A STUDY OF INVESTMENT IN THE CARIBBEAN

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St. Augustine
26th August 1991

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Investment is essential for growth. It has long been known to be one of the major factors in economic development. Fluctuations in investment may have a significant impact on the general functioning of the economy. Both from the perspective of demand management and development planning, understanding the determinants of investment is critical.

In this study we undertake an examination of investment in the Caribbean. A brief discussion of this activity from a historical perspective is included. This is important as one must understand how history has shaped investment decisions and patterns in the Caribbean. This is followed by a literature review and discussion of existing theories of investment. Included here are the Neoclassical, Keynesian and Jorgenson's model. In the last section of the paper we present the results of empirical analyzes and offer some policy implications.

A HISTORICAL OVERVIEW

It may be helpful to our understanding of the investment decision in the Caribbean to explore whether, how and to what extent historical factors impinge on this process. We recall that when the Europeans first came to the region their preoccupation was to find gold. In the course of time settlements developed. The native

civilizations succumbed to this European intrusion and before many decades had either disappeared altogether or was totally subdued. In time, production of tropical commodities for export became the main preoccupation of the settlers and this gradually developed into a system of specialized export production using imported slave labour with European technology and capital. It is in this context that the Caribbean came to be regarded as the place where Europe chose to produce tropical staples.

In this period there readily emerged the situation where investments in the region were, by and large, planned, financed and executed from Europe. The "enterprise of the Indies" was a European enterprise.

With the abolition of slavery and the fundamental changes which began to come in West Indian society and economy the investment decision became more complex. Investment in the staple export sector remained Eurocentric in all aspects. But side by side with this, an investment thrust with Caribbean origin began to take place. Much of this latter investment involved the creation of villages and the development of small scale agriculture providing both domestic food supply and minor staples for export. In part there was integration of small staple production with the plantation sector as evidenced by such phenomena as the emergence of cane farming. Be that as it may, the quality of this investment

thrust was of the nature of "primitive accumulation" and stood in stark contrast to the European initiated investments which was financed and effected through overseas capital markets and the emergent Caribbean banking sector.

Somewhere in all this there began to emerge in the late nineteenth and early twentieth centuries formal financial systems associated largely with the export-import trade and its financing and with surpluses generated therefrom. In addition Government financing of investment in infrastructure (roads, ports) and in social infrastructure (hospitals, schools) made for increased complexity of the whole area of investment decision-making, its financing and its impact on income and employment generation through export production and domestic provisioning. Nor has this process remained static. In the immediate pre-war and post-war years a new wave of investment began to take place associated with mineral resource development (bauxite and oil), with resuscitation of old agricultural staples (sugar and bananas) and with the Lewis inspired thrust into secondary industrial development.

This historical sketch is intended to point to the complexities which a study of investment in the Caribbean must confront. Evidently there are several different investment decision makers, a variety of sources of investment finance and a complex of multiplier/accelerator processes all at work at the same time. For the most part the conflicting and complementary pulls and pushes

became woven into macro-economic variables and relationships but must be kept in mind as we address this complex area of economic life.

LITERATURE REVIEW

The accumulation of real physical capital stock is an important aspect of economic growth. In recent years broad consensus has emerged on several macroeconomic relations, but there is no such convergence of view in the case of the investment function.

Standard models of investment used in the more developed countries cannot be readily applied to the developing countries. This is so because of the structural and institutional features present in most developing countries e.g. absence of well functioning capital markets, the relatively large role of government in capital formation or distortions created by foreign exchange constraints. Thus, many assumptions underlying these more standard models are not satisfied in the developing countries. Furthermore the lack of reliable estimates of capital stock makes it difficult to observe the stock adjustment mechanism. In the absence of information of real financing rates, it is impossible to calculate the user cost of capital. The observable interest rates in these countries do not accurately reflect the scarcity of capital. There are also conceptual problems in defining private investment in economies where autonomous state enterprises play a relatively important role.

development. However whether or not government investment impacts positively or negatively on private investment is an issue which can only to be settled empirically. Alhulawalia (1982) and Srinivasan and Naragua (1977) argue that government investment encourages private investment and augments aggregate demand. On the other hand Sundararajan and Thakur (1980) argue that there is a negative relationship between private and public investment.

Bank credit or changes in bank credit to the private sector has also been employed as an explanatory variable (see Khan, 1988; Tun Wai and Wong, 1982). The relationship between bank credit can be argued on the grounds that the behaviour of each sector of the economy, financial or non-financial, depends at least in part on the amount of readily available funds which may be a constraint. Firms in less developed countries generally exceed the financial capabilities of their entrepreneur and undercapitalization is common. Naturally, loans for financing business operations would finance larger amounts of capital formation than would have been possible otherwise.

In the traditional Keynesian model the link between the real and the monetary sector is provided for by the rate of interest and its effect on investment. This has been a more or less standard approach for developed countries. However this link appears to be inapplicable in a model for developing countries because of the embryonic and unsophisticated nature of the capital markets. It is

interest it is cheaper to invest, but investment may not take place for lack of savings. In these circumstances a rising interest rate could stimulate savings and result in increased investment.

There are also those researchers who hold the view that the interest rate is irrelevant in the context of developing countries. This they believe is due to the rudimentary nature of capital markets, where the interest rate is not determined by the free play of market forces but is administered by the monetary authorities. Hence it does not reflect the true cost of financing investment (Khan, 1988).

When the investment function is specified in terms of the nominal rate of interest rate the inflation rate may also be included (Galbis, 1976). Usually an inverse relationship exists between these variables. That is, increasing inflation implies increases in cost and consequently the level of investment falls.

