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Government size and economic growth: the case of Zambia

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by

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CHAPTER I. INTRODUCTION

The Role of Government in Economic Growth

The role of government in economic growth often generates conflicting points of view. One view is that growth in government size retards economic growth. This is invariably the position of the economists and others who favor the free market and consider government an obstacle to economic growth. Another view is that growth in government size is a catalyst to economic growth. This is often the position of those who consider government to be necessary in removing impediments to economic growth.

The earliest and best known argument in favor of the free market was by Adam Smith, the founder of classical political economy.[1] Adam Smith employed the notion of self-interest (the invisible hand) to show that each individual in society, if left alone, will seek to maximize his own wealth; therefore, all individuals, if unimpeded, will maximize aggregate wealth. In other words, according to Adam Smith, social interest is simply the sum of the self-interests of the individuals in society. For instance, in the first volume of the Wealth of Nations, Smith succinctly stated the argument for the free market as follows:

> ... The annual revenue of every society is always precisely equal to the exchange value of the whole annual produce of its industry .... As every individual, therefore, endeavors as much as he can both to employ his capital in the support of domestic

> industry, and so to direct that industry that its produce may be of the greatest value; every individual necessarily labors to render the annual revenue of the society as great as he can .... By preferring the support of domestic to foreign industry, he intends only his own security; and directing that industry in such a manner as its produce may be of the greatest value, he intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention .... By pursuing his own interest, he frequently promotes that of the society more frequently than he really intends to promote it.[2]

Thus, according to Adam Smith, the interest of society is simply the sum of the self-interests of the members of society. Does government then have any role to play in the interest of society?

Adam Smith prescribed three functions for government as follows: (1) national defense, (2) maintaining law and order, and (3) building and maintaining certain public works and institutions which cannot be run profitably by the private sector. Clearly, government has a very limited role in economic growth.

The case for restricting the role of government in economic growth has, since the day of Adam Smith, been articulated with greater precision. The principal arguments against increased participation of government in economic affairs are that: (1) government operations are often conducted inefficiently because they are not usually subject to economic criteria, (2) many government fiscal and monetary policies tend to lower the productivity of the economy, and (3) government spending crowds out private investment and consumption.[3] From an accounting perspective: $Y = C + I + G + \delta K$; where Y denotes real GNP; C denotes private consumption; I, net investment; G, government spending; K, real capital stock; and δ denotes the rate of depreciation of capital. According to the free market argument, holding δ and K constant, an increase in G comes only at the expense of I and C, and the effect is to diminish the growth of Y.

However, there is the opposite view that growth in the government size is a catalyst to economic growth. The earliest and best known argument for a greater role of government in the economy was by Karl Marx.[4] According to Karl Marx, out of a period of capitalism there emerges a system of socialism in which there is government ownership of the means of production. Marx, however, saw socialism also as a transitory system which is succeeded by communism. Communism, in his sense, is a classless society in that there is only one class -- the proletariat. Therefore, the transition from socialism to communism is characterized by a withering of the state: the state atrophies because there is no role for government in a classless society.

As in the case of the free market argument, the case for the economic function of government has, since the day of Karl Marx, been articulated with greater precision. The principal arguments in this case are that: (1) government is crucial in harmonizing conflicts between private and social interests, (2) government can protect the domestic economy from the vagaries of the world market, and (3) government can secure an increase in productive investment and provide a socially optimal level of economic growth.[5] According to the famous researcher on the characteristics of modern economic growth, Simon Kuznets, one of the characteristics of modern economic growth is having to resolve conflicts continuously generated by rapid changes in economic and social structure.[6] Kuznets asserts that, for economic growth to occur, it is necessary that such conflicts are resolved with least costs; and government in this case plays a crucial role in the peaceful resolution of such growth-induced conflicts.

In addition, government can also stimulate growth by investing in human capital formation: by investing in health and education. Productivity of private investment clearly depends on the health and skills of the labor force. Therefore, a higher level of government spending may not reduce capital formation if a substantial portion of government spending is investment. The point simply is that, concerning the issue of government size and economic growth, there is an opposite view to the free market argument: there is the view that growth in government size is a catalyst to economic growth.

Definition of the Problem

The case of Zambia very well illustrates the constrasting views on the relationship between government size and economic growth. In Zambia, the public sector has grown considerably as a result of the Government's attempt to industrialize the economy through the public sector. Starting in April 1968 with what are now known as the Mulungushi Reforms, the Government has created a complex system of state enterprises or parastatals. The Mulungushi Reforms placed major sectors of the economy under state control, and a state enterprise, the Industrial Development Corporation (Indeco), was created in order to implement Zambia's industrial policy. In April 1970, Indeco became a one hundred percent government-owned subsidiary of the Zambia Industrial and Mining Corporation (ZIMCO) -- the organization which holds the Government's interests in mining and industry.

However, since a sharp and prolonged economic recession began in 1973, this system of state enterprises has been reconsidered. As is now increasingly recognized, the recession in Zambia and other African countries is "... the most severe, prolonged and debilitating socio-economic crisis to hit any world region in recent history."[7] In Zambia, the crisis has, among other things, called into question the Government's strategy of industrialization through the public sector. The principal focus of attention has been on the inefficiency of the parastatals as well as the issue of government subsidies to the parastatals.

The Government itself now recognizes that parastatals, for the most part, operate inefficiently. One reason for this is that the parastatals have to fulfill noneconomic objectives besides that of industrialization. Besides the objective of industrialization, parastatals in Zambia are also designed to benefit consumers and farmers through government subsidies and price controls. However, the prevailing crisis and the necessary recovery program have suggested structural reforms in two areas: (1) rationalizing the scope of the public sector and (2) improving the structure of incentives faced by the private sector.[8]

In principle at least, the Government has come to accept the need for structural reforms and has since 1986 attempted to restructure the copper industry and the civil service. The Government has also attempted to reduce the budget deficit in order to slow down the rate of growth of money supply. Reducing the deficit has, in turn, called for reduction in subsidies to parastatals and phasing out price controls so that the Government can be freed from the budgetary burden of the deficit. The Government has, in fact, succeeded in reducing the deficit from 30% of the Gross Domestic Product in 1986 to 14% in 1987; and has reduced the number of commodities subject to price controls from 21 in 1987 to 11 in 1988.[9]

In practice, however, the removal of subsidies has raised the issue of how to protect the poor. As is often the case, subsidies on goods and services consumed by the poor are justified. However, to contain costs, the subsidies should be accurately targeted; and this cannot easily be done in practice. Thus, while the Zambian Government is committed to phasing out subsidies eventually, there is still the problem of finding more efficient ways of transferring income to the poorest segments of the Zambian population.

In addition, budgetary constraints have also adversely affected education and health services. For instance, according to the United

Nations Department of Public Information: "an alarming increasing in nutrition-related child mortality, the most tragic repercussion of the prolonged crisis here, is raising new questions about long term plans to remove costly government subsidies on basic necessities."[10] The basic problem is how to remove the budgetary burden of subsidies without intensifying the nutrition crisis and therefore retarding long-term economic growth. This problem best illustrates the dilemma that Zambia and other developing countries face: the dilemma of maintaining short-term economic stability without having to retard long-term economic growth.

The purpose of the present study is therefore to examine the relationship between government size and economic growth in Zambia. The study is predicated on two principal factors. First, the study is based on the predominant role of the public sector in the Zambian economy and therefore the expectation that growth in government size has a negative impact on economic growth in Zambia. Second, the study is based on the dilemma that the Zambia Government faces: the dilemma of maintaining short-term economic stability without having to retard long-term economic growth.

The study employs a two-sector growth model to test the hypothesis that economic growth varies inversely with government size in Zambia. In the model, the Zambian economy is characterized as consisting of two sectors: a government sector and a nongovernment sector. The output, that is, the size of the government sector exercises an externality effect on the output of the nongovernment sector, and the term "externality" is defined in the usual economic sense as the case where the actions of one economic agent affect the utility or production of another agent. The model is then applied to time series Zambian data for the period 1964-84.

In addition, the present study examines two related issues: (1) saving as a function of national income, and (2) investment as a function of national income in Zambia. Clearly, an understanding of these issues is invaluable in Zambia because of the vagaries of external borrowing and the problems of debt-servicing.

The Plan of the Study

This study consists of six chapters including the Introduction. Chapter II sets the theoretical framework of the study. Chapter III deals with the sources of economic growth. Accounting for the sources of economic growth helps to understand why economic growth rates vary from time to time and from place to place.

Chapter IV deals with the particular case of government as a source of economic growth. Attention is focused on both the theory and evidence of government as a source of economic growth. The basic conclusion in this case is that the effect of government size on economic growth is, in general, both a theoretical and empirical issue.

Chapter V outlines the two-sector growth model that is used to test the hypothesis that economic growth varies inversely with government size in Zambia. Chapter VI summarizes and draws conclusions from the present study.

It should be noted that in this thesis, endnotes are numbered consecutively throughout each chapter, starting with number one for each new chapter. Tables are numbered in the same way. This system follows the instructions for preparing theses and dissertations by the Graduate School and the Department of Economics at Iowa State University.

Notes

[1]See Adam Smith, An Inquiry into the Nature and Causes of the Wealth of Nations, vol. 1 (London: Oxford University Press, 1976).

[2]Ibid., 455.

[3]See, for instance, Edwin S. Mills, The Burden of Government (Stanford: Hoover Institution Press, 1986).

[4]For a review of Marxian economics, see Mark Blaug, Economic Theory in Retrospect (Cambridge: Cambridge University Press, 1985).

[5]See, for example, Richard Rubinson, "Dependence, Government Revenue and Economic Growth, 1955-70," Studies in Comparative International Development 12 (Summer 1977): 3-28.

[6]Simon Kuznets, "Modern Economic Growth: Findings and Reflections," American Economic Review 63(3) (June 1973): 251.

[7]See editor's introduction, "African Crisis Continues: The Case of Zambia," Hunger Notes 14(4) (January 1989): 16.

[8]See, for instance, National Commission for Development Planning, New Recovery Programme: Interim National Development Plan, July 1987-December 1988 (Lusaka, Zambia: Government Printers, 1987), 1-4.

[9]United Nations, "Zambian Logjam with the World Bank and IMF," Hunger Notes (Lusaka, Zambia: Government Printers, 1987), 1-4.

[10]United Nations, "Zambian Child Mortality and the Economic Crisis," Hunger Notes 14(4) (January 1989): 18.

CHAPTER II. THE THEORETICAL FRAMEWORK

There is no consensus on the measurement of "government." One reason for this is that countries sometimes follow different systems of national accounting. Another reason is that, in some countries, the meaning of "government" is not easy to delineate since the government owns all the means of production, and in a sense everyone works for the government.

Similarly, there is no consensus on the measurement of "economic growth." Two main indices of economic growth are outlined here, in this chapter. The principal shortcoming of these indices concerns the issue of social welfare. Often, the indices do not take into account such factors as income distribution and the quality of life.

Definition and Measurement of "Government"

The term of "government" may be defined in various ways. In the present study, however, government is defined as "... the administration of the functions of state within an organized society, or persons who actually administer these functions."[1] In other words, government is here meant to denote the established system of political rule and administration -- such as a democratic, a monarchic, or an aristocratic; a dual, presidential or parliamentary system of government.

Clearly, there are many systems of government and this makes it difficult to compare government size across countries. Besides, countries sometimes follow different systems of national accounting.

Market-oriented countries, for instance, follow the gross national product (GNP), while some socialist countries follow the net material product (NMP) system; the Marxian equivalent of the GNP system. The use of the GNP and NMP systems presents several conceptual problems in the measurement of government size.[2] One problem, for instance, is that the GNP system distinguishes between private and public sectors while the NMP does not. Rather, the NMP system, following Karl Marx, distinguishes between productive and nonproductive activity. Another conceptual problem is that, in socialist countries, the meaning of government or public sector is not easy to delineate since the government owns nearly all the means of production and in a sense nearly everyone works for the government.

