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Early Contributions of *Staff Papers* to International Economics

MARIO I. BLEJER, MOHSIN S. KHAN, and PAUL R. MASSON*

Staff Papers has, since its inception in 1950, been an important vehicle for the dissemination of research done by staff of the IMF. The paper discusses three areas in which articles published in Staff Papers up until the 1970s made major contributions to the literature in international economics. The areas covered are: first, the absorption approach and the monetary theory of the balance of payments; second, the Mundell-Fleming model; and third, foreign trade modeling. The nature of the contributions and their relationship with further developments in the respective fields are detailed. [JEL B20]

THE INTERNATIONAL MONETARY FUND'S *Staff Papers* first appeared in 1950, apparently in response to a suggestion by Dennis Robertson that such a journal would prevent the premature burial of bright young economists in "an anonymous international bureaucracy" (Polak (1995)). Especially in its early days, the journal served as the main outlet for publication of economic research done by the staff. As such, it reflected—and continues to reflect—the preoccupations and operational needs of the Fund.¹ In particular, a large number of articles in the journal

*Mario I. Blejer is Senior Advisor in the Monetary and Exchange Affairs Department. He is a graduate of the Hebrew University of Jerusalem and holds a Ph.D. from the University of Chicago. Mohsin S. Khan is Deputy Director of the Research Department. He is a graduate of Columbia University and the London School of Economics and Political Science. Paul R. Masson is Assistant Director in the Research Department and was educated at McGill University (B.A.) and the London School of Economics (Ph.D.). The authors are grateful to Manuel Guitián, Jacques Polak, Assaf Razin, as well as other colleagues in the IMF for helpful comments.

¹At the same time, the articles in *Staff Papers* have also closely reflected the prevailing trends in the profession at large.

have been devoted to international monetary economics in its various aspects, to the transmission mechanisms of economic policies, and to practical questions relating to macroeconomic, particularly monetary and fiscal, policies in both industrial and developing economies. It has differed from academic journals in that most articles in *Staff Papers* are generally grounded in the IMF's operational work and reveal the experience gained by the staff in the course of their work. Despite this focus on the practical aspects of economic policy, *Staff Papers* articles have also made major empirical and theoretical contributions to the economics literature.

One way to assess the impact of *Staff Papers* articles on the literature is through a numerical tabulation of citations. A recent article in the *Economic Journal*² uses this technique to rank journals, while making adjustments for "inputs" (e.g., the number of articles in an issue and the number of issues), and finds that *Staff Papers* is one of the "core journals." In one ranking, it appears just above the *Journal of Economic Theory*, and just below the *Journal of International Economics*.³ While such exercises should only be taken as indicative, since the conclusions that result are quite sensitive to methodology, these findings do suggest an important role for *Staff Papers* in the economics profession.

In this paper, we concentrate on three areas where *Staff Papers* articles have, in our view, made especially noteworthy contributions. These areas are first, the absorption approach and the monetary theory of the balance of payments; second, the Mundell-Fleming model of international monetary and fiscal policy transmission under high capital mobility; and third, modeling of foreign trade relationships. In the first area, seminal articles such as Alexander (1952) and Polak (1957) were followed by a number of others that also appeared in the journal, while the second area is represented by two articles, the Fleming (1962) version of the Mundell-Fleming model, and a Mundell (1962) article on the assignment problem. The third area is more diffuse, with a series of important contributions to empirical estimates of trade elasticities (Liu (1954), Junz and Rhomberg (1965), and others) and to the theoretical understanding and empirical underpinnings of multilateral trade models (Armington (1969a and 1969b), and others).

In singling out these articles, which develop approaches that emerged prior to 1970, we have deliberately avoided making an assessment of the

² Burton and Phimister (1995).

³ Another recent ranking of journals has been published in the *Journal of Economic Literature* (Laband and Piette (1994)). However, this study does not include *Staff Papers* in its data set.

importance of more recent contributions. Without the benefit of hindsight, evaluation of the more recent literature is more difficult. However, areas in which *Staff Papers* articles may well be considered in coming years to have made seminal contributions include exchange rate modeling in the 1970s, third-world debt issues and adjustment policies in the 1980s, and policy credibility in the 1990s.

I. The Monetary Approach to Balance of Payments Determination

At the beginning of the 1970s there was a strong upsurge of interest, both in academic circles and among policymakers, in the examination of monetary relations in an open economy, and in the analysis of the interactions between the behavior of monetary aggregates and the determination of the balance of payments. This interest led to the formalization of what became known as “the monetary approach to the balance of payments,” an approach that, from the mid-1970s until the mid-1980s, took center stage in the theoretical and empirical debates that characterized the open-economy macroeconomic literature of the period, and in the discussions surrounding policy implementation in a variety of countries.

By 1975 the monetary approach was well established as a more realistic alternative both to the “Keynesian” approach—seen as concentrating solely on the trade balance and as excessively concerned with the interrelationships between international adjustment and domestic employment—and to the “elasticities” approach—widely regarded as a partial equilibrium response to questions more of a general equilibrium nature. In the next five years, a vast number of dissertations, journal articles, and working papers were written dealing with the analytical underpinnings, the implications, the empirical validation, and the possible extensions of the approach.

Despite the evident intellectual success that the monetary approach was enjoying at that time, a significant amount of skepticism remained in the profession, and the approach stimulated a number of formal theoretical and methodological critiques.⁴ However, despite the criticisms it generated, the monetary approach has had a lasting and consequential influence on macroeconomic thought. This is so because the most relevant and meaningful elements emphasized by the monetary

⁴ See, for example, Hahn (1977).

approach have been widely accepted and, in practice, have become conventional wisdom in today's theoretical and policy-oriented analysis of the balance of payments and of macroeconomic relations in an open economy.

