.

Theil, H. (1953). Repeated least-squares applied to complete equation systems (mimeographed). The Hague: The Central Planning Bureau.

Theil, H., & Nagar, (1961). Testing the independence of regression disturbances. Journal of the American Statistical Association, 56, 793-806.

Thunell, L. H. (1977). Political risks in international business: Investment behavior of multinational corporations. New York: Praeger.

Torneden, R. L. (1975). Foreign disinvestment by U.S. multinational corporations. New York: Praeger.

UNCTAD. (1996). World Investment Report 1996. Investment, trade and international policy arrangements. Geneva: UNCTAD Program on Transnational Corporations.

Van Agtmael, A. (1976). How business has dealt with political risk. Financial Executive, 44, 26-30.

Vernon, R. (1966). International investment and international trade in the product cycle. Quarterly Journal of Economics, 80, 190-207.

Vernon, R. (1971). Sovereignty at bay. New York: Basic Books.

Vernon, R. (1979).The product cycle hypothesis in a new international environment. Oxford Bulletin of Economics and Statistics, 41, 255-267.

Wells, L. (Ed.). (1972). The product cycle and international trade. Boston, MA: Harvard Business School.

White, H. (1980). A heteroscedasticity consistent covariance matrix estimator and a direct test of heteroscedasticity. Econometrica, 48, 817-838.

Whitman, M. (1965). Government risk-sharing in foreign investment. Princeton, NJ: Princeton University Press.

Williamson, O. (1963). Managerial discretion and business behavior. American Economic Review, 53.

Williamson, O. E. (1975). Markets and hierarchies, analysis and antitrust implications: A study in the economics of internal organization. New York: Free Press.

Wilson, B. D. (1980). Disinvestment of foreign subsidiaries. Ann Arbor, MI: UMI Research Press.

Yu, C.-M. (1987). The determinants of United States foreign direct investment: An emphasis on the experience effect. Unpublished doctoral dissertation, University of Michigan.

Zenoff, D. B. (1969). Private enterprise in the developing countries. Englewood Cliffs, NJ: Prentice-Hall.

Zevin, R. B. (1992). Are world financial markets more open? If so, why and with what effects?. In Banuri, T. & Schor, J. B. (Eds.), Financial openness and national autonomy: Opportunities and constraints (pp. 43-83). New York: Oxford University Press.

Zink, D. W. (1973). The political risks for multinational enterprise in developing countries (with a case study in Peru). New York: Praeger.

BIBLIOGRAPHY

Adler, M. (1981). Investor recognition of corporate international diversification: Comment. Journal of Finance, 36, 187-192.

Ady, P. (1972). Private foreign investment and the developing world. New York: Praeger.

Agarwal, J. P. (1978). Zur Struktur der westdeutschen Direktinvestitionen in Entwicklungsländer. Einfluß von Außenhandelsverflechtung and relativen Lohnkosten [On the structure of West German foreign direct investment in developing countries. Impact of trade barriers and relative labor costs]. Die Weltwirtschaft, 1, 114-132.

Agarwal, J. P. (1980). Determinants of foreign direct investment: A survey. Weltwirtschaftliches Archiv, 116(4), 739-773.

Agmon, T. B., & Lessard, D. R. (1977). Investor recognition of corporate international diversification. Journal of Finance, 32, 1049-1055.

Agmon, T. B., & Lessard, D. R. (1981). Investor recognition of corporate international diversification: Reply. Journal of Finance, 36.

Aharoni, Y. (1966). The foreign investment decision process. Boston: Division of Research, Graduate School of Business Administration, Harvard University.

Ahrens, R. (1996). Going global. International Business, 9(7), 26-30.

Aliber, R. A. (1975). Exchange risk, political risk and investor demands for external currency deposits. Journal of Money, Credit and Banking, 7, 161-179.

Aliber, R. Z. (1970). A theory of direct foreign investment. In C. P. Kindleberger (Ed.), The international corporation: A symposium (Chapter 1). Cambridge, MA: MIT Press.

Aliber, R. Z. (1971). The multinational enterprise in a multiple currency world. In J. H. Dunning (Ed.), The multinational enterprise (pp. 49-56). Cambridge, MA.

Allen, A. M. (1973). Guide for investment in developing countries. London: Brown, Knight and Truscott Ltd.

Almon, S. (1965). The distributed lag between capital appropriations and expenditures. Econometrica, 33, 178-196.

Azar, E. E. (1980). The conflict and peace data bank (COPDAB) project. Journal of Conflict Resolution, 24, 143-152.

Bajo-Rubio, O., & Sosvilla-Rivero, S. (1994). An econometric analysis of foreign direct investment in Spain, 1964-89. Southern Economic Journal, 61, 104-120.

Ball, G. W. (1975). Global companies: The political economy of world business. Englewood Cliffs, New Jersey: Prentice-Hall.

Banks, A. S., & Textor, R. B. (1963). A cross-polity survey. Cambridge, Mass.: M.I.T. Press.

Barlett, M. . (1946). On the theoretical specification of sampling properties of autocorrelated time series. Journal of the Royal Statistical Society, Series B, 27, 27-41.

Basi, R. S. (1963). Determinants of United States private direct investment in foreign countries. Kent, Ohio: Kent State University Press.

Basmann, R. L. (1957). A generalized classical method of linear estimation of coefficients in a structural equation. Econometrica, 25, 77-83.

Baumol, W. J. (1959). Business behavior, value and growth. New York: Macmillan.

Bera, A. K., & McAleer, M. (1982). Further results on testing linear and log-linear regression models. Paper presented at the SSRC Econometric Group Conference on Model Specification and Testing, Warwick, England.

Berenblutt, I. I., & Webb, G. I. (1973). A new test for autocorrelated errors in the linear regression model. Journal of the Royal Statistical Society, Series B, 35(1), 33-50.

Bhagwati, J. N. (1958). Immiserizing growth: A geometrical note. Review of Economic Studies, 25, 201-205.

Blake, D., & Walters, R. (1987). The politics of global economic relations (3rd ed.). Englewood Cliffs, New Jersey: Prentice-Hall.

Boddewyn, J. J. (1979a). Foreign divestment: Magnitude and factors. Journal of International Business Studies, 10, 21-26.

