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THE USE OF ECONOMETRIC MODELS IN DEVELOPING COUNTRIES

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## 1. Introduction

The question of stabilization within a framework of national income determination models has not been the major concern of either empirical and theoretical macroeconomic analysis in the developing economies. In a recent survey of the state of the art regarding the use of economy-wide models for LDC's, for example, Blitzer et.al. (1974) does not even include a chapter on macroeconomic income-determination models.

The dominant frameworks for macroeconomic policy analysis and policy recommendations, instead, have been provided by Harrod-Domar aggregate-growth models, static and dynamic linear-programming models and Chenery two-gap models <sup>1/</sup>. Assumptions which generally are made in the construction of these models include: (i) that the degree of capacity utilization, the rate of inflation, and the level of aggregate demand are not important considerations; (ii) that the financial constraints on government and central bank behavior (and, thus, the entire fiscal-monetary-income-international policy-inflation nexus) can be ignored; (iii) that short-run flexibility is limited because elasticities of substitution between labor and capital are practically zero, because short-run price responses are very low, and because any responses which do occur are distributed over long time periods; and (iv) (at least for the programming models on which the greatest resources have been expended) that the most interesting question is "what could happen if socially optimal readjustment of the economy occurred in response to policy changes", rather than "what would happen if the independent economic units which make up the economy followed their traditional behavioral patterns in response to such

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<sup>1/</sup> Examples include Adelman and Thorbecke (1966), Blitzer, Clark, and Taylor (1975), Cabezón (1969), Chenery and Strout (1966), Clark and Foxley (1970, 1973), Eckaus and Parikh (1968), Manne (1974), UNECAFE (1960), and UNCTAD (1968).

changes" <sup>1/</sup>. The resulting models usually include only real phenomena and are characterized by supply bottlenecks due to either foreign exchange or capital constraints.

Such an emphasis reflects two widely-held views. (1) Growth is a relatively more important economic objective (and stabilization less important) in the developing countries than in the developed countries. (2) Income-determination models are of limited value for developing economies <sup>2/</sup>.

Some exceptions to the predominant view have long existed. The participants in the "structuralist-monetarist" controversy in Latin America, for example, have accorded significant importance to inflation and stabilization policies in the development process <sup>3/</sup>.

These exceptions, have been increasing in number. The recognition of considerable underutilized capacity, particularly in cyclical downturns, has increased interest in the use of national-income-determination models for stabilization purposes. Numerous partial-equilibrium econometric estimates have been made which imply significantly nonzero elasticities of substitution and significant responses in both capacity utilization and capacity creation decisions <sup>4/</sup>. Even the strongest advocates of supply-oriented capital-and-foreign-exchange-constrained analysis seem to be having second thoughts about the importance of

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<sup>1/</sup> "Socially optimal" is used here not to imply that externalities are incorporated but to mean that which maximizes the objective function given the constraints imposed by the model itself, starting and terminal conditions, and exogenous variables. Some limited aspects of behavioral responses, of course, are incorporated in these studies, such as the sectoral pattern of income elasticities for private consumption.

<sup>2/</sup> Rao (1952) presents an early statement of this view. Ranis (1974) gives a recent summary.

<sup>3/</sup> For good summaries of the "structuralist-monetarist" debate, see Campos (1964) and Wachter (1974).

<sup>4/</sup> Behrman (1968) summarizes many of these estimates which relate to agricultural supplies. Morawetz (1974) gives references for a number of studies of elasticities of substitution. Behrman (1971a, 1972a, 1972b, 1972c, 1973a, 1973b, 1973c, and 1975c) and Behrman and García (1973) present sectoral estimates for the Chilean experience.

short-run factors and stabilization problems. For example throughout the above-cited survey by Blitzer et.al. (1975), references to the need to treat short run features (e.g., prices responses, capacity-utilization determination, aggregate-demand-related policies) are frequent.

Recently, because of this growing interest in stabilization and other short-run problems, a large number of Keynesian-based national-income-determination models have been constructed and utilized for the developing economies 1/.