As the monetary approach was gaining popularity, a noticeable, albeit amiable, scholarly debate about its origins and "ownership" arose. While all those involved in the development of the approach routinely acknowledged that it has a long intellectual history originating with the eighteenth-century contributions of David Hume,⁵ credit for the modern revival of the monetary approach was simultaneously claimed in two circles of the profession. The academic version of the monetary approach seems to originate with the writings of James Meade in the early 1950s and to continue with the contributions of Harry G. Johnson and Robert A. Mundell in the 1960s.⁶ It reached its peak of popularity during the early 1970s with the intense work of economists associated with the Workshop in International Economics at the University of Chicago.

Years before the standard exposition of the monetary approach arising from these academic contributions became prominent, a number of important analytical and empirical studies were carried out at the IMF, largely under the direction of Jacques Polak. Many of these studies were intended to yield analytical foundations to the Fund's practices and, in many ways, were geared to the IMF's operational work. However, these studies greatly promoted the subsequent development of a rigorous monetary framework for the examination of balance of payments performance that became, essentially, the forerunner to the theories that emerged later, in a more refined and robust formulation, in the academic literature.

Although the precursory role played by the IMF studies is indeed customarily acknowledged in the classical academic references of the 1970s (e.g., Frenkel and Johnson (1976)), the IMF research was not necessarily considered as setting the base for the subsequent developments of the monetary approach but rather was characterized as a "short-lived burst of interest in the monetary-theoretic aspects of the balance of payments at the International Monetary Fund in the late 1950s. . . ." Moreover, Harry Johnson believed that the IMF work was disregarded because of the dominance of Keynesian views in the 1950s and "the relative impotence and disrepute of the Fund as an international

⁵ Curiously enough, however, Harry Johnson, one of the most prominent exponents of the monetary approach, though never denying its original roots, referred to it frequently as 'the new approach.' See, for example, Johnson (1975).

⁶ See Johnson (1958 and 1972), Meade (1951), and Mundell (1968).

monetary institution at that time” (both points are made in Johnson (1977), p. 261).

Despite this dismissal of IMF influence on economic thinking, practically all the subsequent literature on the monetary approach has tended to relate it to the absorption approach, and in particular to the version of that approach published in *Staff Papers* by Sidney Alexander in 1952. The monetary approach is sometimes viewed as a rival of the absorption approach, and sometimes as complementary to it. In Alexander’s (1952) paper the current account of the balance of payments is viewed as the difference between total output and total expenditures, and therefore the effect of specific policies on the external position of a country can be evaluated by assessing the relative impact of these policies on production and spending.⁷ Although the Alexander formulation basically utilizes a Keynesian formulation, it emphasizes an adjustment mechanism based on the effects of changes in the real value of financial wealth on the rate of accumulation and decumulation of foreign assets through the effects of those changes on absorption. In particular, Alexander analyzes in detail the consequences of a devaluation on the balance of payments through the effects of the devaluation on domestic prices.⁸ As prices rise, the real purchasing power of cash and bonds held by the public is reduced and so is the propensity to consume (and, therefore, total absorption), leading to an improvement in the balance of payments. The important points of this model are that the success of an exchange rate adjustment depends on monetary factors and that the analysis utilizes monetary concepts. In substance, these concepts are analogous to those that became the fundamental blocks of the monetary approach.⁹

The building up of these fundamental blocks was an essential preoccupation of the Fund staff by the mid-1950s, a preoccupation that was strongly reflected in *Staff Papers* at the time. The seminal article by

⁷ The connection between balance of payments developments and the flows of income and expenditures was a conceptual analytical tool in the Fund practically since its inception. This was already reflected in the first volume of *Staff Papers* by Tsiang’s (1950) article, particularly in the section on causal relationships between international transactions and domestic income.

⁸ These concepts were further advanced and elaborated in many of the Fund’s operational documents and unpublished papers. A summary of the Fund’s views regarding balance of payments adjustment by the mid-1950s is presented in Bernstein (1956) where he also compares the elasticities and the absorption approaches.

⁹ It is interesting to note that a year before, Alexander published in *Staff Papers* a pioneering exposition of the optimal tariff argument in which the effects of a devaluation on the trade balance are compared with those of the imposition of trade restrictions. That analysis, however, does not incorporate explicit monetary principles. See Alexander (1951).

Polak (1957) is broadly regarded as the starting point of the formal research on the monetary approach in the Fund, but there were a number of articles published in previous *Staff Papers* issues that covered specific elements of the monetary approach that were later combined into a single analytical framework. These include Polak and White (1955) on the endogeneity of money in an open economy model; Hicks, Dorrance, and Aubanel (1957) on the distinction between internal and external sources of monetary expansion; and Holtrop (1957) on the principle that only domestic credit expansion can be treated as an autonomous variable.

Essence of the Approach

While there are some evident differences between the earlier Fund work and the academic versions of the monetary approach, there is no doubt that both variants deal with a very similar question and use comparable methodologies. The essence of the approach is an analytical formulation that emphasizes the interaction between the supply and the demand for money in determining the country's overall balance of payments position. It could be seen, in fact, as an extension to the open economy of the conventional closed-economy monetary models, which highlight the stability of the money demand function and assess the consequences for the economy of changes in the money supply under different conditions. When the expansion of the money supply is not consistent with an equivalent change in the demand (and vice versa), a stock disequilibrium in the money market arises, which affects the spending patterns of economic agents. When the money supply grows faster than the demand, the excess flow supply of money so generated gives rise to a corresponding excess demand for goods and nonmonetary financial assets. In a closed economy the disequilibrium in the money market is eliminated by a combination of increases in prices, interest rates, and possibly output. These changes raise the nominal demand for money to a level commensurate with the new money stock, thus restoring monetary balance.