Zambia, however, follows the GNP system. The government sector in Zambia is defined by the United Nations System of National Accounts -- the UN SNA system. Under this system, government size can be measured as follows: first a distinction is made between the total product of the country and the GNP.[3] The total social product is the broader concept and more difficult to estimate because it includes the unpaid work of housewives or the unpaid work of school children. The GNP is the narrower concept and is measured by the amounts of goods and services which appear on the market; plus an estimate of nonmarket goods and services, for instance, of peasant production. Second, a distinction is made between the GNP and the public sector. The public sector is a subset of the GNP and involves anything within the GNP not on the market. In other words, the public sector is the opposite of the private sector, in which events are determined by market processes of supply and demand. Third, a distinction is made between the public sector and the government sector. The government sector is a subset of the public sector; it represents a part of the public sector devoted to political and administrative purposes. Thus, according to the UN System of National Accounts, the government sector includes:

> ... all bodies, departments and establishments of government -- central, state or provincial, district or county, municipal, town or village -- which engage in a wide range of activities, for example, administration, defense, and regulation of the public order; health, educational, cultural, recreational and other social services; and promotion of economic growth and welfare and technological development.[4]

Once the government sector is delineated, a distinction is then made between four sizes of government. First, government size may be measured by the central government; that is, it may be measured by central government revenues and expenditures. Second, government size may be measured by the general government; that is, it may be measured by the total of central government, provincial or state government revenues and expenditures. This is because government often exists at different geographical levels: the central, departmental, and municipal, rural or village level. Third, government size may be measured by general government plus public institutions such as the post office and the social security administration. Fourth, government size may be measured by general government plus public institutions plus nationalized industries such as mining in some countries, but usually the railroad, the telegraph and telphone companies. This is clearly the widest concept of government size.

Definition and Measurement of "Economic Growth"

The term "economic growth" may be defined in various ways. In the present study, however, economic growth is defined as a rise in total or per capita GNP.[5] And economic growth is to be distinguished from economic development. As Robert A. Flammang has stated: "... economic growth is a process of simple increase, implying more of the same, while economic development is a process of structural change, implying something different if not something more."[6] In other words, development involves structural change while growth does not; and development is therefore often defined as growth plus structural change. For instance, Gerald M. Meier distinguishes between the two concepts as follows:

> Economic development involves something more than economic growth. Development is taken to mean growth plus change; there are essential qualitative dimensions in the development process that may be absent in the growth or expansion of an economy through a simple widening process. This qualitative difference is, especially likely to appear in the improved performance of the factors of production and improved techniques of production -- in growing control over nature. It is also likely to appear in the development of institutions and a change in attitudes.[7]

The point is simply that, economic growth is usually stated in terms of increases in income while economic development is considered to be an economic, a social, as well as a political process.

Economic growth is often measured in two principal ways. One way in which economic growth is measured is by the growth in total income or output, that is, the growth in GNP. Another way in which it is measured is by the growth in per capita income or output, that is, the growth in per capita GNP. The main difference between the two indices is that per capita GNP = GNP/population. Thus, per capita GNP is corrected for population change and as such, per capita GNP is sometimes considered to be a better index of changes in the level of welfare of individuals in society.[8]

However, both indices of economic growth are not adequate measures of social welfare because they do not indicate how national income is distributed and who is benefiting most from the growth in production. For this reason, several other measures are sometimes employed to characterize growth in social welfare.[9] These include: (1) growth in per capita consumption, and (2) the fulfillment of basic human needs. And the basic human needs are considered to be nutrition, education, health, sanitation, water supply, and housing.[10] Corresponding to these basic needs are various indices of the extent to which the basic needs are fulfilled. For instance, life expectancy at birth is the index associated with health, literacy is the index associated with education, infant mortality is associated with water supply and sanitation, etc. In turn, the indices life expectancy, basic literacy, and infant mortality are sometimes combined into a simple index known as the Physical Quality of Life Index (PQLI); which is a composite measure of the degree to which basic needs are met.

The point again is that the two common indices of economic growth are by themselves not adequate measures of growth in social welfare. They ought to be supplemented by other indices such as growth in per capita consumption, and the degree to which basic human needs are being fulfilled.

Notes

[1]Collier's Encyclopedia, 1983 ed., s.v. "Government."

[2]See, for instance, Gertrude E. Schroeder and John S. Pitzer, "The U.S.S.R. and Eastern Europe, 1," in Why Governments Grow: Measuring Public Sector Size, ed. Charles Taylor (Beverly Hills: Sage Publications, 1983), 97-116.

[3]This scheme is adopted from Karl W. Deutch, "The Public Sector: Some Concepts and Implications," in Why Governments Grow: Measuring Public Sector Size, ed. Charles Taylor (Beverly Hills: Sage Publications, 1983), 25-32.

[4]United Nations, A System of National Accounts (New York: United Nations, 1968), 75.

[5]Adopted from The New Encyclopedia Britanica, 1984 ed., s.v. "Economic Growth."

[6]Robert A. Flammang, "Economic Growth and Economic Development: Counterparts or Competitors?" Economic Development and Cultural Change 28(1) (1979): 50.

[7]Gerald M. Meier, Leading Issues in Economic Development (London: Oxford University Press, 1984), 6.

[8]Ibid., 6-8.

[9]Ibid., 6-10.

[10]See Norman Hicks and Paul Streeten, "Indicators of Development: The Search for a Basic Needs Yardstick," World Development 7 (1979): 567-80.

CHAPTER III.

SOURCES OF ECONOMIC GROWTH

The search for sources of economic growth has a long and illustrious history. During the 16th century, the bullionists, in Europe, held that accumulation of gold was the source of wealth of a nation.[1] Towards the end of the 16th century, mercantilists considered a favorable balance of trade to be the source of wealth of a nation. The best known argument in favor of mercantilism was by Thomas Mun and the mercantilists' notion of what determines economic growth was succinctly summed up by the title of his book, England's Treasure by Forraign Trade: or the Ballance of our Forraign Trade is the Rule of our Treasure. During the 17th century, the Physiocrats in France considered agriculture to be the source of wealth of a nation. According to the Physiocrats, only agriculture is capable of yielding a surplus in excess of production costs. Whereas trade and manufacturing are productive, their output is fully offset by factor costs, leaving these nonagricultural sectors barren or "sterile."

Thus, while the bullionists considered gold and the mercantilists considered trade to be the source, the Physiocrats considered agriculture to be the source of growth. In this chapter, two sets of growth theories are examined: the classical and the neoclassical growth theories. As indicated in Chapter I, accounting for sources of economic growth helps to understand why economic growth rates vary from time to time and from place to place.

Classical Growth Theories

The search for sources of economic growth gained prominence during the 18th century following the publication, in 1776, of Adam Smith's treatise: An Inquiry into the Nature and Causes of the Wealth of Nations. According to Adam Smith, growth in the wealth of a nation is determined by two factors:

> ... first, by the skill, dexterity, and judgement with which [the nation's] labour is generally applied; and secondly, by the proportion between the number of those who are employed in useful labour, and that of those who are not employed. Whatever be the soil, climate, or extent of territory of any particular nation, the abundance or scantiness of its annual supply must, in that particular situation depend upon those two circumstances.[2]

Thus, Adam Smith characterized the sources of growth as: (1) 'the skills, dexterity and judgement' of the labor force, and (2) the proportion of labor employed in productive activity. Smith stated that these factors, in turn, depend on the division of labor.[3] And the division of labor is in turn determined by two factors. First, the division of labor is determined by the extent of the market; that is, nothing limits the degree to which specialization can be carried except the marketable volume of output. Second, the division of labor is determined by the amount of capital that the labor force has to work with. Based on this, the second observation, Smith then arrived at the notion that capitalists are the ones responsible for economic growth.

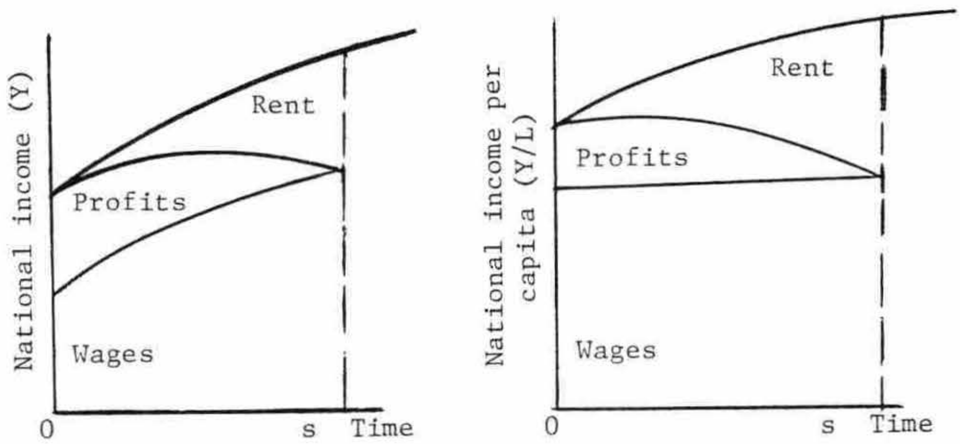
Indeed, Smith is said to have conveyed two principal messages in The Wealth of Nations; messages that struck just the right chord.[4] One is the idea of a self-regulating market; the idea that people, if left alone, will spontaneously organize themselves into a market. The absolute best that the government can do is to duplicate that. At best, the government is useless; at worst, it decreases the wealth of a nation. The other message is of saving being necessary for progress: the idea that saving leads to investment, which leads to growth in the wealth of a nation. In other words, the rate of growth of output is a function of profit on capital. And in stating this, Smith appealed to what was to become the dominant class of the future: the industrial capitalists. In fact, Adam Smith, along with Karl Marx and John Maynard Keynes, is considered to be one of the three economists who have had the most influence on policy.

However, despite the leading influence of Smith, Marx, and Keynes, it is David Ricardo's growth theory which is considered to have much relevance to the case of developing countries.[5] The main emphasis of the Ricardian growth model is on the agricultural sector and land as the determinants of growth.

According to David Ricardo, growth in population leads to an increase in food demand, which, in turn, leads to cultivation on poorer and poorer land; to diminishing returns to labor and capital, and to a fall in agricultural output per worker. Ricardo considered wages to be determined by a standard-of-living and therefore fixed. As agricultural productivity falls, since wages are fixed, labor absorbs a larger and larger fraction of output, while capital absorbs a smaller and smaller fraction; and the residual is rent. Furthermore, Ricardo observed that if profits fall in agriculture, they fall throughout the economy. The fall in profits leads to a fall in the incentives to save and to invest; and therefore to a fall in capital accumulation. In the long run, the economy reaches a stationary state: a point when growth ceased.

Ricardo's growth model is depicted in Figure 1 and this in terms of the two indices of economic growth discussed earlier in Chapter II; namely: (1) economic growth defined as growth in national income, and (2) economic growth defined as growth in per capita national income. In panel (a), growth is measured in terms of national income. As the economy grows, overtime the scarcity of land imposes limits to growth. The result is an increase in rent because it is a return to a fixed factor. Meanwhile, profits fall to zero and wages grow, depending on the growth in population. In panel (b), growth is measured in terms of per capita income. As the economy grows, overtime the scarcity of land again imposes limits to growth. The result is again an increase in rent and fall in profits. However, on a per capita basis, wages remain constant at the subsistence level.

The notion of a stationary state -- the stage when growth ceased -- was fundamental to the classical political economy. However, there were two contrasting points of view, and these are still prevalent



[a]Source: Charles P. Kindleberger, Economic Development (New York: McGraw-Hill Book Co., 1965), p. 43.