Boddewyn, J. J. (1979b). Divestment: Local vs. Foreign, and U.S. vs. European approaches. Management International Review, 19, 21-28.

Boddewyn, J. J. (1983). Foreign direct divestment theory: Is it the reverse of FDI theory?. Weltwirtschaftliches Archiv, 119(2), 345-355.

Boddewyn, J. J. (1985). Theories of foreign direct investment and divestment: A classificatory note. Management International Review, 25(1), 57-65.

Boddewyn, J. J. (1988). Political aspects of MNE theory. Journal of International Business Studies, 19, 341-363.

Boxx, W. R, & Dant, R. P. (1990). Assessing political risk in international business: A dynamic time-variant model. The Southern Business and Economic Journal, April, 210-226.

Breusch, T. S. (1978). Testing for autocorrelation in dynamic linear models. Australian Economic Papers, 17, 334-355.

Breusch, T., & Pagan, A. (1979). A simple test for heteroscedasticity and random coefficient variation. Econometrica, 47, 1287-1294.

Brewer, T. L. (1993). Government policies, market imperfections, and foreign direct investment. Journal of International Business Studies, 24, 101-120.

Brown, W. R. (1976). Islands of conscious power: MNCs in the theories of the firm. MSU Business Topics, 37-54.

Buckley, P. J. (1988). The limits of explanation: Testing the internalization theory of the multinational enterprise. Journal of International Business Studies, 19(2), 181-193.

Buckley, P. J., & Casson, M. (1976). The future of the multinational enterprise. London: Macmillan.

Buckley, P. J., & Casson, M. (1981). The optimal timing of a foreign direct Investment. Economic Journal, 94, 75-87.

Calvet, A. L. (1984). A synthesis of foreign direct investment theories and theories of the multinational enterprise. Journal of International Business Studies, 12(1), 43-59.

Campa, J. M. (1993). Entry by foreign firms in the United States under exchange rate uncertainty. Review of Economics and Statistics, 75, 614-622.

Caselli, F. (1999). Technological revolutions. American Economic Review, 89(1), 78-102.

Casson, M. (1983). The growth of international business. London: George Allen and Unwin.

Casson, M. (1987). The firm and the market. Oxford, U.K.: Basil Blackwell.

Caves, R. (1988). Exchange-rate movements and foreign direct investment in the United States. Harvard Institute of Economic Research.

Caves, R. E. (1971). International corporations: The industrial economics of foreign investment. Economica, 38, 1-27.

Caves, R. E. (1974). Causes of direct investment: Foreign firms' shares in Canadian and United Kingdom manufacturing industries. Review of Economics and Statistics, 56, 279-293.

Chase, C. D., Kuhle, J. L. & Walther, C. H. (1988). The relevance of political risk in direct foreign investment. Management International Review, 28(3), 31-8.

Choi, S.-R., Tschoegl, A. E., & Yu, C.-M. (1986). Banks and the world's major financial centers, 1970-1980. Weltwirtschaftliches Archiv, 122, 48-64.

Chou, T.-C. (1988). American and Japanese direct foreign investment in Taiwan: A comparative study. Hitotsubashi Journal of Economics, 29.

Chow, G. C. (1960). Tests of equality between sets of coefficients in two linear regressions. Econometrica, 28(3), 591-605.

Clague, C., Keefer, P., Knack, S., & Olson, M. (1995, March). Property and contract rights under democracy and dictatorship. Presented at the CREI Conference on Growth, Barcelona, Spain.

Coase, R. H. (1937). The nature of the firm. Economica, 4, 386-405.

Cochrane, D., & Orcutt, G. H. (1949). Application of least squares regressions to relationships containing autocorrelated error terms. Journal of the American Statistical Association, 44, 32-61.

Cook, N. (1980). Stability and flexibility: An analysis of natural systems. Oxford: Pergammon Press.

Countries in trouble. (1986, December). The Economist, 25-28.

Culem, C. G. (1988). The locational determinants of direct investments among industrialized countries. European Economic Review, April, 885-904.

Cushman, D. O. (1985). Real exchange rate risk, expectations, and the level of direct investment. Review of Economics and Statistics, 67, 297-308.

Cushman, D. O. (1987). The effects of real wages and labor productivity on foreign direct investment. Southern Economic Journal, July, 174-185.

Cushman, D. O. (1988). Exchange rate uncertainty and foreign direct investment in the United States. Welwirtschaftliches Archiv, 124, 323-335.

Cyert, R. M., & March, J. G. (1963). A behavioral theory of the firm. Englewood Cliffs: Prentice-Hall.

Davidson, R., & MacKinnon, J. G. (1981). Several tests for model specification in the presence of alternative hypotheses. Econometrica, 49, 781-793.

Davidson, R., & MacKinnon, J. G. (1993). Estimation and inference in econometrics. New York: Oxford University Press.

Denton, F. H. (1969). Factors in international system violence: 1750 to 1960. Santa Monica: The Rand Corporation.

Denton, F. H., & Phillips, W. (1968). Some patterns in the history of violence. Journal of Conflict Resolution, 12(2), 182-195.

Desta, A. (1985). Assessing political risk in less developed countries. Journal of Business Strategy, 5(5), 40-53.

Dewenter, K. L. (1995). Do exchange rate changes drive foreign direct investment?. Journal of Business, 68(3), 405-433.

Dicken, P. (1992). Global shift: The internationalization of economic activity (2nd ed.). New York: The Guilford Press.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. Journal of the American Statistical Association, 74, 427-431.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. Econometrica, 49, 1057-1072.

Dill, W. R. (1957). Environment as an influence on managerial autonomy. Administrative Science Quarterly, 2, 409-443.

Dixit, A. (1989a). Hysteresis, import penetration, and exchange rate pass-through. Quarterly Journal of Economics, 104, 205-228.

Dixit, A. (1989b). Entry and exit decisions under uncertainty. Journal of Political Economy, 97(3), 621-638.

Drake, R. L., & Prager, A. J. (1977). Floundering with foreign investment planning. Columbia Journal of World Business, 12, 66-77.

Drysdale, P. (1972). Direct foreign investment in Asia and the Pacific. Camberra, Australia: Australian National University Press.