Unlike in a closed economy, in an economy open to trade and financial flows, changes in the supply of domestic money can be caused by domestic credit creation and the foreign-exchange activities of the central bank. In these circumstances, the monetary approach to the balance of payments emphasizes that money market disequilibria are reflected not only in changes in nominal income (prices and output) but also in the country's foreign reserve stocks. Therefore, the approach concentrates on the

relationships between the supply and demand for money, on the one hand, and prices, output, interest rates, and the balance of payments, on the other.

An important implication of this analysis is that, in a regime of fixed exchange rates, the aggregate money supply is beyond the direct control of the monetary authority and is rendered endogenous. The central bank, however, retains control over the volume of credit, one of the sources of monetary expansion. Within the framework of the monetary approach to the balance of payments, the distinction between the monetary base and its domestic-credit component becomes central: the monetary authority can control the latter but not the former. For a given expansion of the demand for domestic real balances, an equivalent growth in the money supply can be realized through a suitable increase in domestic credit. However, when the rate of domestic credit creation diverges from the changes in money demand, the difference is made up by equivalent changes in net foreign assets arising from a balance of payments surplus or deficit.

The Contribution of *Staff Papers*

As mentioned above, the preoccupation of staff members with monetary issues in an open economy was reflected in their contributions to *Staff Papers* in the late 1950s and over the 1960s. Polak's 1957 article, widely regarded as the first general equilibrium model formally designed to analyze balance of payments problems in a monetary setting, assumes exports, capital movements, and domestic credit creation to be determined exogenously. The values of nominal income, imports, and money are the direct result of the behavior of domestic credit policies and of the path followed by the exogenous elements in the balance of payments (exports and capital flows). While its results are akin in nature to those obtained in the subsequent academic literature, the Polak model emphasizes in more detail the dynamics of the adjustment path and therefore does not concentrate exclusively on the long-run consequences of monetary policies for the external sector.

The largely theoretical contribution of Polak was empirically complemented by the application of the model to 39 countries by Polak and Boissoneault (1960). This paper demonstrates that, using Polak's model, it is feasible to predict the behavior of imports using monetary data and, therefore, that it is possible to calculate reasonably well the effects of various domestic-credit policies on the balance of payments. This theoretical point is reinforced in Guitián's (1973) paper, in which an analytical

framework is developed to demonstrate that domestic credit is the only appropriate monetary instrument for the control of the balance of payments in a fixed exchange rate system.

An empirical investigation similar to Polak and Boissonneault (1960) was published by Fleming and Boissonneault (1961) but it focuses more specifically on the relationship between money and imports. Methodologically, the Fleming-Boissonneault paper studies the lag structure of the monetary effects in the context of the Polak's model. The relationship between money and imports was further disaggregated by Kanesathasan (1961), who considers the relationship between government imports and tariffs within the context of the monetary model.

Polak's framework was further formalized by Prais (1961), who reformulates the analysis in continuous time. Prais's expenditure function includes a term reflecting the deviations of actual from desired monetary holdings. This term provides an explicit linkage between the real and the monetary sectors of the economy and was extensively adopted in the later formulations of the monetary approach.¹⁰ While the original contributions to the formulation of the monetary approach were presented in nominal terms, Argy (1969) recast the model in real terms by assuming constant prices. He showed how real income objectives and balance of payments targets could be reached by appropriately setting the two available policy instruments (government expenditures and money supply).

After 1970, writings on subjects related to the monetary approach mushroomed and numerous articles, in *Staff Papers* and elsewhere, extended and tested the approach. The publication in 1977 of a collection of papers on the monetary approach written in the Fund after 1957¹¹ helped to highlight the contribution of the Fund staff to the development of the model and increased the visibility of articles previously published in *Staff Papers*.¹² The basic models collected in the 1977 volume were the subject of many empirical applications and, also, of a significant number of extensions.¹³

¹⁰ See, for example, Dornbusch (1976a). Prais's article is the only early *Staff Papers* article that is quoted in the various papers included in the Frenkel and Johnson volume.

¹¹ IMF (1977).

¹² It is worth noting that after the publication of the volume, the *Staff Papers* articles included in the book were mostly quoted as part of the collection and not as original articles. On the one hand, this, of course, may have reduced the visibility of *Staff Papers*, but on the other, the successful reception of the book may have increased the exposure of the papers.

¹³ Since the intention of this paper is not to provide a review of the monetary approach to the balance of payments but rather to trace the impact of the early contributions, no specific references are provided here. For a survey of the monetary approach literature, see Kreinin and Officer (1978).

An important extension was the relaxation of some of the limiting assumptions. For example, if the degree of international capital mobility is low and if the share of nontraded goods is high, then the speed of adjustment to monetary disturbances is reduced. In the short run, therefore, monetary imbalances also affect domestic prices, output, and interest rates, and the relative importance of these effects depends on various factors such as the nature of the exchange rate regime, the degree of openness of the economy in both the goods and the capital markets, the degree of resource utilization, and the extent of nominal and real wage rigidities. Many of these elements were modeled within the original monetary framework, as were the effects of exogenous changes in income growth and of external shocks.