Figure 1. The Ricardian growth model

today. On the one hand, there was the view held by Adam Smith, David Ricardo, and Jean-Baptise Say. This was the view that economic growth eventually ceased because of insufficient supply. In other words, supply was the constraint to economic growth, as depicted, for instance, by the Ricardian model above. On the other hand, there was the view held by Robert Thomas Malthus and Karl Marx (and later by John Maynard Keynes). This was the view that growth ceased because of insufficient demand. For instance, in his theory of under-consumption, Malthus criticized Say's law of markets: the law that supply creates its own demand.[6] Malthus argued that production depends upon effective demand, otherwise there will be under-consumption and growth will be constrained. This effective demand is one which establishes a price high enough to allow a producer to pay all costs of production and still make a profit.

In retrospect, however, it is now generally agreed that the classical economists considerably underestimated the potential of modern technology to raise productivity. In fact, the major source of modern economic growth has been attributed to mass application of technological innovations. For instance, in his well-known studies on modern economic growth, Simon Kuznets has observed that the rates of modern economic growth are unprecedented in history, and the major source of what he calls the 'revolutionary acceleration' has been the application of technological innovations.[7] Technological innovations have, in turn, been the result of modern science. Thus, according to another researcher on modern economic growth, Richard A. Esternlin:

> The scientific revolution helps account not only for the appearance of modern economic growth but also for the broad geographical pattern of its spread. Modern economic development makes its appearance in the Western world where the scientific revolution is occurring and spreads most rapidly to those areas where education development has made the transfer of new knowledge most feasible.[8]

Furthermore, Kuznets and Esternlin have observed that modern science has, in turn, benefited from the mass application of technological innovations because the latter has provided a larger economic surplus for basic applied research, and has also permitted the development of new efficient tools for scientific use. In other words, modern science and technology "... are interrelated, in that one causes another in a cause and effect sequence."[9]

Neoclassical Growth Theories

Classical economists like Adam Smith, David Ricardo, and Robert Thomas Malthus saw the economic problem as a contrast between fixed land and variable labor, while capital is nothing but stored-up labor. However, neoclassical economists like William Stanley Jevons, Carl Menger, Leon Walras, Alfred Marshall, and Aurthur Cecil Pigou saw the economic problem as that of optimal allocation of scarce resources among alternative uses. At least until the 20th century, neoclassical economists did not, for the most part, address the issue of economic growth. The main reason for this seems to be the fact that in Western Europe and North America, growth proceeded rapidly and did not therefore attract as much attention as the problem of optimal allocation of resources.[10] On the other hand, the Great Depression of the 1930s and the growing awareness of poverty outside Europe and North America seem to be the bases for the return to growth analysis during the 20th century.

One product of the return to growth analysis in this century is the Harrod-Domar model; named after the economists Roy F. Harrod and Evsey D. Domar.[11] The essential features of this model are depicted by the Harrod-Domar growth equation which may be obtained as follows. Let:

Y = national income

K = capital stock

I = investment

S = savings

g = growth rate of the economy

s = savings ratio, i.e., S/Y

k = capital/output ratio, i.e., $\Delta K_{t+1}/\Delta Y$

S = I by assumption

$I_t = \Delta K_{t+1}$ by assumption

Also, assuming fixed coefficients of factor inputs, then:

$$g = \frac{\Delta Y}{Y} \tag{3.1}$$

Dividing the numerator and the denominator of the right-hand side of equation (1) by I, and rearranging yields:

$$g = \frac{I/Y}{I/\Delta Y} \tag{3.2}$$

Since S = I by assumption, then,

$$s = \frac{S}{Y} = \frac{I}{Y} \tag{3.3}$$

Similarly, since $I_t = \Delta K_{t+1}$ by assumption, then:

$$k = \frac{\Delta K_{t+1}}{\Delta Y} = \frac{I}{Y} \tag{3.4}$$

Substituting equations (3.3) and (3.4) into equation (3.2) yields:

$$g = \frac{s}{k} \tag{3.5}$$

Equation (3.5) is the Harrod-Domar growth equation and it says that the growth rate of the economy, g, can be increased in two ways. One way is to lower the capital/output ratio, k. This is equivalent to increasing the effectiveness with which capital stock is used to produce output. The other way is to raise the proportion of national income that is saved, s. The assumption in this case is that whatever is saved is invested, that S = I. Therefore, raising the savings ratio increases investment, and this in turn creates additional productive capacity and leads to more income in the following period. Higher income in turn leads to savings, investment, capital formation and greater income in the next period.

Thus, the Harrod-Domar model, in essence, underlines how one period's capital formation is the next period's source of higher savings, capital formation and greater output in the next period, etc. And this is considered to be the main contribution of the Harrod-Domar model to growth analysis.[12]

In the Harrod-Domar model, physical capital accumulation is the ultimate source of economic growth. However, the model, just like the classical models, has been criticized for neglecting the effects of technological change.[13]

Another product of the return to growth analysis during the 20th century is the Solow growth model, by Robert M. Solow.[14] The Solow growth model is generally considered to be the basis for neoclassical growth economics. The model makes a significant departure from the classical and the Harrod-Domar models in that it accounts for technological change.

In his model, Robert M. Solow began assuming an aggregate production function of the form:

$$Q = F(K, L, t) \tag{3.6}$$

where Q is the aggregate output of the economy, K and L are capital and labor inputs and t is time. The variable t appears in the production function to allow for technical change.

In addition, Solow assumed that technical change is neutral; that is, it increases output from given inputs without affecting the marginal products of the inputs. On the basis of this assumption, the production function is written as the special case:

$$Q(t) = A(t)F(K(t), L(t)) \tag{3.7}$$

where A(t) measures the effects of technological change. Equation (3.7) is then totally differentiated with respect to time, to obtain:

$$\frac{dQ}{dt} = F(K(t), L(t))\frac{dA}{dt} + A(t)\frac{\partial F}{\partial K}\frac{\partial K}{\partial t} + A(t)\frac{\partial F}{\partial L}\frac{\partial L}{\partial t}$$

or

$$\dot{Q} = F(K(t), L(t))\dot{A} + A(t)\frac{\partial F}{\partial K}\dot{K} + A(t)\frac{\partial F}{\partial L}\dot{L} \tag{3.8}$$

where dot indicates time derivatives. Dividing equation (3.8) through by Q and dropping the time parameter, t, for notational convenience, yields

$$\frac{\dot{Q}}{Q} = \frac{\dot{A}}{A} + A\,\frac{\partial F}{\partial K}\,\frac{\dot{K}}{Q} + A\,\frac{\partial F}{\partial L}\,\frac{\dot{L}}{Q} \tag{3.9}$$

Noting that $A\,\frac{\partial F}{\partial K} = \frac{\partial Q}{\partial K}$ and $A\,\frac{\partial F}{\partial L} = \frac{\partial Q}{\partial L}$, and substituting these in equation (3.9) yields:

$$\frac{\dot{Q}}{Q} = \frac{\dot{A}}{A} + \frac{\partial Q}{\partial K}\,\frac{\dot{K}}{Q} + \frac{\partial Q}{\partial L}\,\frac{\dot{L}}{Q} \tag{3.10}$$

Defining $\omega_k = \frac{\partial Q}{\partial K}\,\frac{K}{Q}$ and $\omega_L = \frac{\partial Q}{\partial L}\,\frac{L}{Q}$, and therefore $\frac{\partial Q}{\partial K} = \omega_K\,\frac{Q}{L}$ and $\frac{\partial Q}{\partial L} = \omega_L\,\frac{Q}{L}$, and substituting these into equation (3.10) yields:

$$\frac{\dot{Q}}{Q} = \frac{\dot{A}}{A} + \omega_K\,\frac{\dot{K}}{K} + \omega_L\,\frac{\dot{L}}{L} \tag{3.11}$$

or,

$$G_v = G_A + \beta_K G_K + \beta_L G_L \tag{3.12}$$

where,

$G_v = \frac{\dot{Q}}{Q}$ = the growth rate of aggregate output

$G_A = \frac{\dot{A}}{A}$ = the growth rate of total factor productivity

$G_K = \frac{\dot{K}}{K}$ = the growth rate of capital

$G_L = \frac{\dot{L}}{L}$ = the growth rate of labor

$\beta_K = \omega_K$ = the elasticity of output with respect to capital

$\beta_L = \omega_L$ = the elasticity of output with respect to labor

Equation (3.12) is often called the neoclassical growth equation. The equation says that there are three sources of growth of aggregate output, G_v. These are: (1) the growth of total factor productivity, G_A; (2) the growth of capital, G_K; and (3) the growth of labor, G_L.

Clearly, the Solow growth model can be extended to the case of many inputs, for instance:

$$Q = (F(K, L, R; t) \qquad (3.13)$$

where K, L, and R are capital, labor and land, respectively, and t stands for time. It should also be noted that the input coefficients β_K and β_L in equation (3.12), defined as the elasticities of output with respect to capital and labor, indicate the effect on output growth of a 1% increase in the growth of the given factor. Under conditions of competitive equilibrium, it is assumed that each factor is paid according to its marginal product. Thus, for instance, the real wage is equal to the marginal product of labor: $\frac{W}{P} = \frac{\partial Q}{\partial L}$. But by definition from above, $\frac{\partial Q}{\partial L} = \omega_L \frac{Q}{L} = \beta_L \frac{Q}{L}$. By substitution, we obtain: $\beta_L = \frac{WL}{PQ}$. Thus, under the assumption of competitive equilibrium, the β_L is the elasticity of output with respect to labor; and is also equal to the share of labor in total output. Similarly, $\beta_K = \frac{rK}{PQ}$, where r is the return to capital and β_K is share of capital in total output. Because output elasticities can rarely be estimated directly, these product shares are normally used to estimate equation (7).[15]

Clearly, by accounting for technical change, the Solow growth model is a significant departure from the classical and the Harrod-Domar growth models. However, the model has been subject to criticism both in the context of developed and developing countries. And a well-known critic of the neoclassical growth analysis in the context of developed countries is the Keynesian economist, Nicholas Kaldor.[16] According to Kaldor, neoclassical analysis focuses more on substitution and neglects the complementarity between factors of production. If factors of production are complementary, Kaldor argued, there can be no such thing as full-employment equilibrium because in the process of production, the productive possibilities of the economy increase. Production augments but also uses up resources. Furthermore, Kaldor observed that production cannot be said to be supply constrained because if demand is effective, there will be an augmentation of resources; therefore, the concept of full-employment is a misnomer.

Nicholas Kaldor is perhaps best known for his attempts to explain the "stylized" facts of industrialized economies. In addition, Kaldor is known for the propositions or "laws" he advanced to explain the differences in growth rates among industrialized countries.[17] Kaldor subsequently reduced these propositions to three generalizations. These are that: (1) the faster the rate of growth of manufacturing industry, the faster the growth of national income; (2) the faster the growth of manufacturing, the faster the growth of labor productivity in manufacturing; and (3) the faster the growth of manufacturing, the faster the growth of productivity outside manufacturing.

Thus, according to Kaldor, manufacturing is the "engine of growth." Furthermore, in terms of growth analysis, it is noteworthy that Kaldor raised the issue of disequilibrium growth in the context of developed countries. The point is simply that Kaldor seriously questioned the underlying assumptions neoclassical growth analysis even in the context of developed countries.

However, it is in the context of developing countries that the issue of disequilibrium growth is considered to be more significant. And in this case, the issue has been popularized by the structural approach to economic growth.[18] Table 1 summarizes the differences between the neoclassical and the structural approaches to economic growth in developing countries.