Dunning, J. H. (1971). The multinational enterprise. London: Allen and Unwin.

Dunning, J. H. (1973). The determinants of international production. Oxford Economic Papers, 25, 289-336.

Dunning, J. H. (1977). Trade, location of economic activity and the MNE: A search for an eclectic approach. In B. Ohlin, P.-O. Hesselborn, & P.M. Wijkman (Eds.), The international allocation of economic activity: Proceedings of a Nobel Symposium held at Stockholm (pp. 395-418). London: Macmillan.

Dunning, J. H. (1979). Explaining changing patterns of international production: In defense of the eclectic theory. Oxford Bulletin of Economics and Statistics, 41, 269-295.

Dunning, J. H. (1980). Toward an eclectic theory of international production. Journal of International Business Studies, 11, 9-31.

Dunning, J. H. (1981). Explaining the international direct investment position of countries: Towards a dynamic or developmental approach. Weltwirtschaftliches Archiv, 117(1), 30-64.

Dunning, J. H. (1988a). The eclectic paradigm of international production: A restatement and some possible extensions. Journal of International Business Studies, 19, 1-31.

Dunning, J. H. (1988b). Explaining international production. London: Unwin Hyman.

Durbin, J. (1960). Estimation of parameters in time-series regression models. Journal of the Royal Statistical Society, Series B, 22, 139-153.

Durbin, J., & Watson, G. S. (1951). Testing for serial correlation in least-squares regression. Biometrika, 38, 159-171.

Dymsza, W. A. (1972). Multinational business strategy. New York: McGraw-Hill.

Eiteman, D. K., Stonehill, A. I., & Moffet, M. H. (1995). Multinational business finance (7th ed.). New York: Addison-Wesley Publishing Company, Inc.

Engle, R. F. (1982). Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. Econometrica, 50(1), 987-1007.

Engle, R. F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation and testing. Econometrica, 55, 251-276.

Engle, R. F., & Yoo, B. S. (1987). Forecasting and testing in cointegrating systems. Journal of Econometrics, 35, 143-159.

Errunza, V. R., & Senbet, L. W. (1981). The effects of international operations on the market value of the firm: Theory and evidence. Journal of Finance, 36, 401-417.

Fatehi, K. & Safizadeh, M. H. (1994). The effect of sociopolitical instability on the flow of different types of foreign direct investment. Journal of Business Research, 31, 65-73.

Fatehi-Sedech, K. & Satizadech, M. H. (1988). Sociopolitical events and foreign direct investment: American investments in South and Central American countries, 1950-1982. Journal of Management, 14, 93-107.

Fatehi-Sedeh, K. & Safizadeh, M. H. (1989). The association between political instability and flow of foreign direct investment. Management International Review, 29(4), 4-13.

Fayerweather, J. (1969). International business management-A conceptual framework. New York: McGraw-Hill.

Feierabend, I. K., & Feierabend, R. L. (1966). Aggressive behaviors within polities, 1948-1962: A cross-national study. Journal of Conflict Resolution, 10(3), 249-271.

Fitzpatrick, M. (1983). The definition and assessment of political risk in international business: A review of the literature. Academy of Management Review, 8(2), 249-254.

Flowers, E. (1976). Oligopolistic reaction in European and Canadian direct investment in the United States. Journal of International Business Studies, 7, 43-55.

Froot, K. A. & Stein, J. C. (1991). Exchange rates and foreign direct investment: An imperfect capital markets approach. Quarterly Journal of Economics, 106, 1191-1217.

Geary, R. C. (1970). Relative efficiency of count of sign changes for assessing residual autoregression in least squares. Biometrika, 57, 123-127.

Ghoshal, S. (1987). Global strategy: An organizing framework. Strategic Management Journal, 8, 425-440.

Gilpin, R. (1975). Three models of the future. International Organization, 29, 37-60.

Gladwin, T., & Walter, I. (1980). Multinationals under fire. Wiley.

Glejser, H. (1969). A new test for heteroscedasticity. Journal of the American Statistical Association, 64, 316-323.

Godfrey, L. (1978a). Testing for multiplicative heteroscedasticity. Journal of Econometrics, 8, 227-236.

Godfrey, L. G. (1978b). Testing against general autoregressive and moving average error models when the regressors include lagged dependent variables. Econometrica, 46, 1293-1302.

Goldberg, M. A. (1972). The determinants of U.S. direct investment in the E.E.C.: Comment. American Economic Review, 62, 692-699.

Goldberger, A. S. (1991). A course in econometrics. Cambridge, MA: Harvard University Press.

Goldfeld, M. G., & Quandt, R. E. (1972). Nonlinear methods in econometrics. Amsterdam: North Holland.

Graham, E. M. (1998). Market structure and the multinational enterprise: A game-theoretic approach. Journal of International Business Studies, 29(1), 67-83.

Graham, E. M. (1996). Global corporations and national governments. Washington, DC: Institute for International Economics.

Granger, C. W. J. (1969). Investigating causal relations by econometric models and cross-spectral methods. Econometrica, 37, 424-438.

Granger, C. W. J. (1986). Developments in the study of co-integrated economic variables. Oxford Bulletin of Economics and Statistics, 48, 213-228.

Granger, C. W. J., & Newbold, P. (1974). Spurious regressions in econometrics. Journal of Econometrics, 2, 111-120.

Gray, P. H. (1980). The theory of international trade among industrialized nations. Weltwirtschaftliches Archiv, 116, 447-470.

Green, R. T. (1972). Political instability as a determinant of U.S. foreign investment. Austin: Bureau of Business Research, University of Texas.

Green, R. T., & Cunningham, W. H. (1975). The determinants of U.S. Foreign investment: An empirical examination. Management International Review, 15, 113-120.

Green, R. T., & Korth, C. M. (1974). Political instability and the foreign investor. California Management Review, 17(1), 23-31.

Green, R. T., & Smith, C. H. (1972). Multinational profitability as a function of political instability. Management International Review, 12(6), 23-29.

Grosse, R. (1981). The theory of foreign direct investment (Essays in International Business, No. 3). Columbia, SC: University of South Carolina, College of Business Administration, Center for International Business Studies.