A basic problem with the construction and use of these models for policy-making purpose in developing economies is the general lack of accurate, up-to-date information (for example quarterly information on output and its components and sectoral or cyclical indicators which are available with a short time lag). This is a gap which at present forces policymakers to act on incorrect or dated information 2/. It also means that income determination models of developing countries are annual, rather than quarterly. However in the developed countries such models have been "most successful" in predicting output in the

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- 1/ For examples for developing economies in different parts of the world, see Acquah (1972), Bank of Korea (1971, 1972), Behrman and Klein (1970), Beltran and Klein (1971), Bhuiyan (1971), Corbo (1971) Dutta and Su (1969), Hassanein (1970), Islam (1965), Kim, Nam and Lee (1969), Krishnamurthy (1964), Mahertz (1971), Marwah (1964, 1969), Marzouk (1969, 1974), Naranjo (1972), Nugent (1965), Pandit (1971), Panlopulos (1966), Ramagkura (1971), Song (1972), UNCTAD (1968), Yoon (1971), and Yu (1970). Beltran (1974) summarizes the features of many of the Latin American models. Larry Lau has compiled a bibliography of 200 such models, of which 50 related to L. America.
- 2/ For example R. French-Davis (1973) shows that the Klein-Saks stabilization program was originally thought to have failed when inflation doubled in 1958. Reestimates of prices show the rate was approximately constant over the 1957-1958 period. While the social costs of this stability also may have been judged too high, the facts of the case were substantially different than those that went into the original decision.

/next quarter

next quarter or six months; over a nine or twelve month period simple trends are often as good <sup>1/</sup>. Thus improvement in modelling may require an investment in improving the data base, an investment which has the additional pay off of providing more accurate and up-to-date information to policymakers <sup>2/</sup>.

There remains the more philosophical question of our present ability to forecast and affect the very short-run, and its corresponding effects on the long run. However political pressures force governments to accept some advice and take some action in the very short-run, often to the detriment of the long run. Therefore it is probably best for economists to offer advice on the short-run and short run-long run tradeoffs, while specifying the fragile nature of the advice.

A second problem results from a simplistic transfer of aggregate-demand models of developed economies, with little or no adjustment for the special conditions in the developing countries. In consequence numerous shortcomings occur in the model's specifications, shortcomings which are perhaps not as important in the developed country context. For example: (1) National income is determined by aggregate demand in a Keynesian fashion, with no testing for the existence of possible constraints due to the stocks of capital or labor, the supply of foreign exchange, or supply limitations imposed by quantitative restrictions <sup>3/</sup>. (2) Underemployed or surplus labor and dualism in the labor market are not explicitly incorporated. (3) Aggregation is so great that there is no possibility of capturing the impact of policies on relative prices, even though economists like Hansen (1973b) have maintained that policies in developing nations are primarily reflected

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<sup>1/</sup> See Zarnowitz (1967).

<sup>2/</sup> See Behrman and Hanson (1975) and Behrman (1975d) (1975a) for an attempt to develop such a data base and use it in constructing a quarterly model of a developing economy.

<sup>3/</sup> See Barro and Grossman (1971) (1974) (1975) for a theoretical framework of supply as well as demand restraints which determine income for an economy is not in general equilibrium.

in altered relative prices and Wachter (1974) has demonstrated, econometrically, the structuralist proposition that differing speeds of adjustment of relative prices may result in inflation. The possible importance of intersectoral flows, moreover, is lost by the high level of aggregation. On the other hand data problems are often cited as preventing disaggregation to any significant level, and there remains the question of whether disaggregated models provide more accurate projections of aggregate variables, and to what extent such model divert attention from more global problems, such as the financial-monetary-international-income nexus. (4) Potential policy variables are often overlooked. For example it is often assumed that an over-valued exchange rate will be maintained through a continuance of exchange control. (5) The significance of the foreign sector as a source of non-competitive, intermediate imports and of capital goods, as well as government finance and household asset holdings is not well presented. (6) The importance - due to fragmented and poorly functioning capital markets - of direct flows and retained earnings in the real investment process is not explored. (7) The degree of endogeneity of fiscal, monetary and international variables and their interrelation in poorly functioning capital markets is ignored, with the result that policy options are overstated. (8) There is little attempt to integrate the short-run income determination model with long run development models. In particular, though plant and equipment decisions are well treated, no attempt is made to study human capital formation, despite the growing evidence on its significance, in development, and the role of social overhead capital, long emphasized by such leading development economists as Rosenstein-Rodan (1961), is not explored <sup>1/</sup>. (9) There is a tendency to ignore economy wide disequilibrium <sup>2/</sup>.