The neoclassical and structural approaches differ in their assumptions, the empirical implications of these assumptions, as well as in the sources of growth in developing countries. But the most important distinction between the two approaches relates to their assumptions. The neoclassical approach assumes Pareto optimality over time; that prices are flexible enough to maintain equilibrium over time. The structural approach, on the other hand, assumes segmented factor markets, lags in price adjustments and therefore disequilibrium

Table 1. Neoclassical and structural approaches to economic growth

Neoclassical approach	Structural approach
Assumptions	
Factor returns equal marginal productivity in all uses	Income-related changes in internal demand
No economies of scale	Constrained external markets and lags in adjustment
Perfect foresight and continuous equilibrium in all markets	Transformation of productive structure producing disequilibria in factor markets
Empirical implications	
Relatively high elasticities of substitution in demand and trade	Low price elasticities and lags in adjustment
Limited need for sector disaggregation	Segmented factor markets
	Lags in adopting new technology
Sources of growth	
Capital accumulation	Neoclassical sources plus:
Increase in labor quantity and quality	Reallocation of resources to higher-productivity sectors
Increase in intermediate inputs	
Total factor productivity growth within sectors	Economies of scale and learning by doing
	Reduction of internal and external bottlenecks

[a]Source: Hollis Chenery et al., Industrialization and Growth: A Comparative Study (London: Oxford University Press, 1986), 15.

in product and factor markets. According to the structural approach, one source of disequilibrium in developing countries is the duality of the labor market -- a duality between rural, subsistence labor and urban, industrial labor.[19] This duality is often reflected in the differences in returns to labor and capital between the rural agricultural sector, and the urban industrial sector. Another source of disequilibrium is the inefficient allocation of resources in the export sector. This is often reflected in the tendency of imports to expand more rapidly than exports, and in policies that favor import substitution over export expansion. These factors, in turn, account for the recurrent balance of payments problems in many developing countries.

Several economists have conducted studies designed to test the significance of structural variables in explaining growth rates in developed and developing countries.[20] The researchers often test the neoclassical variables: capital stock, labor force growth, and improvements in the quality of labor. They also test the structural variables: capital and labor reallocation, export growth, capital inflow, and the level of development. In addition, the researchers often employ variants of the neoclassical growth equation (3.12) above, with the general form:

$$G_Y = a_0 + a_1\left(\frac{I}{Y}\right) + a_2 G_L + a_3 X_3 + a_4 X_A + a_5 X_E$$

$$+ a_6 X_F + a_7 X_D ,$$

where,

$\frac{I}{Y}$ = the ratio of investment to GNP (a proxy for the growth of capital stock)

G_L = growth of the labor force

X_3 = a measure of increase in labor quality

X_A = a measure of the shift of labor or capital out of agriculture

X_E = a measure of the growth of exports

X_F = a measure of the balance of payments

X_D = a measure of the level of development[21]

Three general results emerge from these studies. First, there is a pattern of an accelerating and then declining rate of growth as per capita income rises. In other words, economies grow and then "decay." Second, the structural factors are more significant for the developing than developed countries, whereas the growth of the labor force has more significant effect in developed than developing countries. Third, the growth of capital stock or investment is the only source of growth that is significant for both groups.

Briefly, then, here is an illustrative account of some of these studies. One of the best known efforts was by Edward F. Denison (1967) who, in his study, examined the sources of growth in the United States and eight European countries during 1950-62.[22] Like Nicholas Kaldor, Denison's primary interest was in explaining differences in growth rates among developed countries. On the other hand, Sherman Robinson (1969) examined the growth of 39 developing countries during 1958-66, and compared his results with those of Denison.[23] Robinson observed that in both cases, capital had the largest effect on growth; as much as 52% in the case of developing countries. But he found significant differences in the effects of labor and structural factors. He found that labor had a rather low contribution to the growth rate in developing countries. On the average, labor accounted for 19% of the growth rate in developing countries. Denison, on the other hand, found that labor accounted for 33% of total growth for the United States and 18% of total growth for the eight European countries. In other words, considered together, Robinson and Denison found labor to be a significant source of growth in developed and not in developing countries.

Similarly, Robinson compared the estimates of the contribution of the structural variable: factor mobility between sectors. In this case, his study, together with that of Denison, showed that factor mobility is a significant source of growth in developing and not in developed countries. This observation has also been supported by the empirical results of Everett E. Hagen and Oli Hawrylyshyn (1969); and Hollin B. Chenery, H. Elkington, and C. Simons (1970).[24] Both studies included developed and developing countries in their samples, and both found structural variables to be significant sources of growth in developing and not in developed countries.

Clearly, these studies suggest that there are somewhat different sets of growth factors for developed and developing countries. And this is one of the arguments sometimes advanced against monoeconomics but in favor of development economics as a separate field of study.[25]

It is argued, development economics is needed because the assumptions of growth economics, based as they are on the existence of a fully developed and well-functioning modern capitalist economy, do not apply in developing countries. The assumption, for instance, by the Harrod-Domar model, that savings equal investment may not hold in developing countries. Higher savings may not lead to higher capital formation in developing countries because of the existence of idle capacity and problems of allocating savings among alternative investment opportunities.

However, the basic point to be made here is that there are many sources of economic growth and these vary greatly in importance from time to time and from place to place. This conclusion is quite apparent when one surveys the history of growth analysis before and after the classical economists.

Notes

[1]See Mark Blaug, Economic Theory in Retrospect (Cambridge: Cambridge University Press, 1985).

[2]Adam Smith, An Inquiry into the Nature and Causes of the Wealth of Nations, Vol. 1 (London: Oxford University Press, 1976), 10.

[3]Ibid., 13.

[4]Mark Blaug, op. cit., 60-63.

[5]See Charles P. Kindleberger, Economic Development (New York: McGraw-Hill Book Co., 1965), 40-45.

[6]See Mark Blaug, op. cit., 165-176.

[7]Simon Kuznets, "Modern Economic Growth: Findings and Reflections," American Economic Review 63(3) (June 1973): 249-251.

[8]International Encyclopedia of the Social Sciences, 1968 ed., s.v. "Economic Growth."

[9]Simon Kuznets, op. cit., 250.

[10]See Charles P. Kindleberger, op. cit., 45.

[11]Ibid., 45-49.

[12]Ibid., 47-48.

[13]Ibid., 48-49.

[14]See Robert M. Solow, "Technical Change and the Aggregate Production Function," Review of Economics and Statistics 39 (August 1957): 312-20.

[15]For the use of income shares and their application in growth analysis, see Edward F. Denison, Why Growth Rates Differ (Washington, D.C.: The Brookings Institution, 1967), 33-53.

[16]See A. P. Thirlwall, "A Plain Man's Guide to Kaldor's Growth Laws," Journal of Post-Keynesian Economics 5(3) (Spring 1983): 345-58.

[17]Ibid.

[18]See Hollis Chenery et al., Industrialization and Growth: A Comparative Study (Washington, D.C.: The World Bank, 1986), 13-36.

[19]Ibid., 15.

[20]Ibid., 27-36.

[21]Ibid., 28.

[22]Edward F. Denison, op. cit.

[23]Sherman Robinson, "Sources of Growth in Less Developed Countries: A Cross-Country Study," Quarterly Journal of Economics 85(3) (August 1971): 391-408.

[24]See Evertt E. Hagen and Oli Hawrylyshyn, "An Analysis of World Income Growth, 1955-1965," Economic Development and Cultural Change 18 (October 1969): 1-96, and Hollis Chenery et al., A Uniform Analysis of Development Patterns, Harvard University Center for International Affairs, Economic Development Report 148 (July 1970), Cambridge, Massachusetts.

[25]See, for example, Dudley Seers, "The Limitations of the Special Case," Bulletin of the Oxford University Institute of Economics and Statistics 25 (May 1963): 77-98.

CHAPTER IV.

GOVERNMENT AS A SOURCE OF ECONOMIC GROWTH

There are many sources of economic growth and these sources vary greatly in importance from time to time and from place to place. This was the theme of Chapter III. The purpose of Chapter IV is to examine the particular case of government as a source of economic growth. The chapter has two sections. Section one deals with the theory while section two reviews the evidence of government as a source of economic growth.

The Theory of Government as a Source of Growth

Although there are many and various sources of growth, however, the sources can be divided into two broad categories.[1] First, economic growth may be due to changes in the resources used in production, that is, due to changes in factor inputs. There are three main sources of this kind; namely, land, labor and capital. Second, economic growth may be due to changes that affect output per unit of input. There are again three main sources of this kind; namely, technology, efficiency, and government. Changes in these sources permit more output to be produced with the same inputs.

Chapter III alluded to the role of technology in the unprecedented increase in product per worker in modern economic growth. Similarly, efficient allocation of resources permits more output to be produced with the same amount of inputs. According to economic theory, efficient allocation of resources implies that there is some allocation of resources that maximizes national product; and this is when resources are allocated in such a manner that their marginal product is greatest.[2] And the marginal product of resources is greatest when the resources are employed where they earn the greatest returns, and when the returns are proportional to the marginal product.

Then, in what sense is government a source of growth?

Several notions of government as a source of growth were introduced in Chapter I. These include the role of government in human capital formation and in harmonizing conflicts between private and social interests. In addition, Chapter I introduced the assertion that government imposes restrictions on efficient utilization of resources, and therefore, removal of these restrictions can stimulate economic growth. Attention in this case centers on the government deficit and its effect on economic variables such as aggregate output, interest rates and private investment.

The present chapter, however, attempts to determine the exact nature of the impact of government on economic growth. For a start, the effect of the government deficit is distinguished between expenditure and tax changes and their impact on output, interest, private investment, etc. Government expenditures, for instance, alter the composition of final output. A good example is that of government subsidies. Economic theory holds that subsidies increase the production and consumption of subsidized goods.[3] Therefore, changes in government subsidy expenditure will alter the composition of final output.

Given the distinction between expenditure and tax changes, economic theory holds that the primary interest is not on the consequences of expenditure and tax changes per se, but on the effects of these changes on relative prices.[4] This is because expenditure and tax changes alter relative prices, which, in turn, induce changes in other economic variables such as employment and output. In other words, the link between government expenditures and taxes on the one hand, and employment and output on the other hand rests on the notion that government expenditures and taxes alter the price or cost of one good relative to another. The changes in relative prices, in turn, induce changes in employment and output.

Government expenditures alter relative prices in three principal ways.[5] First, government expenditures alter relative prices directly; through, for instance, a subsidy or voucher system. Such schemes change the price of subsidized goods relative to the prices of other goods, and this, in turn, changes production and consumption. Second, government expenditures change relative prices indirectly through the regulatory system. Common examples are pollution control devices, minimum wage legislation, tariffs and quotas. These affect relative prices and involve corresponding restructuring of production and consumption. Third, government expenditures affect relative prices indirectly through tax effects. Government expenditures induce tax changes which, in turn, induce changes in relative prices. Thus, according to economic theory, when considering the impact of government expenditures, the main object of interest should not be on the nature and composition of government expenditure increases, but on the nature of relative price effects induced by the tax changes necessary to make government expenditure increases possible.[6]

Then, in what ways do taxes alter relative prices?

Like government expenditures, taxes alter relative prices in three principal ways.[7] First, taxes alter the relative price of labor. The relative price or opportunity cost of labor is the leisure foregone by working. Tax changes affect the choice between labor and leisure. Economic theory holds that lower taxes on wages result in more income for the same work, and this induces people to reduce their labor supply. This is the income effect. However, since with lower taxes the wage is higher, the income in additional wages people give up by not working more is higher. In other words, with lower taxes and high wage rate, the opportunity cost of leisure is higher and this induces people to increase their labor supply. This is the substitution effect. The income and substitution effects work in opposite directions and therefore in theory at least, we cannot determine the net effect of lower taxes on the incentive to work.

Second, taxes alter the relative price of saving. The relative price or opportunity cost of saving is the additional current consumption foregone by saving. Tax changes affect the choice between saving and current consumption. Economic theory holds that lower taxes increase household saving by increasing disposable income. However, if household saving is determined by both wage income and the rate of return on investment (i.e., interest income), then the effect of lower taxes on saving is indeterminate. This is because lower taxes on interest income reduce the price of future consumption in terms of foregone current consumption. As a result, two things can happen: (1) savings can rise if the demand for future consumption is price elastic, or (2) savings can fall if the demand is price inelastic. Thus, based on theory alone, we cannot predict the effect of lower taxes on saving as a function of interest income.