The basic model was also extended to analyze the consequences of once-and-for-all devaluations and of the abandonment of the fixed exchange rate assumption. Monetary research on exchange rate determination in a flexible exchange rate system was seen as the logical counterpart to the original monetary approach formulation. Such research was, in the second half of the 1970s, carried out simultaneously at the Fund and in academic institutions. As a logical sequel to their previous volume, Frenkel and Johnson (1978) collected a number of Chicago studies on the subject.¹⁴ The main theme of the various papers is that the exchange rate, being a relative price of two national monies, is determined primarily by the relative supplies and demands for these monies and that the analysis of exchange rate determination should not be conducted in the partial-equilibrium framework of foreign trade but rather within a general macroeconomic framework.

Despite the appeal of these extended formulations, both the monetary approach to the balance of payments under fixed exchange rates and the monetary approach to the exchange rate lost ground in the mid-1980s. While a detailed analysis of the reasons for these developments is not relevant here, the impact of the debt crisis after 1982 (with the consequent intensification of the phenomenon of currency substitution) and the seemingly exogenous upsurge of capital inflows into emerging markets in the 1990s helped weaken the credibility of some of the central tenets of the approach, particularly as regards the endogeneity or exogeneity of the various monetary aggregates. However, it remains true that the major propositions brought to the fore by the monetary approach (e.g., the importance of money demand in balance of payments analysis) have been largely incorporated into conventional macroeconomic thinking and that

¹⁴ See also Bilson (1978).

the earlier contributions of the Fund staff, as reflected in publications in *Staff Papers*, played a central role in this process.

II. The Mundell-Fleming Model: Capital Mobility, Exchange Rate Flexibility, and Policy Assignment

A major influence on thinking about international macroeconomic policy issues that appeared, at least in part, in *Staff Papers*, was what has become known as the Mundell-Fleming model, after Robert Mundell and J. Marcus Fleming, who were then at the IMF (Fleming (1962) and Mundell (1962)).¹⁵ These two authors considered the effectiveness of monetary and fiscal policies in the context of capital mobility, and under the alternative assumptions of exchange rate flexibility or fixity. Not only did they isolate strong policy conclusions—for instance, that fiscal policy would be more effective in increasing output under fixed rates than with flexible rates; and that the monetary policy should be assigned to external balance, and fiscal policy to internal balance—Mundell and Fleming also created a streamlined, elegant, and easily mastered model that was quickly adopted by practicing economists and taught to generations of graduate students. Moreover, the model has led to numerous empirical applications and extensions and still serves as the backbone of a host of estimated multicountry models.

In a discipline (economics) where often only recent precursors are mentioned in academic articles, the Mundell-Fleming model is extensively cited despite the passage of more than thirty years. Indeed, Jacob Frenkel and Assaf Razin, in their 1987 review article, termed it “still the ‘workhorse’ of traditional open-economy macroeconomics” (Frenkel and Razin (1987b), p. 568). In the influential 1985 North-Holland volume, *Handbook of International Economics: International Monetary Economics and Finance* (Jones and Kenen (1985)), the Mundell-Fleming model is mentioned prominently in many of the chapters, ranging from the ones on stabilization policy and on exchange rate dynamics, to that on economic interdependence and policy coordination. The explanation for the longevity of the Mundell-Fleming model’s contribution may well be the feature Dornbusch highlights when discussing Mundell’s work of the early 1960s: “he created simple, forceful models to serve as organiz-

¹⁵ Though only the Fleming half of the Mundell-Fleming model was published in *Staff Papers*, the *Staff Papers* article by Mundell cited above is on the assignment problem in a world of capital mobility, which is closely related. Other articles by Mundell in this broad subject area appeared in various journals (Mundell (1960, 1961a, 1961b, 1963, and 1964)).

ing frameworks for thought and policy and as springboards for posing new problems” (Dornbusch (1980)).

The Nature of the Contribution

The Mundell-Fleming model was a major step in the process of turning closed-economy macroeconomics into open-economy macroeconomics. Most earlier treatments of the interdependence between countries had concentrated on trade linkages, and, in particular, on the conditions for a positive effect on the trade balance of devaluation (the Marshall-Lerner condition) or on the size of the foreign trade multiplier. These analyses were often based on partial equilibrium approaches, and neglected monetary factors. Moreover, capital flows typically got little attention; instead, the focus was on policies operating in the context of limited capital account convertibility.

By the early 1960s, Meade’s 1951 book had already extensively considered financial policy issues in an open economy, general equilibrium macroeconomic setting, and the absorption approach discussed above had analyzed the domestic savings-investment requirements for achieving external balance. However, capital flows do not appear as prominently here as in the later Mundell-Fleming work, and their implications are not highlighted to the same extent. In Kenen’s words: “Meade (1951, ch. 15) was careful to include them [capital movements], but they could be deleted without altering his argument” (Kenen (1985), p. 636). In contrast, in Mundell-Fleming, they are a central part of the story. No doubt, the greater attention to the subject reflected a decade of enormous expansion of private capital flows, including the move to widespread (current account) convertibility in Europe and the development of the Eurodollar market. Clearly, by 1960, private capital flows were much more important than had been imagined when the postwar international monetary system was designed, at Bretton Woods in 1944. It is also interesting that an examination of the consequences of flexible exchange rates was undertaken at this time at the IMF, which after all was a pillar of the Bretton Woods system of fixed rates. Mundell’s interest in the fixed/flexible rate comparison under highly mobile capital no doubt also reflected his knowledge of the Canadian experience of flexible rates in the 1950s (and Canada’s return to a pegged rate in 1962).

