Production, prices and incomes in the Caribbean economy: A basic model

Vanus James

Introduction

This paper presents a model of production, prices and incomes in the core of the Caribbean economy, in the tradition established by Lewis and the Plantation Economists. The core economy is defined following Lewis (1954; 1958b; 1972:78) as that part of the economy in which production occurs with reproducible capital and wage-labor. Lewis' reproducible capital is a set of produced means of production with associated money value, activated and manipulated through underlying domestic and international competition and capitalist social relations.

In the tradition of the Plantation Economists, the Caribbean economy is identified by the necessity for transformational growth and economic development to be led by a (residential) sector producing product-cycle commodities and achieving worker speed-up as conditions for generating and realizing surplus. This contrasts with other economies whose economic development can be led on a sustained basis by sectors which derive competitive advantage from abundant supplies of natural resources or primary factors of production.

The data of the model is organized in a Social Accounting Matrix (SAM) which essentially compresses an aspect of that introduced by Best (1968) and Best and Levitt (1969) and updates it conceptually to reflect modern levels of interdependence. Thus, the model utilizes a refined version of their classification of productive activity into residential and staple activity. Residential high earnings activities are distinguished from others by the necessity to succeed in competition mainly by producing, product-cycle commodities and fostering increasing worker efficiency. The founding concepts in this classification are the early descriptions of the peasant economy (Lewis, 1949/50), the people's sector (Williams, 1962, 1964) and even the more recent low-wage, capital-starved, largely informal sector (World Bank, 1994). However, the choice of classification is fundamentally a reflection of the importance attached to product-cycle commodities in successful international exchange (Forstner and Ballance, 1990; Root, 1996). It also reflects an attempt to follow Lewis's method, borrowed from "the classics, from Smith to Marx," of explaining entrepreneurship and the rate of surplus accumulation in the Caribbean mainly through class-formation, in particular the emergence of a subclass of residential capitalists (Lewis, 1954: 139, 159; James, 1997).

It should be noted that although the data and model are presented in a 2 sector format to facilitate focus on the essentials, extension to a more general n-sector format can be readily done as long as the essential disaggregation is preserved. Monetary flows are excluded from the data matrix for convenience but the foundations for their analysis are laid by use of worker speed-up to generate endogenous surplus.

In developing the model, the Caribbean economy is assumed to be open to international exchange from the start and no effort is expended on popular concerns about autarky. On the production side, the model which is presented follows Lewis in explaining the growth of output through the level, distribution and accumulation of surplus, but does so with the sectors and dynamics of the Plantation Economists, and hence with a leading role for residential activity and worker speed-up. Correspondingly, the rate of exports, consumption, and the balance of payments are all cast in a nexus with variable worker efficiency. In this regard, the model differs fundamentally from the special neoclassical production models which assume that efficiency is fixed at the maximum level, and from Lewis and other neoclassical models such as Metcalfe and Steedman (1979) in which the variable is not formally incorporated even in the presence of surplus and profit. Similarly, from the perspective of domestic and international exchange and distribution, the model explains relative prices, profits and the terms of trade through the going social wage and variable worker efficiency. No strict duality is presumed as in neoclassical models. Rather, the conditions for duality are identified and turn out to depend on the trade balance.

Another feature of this model might also be considered novel. Models which influence the formulations in this paper, including those of Lewis and Metcalfe and Steedman (1979) disaggregate the economy into capital goods and wage goods sectors and do not address technical change and taste formation. Adoption of the sectoral classification of the Plantation Economists seems to point to a novel approach to
technological change (and to a lesser extent taste formation) in economic theory by treating information, product, and process innovations as a composite output of a specific production sector which can also be used as capital by other sectors. Of course, while the modeling technique might shed light on how to address the unsolved problem of taste formation in economic theory, the issue is not discussed directly in the paper. In fact, the whole problem of choice is eliminated by assuming that each worker has a lexicographic utility function and therefore buys goods and services in fixed proportions using their wage.