Third, taxes alter the relative price of investment. The effect of taxes on the incentive to invest is often analyzed in terms of the 'flexible capital stock adjustment' model, which is considered to have first been employed by Robert E. Hall and Dale W. Jorgenson (1967) in their celebrated study of tax policy and investment behavior.[8] The basic assumption of the model is that a firm maximizes its current profits under competitive conditions. Current profits are defined as "... gross revenue less the rental cost of current inputs and less the rental value of capital inputs."[9] Taxes enter a firm's decision through the rental value of capital, or what is often called the user cost of capital. In the absence of taxes, the user cost of capital is given as:

$$c = q(r + \delta) - \dot{q} \ldots \qquad (4.1)$$

where c is the user cost of capital, q is the price of capital goods, r is the interest rate, δ is depreciation, $\dot{q}$ is the expectations about the price of investment goods.

For a given level of c, a firm's desired level of capital stock is determined by the equality of the rental price of capital to the marginal product of capital. Hall and Jorgenson used the Cobb-Douglas production function to obtain the desired level of capital, K*, as:

$$K^* = \alpha \frac{PQ}{c} \tag{4.2}$$

where P is the price of output, Q is its quantity, c is the rental price of capital, and α is the elasticity of output with respect to capital. Each firm has a desired capital stock at each time. When a firm's actual capital stock falls short of the desired capital, the firm orders capital goods to eliminate the difference. Thus, in the model, gross investment is given as a distributed lag function:

$$I_t = \sum_{i=0}^{\infty} \mu_i \, \Delta K^*_{t-i} + \delta K_t \tag{4.3}$$

Gross investment I_t, in period t, is the sum of a weighted average of past changes in desired capital K*, and replacement investment δK_t. Net investment N_t is then the weighted average of past changes in desired capital stock

$$N_t = I_t - \delta K_t \tag{4.4}$$

Substituting (4.3) into (4.4), we obtain

$$N_t = \sum_{i=0}^{\infty} \mu_i \, \Delta K^*_{t-i} \tag{4.5}$$

Substituting (4.2) into (4.5), we obtain

$$N_t = \alpha \, \mu_0 \, \Delta \frac{P_t Q_t}{c_t} + \alpha \, \mu_1 \, \Delta \frac{P_{t-1} \, Q_{t-1}}{c_{t-1}} \tag{4.6}$$

Equation (4.6) indicates that investment in period t depends on the capital stock as the beginning of the period and changes in the desired level of capital stock in previous periods. Desired capital, in turn, depends on the value of output, the elasticity of output with respect to capital input α, as well as the rental value of capital input c.

Tax policy enters the investment decisions of the firm through the rental value of capital input c_t. A change in c_t, all else equal, results in a change in the desired level of capital stock. A change in the desired capital stock, in turn, results in net investment or disinvestment, thereby increasing or decreasing output and productivity.

Hall and Jorgenson estimated the parameters of equation (4.6) taking

$$c = q(r + \delta) \, \frac{(1 - k)(1 - UZ)}{1 - u}$$

where q is the price of capital goods, r is the discount rate, δ is the rate of replacement, k is the rate of investment tax credit, U the business income tax rate, and Z the present value of the deprecia-ion deduction on one dollar's investment.

While this formulation by Hall and Jorgenson has provided the theoretical basis for substantial research on the incentive to invest, however, the wisdom of employing a Cobb-Douglas production function in the model has seriously been questioned.[10] It is well-known that the elasticity of substitution in the Dobb-Douglas production function is equal to one. Thus, for instance, Robert M. Coen and Robert Eisner have argued: Since the substitution between capital and labor is an important determinant of the demand for capital, it is not reasonable to arbitrarily assign the elasticity a value of one.[11] Coen and Eisner have instead suggested the use of a constant-elasticity-of-substitution (CES) production function. As a result, equation (4.2) above becomes

$$K^* = \alpha^{\sigma}(P/C)^{\sigma}\ Q \qquad (4.2')$$

where α is the elasticity of substitution and the rest of the terms are as defined before. Two important observations follow from equation (4.2'): (1) if $\sigma = 0$, relative prices would not appear in the equation and since tax policy influences investment through its effects on c, there would be no investment response to changes in tax policy. (2) if $\sigma = 1$, Coen and Eisner argue, the results can hardly be regarded as empirical estimates of the effect of tax policy. Therefore, Coen and Eisner suggest that σ should be estimated rather than just assume that $\sigma = 1$. This brings us to the next section of this chapter, the one that reviews the evidence of government as a source of growth.

The Evidence of Government as a Source of Growth

The theory that links taxes with economic growth derives from the notion that lower taxes on wages, interest and corporate income increase output and productivity by increasing the incentives to work, to save, and to invest. However, whether or not lower taxes increase output and productivity is largely an empirical issue. As we have just seen in the preceding section of this chapter, one reason the effect of lower taxes is largely an empirical issue is that, in the case of the incentives to work and to save, the substitution and income effects work in opposite directions and therefore the net effect of lower taxes on labor and saving is indeterminate. On the other hand, empirical studies on the effects of tax changes on the incentive to work have to contend with the seemingly insurmountable problem of measuring the income and substitution effects separately. It is difficult, in practice, to isolate the two effects. In addition, there is the problem of controlling for other factors which affect labor supply. Similarly, researchers on the incentive to save have to contend with the problem of unobservable variables when dealing with intertemporal behavior.[12] For instance, in the standard life-cycle model, savings respond to the expected real after-tax rate of return. This is the rate at which households transform present into future consumption. The problem in this case is that the expected after-tax rate of return is unobservable. Thus, while empirical studies indicate that changes in tax rates have minimal effect on labor supply, the changes have uncertain effect on saving, in particular, on interest income.[13]

Another reason the effect of lower taxes on output and productivity is largely an empirical issue concerns the effect of taxes on the incentive to invest. Results of empirical studies on the incentive to invest seem to be influenced by the underlying assumptions of the models of such studies. In particular, the assumptions made about the substitution between labor and capital seem to be a significant determinant of the outcome. As Robert M. Coen and Robert Eisner have argued, the assumption concerning the substitution between labor and capital is an important determinant of the demand for capital. Thus, depending on this assumption, different studies have yielded different results.

In their study of tax policy and investment behavior in the U.S. during 1931-41 and 1950-63, Robert E. Hall and Dale W. Jorgenson (1967) assumed the elasticity of substitution to be unity; that is, labor and capital are good substitutes.[14] Hall and Jorgenson arrived at two main conclusions: (1) tax policy is highly effective in changing the level and timing of investment, and (2) tax policy has important effects on the composition of investment. According to Hall and Jorgenson, the goodness of fit measure for net investment, R^2, was 0.92 for manufacturers; 0.96 for manufacturing equipment; 0.96 for nonfarm, nonmanufacturing equipment; and 0.99 for nonfarm, nonmanufacturing structures. Their study also found that the U.S. tax reform of 1954 substantially changed the composition of investment; from investment in equipment to investment in structures, while the investment tax credit and depreciation guidelines of 1962 caused a shift toward equipment.

However, Robert M. Coen and Robert Eisner (1969) employed a CES production function and proceeded to estimate and use different values of σ in the standard capital stock adjustment model.[15] Coen and Eisner did not find a statistically significant effect of tax policy on investment. On the other hand, Martin Feldstein (1982) used a Cobb-Douglas production assumed by Hall and Jorgenson and found ($R^2 = 0.98$) that investment is highly responsive to changes in tax policy.[16] Feldstein's findings not only support those of Hall and Jorgenson but also the observation that in the capital stock adjustment model, empirical results are influenced by the value of σ adopted. There seems to be no general agreement on the value of σ that should be used and this is, perhaps, something that future research will resolve.

Meanwhile, several other techniques have been utilized in study-ing the link between government and economic growth, but the predominant one is the cross-section approach. This is the technique employed by Richard Rubinson (1977) in his well-known study of developed and developing countries during 1950 and 1970.[17]

In essence, Rubinson was addressing the issue of economic dependence and its effect on economic growth. For a start, Rubinson adopted the concept of 'economic dependence' as defined by previous studies, and measured by such variables as foreign aid; the structure of trade; foreign investment; and external debt. In previous studies, economic dependence was found to retard economic growth. The purpose of Rubinson's study was to test a hypothesis suggested by previous studies: that one way in which dependence affects economic growth is through its effect on state strength.

To test the hypothesis, Rubinson examined two relationships: (1) the effect of dependence on state strength, and (2) the effect of state strength on economic growth. He defined the degree of state strength as the share of government revenues in Gross Domestic Product, GDP. His sample of countries in different regression equations ranged from 39 to 45, and the sample consisted of both developed and developing countries; because, he argued, dependence is a feature of all countries in the world.[18]

Rubinson's study generated, among others, the following results: (1) government revenues have positive effects on national income, and (2) the positive effects of revenues on national income are significantly related to the level of national income; they are much stronger for poorer than for richer countries. He found the regression coefficient for government revenues to be as high as 0.08 and significant at the 2% level; and R^2 to be as high as 0.95. The regression coefficient for government revenues indicates that an increase of 1% in the revenue/GDP ratio increases the rate of economic growth by 0.08%.

Rubinson also estimated the effect of government revenues on national income in poorer countries to be 1.6 times the size of the effect in richer countries. Briefly then, according to Rubinson, large government stimulates economic growth, especially in poorer countries.

However, in another well-known study, Daniel Landau (1983) arrived at a different conclusion.[19] Unlike Rubinson, Landau examined the relationship between the share of government consumption expenditure in GDP and the rate of growth of real per capita GDP for 96 developed and developing noncommunist countries. Landau found a negative relationship between the share of government consumption in GDP and economic growth rates for various periods during 1960-76. For instance, he found the regression coefficient for government consumption during 1961-76 to be negative (-0.19) and significant at the 1% level, and R^2 to be 0.82. The coefficient indicates that an increase of 1% in the government consumption/GDP ratio decreases the rate of economic growth by 0.19%. Landau, therefore, concluded that "these results are consistent with a pro-free market view that -- within the market economies -- a growth of government hurts economic growth."[20]

Just as in the case of Rubinson and Landau, further evidence on the relationship between government size and economic growth has also tended to be divergent. Rati Ram (1986), for instance, in his study of developed and developing countries during 1960-80, found evidence to support the conclusion by Rubinson that the impact of government size on economic growth is positive; and that the positive effect is especially stronger for low income countries.[21] Although the regression equations he estimated were different from those of Rubinson and Landau, Ram examined the relationship between government consumption expenditure/GDP ratio and the rate of growth of per capita income. In addition, Ram utilized both cross-section and time-series analysis and observed that there was a broad agreement between the results obtained from both techniques. The results support Rubinson's conclusion that large government stimulates economic growth, especially in poorer countries.

However, in his study of the links between taxes and economic growth, Keith Mardsen (1983) arrived at the conclusion that large government retards economic growth.[22] Mardsen examined the relationship between tax/GDP ratios and economic growth rates of 20 developed and developing countries (including Zambia) during 1970-79. Mardsen divided his sample group into 10 pairs of countries with similar per capita incomes but contrasting tax levels. By this criterion, for example, he paired Zambia with Thailand -- with Zambia as the higher tax country -- and then proceeded to compare their growth rates during the 1970s.

Mardsen's principal finding was that, in all cases, countries with lower taxes experienced substantially high real rates of growth of GDP than those with higher taxes. For example, during the 1970s, Thailand, a lower tax country, had real average annual growth rate of 8.3%, compared to 1.5% for Zambia, a higher tax country. Mardsen found that the average annual rate of growth was 7.3% in the low-tax group and 1.1% in the high-tax group. In addition, he found the regression coefficient of the tax variable to be negative (-0.36) and significant at the 1% level: indicating that an increase of 1% in the tax/GDP ratio decreases the rate of economic growth by 0.36%.