Another difference from most earlier contributions (but not the Polak work cited above) is the way money market equilibrium is taken into account when modeling the transmission process. In the partial equilibrium multiplier analysis and the Marshall-Lerner conditions, monetary

factors are given no explicit role. In Meade's general equilibrium approach, a "neutral" monetary policy is one that leaves interest rates unchanged; thus, there is very little interaction between monetary and fiscal policies. In contrast, the Mundell-Fleming model highlights very starkly the linkages between money market equilibrium, interest parity, and the exchange rate. If monetary policy keeps the money supply unchanged under flexible rates, then an expansionary fiscal policy tends to increase interest rates and thereby appreciate the exchange rate, and complete crowding out must occur if interest rates are exogenously given by the rest of the world (provided that money demand takes a simple form). Under fixed rates, reserve inflows increase the money supply, and the extent of crowding out is reduced.

The way Mundell and Fleming analyze money market equilibrium no doubt reflected the growing interest in the demand for money as a central relationship for analyzing balance of payments and financial programming problems. The Mundell-Fleming model thus has common elements both with the earlier Polak (1957) model and the later academic version of the monetary theory of the balance of payments (see the discussion in Section I above). The work of Mundell and Fleming at the Fund also paralleled the revival of interest in money demand and monetary issues elsewhere, in particular at the University of Chicago—most notably associated with Milton Friedman.

A third innovation—or rather, refinement of existing practice—was in the method of analysis. Whereas Meade presented his main argument verbally, and relegated the mathematics to a largely impenetrable supplement in which the equations were handwritten, Mundell and Fleming make models a central part of their analysis. Clearly others (Hicks (1939) and Samuelson (1947), not to mention Walras (1954) and Pareto (1909)) had already gone further in sophisticated and elegant mathematical presentations for the specialist; however, now models were used in a practical, policy-relevant context for the mainstream economist. For instance, the appendix to Fleming (1962) clearly sets down equations and comparative static results, so that assumptions and methods needed to prove the results on policy effectiveness under fixed and flexible rates are not subject to dispute or misinterpretation. No doubt, the example of Mundell and Fleming stimulated interest in international problems and their model, because of its clarity, served as a standard for later work. Though graphical analysis was still in much use (including, for instance, in Mundell (1962 and 1963)), by the next decade new contributions to international macroeconomic analysis relied almost exclusively on mathematical techniques.

Later Extensions of the Mundell-Fleming Model

A strength but also a weakness of the model is its simplicity, which made it important to check whether the main conclusions of Mundell and Fleming's work—in particular, concerning the effectiveness of monetary and fiscal policies—were robust. Later extensions of the model read like an inventory of the major advances in international macroeconomics of the past few decades: modeling of capital flows as a stock adjustment (Branson (1970)); an explicit integration of sticky (not rigid) domestic prices and the inclusion of exchange rate expectations (Dornbusch (1976b)); asset stock dynamics and portfolio balance effects on the uncovered interest parity relationship (Branson (1976); Kouri (1976); Dornbusch and Fischer (1980)); allowing money demand to depend on the exchange rate, through either the effect of import prices on the absorption deflator or exchange rate valuation effects on wealth (Branson and Buitier (1983)); and incorporation of intertemporal budget constraints for the government and for households, including modeling consumption as the result of intertemporal optimization (Blanchard (1985); Frenkel and Razin (1987a)).

Generally speaking, these extensions have made the Mundell-Fleming model richer, thus allowing it to be applied to more interesting questions—for instance, the effects of temporary versus permanent changes in financial policies or in the terms of trade—without overturning its central insights at least concerning short-run effects. For instance, the ineffectiveness of monetary policy under fixed rates was shown to depend on perfect capital mobility and on the inability to sterilize reserve flows, which empirical work has to some extent contradicted. However, the limiting case studied by Mundell and Fleming is still a useful benchmark. Likewise, the ineffectiveness of fiscal policy under floating rates no longer strictly holds if the exchange rate affects money market equilibrium; for example, an exchange rate appreciation may lower the demand for money if the price of domestic absorption (rather than the GDP deflator) appears in that demand function, so that for a given supply of money, output can rise (Branson and Buitier (1983)). Nevertheless, an important insight of the Mundell-Fleming model remains, namely, that under flexible rates fiscal expansion can be expected in normal cases to lead to crowding out through exchange rate appreciation.¹⁶

¹⁶ Fleming (1962) acknowledges that some might consider the possibility of exchange rate appreciation in these circumstances as an “academic *curiosum*” but goes on to point out that Rhomberg's model of the Canadian economy gives just that result. Today, with the experience of the Reagan fiscal expansion and German unification behind us, few would consider this case an academic curiosity.

Empirical Applications

Just as the extended Mundell-Fleming model remains the “workhorse” model for theorizing, it also serves as the intellectual underpinning for the empirical models most widely used to study international economic policy questions. Indeed, the current crop of multicountry macroeconomic models, those that incorporate forward-looking expectations and typically model nonaccommodating monetary policy in terms of keeping a monetary aggregate close to its target value (Gagnon (1991); Masson, Meredith, and Symansky (1990); McKibbin and Sachs (1991); Taylor (1993)) are closer to the original Mundell-Fleming model than the earlier vintages of multicountry models with backward-looking expectations and interest rates, rather than the money supply, as exogenous monetary policy variables. In the latter models, a fiscal expansion produces little in the way of crowding out, because with an accommodating monetary policy there is little or no increase in short-term rates, and in any case neither the exchange rate nor the long-term interest rate can *jump* on impact in anticipation of future effects.¹⁷