Grosse, R. (1985). An imperfect competition theory of the MNE. Journal of International Business Studies, 16, 57-80.

Grosse, R., & Behrman, J. N. (1992). Theory in international business. Transnational Corporations, 1(1), 93-126.

Grosse, R., & Trevino, L. J. (1996). Foreign direct investment in the United States: An analysis by country of origin. Journal of International Business Studies, 27, 139-155.

Grubel, H. G. (1968). International diversified portfolios: Welfare gains and capital flows. American Economic Review, 58, 1299-1314.

Gruber, W., Metha, D., & Vernon, R. (1967). The R&D factor in international trade and international investment of U.S. industries. Journal of Political Economy, February, 20-37.

Gujarati, D. N. (1988). Basic econometrics (2nd edition). New York: McGrawHill.

Gujarati, D. N. (1995). Basic econometrics (3rd edition). New York: McGrawHill.

Gupta, D. K. (1990). The economics of political violence. The effect of political instability on economic growth. New York: Praeger.

Gurr, T. (1968). A causal model of civil strife: A comparative analysis using new indices. The American Political Science Review, 4, 1104-1124.

Haendel, D. H., West, G. T., & Meadow, R. G. (1975). Overseas investment and political risk. Philadelphia: Foreign Policy and Research Institute.

Haner, F. T. (1979). Rating investment risks abroad. Business Horizons, 22(2), 18-23.

Hausman, J. A. (1978). Specification tests in econometrics. Econometrica, 46, 1251-1271.

Hennart, J.-F. (1982). A theory of multinational enterprise. Ann Arbor: University of Michigan.

Hennart, J.-F. (1986). What is internalization?. Welwirtschaftliches Archiv, 122, 790-803.

Hofer, C. W., & Haller, T. P. (1980). Globescan: A way to better international risk assessment. Journal of Business Strategy, 1(2), 41-55.

Holsti, K. J. (1988). International politics: A framework for analysis (5th ed.). Englewood Cliffs, New York: Prentice-Hall.

Horst, T. (1972). Firm and industry determinants of the decision to invest abroad: An empirical study. Review of Economics and Statistics, 54, 258-266.

Horst, T. (1979). The industrialized composition of U.S. exports and subsidiary sales to the Canadian market. American Economic Review, 62(1), 37-45.

Hufbauer, G. C. (1975). The multinational corporation and direct investment. In P. B. Kenen (Ed.), International trade and finance (pp. 253-319). Cambridge, England: Cambridge University Press.

Hymer, S. H. (1976). The international operations of national firms: A study of direct foreign investment. Cambridge, MA: MIT Press.

International Bank for Reconstruction and Development & International Chamber of Commerce, Commission on Foreign Investments. (1962). International investment insurance: Analysis of replies received (Document No. 109, 12.11.1962-mtp). Washington, DC: Author.

Itagaki, T. (1981). The theory of the multinational firm under exchange rate uncertainty. Canadian Journal of Economics, 14(2), 276-297.

Jacquillat, B., & Solnik, B. (1978). Multinationals are poor tools for diversification. Journal of Portfolio Management, Winter, 8-12.

Jarque, C. M., & Bera, A. K. (1987). A test for normality of observations and regression residuals. International Statistical Review, 55, 163-172.

Johnson, H. G. (1970). The efficiency and welfare implications of the international corporation. In C. P. Kindleberger (Ed.), The international corporation (pp. 35-56). Cambridge, MA: MIT Press.

Judge, G. G., Hill, R. C., Griffiths, W. E., Lütkepohl, H., & Lee, T.-C. (1982). Introduction to the theory and practice of econometrics. New York: John Wiley & Sons.

Juhl, P. G. (1979). On the sectoral patterns of West German manufacturing investment in less developed countries: The impact of firm size, factor intensities and protection. Weltwirtschaftliches Archiv, 115, 508-521.

Kazmier, L. J., & Pohl, N. F. (1987). Basic statistics for business and economics (2nd edition). Singapore: McGrawHill.

Keegan, W. J. (1974). Multinational scanning: A study of the information sources utilized by headquarters executives in multinational companies. Administrative Science Quarterly, 19, 411-421.

Kennedy, C. (1984). The external environment-strategic planning interface: US multinational corporate practices in the 1980s. Journal of International Business Studies, Fall, 99-108.

Kennedy, P. (1985). A guide to econometrics (2nd edition). Cambridge, Mass.: M.I.T. Press.

Kindleberger, C. P. (1969). American business abroad: Six lectures on direct investment. New Haven: Yale University Press.

Kissinger, H. (1994). Diplomacy. London: Simon & Schuster.

Kmenta, J. (1986). Elements of econometrics (2nd edition). New York: Macmillan.

Knack, S., & Keefer, P. (1995). Institutions and economic performance: empirical tests using alternative measures of institutions (Working Paper No. 109). Maryland: University of Maryland, IRIS Center.

Knickerbocker, F. T. (1973). Oligopolistic reaction and multinational enterprise. Boston: Division of Research, Harvard University Graduate School of Business Administration.

Kobrin, S. J. (1976). The environmental determinants of foreign direct manufacturing investment: An ex post empirical analysis. Journal of International Business Studies, 7, 29-42.

Kobrin, S. J. (1978). When does political instability result in increased investment risk?. Columbia Journal of World Business, 13, 113-122.

Kobrin, S. J. (1979). Political risk: A review and reconsideration. Journal of International Business Studies, 10(1), 67-80.

Kobrin, S. J. (1982). Managing political risk assessment: Strategic response to environmental change. Berkeley, CA: University of California Press.

Kobrin, S. J., Basek, J., Blank, S., & La Palombara, J. (1980). The assessment and evaluation of noneconomic environments by American firms: A preliminary report. Journal of International Business Studies, 11, 33-47.

Koechlin, T. (1992). The determinants of the location of USA direct foreign investment. International Review of Applied Economics, 6(2), 203-216.

Kogut, B. (1985). Designing global strategies: Corporate and competitive value added chain. Sloan Management Review, 25, 15-28.

Kohlhagen, S. W. (1977). Exchange rate changes, profitability, and direct foreign investment. Southern Economic Journal, 44, 43-52.

Kojima, K. (1973). A macroeconomic approach to foreign direct investment. Hitotsubashi Journal of Economics, 14, 1-21.