<sup>1/</sup> Many of the studies previously attempt to correct one or two of these shortcomings. Nevertheless, the list of shortcomings in any specific study generally is quite large. For example, one well known study of Chile, Corbo (1971), considers the problem of an endogenous money supply and includes supply constraints, but does not avoid most of the other shortcomings listed in the text. Moreover in the simulations of that study, because of convergence problems, excess demand is exogenized so that there is no link between monetary and real variables or the money supply and prices.

<sup>2/</sup> See Barro and Grossman (1971) (1974) (1975) and Behrman (1975c)

At the same time that interest in and use of stabilization models for the LDC's has been growing, controversies have emerged over the specification of income-determination models for the developed economies. In the past decade, critics have claimed that deficiencies in the theoretical structure deficiencies which may be related to points 1-9 above, make any analysis of stabilization policies based on such models suspect. Recently, however, some convergence seems to have occurred at least in regard to the nature of the issues. Ando (1974), Blinder and Solow (1973), Hansen (1973a) and others have attempted to adjust the IS-LM model to explore these controversies.

Given some convergence on the nature of stabilization issues in the developed countries and given the increasing preoccupation with stabilization problems in the developing countries, the time seems ripe to re-examine the applicability of modern stabilization analysis to the special situations of the developing countries. This paper begins such an attempt.

The strategy pursued in the paper is to examine briefly in turn, each of the components of recent models for stabilization in developed economies. Then the paper considers how they need to be altered for analysis of stabilization in developing economies. A recent model of one developing economy - Chile - and a study in process of Panamá are considered as examples with emphasis on the question of how successfully do these examples succeed in incorporating the important features of these particular developing economies <sup>1/</sup>.

The prototype model for the developed economies used as a starting point combines the features of the closed economy model of Ando (1974) and the analysis of international capital movements of Branson (1974).

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<sup>1/</sup> At least a paper, if not a book, could be written on data problems. In this presentation some allusions are made to these problems, but they are not treated systematically so that the paper can be kept of a manageable length.



This model is somewhat complex in order to incorporate a number of features discussed in recent controversies. Solution by differentiation does not lead to simple elegant expressions. For understanding of it beyond that provided below, the reader is referred to the papers by Ando and Branson.

The Chilean model which is used as an example is the 172 endogenous variable annual macroeconometric model for 1945-1965 presented in Behrman (1975c). It is a nine-sector model with capacity creation, capacity utilization, export, import, price and wage determination relations for each sector. Consumption-savings decisions are estimated for households and nonprofit institutions, business, and the government. Many aspects of government fiscal and monetary policies are endogenous. In its specification the attempt is made to overcome the eight common shortcomings frequently encountered in Keynesian-based national-income determination models for developing economies which are listed above. For understanding of this model beyond that provided below the reader should consult the above-mentioned reference. Less explicit reference is made to a trimestral model of Panamá, presently under construction.

Before proceeding to consider how the components of such a model must be modified in order to capture the features of developing countries a caveat is in order. The developing countries are far from homogeneous. In terms of almost any relevant feature the range across countries is enormous. In what follows below, therefore, the suggested modifications reflect characteristics not necessarily common to all developing countries but at least to a significant number of them.

## 2. Components of National-Income Determination Models

Table 1 presents the prototype model for the developed economies which is used as a starting point for the discussion of this section. Each of the major components of that model are now examined in turn with focus on how they need be altered for analysis of stabilization issues generally in developing countries.

### /2.1 Labor Market,

## 2.1 Labor Market, Supply, and Determination of Prices and Wages

### 2.1.A The Developed Country Model

Equations (1) through (4) describe the labor market and the determination of prices and wages in a recent model for developed economies.

Equation (1) depicts the short-run relationship between output and the required manhours to satisfy demand. It is assumed that at any point in time the economy has a collection of machines whose labor-output ratio were determined by the technology and the expected relative prices at the time each machine was manufactured. Given the relative prices of the current period, machines and the labor associated with them are used in production in order of their efficiency until the desired output is produced. New machines may contain different technology, based on expected relative prices. Thus producers durable equipment takes the form of putty clay.