Indeed, in some models with backward-looking expectations and a relative neglect of capital flows as determinants of exchange rate movements, fiscal expansion normally produces exchange rate depreciation, not appreciation (Helliwell and Padmore (1985), p. 1121, cite simulations of the Japanese Economic Planning Agency model). As a result, fiscal policy multipliers under both fixed and flexible exchange rates tend to be positive and large in these models and their effects tend to die out slowly. In contrast, simulations of the forward-looking models with flexible exchange rates give results that are much closer to the original Mundell-Fleming result. These models embody the assumption of high capital mobility, often assuming that uncovered interest parity holds, and exchange rate expectations correctly anticipate the effects in the model of present and future values of the exogenous variables. As a result of either a temporary or a permanent fiscal expansion, the exchange rate appreciates on impact, which tends to limit (though not crowd out completely) the expansionary effect on output. The dynamics of the model then imply declining multipliers and a reversal of the appreciation (and, ultimately, a negative effect on output and a long-run depreciation from permanently higher government consumption spending if effects on interest rates and the capital stock are taken into account).

A return to the basics of the Mundell-Fleming model can also be

¹⁷ See simulation results reported in Bryant and others (1988).

explained by a desire to understand the nature of the international linkages—something that had been lost in the large-scale international models, which typically linked together models with quite different intellectual underpinnings (the best-known example of this is Project LINK).¹⁸ This has been especially important in recent work on international economic policy coordination, where the nature of the transmission mechanism is crucial to the gains from policy coordination. Whether monetary expansion is positively or negatively transmitted (under flexible exchange rates) is the key question for evaluating whether the uncoordinated equilibrium is too contractionary or too expansionary. The Mundell-Fleming framework is general enough to allow both possibilities, and to relate them to intuitively important structural parameters that can be estimated (see, for instance, Ghosh and Masson (1994)). Thus, empirical studies of the gains from policy coordination have relied on what is basically the Mundell-Fleming framework, with a few of the extensions mentioned above. It is likely that future policy questions will continue to use this framework as the benchmark for an intuitive understanding of the likely direction of effects, and that much empirical work in international economics will continue to estimate variants of the model.

III. Foreign Trade Relationships

Papers on a variety of empirical aspects of import and export relationships have figured prominently in *Staff Papers*.¹⁹ This is certainly not surprising, since after all foreign trade is central to the business of the Fund. How the demand and supply of imports and exports are determined has a bearing on a number of important macroeconomic policy issues, including, among others, the effects of both expenditure-reducing (monetary and fiscal) and expenditure-switching (exchange rate and tariff) policies on a country's external balance; projections of world trade and payments; and the international transmission of changes in economic activity and prices. Thus, in this particular area IMF staff research has

¹⁸ The chapter by Frankel in the book on multicountry simulations edited by Bryant and others (1988) attempts to understand the model simulations in the context of the Mundell-Fleming model and expresses puzzlement at inconsistencies.

¹⁹ Between 1950 and 1990, there were about 100 empirical papers on foreign trade published in *Staff Papers*. This track record probably puts *Staff Papers* far ahead of any other journal on this particular subject. For a detailed survey of the empirical foreign trade literature, see Goldstein and Khan (1985).

meshed closely with the institution's policy interests, and the outcome is evident in *Staff Papers*.

The papers on foreign trade that have appeared in *Staff Papers* can be grouped into two broad categories. First, there are papers that specify and estimate import and export equations at the individual country level. And second, there are the papers that develop "world" trade models that deal with groups of countries. This section will take up each category in turn.

Individual-Country Trade Models

Virtually all models of imports and exports are variants of what has been termed by Goldstein and Khan (1985) the "imperfect substitutes" model. The key underlying assumption of this general model, as the name suggests, is that neither imports nor exports are perfect substitutes for domestic goods.²⁰ The main characteristics of the imperfect substitutes model are as follows. On the demand side, in accordance with conventional demand theory, the consumer maximizes utility subject to a budget constraint. The resulting demand equations for imports and exports relate the quantities to the level of income, the own price, and the price of domestic substitutes. The specification of the supply function is equally straightforward—the producer is assumed to maximize profits subject to a cost constraint. The resulting function relates quantities to productive capacity, the own price, and the price of inputs into the production process.

The bulk of the empirical trade literature has focused on demand functions, and that concentration is also apparent in the work done in the IMF. The empirical counterpart to the imperfect substitutes demand model, for example, makes the volume (or real value) of imports a function of current domestic real income and the relative price of imports to the domestic price level.²¹ Symmetrically, the demand for exports relates the volume (or real value) of exports to foreign real income and the relative price of exports to the foreign price level. The differences that exist among the studies essentially arise from differences in definitions

²⁰ If they were perfect substitutes then one would see either the domestic or the foreign good taking up the entire market and each country would be either an importer or an exporter of a traded good but not both. Neither of these predictions has empirical support.

²¹ For developing countries, foreign exchange constraints have also sometimes been introduced as an additional variable, or even in place of the relative price and income variables. See, for example, Hemphill (1974).

of various variables involved, the samples for which the studies are done, and the types of estimation procedures utilized.

Aside from the fact that understanding and explaining foreign trade flows is an essential part of the IMF's mandate, the initial work on the subject was largely motivated by a desire to counter the general belief in "elasticity pessimism" prevailing in the postwar period. As Machlup (1950) pointed out, most studies in the prewar and early postwar periods seemed to show that price elasticities of imports and exports were quite low. This observation was later confirmed in the comprehensive survey in *Staff Papers* by Cheng (1959), which compiled estimates of elasticities from 42 books and articles published in the period 1937 to 1957. Clearly, the evidence was worrisome, since it implied that the Marshall-Lerner conditions were apparently not met in a number of countries, thereby casting doubt on the effectiveness of devaluation—a policy being frequently recommended by the Fund—to correct external imbalances. The challenge for the IMF staff was to ascertain whether this was indeed the case or whether it was the result of faulty or inappropriate empirical analysis.