Clearly, the relationship between government size and economic growth is an empirical issue. This conclusion is again quite apparent when one surveys the theory and evidence of government as a source of economic growth.

Notes

[1] See Edward F. Denison, Why Growth Rates Differ (Washington, D.C.: The Brookings Institution, 1967), 7.

[2] For a discussion on the efficiency conditions for allocation of resources, see Richard E. Just et al., Applied Welfare Economics and Public Policy (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1982), 15-47.

[3] See James M. Henderson and Richard E. Quandt, Microeconomic Theory: A Mathematical Approach (New York: McGraw-Hill Book Co., 1980), 304-305.

[4] See Geoffrey Brennan and Jonathan Pincus, "The Growth of Government: Do the Figures Tell Us What We Want to Know?" in Why Governments Grow: Measuring Public Sector Size, ed. Charles Taylor (Beverly Hills: Sage Publications, 1983), 33-49.

[5] Ibid., 44-45.

[6] Ibid., 45.

[7] For a discussion on the incentive effects of taxation, see Robin W. Boadway and David E. Wildasin, Public Sector Economics (Boston: Little, Brown and Company, 1984), 287-347.

[8] Robert E. Hall and Dale W. Jorgenson, "Tax Policy and Investment Behavior," American Economic Review 57(3) (June 1967): 391-414.

[9] Ibid., 392.

[10] Robert M. Coen and Robert Eisner, in particular, have raised this objection. See Robert M. Coen, "Tax Policy and Investment Behavior: Comment," American Economic Review 59(3) (1969): 370-79, and Robert Eisner, "Tax Policy and Investment Behavior: Comment," American Economic Review 59(3) (1969): 380-89.

[11] Ibid.

[12] See Robin W. Boadway and David E. Wildasin, op. cit., 313.

[13] See, for instance, Aris Protopapadakis, "Supply-Side Economics: What Chance for Success?" in The Supply Side Solution, eds. Bruce Bartlett and Timothy T. Roth (Chatham, N.J.: Catham House Publishers, Inc., 1983), 274-76.

[14] Robert E. Hall and Dale W. Jorgenson, op. cit.

[15] Robert M. Coen, op. cit., and Robert Eisner, op. cit.

[16] Martin Feldstein, "Inflation, Tax Rules and Investment: Some Econometric Evidence," Econometrica 50(4) (July 1982): 825-65.

[17] Richard Rubinson, "Dependence, Government Revenue and Economic Growth, 1955-70," Studies in Comparative International Development 12 (Summer 1977): 3-28.

[18] Ibid., 5.

[19] Daniel Landau, "Government Expenditure and Economic Growth: A Cross-Country Study," Southern Economic Journal 49 (January 1983): 783-92.

[20] Ibid., 790.

[21] Rati Ram, "Government Size and Economic Growth: A New Framework and Some Evidence from Cross-Section and Time Series Data," American Economic Review 76(1) (March 1986): 191-203.

[22] Keith Mardsen, "Links Between Taxes and Economic Growth: Some Empirical Evidence," World Bank Staff Working Papers (605) (August 1985): 1-34.

CHAPTER V. A MODEL OF GOVERNMENT SIZE AND ECONOMIC GROWTH

A common practice in the empirical study of sources of growth is to relate growth in national income to changes in labor and capital through a production function. Chapter III showed how this approach has been extended to include structural variables such as imports and exports, as well as resource allocation between sectors. The purpose of the present chapter is to employ the sources of growth approach to the study of relation between government size and economic growth. This is done by following the practice of introducing an externality in the production function; the externality here being government size. The model in this chapter is adopted from the analyses by Gershon Feder (1983) and Rati Ram (1986) and is applied to Zambian data for the period 1964-84 in order to test the hypothesis that economic growth varies inversely with government size in Zambia.[1]

A Two-Sector Model of Government Size and Economic Growth

A two-sector model is employed here to characterize the effect of government size on economic growth. The basic assumptions of the model are:

1. The economy consists of two sectors; a government sector, (G), and a nongovernment sector (N). The output, i.e., the size of the government sector exercises an externality

effect on the output of the nongovernment sector; and the term "externality" is defined in the usual economic sense as the case where the actions of one economic agent affect the utility or production function of another agent.

2. The economy has available two primary factors of production: Labor (L) and capital (K).

3. The technology of production in each sector is linearly homogeneous and given by:

$$N = N(K_N, L_N, G)$$

$$G = G(K_G, L_G)$$

where,

N = nongovernment sector output

G = government sector output

K_N, K_G = capital stock for the nongovernment and government sectors, respectively

L_N, L_G = labor force for the nongovernment and government sectors, respectively

$K_N + K_G = K$ = total capital stock

$L_N + L_G = L$ = total labor force

4. Total output (Y) is the aggregate of the output in the two sectors:

$$N + G = Y$$

5. Relative factor productivity in the two sectors differ, such that:

$$\frac{G_K}{N_K} = \frac{G_L}{N_L} = (1 + \delta)$$

where,

$$G_K = \frac{\partial G}{\partial K}, \quad G_L = \frac{\partial G}{\partial L}$$

$$N_K = \frac{\partial N}{\partial K}, \quad N_L = \frac{\partial N}{\partial L}$$

In the absence of externality effect of government, and for a given set of prices, a situation in which $\delta = 0$ would reflect on allocation of resources such that the marginal productivity of factors of production is the same in both sectors; and such an allocation maximizes output. However, it is assumed here that government exercises an externality, $\delta \neq 0$, and, therefore, factor productivity differs between the two sectors. This assumption is based on the issues considered in Chapters I and IV. Under the free market argument, for instance, $\delta < 0$; this implies that factor productivity in the nongovernment sector is greater than in the government sector. The opposite is equally true.

The basic equations of the model then are:

$$N = N(K_N, L_N, G) \tag{5.1}$$

$$G = G(K_G, L_G) \tag{5.2}$$

$$K_N + K_G = K \tag{5.3}$$

$$L_N + L_G = L \tag{5.4}$$

$$N + G = Y \tag{5.5}$$

$$\frac{N_K}{G_K} = \frac{N_L}{G_L} = (1 + \delta) \tag{5.6}$$

Since the interest is in changes overtime, equations (5.1) - (5.5) are set as functions of time. As in Chapter III, differentiation of these equations with respect to time yields:

$$\dot{N} = N_K \dot{K}_N + N_L \dot{L}_N + N_G \dot{G} \tag{5.7}$$

$$\dot{G} = G_K \dot{K}_G + G_L \dot{L}_G \tag{5.8}$$

$$\dot{K}_N + \dot{K}_G = \dot{K} \tag{5.9}$$

$$\dot{L}_N + \dot{L}_G = \dot{L} \tag{5.10}$$

$$\dot{N} + \dot{G} = \dot{Y} \tag{5.11}$$

where dot indicates time derivatives. Rearranging equation (5.6) yields:

$$G_K = N_K(1 + \delta) \tag{5.12}$$

$$G_L = N_L(1 + \delta) \tag{5.13}$$

Substituting equations (5.7) - (5.10) into equation (5.11) yields:

$$\dot{Y} = N_K\ \dot{K}_N + N_L\ \dot{L}_N + N_G\ \dot{G} + G_K\ \dot{K}_G + G_L\ \dot{L}_G \tag{5.14}$$

Substituting equations (5.12) and (5.13) into (5.14), we obtain:

$$\dot{Y} = N_K\ \dot{K}_N + N_L\ \dot{L}_N + N_G\ \dot{G} + N_K(1 + \delta)\dot{K}_G + N_L(1 + \delta)\dot{L}_G$$

$$= N_K(\dot{K}_N + \dot{K}_G) + N_L(\dot{L}_N + \dot{L}_G) + N_G\ \dot{G}$$

$$+ \delta(N_K\ \dot{K}_G + N_L\ \dot{L}_G) \tag{5.15}$$

Defining total investment $I = \dot{K} = \dot{K}_N + \dot{K}_G$ and since $\dot{L} = \dot{L}_N + \dot{L}_G$ from equation (5.10), substituting these into equation (5.15), we obtain:

$$\dot{Y} = N_K\ I + N_L\ \dot{L} + N_G\ \dot{G} + \delta(N_K\ \dot{K}_G + N_L\ \dot{L}_G) \tag{5.16}$$

From equations (5.8), (5.12) and (5.13):

$$\dot{G} = N_K(1 + \delta)\dot{K}_G + N_L(1 + \delta)\dot{L}_G$$

$$= (1 + \delta)(N_K\ \dot{K}_G + N_L\ \dot{L}_G)$$

Therefore,

$$N_K\ \dot{K}_G + N_L\ \dot{L}_G = \frac{\dot{G}}{1 + \delta} \tag{5.17}$$

Substituting equation (5.17) into (5.16) yields:

$$\dot{Y} = N_K\ I + N_L\ \dot{L} + N_G\ \dot{G} + \delta\left(\frac{\dot{G}}{1 + \delta}\right)$$

$$= N_K\ I + N_L\ \dot{L} + \left(\frac{\delta}{1 + \delta} + N_G\right)\dot{G} \qquad (5.18)$$

By the assumption of linear homogeneity of the production function:

$$N_L = \beta\left(\frac{Y}{L}\right) \qquad (5.19)$$

Defining $N_K = \alpha$, substituting for N_K and N_L in equation (5.18) and dividing through by Y, we obtain:

$$\frac{\dot{Y}}{Y} = \alpha\left(\frac{I}{Y}\right) + \beta\left(\frac{\dot{L}}{L}\right) + \left(\frac{\delta}{1 + \delta} + N_G\right)\left(\frac{\dot{G}}{G}\right)\left(\frac{G}{Y}\right) \qquad (5.20)$$

Equation (5.20) is a sources-of-growth equation with government as a source of growth, together with labor and capital. It should be noted that if marginal factor products are equal across sectors ($\delta = 0$), and if there is no government externality ($N_G = 0$), then equation (5.20) reduces to the familiar neoclassical sources-of-growth equation stated in Chapter III as equation (3.6):

$$\frac{\dot{Q}}{Q} = \frac{\dot{A}}{A} + \omega_K \frac{\dot{K}}{K} + \omega_L \frac{\dot{L}}{L}$$

where,

$\frac{\dot{Q}}{Q} = \frac{\dot{Y}}{Y}$ = the growth rate of aggregate output

$\frac{\dot{K}}{K} = \frac{I}{Y}$ = the growth rate of capital

$\frac{\dot{L}}{L}$ = the growth rate of the labor force

$w_K = \alpha$ = the elasticity of output with respect to capital

$w_L = \beta$ = the elasticity of output with respect to labor

In the present case, however, it is assumed that $\delta \neq 0$ and $N_G \neq 0$. On the basis of equation (5.20), the fitted equation in the present study is:

$$\dot{Y} = \alpha(\frac{I}{Y}) + \beta\dot{L} + (\frac{\delta}{1 + \delta} + N_G)\dot{G}(\frac{G}{Y}) \qquad (5.21)$$

where $\dot{G}(G/Y)$ is the measure of government size.[2]

This method of specifying the effect of government size on economic growth is considered a recent innovation and is the approach employed by Rati Ram in his study of developed and developing countries. However, the traditional approach is simply to introduce G as an argument in the aggregate production function:

$$Y = F(K, L, G). \qquad (5.22)$$

This is the basic Solow growth model minus technical change but with G as an additional input. From Chapters III and IV, the result of manipulating this equation yields:

$$\dot{Y} = \alpha(\frac{I}{Y}) + \beta\dot{L} + \gamma\dot{G} \qquad (5.23)$$

where $\dot{G}$ is the measure of government size. This approach is often simplified further by introducing the regressor G/Y in place of $\dot{G}$ in equation (5.23) to obtain:

$$\dot{Y} = \alpha(\frac{I}{Y}) + \beta L + \gamma(\frac{G}{Y}) \qquad (5.24)$$

where G/Y is the measure of government size.[3] This is the approach employed by Richard Rubinson and Daniel Landau in their studies of the impact of government size on economic growth.