Kojima, K. (1975). International trade and foreign investment-Substitutes or complements. Hitotsubashi Journal of Economics, 16, 1-12.

Kojima, K. (1985). Japanese and American direct investment in Asia: A comparative analysis. Hitotsubashi Journal of Economics, 26, 1-35.

Kojima, K., & Ozawa, T. (1984). Micro and macroeconomic models of direct foreign investment: Towards a synthesis. Hitotsubashi Journal of Economics, 25(2), 1-20.

Kravis, I. B., & Lipsey, R. E. (1982). The location of overseas production and production for export by U.S. Multinational firms. Journal of International Economics, 12(3), 201-223.

Kronfol, Z. A. (1972). Protection of foreign investment. Netherlands: A. W. Sijthoff Leiden.

Krueger, N., Jr., & Dickson, P. R. (1994). How believing in ourselves increases risk taking: Perceived. Decision Sciences, 25(3), 385-401.

LaPalombara, J., & Blank, S. (1977). Multinational corporations in comparative perspective. New York: National Industrial Conference Board, Public Affairs Research Division.

Leamer, E. E. (1978). Specification searches: ad hoc inference with nonexperimental data. New York: John Wiley & Sons.

Lee, C. H. (1983). International production of the United States and Japan in Korean manufacturing industries: A comparative study. Weltwirtschaftliches Archiv, 119.

Lee, C. H. (1984). On Japanese macroeconomic theories of direct foreign investment. Economic Development and Cultural Change, 32, 713-723.

Levis, M. (1979). Does political instability in developing countries affect foreign investment flow?. Management International Review, 19(3), 59-68.

Lindley, D. V. (1957). A statistical paradox. Biometrika, 44, 187-192.

Little, J. S. (1978). Locational decisions of direct foreign investors in the U.S. New England Economic Review, July/August, 43-63.

Liu, T. C. (1960). Under-identification, structural estimation, and forecasting. Econometrica, 28, 855-865.

Ljung, G. M., & Box, G. P. E. (1978). On a measure of lack of fit in time series models. Biometrika, 66, 66-72.

Logue, D. E., & Willett, T. D. (1977). The effects of exchange rate adjustment on international investment. In P. B. Clark, D. E. Logue, & R. J. Sweeney (Eds.), The effects of exchange rate adjustments (pp. 137-150). Washington, DC: Government Printing Office.

Lucas, R. E. (1976). Econometric policy evaluation: A critique. In K. L. Brunner (Ed.), The Phillips curve and labor markets (supplement to the Journal of Monetary Economics) (pp. 10-46).

MacKinnon, J., White, H., & Davidson, R. (1983). Tests for model specification in the presence of alternative hypothesis: some further results. Journal of Econometrics, 21, 53-70.

Maddala, G. S. (1992). Introduction to econometrics (2nd edition). New York: Macmillan.

Magee, S. P. (1976). An appropriability theory of the multinational corporation. In J. Bhagwati (Ed.), The new international economic order: The North-South debate (pp. 317-340). Cambridge, MA: MIT Press.

Magee, S. P. (1981). The appropriability theory of the multinational corporation. Annals of the American Academy of Political and Social Science, 458, 123-135.

Magee, S. P., & Young, L. (1982). Multinationals, tariffs, and capital flows with endogenous politicians. In C. P. Kindleberger & D. B. Audretsch (Eds.), The multinational cooperation in the 1980s (pp. 21-38). Cambridge, MA: MIT Press.

Marris, R. (1963). A model of the managerial enterprise. Quarterly Journal of Economics, 78.

Mason, R. H. (1980). A comment on Professor Kojima's 'Japanese type versus American type of technology transfer'. Hitotsubashi Journal of Economics, 20.

McClintock, B. (1988). Recent theories of foreign direct investment: An institutionalist perspective. Journal of Economic Issues, 22, 477-484.

McManus, J. C. (1972). The theory of the international firm. In G. Paquet (Ed.), The multinational firm and the nation state (pp. 66-93). New York: Macmillan.

Meredith, L. (1984). U.S. Multinational investment in Canadian manufacturing industries. Review of Economics and Statistics, February, 66, 111-119.

Mirer, T. W. (1988). Economic statistics and econometrics (2nd edition). New York: Macmillan.

Mizon, G. E., & Richard, J. F. (1986). The encompassing principle and its application to testing non-nested hypotheses. Econometrica, 54, 657-678.

Moran, T. (1974). Multinational corporations and the politics of dependence. Princeton, New Jersey: Princeton University Press.

Moran, T. (Ed.). (1985). Multinational corporations. Lexington, MA: Lexington Books.

Nehrt, L. C. (1972). International finance for multinational business. Scranton, Pa.: Intext Educational.

Nelson, C. R., & Kang, H. (1984). Pitfalls in the use of time as an explanatory variable in regression. Journal of Business and Economic Statistics, 2, 73-82.

Nelson, C. R., & Plosser, C. I. (1982). Trends and random walks in macroeconomic time series: Some evidence and implications. Journal of Monetary Economics, 10, 139-162.

Nerlove, M. (1958). Distributed lags and demand analysis for agricultural and other commodities (Agricultural Handbook No. 141). Washington, DC: U.S. Department of Agriculture.

Nigh, D. (1985). The effect of political events on United States direct foreign investment: A pooled time-series cross-sectional analysis. Journal of International Business Studies, 16, 1-17.

Ning, Y., & Reed, M. R. (1995). Locational determinants of the US direct foreign investment in food and kindred products. Agribusiness, 11(1), 77-85.

One world?. (1997, October). The Economist, p. 79.

Otero, J. M. (1993). Econometría. Series temporales y predicción. Madrid, Spain: Editorial AC.

Park, R. E. (1966). Estimation with heteroscedastic errors. Econometrica, 34(4), 888.

Parry, T. G. (1980). The multinational enterprise: International investment and host-country impacts. Greenwich, Connecticut: JAI Press.

Parry, T. G. (1985). Internalization as a general theory of foreign direct investment: A critique. Weltwirtschaftliches Archiv, 121(3), 564-569.

Perlmutter, H. V. (1969). The tortuous evolution of the multinational corporation. Columbia Journal of World Business, 4, 9-18.