Taking up this challenge, Guy Orcutt, a staff member of the Fund at that time, produced a paper that has probably had the most significant and long-lasting influence on empirical trade analysis (Orcutt (1950)). While it was not published in *Staff Papers*, it nevertheless has become closely associated with the IMF.²² The debt to Orcutt is clearly acknowledged by Houthakker and Magee (1969) in their seminal paper on estimates of import and export equations. Furthermore, the standard textbook on quantitative international trade by Leamer and Stern (1970) uses the Orcutt paper as its organizing framework.

Orcutt gave a list of reasons why existing estimates of price elasticities of the demand for imports and exports may be biased downward. These included nonlinear effects of relative price changes on quantities; simultaneous-equation bias; aggregation bias; and lack of accounting for lags.²³ This list provides a convenient way to group and cover a representative

²² The paper was discussed by the IMF's Executive Board. There are several stories, all unconfirmed, as to why this paper was not published in *Staff Papers*. One is that it was considered "too technical." Another story is that the senior staff of the Research Department did not like the paper's implication that it was really difficult to properly estimate trade elasticities. A third story is that Orcutt himself preferred to publish in a well-established journal rather than in one just starting out. While the real reason why it was not published in *Staff Papers* has been forgotten, the fact that it was not means that the journal received fewer citations in the subsequent empirical trade literature than it otherwise would have.

²³ A fifth source of bias—errors in observation—is not taken up here.

sample of papers on individual-country trade models that have since appeared in *Staff Papers*.

Nonlinear Effects of Relative Price Changes

Most econometric studies of the demand for imports, including the more recent ones, assume that the elasticities of import demand with respect to relative prices are constant for all values of the explanatory variable.²⁴ It can, however, be argued that the price elasticity itself will vary directly with the size of the price change, since the price change must be large enough to overcome buyer inertia and the costs associated with switching suppliers. This proposition was tested first by Liu (1954) for the case of U.S. imports. In brief, Liu included a squared relative-price term in a standard import demand equation to capture the hypothesized non-linearity in behavior, and found that the hypothesis had empirical support. This finding was also confirmed by a more elaborate set of tests devised by Goldstein and Khan (1976). However, despite the obvious importance of the issue of large versus small price changes for determining the impact of exchange rate changes—which usually tend to lead to larger than normal changes in relative prices—on trade flows, these are the only two studies in *Staff Papers* that look at this particular issue.

Simultaneity

As is well-known, price elasticities in trade relationships can be seriously biased by simultaneity between quantities and prices. Thus, single-equation estimates of the price elasticities of demand and supply can be weighted averages of the “true” demand and supply elasticities and consequently can be biased downward. The basic conditions under which one can estimate a demand equation that would be free of such bias are either that the price elasticity of supply is infinite, or that the demand function is stable while the supply function shifts.

For the case of imports, simultaneity is not that serious a problem. It is quite plausible to assume that for a small country the supply of imports from the rest of the world is infinitely elastic, and most studies have made this assumption. For countries like the United States, however, this assumption has to be tested, as is done, for example by Liu (1954) and Ahluwalia and Hernández-Catá (1975).²⁵ On the export side there is a greater presumption of simultaneous-equation bias, and techniques such as two-stage least squares or instrumental variables have been employed

²⁴ This assumption is, of course, inherent in the popular use of a log-linear functional form for the import equation.

²⁵ See also Liu (1955).

by, among others, Rhomberg and Boissonneault (1964) and Junz and Rhomberg (1965).²⁶

Aggregation

Typically, trade models focus on determining aggregate imports or exports. If the effect of the explanatory variables—relative prices and income—is exactly the same for aggregated and disaggregated groups, or if the relationship between the components and aggregate explanatory variables is a stable one, then one can be indifferent between the aggregate and disaggregated equations. If these basic preconditions are not satisfied, however, the estimates obtained directly from the aggregate relationships are likely to be biased. Therefore, in aggregate trade equations, if goods with relatively low price elasticities display the largest variation in prices and exert a dominant effect on the estimated aggregate price elasticity, the estimate will be biased downward.

To account for the possibility of aggregation bias, estimates need to be obtained at the disaggregated level. For example, Deppler and Ripley (1978) show that the import price elasticity of manufactures is about three times the size of the price elasticity of foods and beverages. This result is typical of that found in the literature—see Goldstein and Khan (1985).

Lags

The theoretical formulations of import and export models assume that importers and exporters are always on their long-run demand and supply schedules. In reality, of course, the presence of adjustment costs and incomplete information implies that the adjustment of imports and exports to changes in relative prices will not be instantaneous. This delayed response of trade can be due to recognition lags, decision lags, delivery lags, replacement lags, and production lags. Gauging the pattern and length of such time lags is important for calculating the short-term and long-term price elasticities and thus for determining the proper effects of exchange rate and tariff policies.

Even though Orcutt (1950) discussed this issue in some detail, early papers in *Staff Papers*, such as Liu (1954), Fleming and Tsiang (1956), and Romanis (1961), did not incorporate the notion of lagged adjustment of imports and exports. The first paper to do so, by Junz and Rhomberg (1965), produced extraordinarily long lags.²⁷ Numerous later studies published in *Staff Papers* showed that the average lag in adjustment is quite

²⁶ The paper by Goldstein and Khan (1978) deals explicitly with this issue of simultaneity in the determination of exports.