The role of foreign capital inflows has also been documented (Blejer and Khan, 1984; Weisskopf, 1982; Sundararjan and Thakur, 1980; Tun Wai and Wong, 1982). In the sixties it was believed that external capital could perform a significant role in both resource mobilization and structural transformation, both of which were needed for the acceleration of capital formation. In developing countries where there are incentives to lure foreign investors, there might also be capital investment in plant and machinery and

not just infrastructural facilities. Specific corporations are set up in order to investigate and encourage potential sources of foreign investment. Direct foreign investment may also have linkage effects, that is, it can have an accelerator effect on other industries.

Another form of capital inflow may be in the form of debt. If a country has relatively easy access to creditors, then capital inflow in the form of external debt may be forthcoming to assist in increasing the level of investment. An economy might also attract foreign funds if the rate of interest offered by the financial system is competitive.

Researchers have also included other variables in the investment function. Rashid (1984) included a retained earnings variable and instead of using government investment, used government expenditure. The availability of internal finance enhances a firm's ability to invest. It avoids dependence on credit for investment. Furthermore internal finance is important for firms that must seek external funding. Lenders must choose which loan request to fund. In order to do this, they need screening devices based on observable characteristics. Internal finance provides such a signal because even though lenders may have difficulty predicting the cash flow generated by a new project the loan will be secure to some degree if the firm's existing cash flow can service the new debt (Fazzari and Athey, 1987).

Love (1988) examines the relationship between export instability and investment. Since developing countries import most of their raw materials, equipment and machinery needed for investment, the foreign exchange earnings of these countries will thus be important. As a result instability in foreign exchange earnings induces instability in investment via the country's ability to import the much needed inputs. Billsborrow (1977) demonstrates that foreign exchange is the single most important influence on investment in developing countries because the import content of investment inputs is so high.

Yoo (1977) claims that in less developed countries money contributes significantly to the capital accumulation process. Money holdings are alternatives to the holdings of physical capital and they permit real resources to be released for physical capital accumulation. Thus money holdings can serve as a conduit through which capital accumulation can take place.

In the final analysis what determines private investment depends on time as well as specific factors. These can only be identified by empirical investigation.

INVESTMENT THEORY - ITS CURRENT STATE

Investment may be undertaken for a variety of reasons among them: the expected rate of profit, the current level of income, the

expected level of income growth, expectations of future prices. Various theories of investment have been formulated. In this section we shall discuss both static and dynamic theories.

The Neoclassical Theory

The neoclassical investment theory focuses on the interaction between the production function and the securities market. In their theory of investment behaviour the neoclassical economists assumed that both capital and labour were fully employed, a perfectly substitutable production function in which capital and labour were the only inputs and were subject to diminishing returns, and the rate of interest represented the opportunity cost of funds.

The production function may be written as

$$Y=F(k,l)$$

where Y is real output, k is the capital stock and l is labour. Capital is the only variable input since labour is fixed at full employment level hence

$$Y=F(k)$$

The marginal productivity of capital is measured by the first derivative of this function (dY/dk). Further, as investment increases - as more and more units of capital are added to labour - the marginal productivity of capital falls. Thus an inverse relationship exists between the marginal productivity of capital and the stock of capital.

In the neoclassical type economy there were only three assets: money, securities and capital goods. Money yielded no financial return consequently would not be held as an asset. The prevailing rate of interest represented the yield of securities while the rate of return on capital goods was the marginal productivity of capital. A potential investor was therefore faced with two options and he was assumed to choose that which yielded the greater return.

Under these conditions the individual would invest until the marginal productivity of capital was just equal to the interest rate. Any further investment implies that the investor could have earned a higher rate of return elsewhere. Thus in the neoclassical theory investment would take place as long as the marginal productivity of capital is not less than the return on the alternative asset-securities.

This relationship may be represented diagrammatically

Fig. 1

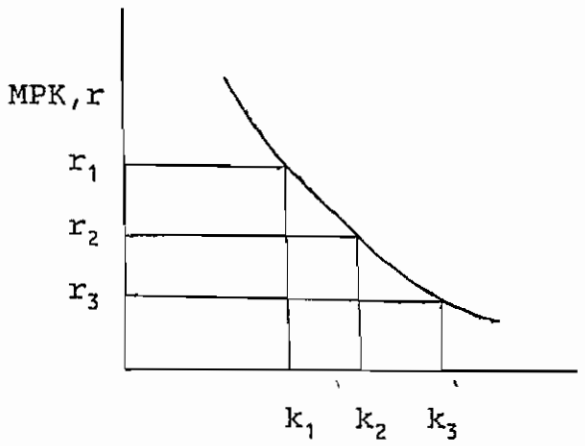
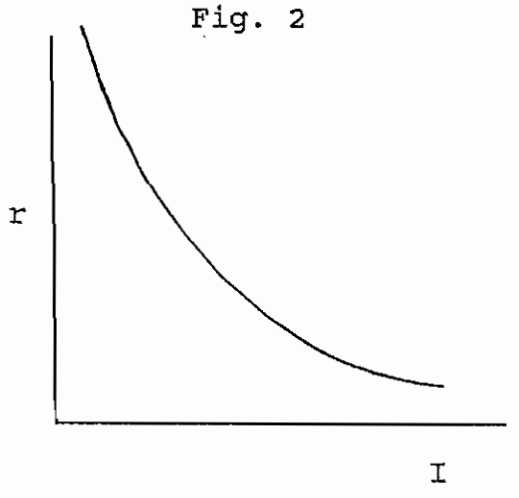


Fig. 2



In Fig.1 a relationship between the marginal productivity of capital (MPK), the rate of interest (r), the capital stock (k) and additions to it are depicted. At all points along the curve the marginal productivity of capital is equal to the rate of interest. If the rate of interest falls from r_1 to r_2 the marginal productivity of capital becomes higher than the rate on the alternative asset, it would be to the investor's benefit to invest more and to do so until both rates coincide. Eventually investment would cease at point b. A similar change occurs if r_2 falls further to r_3. This negative relationship between the level of investment (I) and the interest rate is illustrated in Fig. 2.