Piper, Jr., J. R. (1971). How U.S. firms evaluate foreign investment opportunities. MSU Business Topics, 19(3), 11-20.

Plosser, C. I., & Schwert, G. W. (1978). Money, income and sunspots: Measuring economic relationships and the effects of differencing. Journal of Monetary Economics, 4, 637-660.

Pomper, C. L. (1976). International investment planning: An integrated approach. Amsterdam: North-Holland Publishing Co.

Porter, M. E. (1976). Please note location of nearest exit: Exit barriers and planning. California Management Review, 19, 2-33.

Porter, M. E. (1990). The competitive advantage of nations. New York: The Free Press.

Posner, M. V. (1961). International trade and technical change. Oxford Economic Papers, 13, 323-341.

Poynter, T. A. (1985). Multinational enterprises and government intervention. New York: Saint Martin's Press, Inc.

Prakash, A. J., Chang, C-H., Hamid, S., & Smyser, M. W. (1996). Why a decision maker may prefer a seemingly unfair gamble. Decision Sciences, 27(2), 239-252.

Pyndick, R. (1988). Irreversible investment, capacity choice, and the value of the firm. American Economic Review, 78, 969-985.

Ragazzi, G. (1973). Theories of the determinants of direct foreign investment. International Monetary Fund Staff Papers, 20, 471-498.

Ramsey, J. B. (1969). Tests for specification errors in classical linear least squares regression analysis. Journal of the Royal Statistical Society, Series B, 31, 350-371.

Rao, C. R. (1965). Linear statistical inference and its applications. New York: John Wiley & Sons.

Reuber, G. L. (1973). Private foreign investment in development. Oxford: Clarendon Press.

Riedel, J. (1975). The nature and determinants of export-oriented direct foreign investment in a developing country: A case study of Taiwan. Weltwirtschaftliches Archiv, 111(3), 505-528.

Robinson, R. (1964). International business policy. New York: Holt, Rinehart and Winston.

Robock, S. H. (1971). Political risk: Identification and assessment. Columbia Journal of World Business, 6(4), 6-20.

Root, F. R. (1968). U.S. business abroad and the political risks. MSU Business Topics, Winter, 73-80.

Root, F. R. (1972). Analyzing political risks in international business. In A. Kapoor & P. Grub (Eds.), The multinational enterprise in transition (pp. 354-365). Princeton, NJ: Darwin Press.

Root, F. R. (1988). Environmental risks and the bargaining power of multinational corporations. International Trade Journal, 3(1), 111-124.

Root, F. R., & Ahmed, A. A. (1979). Empirical determinants of manufacturing direct foreign investment in developing countries. Economic Development and Cultural Change, July, 751-767.

Rugman, A. M. (1980). Internalization as a general theory of foreign direct investment: A re-appraisal of the literature. Weltwirtschaftliches Archiv, 116, 365-379.

Rugman, A. M. (1981). Inside the multinationals: The economics of internal markets. New York: Columbia University Press.

Rugman, A. M. (1986). New theories of multinational enterprises: An assessment of internalization theory. Bulletin of Economic Research, 38, 101-118.

Rummel, R. J., & Heenan, D. A. How multinationals analyze political risk. Harvard Business Review, Winter, 67-76.

Russett, B. R: (1964). World handbook of social and political indicators. New Haven: Yale University Press.

Scaperlanda, A. E. (1974). Trends, composition and determinants of United States direct investment in Canada. Washington, DC: U.S. Department of Commerce, Office of Foreign Direct Investments.

Schneider, F., & Frey, B. S. (1985). Economic and political determinants of foreign direct investment. World Development, 13(2), 161-175.

Schollhammer, H. (1978). Identification, evaluation, and prediction of political risks from an international business perspective. In M. Ghertman & J. Leontiades (Eds.), European research in international business (pp. 91-109). Amsterdam: North-Holland.

Schollhammer, H., & Nigh, D. (1984). The effect of political events on foreign direct investments by German multinational corporations. Management International Review, 24(1), 18-40.

Schollhammer, H., & Nigh, D. (1986). The effects of political events on Japanese foreign direct investments. Asia Pacific Journal of Management, 3, 133-156.

Sethi, S. P., & Luther, K. A. N. (1986). Political risk analysis and direct foreign investment: Some problems of definition and measurement. California Management Review, 28(2), 57-68.

Shapiro, A. C. (1981). Managing political risk: A policy approach. Columbia Journal of World Business, 16, 63-69.

Simon, H. A. (1955). A behavioral model of rational choice. Quarterly Journal of Economics, 70, 99-118.

Simon, H. A. (1959). Theories of decision-making in economics and behavioral science. American Economic Review, 49, 253-283.

Simon, J. D. (1982). Political risk assessment: Past trends and future prospects. Columbia Journal of World Business, 17, 62-71.

Simon, J. D. (1984). A theoretical perspective on political risk. Journal of International Business Studies, 15(3), 123-143.

Smith, C. N. (1971). Predicting the political environment in international business. Long Range Planning, 4, 7-14.

Spanhel, C. L., & Boddewyn, J. J. (1982, August). The foreign divestment decision process: A descriptive model. Paper presented at the Annual Meeting of the Academy of Management, New York.

Stapenhurst, F. (1992). The rise and fall of political risk assessment?. Management Decision, 30(5), 54-57.

Statistics Canada (1993). Canadian Economic Observer (Cat. No. 11-010).

Statistics Canada (1995). Canada's international investment position, Historical Statistics, 1926 to 1992 (Cat. No. 67-202).

Stevens, G. V. (1977). Comment on 'The effects of exchange rate adjustment on international investment'. In P. B. Clark, D. E. Logue, & R. J. Sweeney (Eds.), The effects of exchange rate adjustments (pp. 183-188). Washington, DC: Government Printing Office.

Stewart, M. B., & Wallis, K. F. (1981). Introductory econometrics. Oxford: Basil Blackwell.

Stobaugh, Jr., R. B. (1969). How to analyze foreign investment climates. Harvard Business Review, 47(5), 100-108.

Stock, J. (1987). Asymptotic properties of least-squares estimators of cointegrating vectors. Econometrica, 55, 1035-1056.