²⁷ It is possible that this result is simply a consequence of using pooled annual time-series cross-section data for the estimation.

short—about a year for both imports and exports for a variety of countries. However, as it is not zero, the distinction between short-run and long-run elasticities has to be made in assessing the effects of relative price changes on trade flows.

It is apparent from the preceding discussion that advances made over the years by researchers both in the IMF and elsewhere to overcome the problems outlined by Orcutt (1950) have substantially changed the profession's view about the sizes of import and export elasticities. Indeed, one can say that the elasticity pessimism of the 1950s has now given way to elasticity optimism, with Marshall-Lerner conditions widely believed to be satisfied in most countries. Thus, it is no longer a matter of debate whether devaluation, other things equal, can be successful in improving the trade balance.

World Trade Models

The IMF's mandate to exercise surveillance over the international monetary system and monitor developments at the global level has led since the late 1960s to substantial interest in research on world trade and payments. The main focus of the papers published in *Staff Papers* in this area has been on projecting world trade flows and studying the policy and economic interactions among countries.

The first paper to appear on the subject in *Staff Papers* was by Taplin (1967), which surveyed existing models that analyzed the structure of world trade and those that traced the transmission of short-run fluctuations between countries or groups of countries. The second issue was taken further by Rhomberg (1970), who considered a variety of approaches and techniques for constructing a "world" economic model by linking—directly and indirectly—existing national economic models in such a way as to achieve sufficient detail of the various relationships between domestic economic variables, economic policies, trade and payments flows, and coordinated international action. Both of these papers essentially described the existing state of the art, and proposed alternative strategies as to how one might go about constructing world trade models.

The breakthrough in the design of world trade models was made by Armington (1969a and 1969b), who developed a theoretical approach that became the centerpiece of subsequent work on this subject.²⁸

In brief, the Armington model took the notion of imperfect substitutes

²⁸ See, for example, Branson (1972), Hickman and Lau (1973), Samuelson (1973), and Deppler and Ripley (1978). It also provided the basic structure for the Multilateral Exchange Rate Model (MERM)—Artus and Rhomberg (1973).

a step further by distinguishing commodities both by kind—as done in the imperfect substitutes model—and by place of production. Types of commodities (“goods”) correspond to broad commodity classifications, such as nontradables, manufactures, food, raw materials, etc. Goods produced by different countries are called “products.” For example, in the Armington framework, French and German manufactures are the same good but are different products, and these products are assumed to be imperfect substitutes for one another. This distinction, along with certain other assumptions relating to the separability of import demand between goods and products, and that the elasticities of substitution between all pairs of products in the same goods family are identical and constant in any market, sharply reduced the amount of information needed to derive the direct and cross-price elasticities of demand for imports of any product into a country from another country.²⁹ Thus, the model’s main appeal lies in the fact that it provides an extremely economical and consistent method for estimating all the bilateral and multilateral direct and cross-price effects of a single or simultaneous set of traded goods price changes, such as that brought about by an exchange rate change.

Even though the Armington model has had an enormous influence on the papers on world trade models, applying it to actual data is fraught with difficulties. One is choosing the right level of aggregation for the goods categories. If these are defined too narrowly, the separability assumption is likely to be violated; if they are very broadly defined, the assumptions about equal elasticities of substitution are likely to be violated. A second problem is that the estimates of direct and cross-price elasticities will only be as good as the estimates of the underlying elasticities of substitution and own price elasticities of goods. While there are estimates of the former, much less is known about the latter.

The model was subsequently empirically implemented by Armington (1970). Incorporating trade data for 1966–68, together with the requisite assumptions regarding elasticities, the model was used to calculate the effects on trade, as well as other domestic variables such as prices, incomes, and expenditures, of exchange rate changes. The results showed that the full effects of an exchange rate change—that is, taking full account of international feedbacks—were quite different from those obtained when considering a country in isolation. Further work on world trade models that appeared in *Staff Papers* was more in the nature of refinements and adjustments of the model maintained in the Research Department of the Fund.

²⁹ This particular feature made the model very useful to the development of open-economy Computable General Equilibrium (CGE) models. See, for example, Dervis, de Melo, and Robinson (1982), and the survey by Robinson (1989).

IV. Concluding Remarks

Our focus in this paper has been on early contributions to international economics by *Staff Papers*, and we have singled out three of them: the theory of the balance of payments determination, the Mundell-Fleming model, and empirical foreign trade relationships. Other areas in which major contributions have appeared in *Staff Papers* from the very first, and continue to do so, are international liquidity, including such aspects of the question as the demand for reserves and the role of Eurocurrency markets; the demand for money; stabilization and adjustment policies in developing economies; and the macroeconomic dimensions of public finance and budgetary policies. However, it is worth noting that a good part of the significant work done at the IMF in these areas did not get published in *Staff Papers*. For instance, Triffin's discussion of the dollar shortage and dollar glut only appears in *Staff Papers* in the form of a rebuttal to criticisms by Oscar Altman (Altman (1961); Triffin (1961)). And a large part of the work done on international liquidity in the context of the Special Drawing Right appeared in a book (IMF (1970)), rather than the journal. More generally, Fund economists have frequently published in outside journals, and the IMF has published a series of books on fiscal and monetary issues.

In recent years *Staff Papers* has also been in the forefront of work on exchange rate modeling, developing-country debt issues, and policy credibility. The journal made its mark early and has maintained its high standards throughout its 45 years of existence. It is still therefore true that no economist who specializes in international monetary issues can dispense with keeping reasonably up to date with what is being written in *Staff Papers*.

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