The neoclassical theory is not without flaws. From a macroeconomic perspective labour will be perfectly elastic to the firm. Consequently both inputs into the production function become variable and there is no guarantee that the marginal productivity of capital will diminish with additions to the stock. The Neoclassical approach requires the investor to adopt an infinite horizon which may not be justified in the normal scheme of business operation. Also in their treatment of investment behaviour the neoclassical economists neglect the supply side in the capital goods sector. They treat price as though it is constant. The demand of a single firm might not influence the price of capital goods, but at the level of the macroeconomy it is not impossible to envisage movement in prices depending on the elasticity of supply in the capital goods sector.

J.M. Clark and A. Aftalion

Shortly before World War I J.M. Clark in the United States and A. Aftalion in France simultaneously introduced what is known as the accelerator or the acceleration principle. This treatment, which antedates Keynes, relates net investment to the rate of change in income or sales.

In their models a simple explanation for investment in period t is as a partial or complete adjustment of the real capital stock k_{t-1} at the beginning of the interval to its desired level k^*_t.

The capital stock adjustment process in period t can be divided into two subprocesses. The first subprocess is the change in the desired capital stock $(k^*_t - k^*_{t-1})$. The second subprocess is an adjustment of the actual capital stock to the desired stock of period t-1, an adjustment which takes time to complete. This process is symbolized by $\beta(k^*_{t-1} - k_{t-1})$. The adjustment coefficient as usual is positive and no larger than unity. In addition it is assumed that $k^*_t = \gamma Y_t$ and $k^*_{t-1} = \gamma Y_{t-1}$ where γ is the desired capital output ratio.

Combining these insights investment (I) may be expressed as

$$I_t = \alpha(k^*_t - k^*_{t-1}) + \beta(k^*_{t-1} - k_{t-1})$$

and α are β adjustment coefficients.

Since $k^*_t = \gamma Y_t$ and $K^*_{t-1} = \gamma Y_{t-1}$

$$I_t = \alpha\gamma(Y_t - Y_{t-1}) + \beta Y_t - \beta k_{t-1}$$

or denoting $Y_t - Y_{t-1}$ by dY/dt

$$I = \alpha\gamma dY/dt + \beta Y_{t-1} - k_{t-1}$$

The simple accelerator model is a special case of the model above. It ignores the last two terms by considering the coefficient as near zero. It also assumes investment to be interest elastic. This version can be represented as

$$I = \alpha\gamma dY/dt$$

$$I = k\ dY/dt$$

however investigation with this model fits data badly. To improve this poor statistical fit economists have turned to a more flexible version of the accelerator model. A flexible accelerator allows for the process of capital stock adjustment taking more than one time period. Robert Eisner has been the principal proponent of this approach.

The Keynesian Theory

The Keynesian theory of investment proceeds along lines similar to that of the neoclassical. However Keynes introduced the role of expectations into his theory. According to him, a firm contemplating an investment, reaches a decision on the basis of three sets of facts: the price of the asset, the expected returns, and the rate of interest.

For an investment to be considered, the present value (PV) of the stream of expected returns (R) over the life of the asset (t), given by

$$PV = \sum_{t}^{n} R_t / (1+i)^t$$

must at least cover the price of the asset. That is the expected net returns after being discounted must at least be equal to the price. The question therefore arises: what discount rate (i) will make the expected net return just equal to the price (P), that is given P and R_t what values of i satisfies

$$P = \sum_{t}^{n} R_t / (1+i)^t$$

The rate of discount which satisfies this equation, the yield on the asset, Keynes referred to as the "marginal efficiency of the asset." He also argued that as investment increases, the marginal efficiency of investment declines.

The finance required to undertake investment may either be borrowed of owned. If it is borrowed the rate of interest is the actual cost, if it is owned it is the opportunity cost. Thus, on the one hand the marginal efficiency of the asset represents the yield, while on the other the interest rate represents the cost of funds. It would therefore pay the firm to invest so long as the marginal efficiency of the asset exceeds the market rate of interest.

Alternatively the present value of the stream of anticipated returns resulting from an investment (with allowance for uncertainty and discounted at the market rate or interest) must exceed the cost of investment.

These relationships can be illustrated in the diagrams below.

Fig. 3

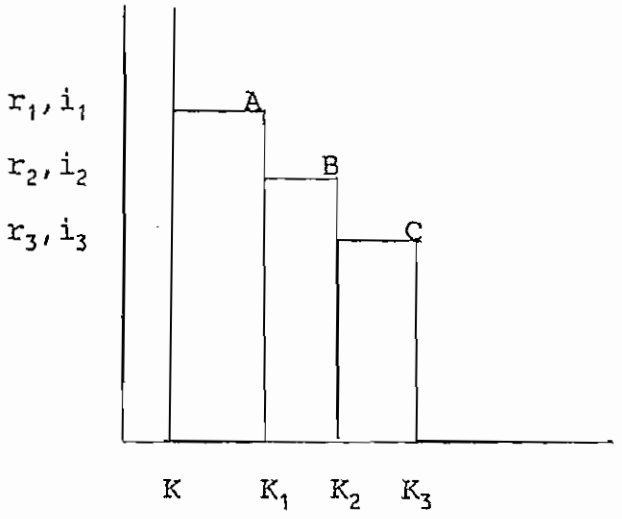
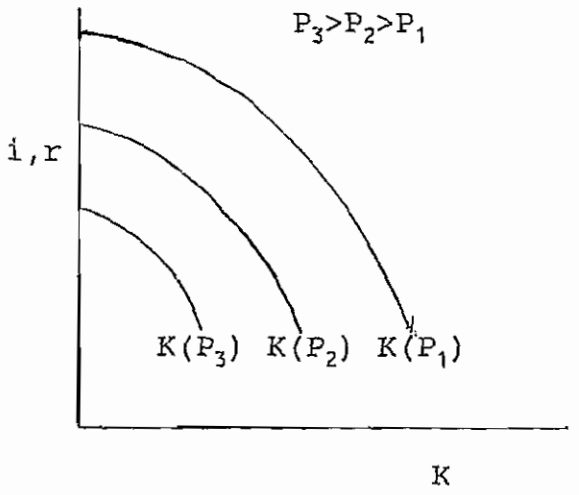