The model presented helps to clarify why it could be true, as claimed by the Plantation Economists (Best, 1968, 1980; Best and Levitt, 1969), that long-run Caribbean transformation rests primarily on the dynamics of the residentiary sector. Indeed, the results could be treated as specifications of necessary conditions for successful development led by the residentiary sector. This issue has commanded a substantial amount of the attention of social scientists in the Caribbean since World War II. In its essentials, it was first considered formally by Gallotti (1948). Gallotti, having recognized the rise (and the employment potential) of a substantial residentiary sector in the Caribbean, nevertheless argued that the latter was unlikely to form the basis of long-run development led by the logic of Ricardian comparative advantage, its development would be limited by supply factors such as inadequacy of power, of capital and of labor skills, and by demands factors such as small local markets and inability to compete in large markets with European and American industries (Gallotti, 1948: 29, 30, 234, as quoted in Best, 1980:7). And, even while he disagreed with Gallotti about the potential for industrial development in the region, Lewis (1949-1950:1) held that, by 1949 the process of development through the peasantry had gone as far as it could (James, 1997:3,4).

The organization of the paper reflects an underlying concern with the conditions of successful socioeconomic development and the design of development policy which preoccupied Lewis and the Plantation Economists. Caribbean economic development essentially has three dimensions. The first is the general expansion of production in the core high earnings economy which concerned Lewis describe under steady state conditions and the basic system of prices which underwrites domestic and international exchange, and income creation and distribution. The second is the process of transformation growth from staple domination of the economy to residentiary domination, since residentiary production is defined to embody the domestic capacity for product-cycle output and worker speed-up. The third aspect of development is the absorption and integration of the low earnings activities and households into the high earnings sectors (Lewis, 1958: 45), associated employment creation and the adjustment of the distribution of incomes within and between receiving accounts. This aspect is not discussed here but the analyses of production, prices, transformational growth and incomes provide the foundation for in future work in this area.

The model: production, prices and incomes

The model of the core Caribbean economy recognizes production as work with produced capital by employed workers. Indeed, the speed of work is modeled explicitly, partly as a way of representing the underlying social system which elicits work and endogenous surplus. Production sectors are disaggregated to isolate those which might serve as the engine of growth in the sense of tending to transform others while emerging to donate the economy. Here, we follow Lewis (1954, 1958) and identify those activities which either currently yield high earnings or have a theoretically reasonable potential of doing so; the low earnings sectors are the complement of this set. We also follow Best (1968, 1980) and distinguish between the composite of high-earnings residentiary activities ($X_R$) which actually or potentially generates high earnings through worker speed-up or product-cycle output and the composite of high-earnings staple activities ($X_p$), including traditional exports (such as oil, bauxite, sugar, arid coffee) which, though important in determining short run capacity to import, have reached the limits of their capacity to generate product-cycle output and worker speed-up.

For residentiary producers to accumulate in the face of capitalist competition, they must generate increasing surplus and hence must continually increase the speed of work above subsistence levels. The rate of profit is integrally linked to the efficiency with which labor produces surplus. Rising worker efficiency converts more means of production into output per unit period, increases surplus production, keeps down unit
costs, and hence improves competitive advantage. If workers were to slow down sufficiently, the surplus would be eliminated entirely and existence would be at the subsistence level. Further, any output produced must also be marketed since sale is not guaranteed to any unit in a market economy. To win markets, residiary firms must ensure that their commodities have a product-cycle character endowed by product and/or process innovation. It follows immediately that residiary activity is not to be confused with either founding subsistence production or informal production.

It is not worthwhile to begin the analysis of Caribbean economies with data designed to extract theorems of autarky. Notions of autarky have no counterpart in Caribbean history and illuminate very little about all economy which was developed as an exporting unit from its inception. The historical dependence on imports and on metropolitan institutions and creative initiatives in the nonresidency system implies that the trading institutions display few, if any, of the self-sufficiency characteristics of pricing and production characteristics associated with viable autarky. Import (and hence balance of trade) constraints on the development of production and price formation must be repressed in each modeling step along with all other essential aspects of the terms of international exchange.