However, the new approach has at least two principal advantages over the traditional approach. First, the new approach allows for intersectoral productivity differential, δ, between the government and nongovernment sectors. Second, the new approach explicitly models the externality effect of government size, N_G, and therefore conveys better information on the manner in which government size affects economic growth. But for the sake of comparison, both equations (5.21) and (5.24) were fitted in the present study.

Time Series Analysis of Zambian Data: 1964-84

In estimating equations (5.21) and (5.24), a trend factor, T, was added to each equation. By convention, T represents autonomous growth in Y and is therefore a measure of "... our ignorance of the true forces that determine the growth of the dependent variable."[4] Following conventional practice, the rate of growth of GDP was used as the proxy for economic growth, and GDP at constant 1980 prices was used for the aggregate output measure Y. The rate of population growth, $\dot{P}$, was used in place of the rate of increase in labor input, $\dot{L}$; investment was defined as gross fixed capital formation plus change in stocks; and saving was derived as a residual: GDP minus consumption. Given that there is no consensus on the measurement of government, three proxies for government were employed: (1) government final consumption, (2) government revenues, and (3) total government expenditures. Annual rates of growth of Y, L, and G, i.e., $\dot{Y}$, $\dot{L}$, and $\dot{G}$ were approximated by first differences for the logarithms of the variable values for successive years during 1964-84.

The data fitted to both equations (5.21) and (5.24) were obtained from various issues of the Monthly Digest of Statistics, published by the Republic of Zambia, Central Statistical Office. Supplementary data were obtained from various issues of the International Financial Statistics, published by the International Monetary Fund. Estimates covered the full period 1964-84 and were obtained by the method of ordinary least squares (OLS) using the PROC SYSREG procedure of the Statistical Analysis System, SAS.

The results from fitting equations (5.21) and (5.24) are reported in Tables 5.1, 5.2, and 5.3. The three tables represent, respectively, the three proxies of government; namely, government final consumption, government revenues, and total government expenditures.

Table 5.1. Least squares estimates of GDP growth rates (t-ratios are in parentheses)

Regressors	Equations (1)	(2)	(3)	(4)	(5)
Intercept	16.936*	0.215*	16.941*	0.200*	53.105*
	(1.53)	(3.05)	(1.48)	(2.68)	(2.37)
T	-0.009*		-0.009*		-0.027*
	(-1.51)		(-1.46)		(-2.36)
I/Y	0.231	-0.709*	0.231	-0.463	0.563
	(0.33)	-1.96)	(0.32)	(-0.77)*	(0.82)
$\dot{L}$	-2.481*	-2.469*	-2.483*	-2.589	-1.821*
	(-1.87)	(-1.68)	(-1.74)	(-1.82)	(-1.41)
$\dot{G}(G/Y)^a$		-0.041	0.004		
		(-0.07)	(0.01)		
G/Y^a				-0.133	0.898*
				(-0.51)	(1.82)
SSE	0.070	0.080	0.070	0.079	0.058
R^2	0.410	0.327	0.410	0.338	0.517
s^2	0.004	0.005	0.005	0.005	0.004
Degrees of freedom	16	16	15	16	16

[a]G = government final consumption.

*Coefficient significant at the .10 level.

Table 5.2. Least squares estimates of GDP growth rates (t-ratios are in parentheses)

Regressors	Equations (1)	(2)	(3)	(4)	(5)
Intercept	16.936* (1.53)	0.212* (3.19)	22.067* (2.02)	0.226* (3.36)	18.567** (1.14)
T	-0.009* (-1.51)		-0.011 (-2.00)		-0.009** (-1.13)
I/Y	0.232 (0.33)	-0.706* (-2.13)	0.541 (0.78)	-0.369 (-0.73)	0.250 (0.34)
$\dot{L}$	-2.481* (-1.87)	-2.602* (-2.13)	-2.634* (-2.09)	-2.689* (-1.92)	-2.438* (-1.74)
$\dot{G}(G/Y)^a$		0.426** (1.09)	0.635* (1.69)		
G/Y^a				-0.333** (-0.93)	0.071 (0.14)
SSE	0.070	0.075	0.059	0.076	0.070
R^2	0.410	0.373	0.505	0.361	0.410
S^2	0.004	0.005	0.004	0.005	0.004
Degrees of freedom	16	16	15	16	16

[a]G = government revenues.

*Coefficient significant at the .10 level.

**Coefficient significant at the .20 level.

Table 5.3. Least squares estimates of GDP growth rates (t-ratios are in parentheses)

Regressors	Estimators (1)	(2)	(3)	(4)	(5)
Intercept	16.936*	0.216*	16.480	0.208*	36.773*
	(1.53)	(3.18)	(1.40)	(3.03)	(1.81)
T	-0.009*		-0.008*		-0.019*
	(-1.51)		(-1.39)		(-1.80)
I/Y	0.232	-0.762*	0.190	-0.460	0.517
	(0.33)	(-2.16)	(0.25)	(-0.86)	(0.70)
$\dot{L}$	-2.481*	-2.410*	-2.450*	-2.597*	-2.133*
	(-1.87)	(-1.70)	(-1.77)	(-1.84)	(-1.58)
$\dot{G}(G/Y)^a$		0.226	0.082		
		(0.48)	(0.17)		
G/Y^a				-0.436**	0.436**
				(1.16)	(1.16)
SSE	0.070	0.079	0.070	0.064	0.064
R^2	0.410	0.336	0.412	0.459	0.459
s^2	0.004	0.005	0.005	0.004	0.004
Degrees of freedom	16	16	15	16	15

[a]G = total government expenditures.

*Coefficient significant at the .10 level.

**Coefficient significant at the .20 level.

The statistical significance of the coefficients in each table was established by t-tests with n - k degrees of freedom, i.e., by testing the hypothesis:

$$H_0: \ \beta_i = 0$$

$$H_A: \ \text{negation}$$

where n is the number of observations, k is the number of regressors, and β_i is the coefficient of a given regressor. Statistically significant coefficients are marked with asterisks in each table.

In each table, equation (1) depicts the results from fitting the production function without government as a regressor. The coefficients of equation (1) have plausible signs, the t-ratios are large, especially for the regressors T and $\dot{L}$. In fact, in all but one equation, the elasticity of labor is numerically larger than -2, implying that labor force growth has a negative and very significant impact on economic growth in Zambia.

The main reason for the large negative impact of labor force growth on economic growth seems to be the characteristic of the Zambian population. Construction of a population pyramid and calculation of the age-dependency and aged-child ratios for Zambia should reveal that Zambia has a relatively "young" population, consisting of a very large proportion of children and a very small proportion of the elderly.[5] This is a general characteristic of the population of developing countries.[6] One important implication of a young population is that Zambia devotes a considerable proportion of its resources to the maintenance of a high percentage of dependents. It also means that the economy cannot generate employment rapidly enough to absorb the growth in labor; hence, the large negative impact of the regressor $\dot{L}$.

The coefficient of capital, I/Y, in all cases confirms the importance of capital as a determinant of economic growth. However, the estimate of the coefficient seems to be "contaminated" by collinearity between capital and the regressor T. This can be seen from comparing equations (1) and (2), (1) and (4) in all the tables. It is clear that the omission of T from the regression reverses the sign of the coefficient of capital: suggesting that there is some relationship between T and I/Y. It is quite plausible that in an open economy such as that of Zambia, productivity of capital largely depends on other exogeneous variables represented by the regressor T; such as imports and exports. Therefore, omitting these variables from the regression changes the impact of capital on economic growth.

The statistical significance of including the regressor T was established by testing the hypothesis:

$$H_0: \; C\beta = \theta$$

$$H_A: \; \text{negation}$$

where C is a row of vectors and θ is the value of C under H_0. The test statistic was an F-statistic of the form:

$$F = \frac{(SSE(w) - SSE(\Omega))/q}{SSE(\Omega)/(n - k)}$$

where,

$SSE(w)$ = SSE of the restricted model

$SSE(\Omega)$ = SSE of the full model

n = number of observations of the full model

k = number of parameter estimates of the full model

q = number of restrictions.

The test statistic has $F(q, n - k)$ degrees of freedom and these are shown in each table.

In each case, the test statistic showed that T belongs in the regression. This can also be seen from the fact that in all cases when T was included in the regression, R^2 was relatively larger and the coefficients were of the proper signs.

In assessing the efficacy of government as a regressor, the starting point was to test the underlying hypothesis of this study: that economic growth varies inversely with government size in Zambia. For this, t-tests were constructed as follows:

$$H_0: \beta_i < 0$$

$$H_A: \beta_i > 0$$

where β_i is the coefficient of government as a regressor in a given equation. In all cases, H_0 was rejected: implying that, statistically, economic growth does not vary inversely with government size in Zambia. In other words, government growth has a positive impact on economic growth in Zambia.

Is the impact statistically significant? One basic conclusion arises from looking at the results in the three tables and that is: for a given proxy of government, the significance of the coefficient of government depends on how government size is measured, whether as $\dot{G}(G/Y)$ or simply as G/Y. In Table 5.1 where government is proxied by government final consumption, the coefficient is significant when government size is measured as G/Y and insignificant when size is measured as $\dot{G}(G/Y)$. In Table 5.2 where government is proxied by government revenues, the coefficient is significant when government size is measured as $\dot{G}(G/Y)$ and insignificant when size is measured as G/Y. And in Table 5.3 where government is proxied by total government expenditures, the coefficient is significant when government size is measured as G/Y and insignificant when size is measured as $\dot{G}(G/Y)$. Clearly, the significance of the coefficient depends on the proxy for government and on how government size is defined.

It is instructive to compare the results of the present study with those of Rati Ram because he not only included Zambia in his sample but also estimated the coefficient of government $\dot{G}(G/Y)$ for Zambia using time series data for the period 1960-80. Using government final consumption as the proxy for government, Ram found the coefficient of government for Zambia to be positive (1.36) and significant.[7] In the present study, when government is proxied by government final consumption and government size is measured as $\dot{G}(G/Y)$, the coefficient is positive (0.004) but insignificant. Thus, in both studies, the coefficient is of the same sign but differs in magnitude. What could be the source of the difference in the size of the coefficient?

One reason seems to be the fact the studies cover different periods: 1960-80 in Ram's study, 1964-84 in the present study. It should be noted that Zambia has only been independent since 1964 (see Appendix A). And it is possible that a change of government can influence the relationship between government size and economic growth. This could be the case with Ram's study.

Another reason the size of the coefficients differs between the two studies seems to be the difference in the techniques of estimation: autoregressive integrated moving average (ARIMA) technique in Ram's study, classical least squares in the present study. In particular, Ram employed an AR(1) model, for which the estimates were obtained by the AUTOREG procedure of the Statistical Analysis System, i.e., the SAS AUTOREG procedure, while the results of the present study were obtained by the SAS SYSREG procedure.

However, the efficacy of employing an AR(1) model to Zambian data is questionable. This is because building an adequate ARIMA model requires a large sample size; 50 observations is the conventional minimum.[8] Therefore, on occasions when a smaller sample is used, such as the 20 observations in Ram's study, there is need to interpret the results with caution.

Notwithstanding the difference in the magnitude of the coefficient, the two studies indicate that government size has a positive impact on economic growth in Zambia. The main reason for the positive impact of government growth seems to be the role the Government has played in providing socio-economic services. A preliminary analysis of the direction of government expenditures since 1964 shows that expenditures on socio-economic services are second only to constitutional and statutory expenditure in the current budget and predominate in the capital budget (see Table 5.4).