Equation (2) gives the unemployment rate as a function of manhours and population characteristics. It incorporates into one expression the determination of hours worked per person and the response of the size of the labor force to employment conditions and demographic features of the population.

Equation (3) is a Phillips-curve relation for the determination of the rate of change of wages as a function of the unemployment rate and price expectations. It may be considered a reduced form equation of underlying supply and demand relations in the labor market.

Equation (4) determines the price level of output under the hypothesis of a (possibly lagged) mark-up on minimized average cost. The price level should vary proportionally with the money wage level and reciprocally with long-run productivity. The mark-up factor is  $u$ . Since the mark-up may vary in the short-run with the utilization of capacity, the unemployment rate is also included in this function.

### /2.1.B Modifications

### 2.1.B Wage and price determination in dualistic labor markets

Most of the developing economies are characterized by dualism in their labor and product markets.

To capture the effects of long-run changes in sectoral distribution of the labor force, as well as the short-run problems of income determination, it is necessary to include explicitly, this dualism.

In a dualistic labor market the modern sector is market oriented and pays wages approximately proportional to the value of the marginal product of labor. Its technology is fairly recent, and permits but limited substitution between primary factors <sup>1/</sup>. In some countries unions are quite powerful in this sector.

The traditional sector is much less market oriented. In most countries a major component of this sector is noncommercial agriculture. For this subsector the marketed surplus often is a small part of total production and may be an inverse function of price. However analysis in Behrman (1968), suggests that these responses also may be positive and quite large. Factor substitution usually is possible, but the relatively high labor-to-capital ratio often results in disguised unemployment with marginal products substantially below those in the modern sector. Because of family and communal arrangements, the income of individual laborers is determined by tradition and is related to the average rather than the marginal product.

The dominant view of the impact of this dualism on the labor market, is based on the well known model of Lewis (1954). The average share of labor in the traditional sector, plus a differential for the costs of moving from the traditional to the modern sector, provides a floor for the wages in the modern sector <sup>2/</sup>. The average share of labor in

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<sup>1/</sup> The movement towards putty-clay considerations in the macroeconomic literature for developed economies lags substantially the emphasis on ex post fixed proportions for the modern sector of the less developed ones. Eckaus (1955) provides an early statement regarding less developed countries.

<sup>2/</sup> The discrepancy between the marginal products in the two sectors obviously leads to static inefficiencies.

the traditional sector is assumed to remain approximately constant over a wide range of sizes for the traditional labor force <sup>1/</sup>. It is therefore argued that a substantial range, the supply of labor for the modern sector will be quite elastic.

Using this approach equations (1) and (2), would refer to the modern sector (with all the included variables referring only to that sector). The traditional sector, would act as one residual claimant on labor and urban unemployment, open or disguised, as the other <sup>2/</sup>. However in practice it might be necessary to aggregate these two residuals, given the problems of defining urban unemployment and to continual shifts in demand for "modern" goods, which affect both open unemployment and rural-urban migration in a complicated fashion.

Prima facie this approach might seem to lead to a something approximating a Keynesian case in the modern sector, with an "unlimited supply of labor" at a fixed wage, and employment in the modern sector determined by demand for modern sector goods. But this wage is fixed in real terms, so the situation is also classical in an important sense.

If modern and traditional goods were good substitutes, so that we could treat them as one good, Equations 1 and 2 could once again apply to the economy and Equation 3 could be replaced by an equality between (expected) real wages in the modern sector and the exogenously-given,

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<sup>1/</sup> The average share per laborer is generally assumed to be fixed by tradition until enough labor exits from this sector so that the marginal product of labor rises to this level and market prices begun to dominate (Fei and Ranis (1964)).