Studenmund, A. H. (1992). Using econometrics: A practical guide (2nd edition). New York: HarperCollins Publishers.

Summary, R. M., & Summary, L. J. (1995). The political economy of United States foreign direct investment in developing countries: An empirical analysis. Quarterly Journal of Business and Economics, 34(3), 80-92.

Swamidass, P. M. (1990). A comparison of the plant location strategies of foreign and domestic manufacturers in the U.S. Journal of International Business Studies, 21, 301-317.

Tallman, S. B. (1988). Home country political risk and foreign direct investment in the United States. Journal of International Business Studies, 19(2), 219-234.

Tallman, S. B. (1992). A strategic management perspective on host country structure of multinational enterprises. Journal of Management, 18(3), 455-471.

Teece, D. J. (1976). The multinational corporation and the resource cost of international technology transfer. Cambridge, MA: Ballinger.

Teece, D. J. (1981). The multinational enterprise: Market failure and market power considerations. Sloan Management Review, 22, 3-17.

Teece, D. J. (1986). Transactions cost economics and the multinational enterprise: An assessment. Journal of Economic Behavior and Organization, 7, 21-45.

Theil, H. (1953). Repeated least-squares applied to complete equation systems (mimeographed). The Hague: The Central Planning Bureau.

Theil, H., & Nagar, (1961). Testing the independence of regression disturbances. Journal of the American Statistical Association, 56, 793-806.

Thunell, L. H. (1977). Political risks in international business: Investment behavior of multinational corporations. New York: Praeger.

Torneden, R. L. (1975). Foreign disinvestment by U.S. multinational corporations. New York: Praeger.

UNCTAD. (1996). World Investment Report 1996. Investment, trade and international policy arrangements. Geneva: UNCTAD Program on Transnational Corporations.

Van Agtmael, A. (1976). How business has dealt with political risk. Financial Executive, 44, 26-30.

Vernon, R. (1966). International investment and international trade in the product cycle. Quarterly Journal of Economics, 80, 190-207.

Vernon, R. (1971). Sovereignty at bay. New York: Basic Books.

Vernon, R. (1979).The product cycle hypothesis in a new international environment. Oxford Bulletin of Economics and Statistics, 41, 255-267.

Wells, L. (Ed.). (1972). The product cycle and international trade. Boston, MA: Harvard Business School.

White, H. (1980). A heteroscedasticity consistent covariance matrix estimator and a direct test of heteroscedasticity. Econometrica, 48, 817-838.

Whitman, M. (1965). Government risk-sharing in foreign investment. Princeton, NJ: Princeton University Press.

Williamson, O. (1963). Managerial discretion and business behavior. American Economic Review, 53.

Williamson, O. E. (1975). Markets and hierarchies, analysis and antitrust implications: A study in the economics of internal organization. New York: Free Press.

Wilson, B. D. (1980). Disinvestment of foreign subsidiaries. Ann Arbor, MI: UMI Research Press.

Yu, C.-M. (1987). The determinants of United States foreign direct investment: An emphasis on the experience effect. Unpublished doctoral dissertation, University of Michigan.

Zenoff, D. B. (1969). Private enterprise in the developing countries. Englewood Cliffs, NJ: Prentice-Hall.

Zevin, R. B. (1992). Are world financial markets more open? If so, why and with what effects?. In Banuri, T. & Schor, J. B. (Eds.), Financial openness and national autonomy: Opportunities and constraints (pp. 43-83). New York: Oxford University Press.

Zink, D. W. (1973). The political risks for multinational enterprise in developing countries (with a case study in Peru). New York: Praeger.

ENDNOTES

[1] UNCTAD undertook a survey of the top 100 TNCs (transnational corporations) based in developed countries to understand better their strategies and to analyze expected changes in their investment patterns over the next five years. In that survey, information on TNCs, such as total assets, sales, number of employees, number of affiliates, the geographical and industrial distribution of their activities abroad, and planned investments abroad, was collected. The rate of response of the survey was about 80 percent. Developing country TNCs were not included in the survey.

[2] This statement, though relatively old, is still valid in lieu of recent economic and political developments.

[3] Dill (1957, p. 410) defines task environment as "... that part of the total environment... which [is] potentially relevant to goal setting and goal attainment."

[4] As of the end of 1997, there were 193 states.

[5] This section is based upon the definitions given in UNCTAD, World Investment Report 1996, pp. 219-220.

[6] Because only a few firms are genuinely multinational corporations (that is, owned by stockholders in several countries), a number of authorities, including the United Nations agencies, are in favor of using the term transnational corporation. However, the term multinational corporation/company (MNC) is so firmly established in popular usage that it will be used throughout this paper, unless the descriptions of previous studies requires the usage of the original term employed in those studies.

[7] In some countries such as Germany and the United Kingdom, a stake of 20 percent or more is a threshold.

[8] There are, however, some exceptions. For example, in the case of Germany, loans granted by affiliate enterprises to their parent enterprises are not deducted from the stock.

[9] The empirical studies on the market size hypotheses are presented in a section below.

[10] Two points must be noted. First, the order of the hypotheses here does not wholly correspond with that of Agarwal (1980). Second, the first hypothesis corresponds to Agarwal's introduction of the section on market imperfections. The third hypothesis is merely cited in Agarwal's paper because it first appeared at the time of that author's article, and has been developed ever since.

[11] Agarwal (1980) also includes a section on the determinants of the inflow of FDI. However, since the variables analyzed (political instability and cheap

labor) correspond to those used in the dissertation they are discussed on separate sections below.

[12] For the contributions of Hymer to FDI theories, see Dunning (1981), and Dunning and Rugman (1985).

[13] For the attainment of a Pareto-efficient situation in an economy three marginal conditions must be satisfied: (a) Effiency of distribution of commodities among consumers (efficiency in exchange); (b) Efficiency of the allocation of factors among firms (efficiency of production); and (c) Efficiency in the allocation of factors among commodities (efficiency in the product-mix, or composition of output). In the context of Berson's (1937-8) social welfare function and perfect competition as relates to Pareto's marginal condition (a), utility maximization by each of two individuals requires the choice of the product-mix where the marginal rate of substitution of two commodities is equal to the ratio of their prices. In perfect competition, all consumers are faced by the same commodity prices.