Fig.4



In Fig. 3 the relationship between the marginal efficiency of the asset (i), the rate of interest (r) and the capital stock (K) are illustrated for the firm and in Fig. 4 for all firms. Fig. 3 shows that as the value of assets in which the firm proposes to invest increases the marginal efficiency of the asset falls. A, B and C represents equality of the marginal efficiency of investment and the rate of interest. If r_1 falls to r_2 then the marginal efficiency

would be greater than the rate of interest and it would be to the firms's benefit to increase investment. However the marginal efficiency would eventually fall from i_1 to i_2 . There will be no more investment after B. Thus any programme that increases the capital stock will reduce the marginal efficiency. The step function indicates the lumpy nature of investment. Summing horizontally we arrive at Fig. 4, a smooth curve because it is assumed that aggregation eliminates the discontinuities which characterizes the micro schedules. The optimal stock of capital is here related to the rate of interest at a particular price of capital.

It is possible to incorporate supply analysis into the Keynesian treatment of investment behaviour. This can be illustrated using the following diagrams.

Fig. 5

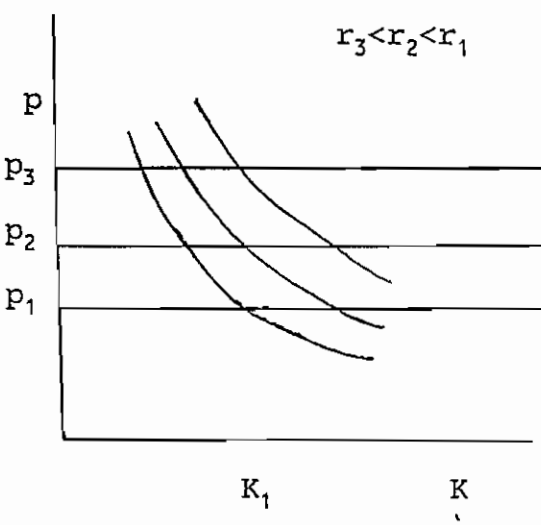
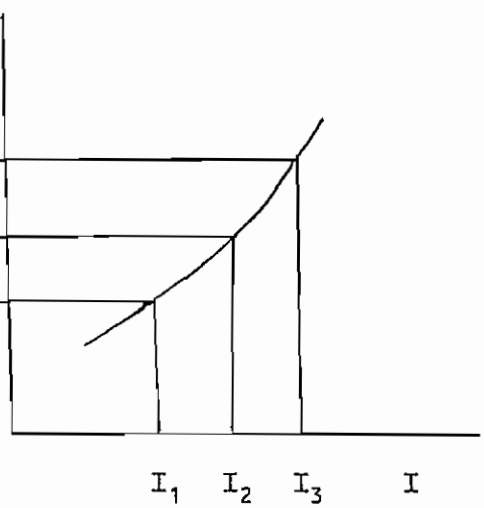


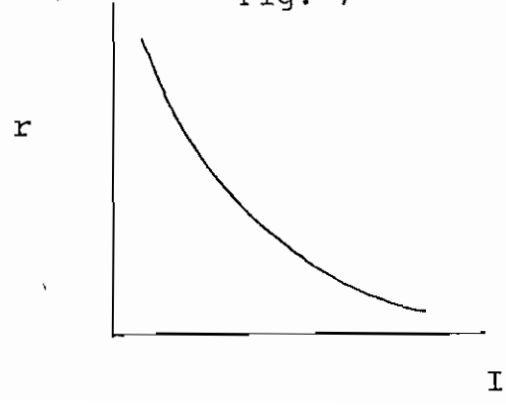
Fig. 6



We have seen that the optimal size of the capital stock is a decreasing function of both the interest rate and the price of capital. In Fig. 5 the curves are downward sloping indicating that the higher the price level the smaller the optimal stock. It shows that for any size of capital stock and rate of interest the price at which it is just profitable to purchase an additional asset (another way of representing Fig. 4). Fig. 6 shows the supply side of the capital goods sector which is assumed to be characterized by rising supply function.

At price P_1 and rate of interest r_1 the existing stock of capital is k_1. Only replacement investment is necessary and this is supplied at OI_1. At this point the market is in equilibrium and no net investment takes place. Assume that the interest rate falls from r_1 to r_2, this creates excess demand and as a result the demand price rises leading to a supply response at price P_2 and investment OI_2; net investment is I_1I_2. On this basis a downward sloping investment demand function relating investment to the rate of interest is derived.

Fig. 7



As with the neoclassical theory the Keynesian investment function is an inverse function of the interest rate. However it overcomes the shortcoming in respect of the supply side considerations.