Emergence of a self-reliant (as distinct from self-sufficient) residiary sector (from within the traditional subsistence economy) means that, in contrast to traditional neo-Ricardian open economy models such as Steedman and Metcalfe (1979), a model which describes the core of the Caribbean economy must assume two export (tradeable) commodities and no commodity which cannot be exported and is nontradeable in the sense intended by Little and Mirrlees (1974). The matrix of technical coefficients must be specified to reflect the use of capital goods and consumer goods in the production of residiary and staple output. We assume that each type of output can be used either as a capital good or as a consumption commodity. Further, it is assumed that there are two binding primary inputs which cannot be produced by the country's production system; labor-time (or worker effort) and imports. We ignore the problem of a binding land constraint.

The paper sets out a general model of production and prices in a typical Caribbean-type economy. It assumes the going social wage, variable worker efficiency and the technical data of production set out as a single chosen technique. Variable worker efficiency is also treated as a method of representing the nature of the social framework of production. To eliminate the problem of consumers choice, it also assumes that consumers have lexicographic utility functions. The model also admits of an open economy from the start and assumes a small country pricing constraint on exports of staple. On this basis, and using a disaggregation of the economy into staple and residiary activities, relations were derived logically which explain growth, exports, consumption, and the balance of payments, on the one hands, and relative prices, profits and the terms of trade, on the other.

The rate of output per worker and the rate of exports from each sector is a function of the integrated technical coefficients of the economy, the steadystate rate of growth and the level of final consumption and export demand. In particular, the rate of staple output and exports adjusts interdependently with the rate of residiary output through the integrated technical conditions, the speed of work in the residiary sector, and the money-valued balance of trade which include residiary exports. Domestic relative prices and the terms of trade between imports and staple similarly depend on these integrated factors.

Underlying the output relations is an equilibrium condition which features a nexus of the rate consumption of both residiary and staple output, the rate of economic growth in both sectors and the associate efficiency of labor. Also, underlying the price relations is an equilibrium condition defined in terms of a nexus of the real wage bundle which includes residiary output, the efficiency of labor and the rate of profit as well as the real-wage denominated rate of exchange and costs of imports. Just as important, it is clear that the real price of imports and staple which are used in these relations are functions of the efficiency of labor, the rate of profit, the terms of trade, the real rate of exchange, and the integrated labor and imports coefficients of production of both residiary and staple output.

Moreover, there is no general duality between the production and price aspects of the economy as suggested in neoclassical models; indeed, it is found
that conditions for duality are derived in terms of the behavior of the balance of trade. In particular, duality exists only if trade balances exactly and the speed of work is fixed at its maximum rate. It follows that the adjustment of output in the economy depends directly on the relative price of residiatory output.

**Results and conclusions**

Looking from the perspective of development, it was shown that a path of transformational growth can be derived in terms of the rate at which the economy can increase its output of residientiary commodities per worker. The model implies that a condition for such residientiary expansion is that staple output must grow at a commensurate rate. There is reasonable justification to emphasize the short-run importance of promoting expansion of the staple sector in the process of transforming the Caribbean economy.

Finally, the SAM was used to generate equations describing the income accruing to the household and other institutional accounts as a function of injections into the various activities and sectors of the sistem. The economic data in the multipliers of these equations take account of income and final consumption effects as well as interindustry linkage effects. Also, the incomes of any account depends on injections in all sectors together with these highly integrated multipliers. An important reason for this high degree of interaction between injections and multipliers in determining income is that, rather than serving as a leakage, value-added generates direct interindustry consumption and other demand linkages which stimulate domestic production and trade in the multiplier process. The more general multipliers of the income model are expected to be larger than more traditional Lewisian and NeoRicardian multipliers which are based on data representing only the interindustry effects.

In general, taking the assumptions of the model as specified, there are logically consistent theoretical foundations for agreeing with the Plantation Economists that the transformational growth path of the economy can be reasonably well-described in terms of the dynamics of output price formation and income in the domestic sector in which initiatives to innovate and speed-up work are concentrated, that is, the residientiary sector. This means that, looking from the perspective of the implications of the chosen generalizations of the model, it is reasonable to hold that it might be true that the development of the economy depends significantly on the dynamics of residientiary growth. Social scientists might benefit from efforts to study many aspects of the Caribbean development process from this perspective.

**References**


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* Coordinator, Policy development Unit, Planning Office of Jamaica.