Socio-economic services have been given top priority in Zambia partly to make up for the colonial legacy, and partly due to the Government's philosophy of humanism which, until recently, advocated the provision of free basic services such as education and health. It is this type of expenditure which possibly explains the positive impact of government on economic growth in Zambia.

Finally, this study was concluded by examining the investment and savings function for Zambia during 1964-84. This was because of supply-side economics which suggests that the way in which government size affects economic growth is through its effect on investment and savings.[9]

Appendix C depicts the investment/GDP and the savings/GDP ratios for Zambia during 1964-84. It is clear that the shares of investment

Table 5.4. The direction of government current expenditures[a]

	Mean share, 1968-1978 (%)
1. Constitutional and statutory expenditure	33.4
2. Ministry of Education	15.5
3. Ministry of lands, natural resources and rural development	12.1
4. Ministry of power transport and works	7.3
5. Ministry of Health	7.2
6. Ministry of Planning and Finance	6.2
7. Zambia Police	4.3

[a]Source: Republic of Zambia, Monthly Digest of Statistics, 9(5) (May 1973): 29-32, and 15(12) (December 1979): 30-31.

and savings have declined since 1973. During 1964-74, investment averaged 28.5% of the GDP, but fell to 22.9% during 1974-84. Similarly, savings fell from 41.6% during 1964-74 to 20.7% of the GDP during 1974-84.

However, as a function of GDP, the savings function provides a better fit than the investment function. This can be seen from the results of simple regression for the 1964-84 period:

$$I/Y = -3.019 + 0.166(y) \qquad (R^2 = 0.002)$$

$$S/Y = -5.920 + 0.638(y) \qquad (R^2 = 0.056)$$

where y is GDP per capital, S is savings, Y and I are as defined before. Clearly, there is a weak link between GDP and the level of investment. Thus, even if the issue of government size and economic growth were approached from the supply-side view, there would still be the issue of the weak link between investment and GDP. It was for this reason that the study did not proceed to examine the relationship between I/Y and $\dot{G}$(G/Y) or G/Y.

Notes

[1]Gershon Feder, "On Exports and Economic Growth," Journal of Development Economics 12 (February/April 1983): 59-73, and Rati Ram, "Government Size and Economic Growth: A New Framework and Some Evidence from Cross-Section and Time Series Data," American Economic Review 76(1) (March 1986): 191-203.

[2]This equation can also be written as:

$$d(\ln Y) = \alpha(\frac{I}{Y}) + \beta[d(\ln L)] + (\frac{\delta}{1+\delta} + N_G)[d(\ln G)(\frac{G}{Y})]$$

where [d(ln G)](G/Y) is the measure of government size.

[3]This equation can also be written as:

$$d(\ln Y) = \alpha(\frac{I}{Y}) + \beta[d(\ln L)] + \gamma(\frac{G}{Y})$$

where G/Y is the measure of government size.

[4]A. Koutsoyianis, Theory of Econometrics (London: Macmillan Press Ltd., 1977), 280.

[5]By definition, the age-dependency ratio is given as:

$$\frac{P_{0-14} + P_{65+}}{P_{15-64}} \times 100$$

where P_{0-14} = number of people under 15 years of age; P_{65+} = number of people of age 65 and over, and P_{15-64} = number of people of age 15 to 64. Similarly, the aged-child ratio is defined as:

$$\frac{P_{65+}}{P_{0-14}} \times 100$$

where P_{0-14} and P_{65+} are as defined above.

[6]On the characteristics and effects of a "young" population, see Michael P. Todaro, Economic Development in the Third World (London: Longman, 1977), 157-79.

[7]Rati Ram, op. cit., 201.

[8]See Alan Pankratz, Forecasting with Univariate Box-Jenkins Models (New York: John Wiley & Sons, 1983), 11.

[9]See, for instance, Bruce Bartlett and Timothy T. Roth, eds., The Supply-Side Solution (Chatham, N.J., Chatham House Publishers, Inc., 1983).

CHAPTER VI.

SUMMARY AND CONCLUSIONS

The role of government in economic growth often generates conflicting points of view. One view is that growth in government size retards economic growth. This is usually the position of economists and others who favor the free market and seek to restrict the functions of government to national defense, maintaining law and order, and maintaining certain public works which cannot be run profitably by the private sector. The principal arguments against increased participation of government in economic affairs are that: (1) government operations are often conducted inefficiently because they are not usually subject to economic criteria, (2) many government fiscal and monetary policies tend to lower the productivity of the economy, and (3) government spending crowds out private investment and consumption. Another view is that government size is a catalyst to economic growth. This is often the position of those who consider government to be necessary in removing impediments to economic growth. The principal arguments in this case are that: (1) government is crucial in harmonizing conflicts between private and social interests, (2) government can protect the domestic economy from the vagaries of the world market, and (3) government can secure an increase in productive investment and provide a socially optimal level of economic growth.

The case of Zambia very well illustrates the contrasting views on the relationship between government size and economic growth.

On the one hand, the public sector has grown considerably since 1968 as a result of the Government's attempt to industrialize the economy through the public sector. On the other hand, a sharp and prolonged recession since 1973 has prompted the Government to institute structural reforms. As a result, the Government now faces the dilemma of maintaining short-term economic stability without having to retard long-term economic growth.

The purpose of the present study was, therefore, to examine the relationship between government size and economic growth in Zambia. The underlying hypothesis of the study was that economic growth varies inversely with government size. In testing this hypothesis, the study began by distinguishing between "economic growth" and "economic development" and then reviewed the sources of economic growth.

Economic growth is often defined as a rise in total or per capita GNP, while economic development is considered to be growth plus structural change. Through the years, the sources of economic growth have been characterized as: gold, trade, agriculture, labor, capital, science and technology. Clearly, there are many sources of economic growth and these vary in importance from time to time and from place to place. Empirical studies show that structural factors such as reallocation of resources between sectors, growth of exports and balance of payments are more significant for developing than developed countries, whereas the growth of the labor force has more significant effect in developed than developing countries.

However, although there are many and various sources of economic growth, the sources can be divided into two broad categories. First, economic growth may be due to changes in the resources used in production, that is, due to changes in factor inputs. There are three main sources of this kind; namely, land, labor, and capital. Second, economic growth may be due to changes that affect output per unit of input. There are again three main sources of this kind; namely, technology, efficiency, and government. Changes in these sources permit more output to be produced with the same inputs.

The present study considered the particular case of government as a source of economic growth. Attention was initially focused on the theory and evidence of government as a source of economic growth. The study then employed a two-sector growth model to characterize the effect of government size on economic growth. This was done by following the practice of introducing an externality in the production function; the externality in this case being government size. The model was then applied to Zambia data for the period 1964-84 in order to test the hypothesis that economic growth varies inversely with government size in Zambia.

A basic conclusion that arises from this study is that the effect of government on economic growth is both a theoretical and empirical issue. One reason for this is the indeterminancy that arises from the operation of the income and substitution effects on the incentives to work and to save. Another reason is the lack of a general agreement on the parametric value of the substitution between capital and labor; a value that is necessary in determining the effect of tax policy on the incentive to invest. Furthermore, the effect is both a theoretical and empirical one because the significance of the impact of government size depends on the proxy for government and how government size is measured.

However, empirical evidence suggests that government size exercises a positive effect on economic growth in Zambia. The main reason for this positive effect seems to be the role the Government has played in providing socio-economic services.

But to state that government size exercises a positive effect on economic growth in Zambia is not in any way to argue against the recent structural reforms in Zambia. On the contrary, the positive impact of government should be seen as a basis for continued effort to rationalize the scope and operations of the public sector in order to increase efficiency in the use of resources.

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APPENDIX A. A BRIEF HISTORY OF ZAMBIA

Zambia was born out of a vast mining complex, primarily that of copper. Even though David Livingstone and other nineteenth century European explorers realized the potential of the region, it was John Cecil Rhodes, however, who through the British South Africa Company, brought it under British influence. In 1891, the Company divided the region into two administrative units: North-Western and North-Eastern Rhodesia. Northern Rhodesia was created in 1911 when the two territories were amalgamated. In 1924, it became a British Protectorate when the Imperial Government took over the administration from the Company. Together with Southern Rhodesia and Nyansaland, on August 31, 1953, Northern Rhodesia formed the Federation of Rhodesia and Nyansaland -- also known as the Central Africa Federation. This was dissolved on December 31, 1963. And on October 24, 1964, the British Protectorate of Northern Rhodesia became an independent republic under the name of Zambia.

APPENDIX B. MACROECONOMIC INDICATORS OF THE ZAMBIAN ECONOMY: REAL GDP, GDP GROWTH RATES, INVESTMENT AND POPULATION[1]

Year	Real GDP (millions of K)	GDP growth rates	Investment (millions of K)	Population (millions)
1964	1618	-	57.2	3.60
1965	1915	0.16853	155.9	3.70
1966	2172	0.12593	226.2	3.83
1967	2449	0.12003	274.2	3.95
1968	2632	0.07206	320.7	4.05
1969	3123	0.17105	238.0	4.06
1970	2695	-0.14740	338.0	4.18
1971	2697	0.00074	416.0	4.30
1972	2962	0.09372	421.0	4.42
1973	2934	-0.00950	459.0	4.68
1974	3132	0.06531	692.0	4.83
1975	3056	-0.02456	642.0	4.98
1976	3187	0.04197	452.0	5.14
1977	3035	-0.04887	490.0	5.30
1978	3067	0.01049	537.0	5.47
1979	2975	-0.03046	576.0	5.65
1980	3064	0.02948	701.0	5.83
1981	3253	0.05986	673.0	5.83
1982	3161	-0.02869	603.0	6.03
1983	3099	-0.01981	575.0	6.24
1984	3058	-0.01332	724.0	6.44

[1] Source: Republic of Zambia, Monthly Digest of Statistics, 22(5) (August 1986): 1-52. International Monetary Fund, International Financial Statistics, Yearbook, 1986.

APPENDIX C. MACROECONOMIC INDICATORS OF THE ZAMBIAN ECONOMY: REAL GDP, REAL PER CAPITA GDP, INVESTMENT/GDP AND SAVINGS/GDP RATIOS

Year	Real GDP	Real GDP per capita	Share in GDP of			
	(millions of kwacha)		Investment %	Savings %	Imports %	Exports %
1964	1,618	449	11.4	38.4	42.6	82.0
1965	1,915	518	24.5	39.9	37.0	56.0
1966	2,172	572	28.9	43.0	39.5	57.7
1967	2,449	628	30.8	36.9	43.5	52.4
1968	2,632	650	32.4	39.3	44.3	54.0
1969	3,123	758	18.1	51.4	32.4	68.2
1970	2,695	634	28.4	45.4	37.1	55.5
1971	2,697	614	37.3	35.1	44.5	44.1
1972	2,962	654	35.3	36.9	41.9	46.0
1973	2,934	627	29.2	45.0	33.2	46.4
1974	3,132	648	36.6	46.0	40.5	47.8
1975	3,056	614	40.6	21.0	55.8	34.5
1976	3,187	620	24.1	29.3	39.3	42.6
1977	3,035	573	25.1	22.5	42.7	38.7
1978	3,067	561	23.9	20.5	36.9	32.8
1979	2,973	526	14.1	23.1	36.5	44.0
1980	3,064	526	23.3	19.3	45.4	39.6
1981	3,253	558	19.3	6.8	41.1	27.7
1982	3,161	524	16.9	8.0	36.5	27.3
1983	3,099	497	13.8	12.6	31.8	30.6
1984	3,058	474	14.7	18.5	32.8	36.6
1964-74	2,575	614	28.5	41.6	39.7	55.5
1974-84	3,099	557	22.9	20.7	39.9	36.6

[1] Sources: Republic of Zambia, Monthly Digest of Statistics, 22(5) (August 1986): 1-52. International Monetary Fund, International Financial Statistics, Yearbook 1986.