Post Keynesian Developments - Jorgenson's Model

Dale Jorgenson's treatment of investment behaviour is based on the neoclassical theory of optimal capital accumulation. This approach cannot be described as novel and was adopted by Klein (1974) and Roos (1948). In these studies of investment the neoclassical theory was employed to provide a list of explanatory variables for investment expenditures. The prices of investment goods, changes in their prices, the rate of interest and the level of stock prices were used along with such variables as output, changes in output and commodity prices. However little attention was paid to the manner in which the rate of interest and the price of investment goods entered the demand for investment function. Both variables enter the Jorgenson's model through the user cost of capital services variable.

What Jorgenson does is attempt to reconcile the econometric literature on investment with the neoclassical theory of optimal capital accumulation. The central feature of the neoclassical theory is the response of the demand for capital to changes in relative factor prices. This feature is absent from much of the econometric literature on investment.

Many controversies emanate from the neoclassical theory of optimal capital accumulation. For example there is no agreement on what the entrepreneur should maximize. A second controversial matter is the assumption that the set of technological possibilities confronted by a firm can be described as a production function where the flow of output is a function of flows of labour and capital services, the flow of capital services being in turn proportional to the stock of capital goods. But the concept of capital service is not essential to the Neoclassical theory. A production function relating output at each point in time to inputs of labour and capital at that point in time may be replaced by a production function relating output at each point in time to investment goods at every point in time. Thus the flow of capital services from each investment good is proportional to the stock of capital that may be obtained by simply adding together all past acquisitions less replacements. Moreover the production process may be characterized so that the notion of a production function may be dispensed with altogether. Yet another controversy focuses on the flow of replacement goods for which many alternative definitions may be employed.

On his part Jorgenson presents a theory of investment based on the neoclassical theory of optimal accumulation of capital. In this model he considers a version of the neoclassical theory in which the objective is to maximize net worth. He also considers a description of technological possibilities in which output at each

point in time depends on the flow of labour and capital services at that point in time. The short run determination of investment behaviour depends on the time form of lagged response to changes in the demand for capital. This time form is assumed to be fixed. Replacement investment is assumed proportional to the stock of capital goods in place.

In its most general form Jorgenson's model may be represented as

$$I_t = w(L)[k^*_t - k^*_{t-1}] + \delta k_{t-1}$$

where w(L) is a power series in the lag operator L and the coefficient δ a depreciation rate. The desired capital stock is represented by (k^*) and the production function is Cobb-Douglas with elasticity of output with respect to capital, α

$$- \qquad \alpha (PY/C)$$

where P is a price index, α is unity on average in the long run but is sometimes adjusted to smooth the k series. C is the cost of capital:

$$C = q\,[(1-uv/1-u)\delta + (1-uw/1-u)r]$$

where q, δ and r are respectively a price index of capital goods, the rate of depreciation and the interest rate. The additional parameters (u,v,w) introduce tax considerations and are respec-

tively the total tax rate on corporate income, the proportion of depreciation deductible for corporate income tax purposes and the proportion of interest payments similarly deductible.

The demand for capital is assumed chosen so as to maximize net worth where net worth is defined as the integral of discounted net revenues and net revenue is defined as current revenue less expenditure on both current and capital accounts including taxes.

The maximization of net worth is subject to a standard neoclassical production function and the constraint that the rate of growth of capital is investment less replacement. The marginal productivity conditions are then obtained. The user cost of capital (C) is derived from the marginal productivity of capital condition.

Jorgenson derives the final form of the model from a series algebraic manipulations. Defining the proportion of projects completed in time t as w_t, investment in new projects as I^e_t and the level of starts of new projects as I^n_t, investment is the weighted average of past starts of projects; i.e.

$$I^e_t = w(L) I^n_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Jorgenson further assumes that in each period new projects are initiated until the backlog of uncompleted projects is equal to the difference between desired capital stock and the actual capital

stock. Thus

$$I^n_t + (1 + w_0) I^n_{t-1} + \ldots = k^*_t - k_t \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

$$I^n_t = k^*_t - [k_t + (1 + w_0) I^n_{t-1} + \ldots] \quad \ldots \quad \ldots \quad (3)$$

which implies that

$$I^e_t = w(L)[k^*_t - k^*_{t-1}] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

Total investment I_t is the sum of investment for expansion and investment for replacement (I^r_t)

$$I_t = I^e_t + I^r_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

with I^r_t assumed proportional to capital stock. The justification for this assumption is that the model for replacement is not the distribution of replacement for a single period but rather the infinite series of replacements generated by a single investment.

$$I^r_t = k_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

Thus the Jorgenson investment function is of the form:

$$w(L)[k^*_t - k^*_{t-1}] + \delta k_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

When we come to empirical testing we make investment a function of government investment, output, the cost of capital, credit availability and in the context of small, open economies, a foreign savings variable.

EMPIRICAL RESULTS

A general model estimated for the three economies, Trinidad and Tobago, Jamaica and Bardados is of the form

$$I_p = (GDP,\ I_g,\ WLR/PLR,\ C_p\ S_f)$$

where
- I_p = Private Investment
- I_g = Government Investment
- GDP = Gross Domestic Product
- WLR = Weighted Loan Rate
- PLR = Prime Loan Rate
- C_p = Credit to the Private Sector
- S_f = Foreign Savings

The results are presented in the Appendix. Other similar models are also estimated. Gross domestic product, credit to the private sector and foreign savings are expected to impact directly on private investment. The relationship between credit to the private and public sectors depends on whether the latter crowds out or enhances the former. If crowding out occurs then an inverse relationship is expected, if government investment enhances private investment a direct relationship is anticipated. If the Keynesian theory holds in the Caribbean then an inverse relationship is

expected between the interest rate and investment. On the other hand if the McKinnon Shaw hypothesis holds then the reverse is true.