[14] Appropriability means the ability of private originators of ideas to obtain for themselves the pecuniary value of the idea to society.

[15] This situation is analogous to the notion of decreasing marginal products of the factors of production in economic theory.

[16] The authors further suggest that indirect portfolio diversification by multinational firms helps complete international capital markets. Limitations of this paper are indicated in Bicksler (1984).

[17] Most economists now regard the concept of immesirizing growth as more a theoretical point than a real-world issue.

[18] This relationship can be viewed as a joint maximizing (or mini-max) problem as in game theory.

[19] This article is unique in that there are no other studies, known to the author of this dissertation, that have explicitly applied a labor-productivity variable to empirically assess its effect on FDI flows.

[20] In another major study of "serious interstate disputes", Maoz (1982) identified the incidence of such conflicts, all involving the threat, display and/or use of military force, their location, participants, and outcome. In the period from 1815 to 1976, the author identified 827 conflicts, 210 of which occurred in the nineteenth century, with the remaining 617 in the twentieth century. For the entire period, there was an annual average of 5.2 war-threatening or war-producing conflicts. The most peaceful period followed the Napoleonic wars, while the period since 1945 has seen the highest number of conflicts. However, considering that in the 1820s and 1830s there were only about twenty-three nation-states, and that in the author's time there were more than 160, the incidence of conflicts, when divided by the number of actors, has not actually increased. Maoz' figures indicate that the most

conflict-prone era was between 1910 and 1920, while the period since 1950 has been comparable to the 1850s and 1860s.

[21] Root uses the term country risk rather than political risk because the latter implies that the causes of the risk are wholly political whereas government behavior is motivated by economic as well as political and social factors.

[22] This can be inferred from the second law of thermodynamics in its third form –that is, in terms of entropy- which states the following: In any thermodynamic process that proceeds from one equilibrium state to another, the entropy of the ***system and environment*** either remains unchanged or increases. However, the entropy remains the same only for reversible processes (processes carried out without friction and so slowly that the process can be reversed at any stage by making an infinitesimal change in the environment of the system). Since no process is truly reversible, entropy will increase when a process occurs spontaneously.

[23] Dunning's eclectic theory deals only with necessary conditions (prerequisites) but not with the motivations and precipitating circumstances – also needed to explain why are there MNEs (Boddewyn, 1985)-.

[24] In Dunning's eclectic theory, this knowledge or expertise is essentially of the traditional economic type since it refers to superior technology, cheaper or better products, more efficient production, superior servicing, effective marketing, lower-cost financing, etc.

[25] The scope of this study is limited to the relationship between political instability and FDI behavior. Therefore, the dimension of political risk assessment will not be discussed in the literature review and will only be considered in the context of the implications for managers that can be derived from the empirical findings of this paper.

[26] "By the end of 1970, non-residents controlled 36% of all capital employed in the non-financial industries in Canada ... The foreign penetration was even more pronounced in selected industries, especially the petroleum and natural gas where non-residents controlled 76% of the capital; mining and smelting, where the ratio stood at 70%; and 61% in manufacturing." Canadian Economic Observer (Cat. No. 11-010), Statistics Canada, April 1993, p. 38.

[27] Most of the following material has been adapted from the following sources: Gujarati (1995, 1988), Maddala (1992), Mirer (1988), Stewart and Wallis (1981), Otero (1993), Studenmund (1992), Kazmier and Pohl (1987), and Kennedy (1985).

[28] The OLS estimators are actually linear functions of the dependent variable Y. But Y is itself a linear function of u in (1). Hence, the estimators are ultimately linear functions of u, which is random by assumption.

[29] If two random variables are statistically independent, the coefficient of correlation between the two is zero. However, the converse is not necessarily

true; that is, zero correlation does not imply statistical independence. However, if two variables are normally distributed, zero correlation necessarily implies statistical independence.

[30] This result, due to Rao (1965), is very powerful because unlike the Gauss-Markov theorem it is not restricted to the class of linear estimators only.

[31] Implied in this procedure is the assumption that the error variance of u_t, σ_t^2, is functionally related to the regressors, their squares, and their cross-products. If all the partial slope coefficients are simultaneously equal to zero, then the error variance is the homoscedastic constant equal to α_1.

[32] However, every addition of a dummy variable will consume one degree of freedom.

[33] If a relevant variable is excluded, the coefficients of the variables retained in the model are generally biased as well as inconsistent, the error variance is incorrectly estimated, and the usual hypothesis-testing procedures become invalid. On the other hand, including an irrelevant variable in the model still gives unbiased and consistent estimates of the coefficients in the true model, the error variance is correctly estimated, and the usual hypothesis-testing procedures are still valid; however, including irrelevant variables may lead to : (1) the loss in efficiency of the estimators, (2) the problem of multicollinearity, and (3) the loss of degrees of freedom.

[34] The predetermined variables are divided into two categories: exogenous, current as well as lagged, and lagged endogenous.

[35] The term rank refers to the rank of a matrix and is given by the largest-order square matrix (contained in the given matrix) whose determinant is nonzero.

[36] In small samples $\hat{Y}_{1t}$ is likely to be correlated with μ_t^*. From Equation (64), it can be seen that $\hat{Y}_{1t}$ is a weighted linear combination of the predetermined X's, with $\hat{\Pi}$'s as the weights. Even if the predetermined variables are nonstochastic, the $\hat{\Pi}$'s, being estimates, are stochastic. Therefore, $\hat{Y}_{1t}$ is stochastic too. Given that the reduced-form coefficients, the $\hat{\Pi}$'s, are functions of the stochastic disturbances, such as μ_2, and since $\hat{Y}_{1t}$ depends on the $\hat{\Pi}$'s, it is likely to be correlated with μ_2, which is a component of μ_t^*. Consequently, $\hat{Y}_{1t}$ is expected to be correlated with μ_t^*. This correlation disappears as the sample size tends to infinity. In a nutshell, in small samples the 2SLS procedure may lead to biased estimation.

[37] Using the lag operator L, Equation (67) can be written as $(1-L)Y_t = u_t$. The term unit root refers to the root of the polynomial in the lag operator.