All series are in nominal terms. The method of estimation is ordinary least squares. Student-t statistics are indicated in parentheses and R^2 is adjusted for degrees of freedom. All equations are estimated from annual data, but the sample period varies. A dummy (D) variable is included in the model for Trinidad to capture the effects of the oil boom.

Government investment is defined as government capital expenditure. Private investment is total investment less government investment. Foreign savings is total investment less domestic savings. This definition is only applicable to the models for Trinidad and Jamaica. A foreign savings variable could not be estimated for Barbados because of the unavailability of national income accounts based on the income approach. Thus a measure of capital inflow was adopted as a proxy for foreign injections into the Barbadian economy. This capital inflow variable is defined as the sum of net capital inflow and financing made available through the International Monetary Fund (NKI).

Trinidad and Tobago

All models for the Trinidad economy showed a good fit. This is based on the R^2, F and Durbin-Watson statistics. GDP is significant at the five percent level in all models. In the general model (i), every dollar increase in gross domestic product results in an increase in private investment by $0.34. The coefficient in the other models vary between 0.26 and 0.45.

Government investment (I_g) is significant at the five percent level in four models. However it is inversely related to private investment (I_p). Thus, the crowding out hypothesis holds in the Trinidad and Tobago economy at least for the period under study. This coefficient is also quite high. For each dollar invested by the government approximately $0.50 of private investment is crowded out. This result indicates substitutability between the public and private sector investment. That is, both the public and private sectors compete for the same amount of physical and financial resources and because of the dominating role in developing countries, the former is able to siphon resources for its use at the expense of the private sector.

The coefficient of the loan rate (WLR) is negative but insignificant. Increases in interest rates, lead to an overall increase in costs and an eventual decline in private investment. However this negative impact is not statistically significant. This relation-

ship suggests that investors in Trinidad behave in a manner consistent with Keynesian theory. A possible reason for the insignificance of the coefficient might be that the interest cost as a percentage of total cost is very small.

The coefficient of credit to the private sector is of the wrong sign a priori and statistically significant. This perverse result may be due, in part, to the rapid growth and high level of consumption during the period under study. With low real interest rates and a high level of liquidity in the system (due to the massive inflow of oil revenues) much of private borrowing was for consumption purposes rather than for investment, and rapid growth in private credit was not marked by growth in private investment.

The results indicate that foreign savings are an important determinant of private investment. The coefficient has the correct sign and it is significant. Approximately one quarter of all foreign savings is channelled into private investment. With high levels of consumption, foreign savings to some extent filled the gap created by the shortage of domestic savings in facilitating investment.

A model is estimated for the longer period 1960-87. Gross domestic product, government investment, the prime loan rate and a dummy variable are included as explanatory variables. Based on the R^2, F and D.W. statistics, the fit of the model is good. GDP is

significant at the one percent level. Government investment and the prime loan rate are both insignificant and inversely related to private investment. The coefficient of I_g is small (-0.09) indicating that over the longer period crowding out was not as severe. The dummy variable is significant at the ten percent level.

Jamaica

The models for the period 1977-1987 performed well based on the R^2, F and D.W. statistics. Model (i) and (iii) for the longer period 1967-87 were corrected for autocorrelation.

In the models for the longer period, gross domestic product is significant at the five percent level. The size of the coefficient is smaller than that of Trinidad. Government investment is negative and significant at the one percent level. The size of the coefficient is almost on average twice the coefficient in the Trinidad and varies between 0.82 and 1.07. Thus, government investment almost totally crowds out private investment, and may even result in a decline in total investment.

The sign of the interest rate (PLR) indicates that investors' behaviour is consistent with Keynesian theory. This variable is significant in model (i), unlike in the Trinidad models where it is insignificant in all models.

Credit to the private sector is directly related to private investment unlike in the Trinidad and Tobago economy. In Jamaica credit contributes to private investment, however the size of the coefficient is small and insignificant, indicating that only a small proportion of credit to the private sector finds it way into private investment.

Foreign savings appear to be the most important determinant of private investment. It is significant at the one percent level and the coefficient is quite large. Approximately half of all foreign savings is channelled into private investment, twice the amount that is directed into private investment in Trinidad.

Based on the R^2, F and D.W. statistics the models estimated for the shorter period (1977-87) perform better. Also the model that included the prime loan rate had a better fit than that which included the weighted loan rate. Gross domestic product is significant at five percent. The coefficient of government investment is negative, significant and greater than one. During this period, government investment clearly crowded out private investment to such an extent that a fall in total investment occurred.

The interest rate (PLR) is significant at the 10% level only. The sign of the coefficient is consistent with Keynesian economic theory. In model (iii) the weighted loan rate (WLR) is substituted

for the prime loan rate (PLR). While it has the correct sign a priori it is insignificant. Thus the weighted loan rate, when employed, in both the Trinidad and Jamaica models proved to be insignificant in influencing private investment.

In the model for the shorter period, credit to the private sector has a negative impact unlike in the longer period. As in Trinidad credit fuelled some form of expenditure that was inversely related to private investment. This might have been possible because of expenditure on consumption goods. Foreign savings are positive and significant with a coefficient of 0.45.

Barbados

The investment models for Barbados do not perform as well as those for Jamaica and Trinidad based on the R^2 and F statistics. Gross domestic product is insignificant, unlike in the other countries and the coefficient is quite small. This is surprising because income is usually an important determinant of investment.

Government investment is positively related to private investment. It is significant in two models at the ten percent level. Thus the crowding out hypothesis does not hold in the Barbadian economy at least for the period under study. Thus government investment actually complements private investment. The coefficient varied between 0.74 and 1.33, suggesting that for every dollar increase in

government investment private investment increases on the average by a dollar. This is the opposite of what was observed in the Jamaican economy.

In two models the interest rate (PLR) was significant at the ten percent level. It is directly related to private investment. This is in conflict with the results pertaining to Jamaica and Trinidad. The evidence here refutes an application of the Keynesian theory to the Barbadian economy. Rather, it may be seen as an acceptance of the McKinnon-Shaw hypothesis according to which, rising interest rates lead to a rise in the level of savings. This in turn facilitates an increase in the amount of resources that is available for investment, and rations out all low yielding inefficient investments. As a result interest rates and investment are directly related.

This positive relationship could also be rationalized from the internal rate of return perspective. Increases in interest rates would not lower the level of investment as long as the return on a project is greater than the interest cost. That is, investments would be undertaken as long as the internal rate of return is higher than the interest rate despite increasing interest rates.

Credit to the private sector is inversely related to private investment as in the Trinidad and Tobago economy, but it is insignificant. Credit does not appear to facilitate investment.

Individuals borrow from the financial system and instead of undertaking investment, there seems to be a tendency for increases in the level of consumption. Nevertheless the coefficient is quite small and the impact on investment though perverse is not substantiated.

The foreign inflow variable (net capital inflows) is positively related to investment but insignificant. This is surprising because of the openness of the Barbadian economy. A possible reason for this result might be found in the definition of foreign inflows. Perhaps if foreign savings were included, the real significance of a foreign inflow variable would have been captured.

POLICY IMPLICATIONS

The evidence indicates that crowding out exists in Trinidad and Jamaica. On this basis the monetary/fiscal authorities should take great care when advising on the financing of government investment projects. Projects undertaken by the government should ideally seek to augment and enhance those by the private sector. Investments must be scrutinized in order to ensure that government investment complements private investment and not displace it.

In Barbados, government investment is complementary to private investment. Perhaps Jamaica and Trinidad could examine the process by which this relationship is achieved and follow a similar course

of action.

In Trinidad, Barbados and Jamaica (model for the shorter period) credit to the private sector is inversely related to private investment. Based on this result the authorities should borrow from the financial system, as a consequence the amount of credit available to the private sector will fall. This will result in an eventual decline in consumption expenditure by the private sector. If some action along these lines is embarked upon, financial crowding out would not take place because the funds borrowed by the government sector would not have been spent on investment by the private sector. Thus, by borrowing from the financial system, the government is not reducing funds available to the private sector for investment purposes. Instead they would be tapping into resources that would have been spent on consumption.

The results of the model for Jamaica over the longer period indicates that some proportion of credit to the private sector finds its way into private investment. Although the coefficient is small and insignificant it shows that there is potential for channelling credit into the private sector investment. Perhaps if more attractive investible projects were available then a larger proportion of credit would be invested.

In Trinidad and Jamaica, investors behave in a manner that is consistent with Keynesian economic theory. In Trinidad the

interest rate variable is insignificant. This indicates that if the monetary authorities decide to lower the rate of interest in an attempt to increase the level of private investment the realized impact would not be statistically insignificant. Thus if investment is to be increased in the Trinidad and Tobago economy, the monetary authorities should concentrate their efforts elsewhere, as investment appears to be not interest rate sensitive.

In Jamaica (1967-87) the result is somewhat ambiguous. According to model (i) significant increase in investment can be realized if interest rates fall. Thus, if the monetary authorities wish to boost investment, the interest rate, as a tool can be manipulated. However in model (ii) the result is similar to that for Trinidad. When the prime loan rate is employed for the period 1977-87, the former is true, while the latter is true in the model that replaces the prime loan rate for by the weighted loan rate.

In Barbados the positive relationship between the loan rate and investment indicates that the monetary authorities cannot induce a rise in the level of investment by lowering the level of interest rates. Rather increases in the interest rates bring about increases in the level of investment. However through the medium of increased savings, and the rationing out of low yielding investment projects, the level of investment may rise.

Foreign savings are important in facilitating private investment. Based on this result the authorities should ensure that as much foreign savings as possible are directed into private investment. Foreign savings absorbed in investment may have an additional benefit. Savings usually involve interest payments in the future. If foreign savings are spent on investments which are profitable then future interest payments could be afforable. If however the foreign savings are spent on consumption goods, then no returns would be forthcoming and interest payments by the recipient country could be a net charge on that economy.

CONCLUSION

In this paper we have begun to study investment behaviour in the Caribbean. The empirical results are interesting. Interest rates are generally less important in influencing investment. The need to avoid crowding oút in these economies should be of utmost concern. It is also important that credit to the private sector be directed into investment. The monetary authorities should ensure that inflows of foreign savings be channeled into private investment.

APPENDIX

APPENDIX I :EMPIRICAL RESULTS

TRINIDAD (1967-1987)

	Constant	GDP	I_g	WLR	PLR	D	C_p	S_f	R^2	D.W	F
(i)	719.3 (0.961)	0.341 (2.448)	-0.480 (-1.966)	-97.7 (-1.014)		317.2 (1.588)	-0.622 (-2.018)	0.298 (2.772)	0.897	2.16	30.1
(ii)	901.6 (1.161)	0.454 (3.613)	-0.626 (-2.634)	-122.5 (-1.231)			-0.854 (-3.011)	0.198 (2.165)	0.887	2.01	32.3
(iii)	-26. 9 (-0.195)	0.260 (2.276)	-0.360 (-1.685)			350.4 (1.778)	-0.495 (-1.755)	0.305 (2.841)	0.8968	2.22	35.8
(iv)	924.9 (1.074)	0.344 (2.699)	-0.448 (-1.811)	-114.2 (-1.035)			-0.502 (-1.936)		0.861	2.06	31.8
(v)	-37.62 (-0.255)	0.365 (3.498)	-0.491 (-2.292)				-0.721 (-2.694)	0.194 (2.086)	0.883	1.98	38.7

TRINIDAD (1960-1987)

(i)	4I9.4 (0.692)	0.123 (3.856)	-0.918 (0.848)		-41.08 (0.473)	180.73 (1.599)			0.893	2.32	54.4

JAMAICA (1967-1987)

	Constant	GDP	I_g	WLR	PLR	C_p	S_f	R^2	D.W	F
(i)	303.1 (1.331)	0.211 (4.748)	-1.071 (-6.943)		-61.18 (-3.091)	0.061 (0.868)	0.524 (8.108)	0.856	1.44	24.4
(ii)	-28.53 (-0.097)	0.218 (2.489)	-1.268 (-4.467)		-4.175 (-0.105)	0.146 (1.077)		0.71	1.98	13.37
(iii)	-82.39 (-0.618)	0.106 (2.753)	-0.831 (-4.801)			0.069 (0.764)	0.440 (5.575)	0.763	1.82	17.02

JAMAICA (1977-1987)

	Constant	GDP	I_g	WLR	PLR	C_p	S_f	R^2	D.W	F
(i)	256.8 (0.601)	0.331 (2.000)	-1.114 (-5.157)		-86.17 (1.387)	-0.227 (-0.553)	0.458 (3.612)	0.938	1.97	31.36
(ii)	58.81 (0.267)	0.246 (3.922)	-1.090 (-5.477)		-57.10 (-1.830)		0.410 (4.669)	0.945	1.99	44.24
(iii)	-26.331 (-0.087)	0.201 (1.974)	-1.040 (-4.883)	-31.18 (-1.035)		0.023 (0.068)	0.432 (3.234)	0.929	2.41	27.29

BARBADOS (1974-1987)

	Constant	GDP	I_g	PLR	C_p	NKI	R^2	D.W	F
(i)	-83.69 (-0.658)	0.031 (0.596)	0.935 (0.862)	18.34 (1.308)	-0.056 (-1.196)	0.231 (0.736)	0.59	1.83	4.78
(ii)	-108.79 (-0.907)	0.024 (0.480)	1.340 (1.471)	22.12 (1.741)	-0.101 (-0.372)		0.60	1.73	6.16
(iii)	-68.08 (-0.731)	0.023 (0.800)	0.747 (1.489)	16.45 (1.708)		0.242 (0.842)	0.64	1.78	6.68

APPENDIX II: DATA

TRINIDAD

	I_p	I_g	GDP	WLR	PLR	C_p	S_f
1960	230.9	37.4	918.3		6.50		176.7
1961	197.1	61.7	1002.8		7.50		172.0
1962	237.6	57.8	1061.7		7.00		208.8
1963	216.2	59.6	1162.7		6.50		205.7
1964	195.8	78.5	1220.4		7.00		224.7
1965	268.0	57.6	1262.7		7.00		303.8
1966	223.2	62.9	1240.7		7.75		173.9
1967	178.8	54.4	1324.4	8.11	7.63	181.5	155.8
1968	228.2	72.4	1517.8	8.02	7.50	194.7	176.2
1969	196.9	70.9	1558.4	8.17	8.00	266.7	221.6
1970	315.3	109.7	1643.7	8.62	7.72	327.4	163.2
1971	484.7	117.1	1771.0	8.43	7.38	358.8	399.8
1972	532.0	119.9	2081.5	8.18	6.88	500.5	523.5
1973	557.0	108.5	2654.2	10.26	9.13	584.7	268.3
1974	627.7	287.5	4192.7	10.66	9.13	654.3	-116.4
1975	1095.8	353.5	5300.1	10.11	8.25	880.0	-391.5
1976	690.4	805.1	6090.5	9.80	7.75	1244.7	-120.4
1977	1028.4	979.1	7532.8	9.09	8.25	1763.1	239.8
1978	1302.2	1281.4	8549.6	9.94	8.50	2336.1	527.0
1979	1526.8	1686.2	11045.8	10.74	10.00	2734.0	785.1
1980	2189.0	2391.3	14966.1	11.70	11.00	3314.3	44.7
1981	1359.5	3181.1	16438.0	12.35	11.25	4068.7	38.9
1982	1833.5	3583.6	19175.5	12.67	11.50	4872.1	3007.1
1983	2544.4	2540.0	18719.4	12.31	11.50	5670.4	3938.1
1984	2179.8	2010.8	18826.8	12.65	12.75	6071.1	2723.3
1985	1496.8	1645.1	18076.8	13.41	12.50	5839.7	2011.8
1986	2134.4	978.3	17242.4	13.14	12.00	5908.9	3112.7
1987	1566.0	851.7	16571.5	11.70	11.50	6091.3	2140.2

BARBADOS

	I_p	I_g	GDP	PLR	C_p	NKI
1974	131.7	37.5	702.9	11.00	272.6	27.9
1975	108.0	48.3	812.4	9.75	302.1	59.7
1976	176.5	60.4	873.5	8.00	344.0	50.0
1977	110.4	83.7	993.6	7.75	369.2	94.6
1978	183.2	71.3	1112.0	8.25	407.5	61.0
1979	230.4	86.8	1349.4	8.25	484.2	13.1
1980	285.4	138.9	1730.6	9.25	574.8	87.7
1981	351.8	173.1	1905.0	13.50	702.3	277.4
1982	337.8	112.7	1990.0	11.75	730.3	124.5
1983	294.4	126.7	2112.7	10.50	818.4	132.8
1984	239.5	134.4	2302.8	11.00	874.0	22.9
1985	226.7	146.1	2409.9	9.12	908.7	-17.2
1986	258.7	165.1	2646.0	8.50	941.0	3.6
1987	455.4	191.3	2913.8	8.50	1026.3	144.9

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