<sup>2/</sup> Harris and Todaro (1970) attribute a certain minimum level of urban unemployment to the existence of government or unions which establish fixed wages. They claim that rural-urban migration occurs as long as the expected income (taking into account both the higher modern-sector wage and the probability of obtaining employment) exceeds the traditional average labor share. The result will be an equilibrium level of open unemployment or disguised unemployment in the cities which persists as long as government or unions maintain a differential between the traditional average labor share and the modern-sector wage.

traditional labor income. Equilibrium employment and output would be unresponsive to changes in aggregate demand. Rather than wages determining the price level, as shown in Equation 4, prices (as determined by Equation 14, the demand for money) would tend to determine nominal wages in a more classical fashion <sup>1/</sup>. These results hold in their essentials if the goods are not perfect substitutes, although a shift in demand patterns could alter the distribution of employment, and if directed toward modern goods, obtain some aggregate efficiencies.

The problem with this approach is that it does not cover the case of keynesian unemployment in the cities, due to a shortage of aggregate demand. For a given fully employed labor force there is one and only one allocation of labor which equates (expected) urban wages with a given, traditional labor income <sup>2/</sup>. To consider both dualistic labor markets and Keynesian unemployment the strict equality between labor incomes in the traditional and modern sectors must be replaced by a gradual adjustment process toward equality. In that case a drop in aggregate demand, assuming also a slow adjustment of prices, would lower modern sector output, cause urban unemployment and slow rural urban migration out of the growing population. The average rural income might fall below the (expected) wage for a time.

Over a longer period migration and human capital would alter urban labor supply substantially, and capital labor ratios would vary. Moreover changes in minimum as opposed to average, wages, may depend (inversely) upon (lagged?) urban unemployment. These factors would tend to narrow the relation between measured (expected?) urban wages and the average share of labor in the traditional sector, over the longer run.

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<sup>1/</sup> Interest rates also enter so the model is not completely dichotomized.

<sup>2/</sup> Suppose that production functions in both sectors are Constant Return to Scale and for simplicity that individual returns in the traditional sector are equal to the average product of labor. For given capital stocks in the two sectors there is only one labor allocation which equates marginal product in the modern sector and average in the traditional and "employs" all of the labor force. If unemployment in the urban sector is permitted, then a single "equilibrium" level of unemployment will be determined, unless the elasticities of labor "demand" schedules in the two sectors have a particular configuration.

The basic problem with all these observations, is the fact that Equation 3 remains a reduced form of the operations of the labor market in which the underlying supply and demand relations are not well stated or perhaps even understood. The explicit statement of these relations becomes very important in explaining wages in one sector of a jointly determined two (or more) sector model. In an explicitly two sector model wages in the urban sector are determined by the demand for labor which depends on nominal wages and prices of urban sector goods and the supply of labor which is dependent upon nominal wages and on prices in the two sectors. Far from being constant, rural supply, relative prices of rural goods and rural incomes may all vary inversely with the number working in the urban sector <sup>1/</sup>.

The same problem of incomplete specification exists in the equation of price determination via markup, expressed in Equation 4, aside from the obvious point that short-run variations in markups (and therefore their explanation) are much more important in countries where the industrial non-wage share reaches forty to fifty percent of value added, (See Michalopoulos (1969)) and some important items in the price index are produced by government factories or closely controlled by governments. At best Equation 4 could explain relative prices, in a two good model, but not their absolute level.

One alternative might be to treat the traditional sector, rather than its labor force, as a residual. The urban wage level could be related to the unemployment rate and some trend in rural incomes. The price index could be determined through a markup equation, with a non unitary elasticity of the price index with respect to the urban wages. The difficulty with this approach is that it neglects the determinants of the intersectoral movements it is trying to model.

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<sup>1/</sup> Fei and Ranis (1964) claims that it is difficult to use the rural surplus for development as rural labor incomes do not remain at the traditional level and prices of rural goods tend to rise. See also Hymer and Resnick (1971).

A second approach would be to retain the demand determined employment figure of equation 1 and jointly determine the unemployment rate, the wage in the modern sector the (residual) labor force, output, and average product in the traditional sector, through a set of equations which require relative prices to adjust to equate demands and supplies for both traditional and modern products, and long-run equality between real labor earnings in the two sectors. This approach would obviously require a division of aggregate demands between the two sectors and an equation to determine the general price level.

In the Chilean model (Behrman(1975c)) of income determination in an inflationary economy, the major determinant of the general price level was the rate of change of the money supply, with its impact distributed over a number of years. As described below, this money supply was determined by other factors in the system. Because of the distributed lags in the price-determination process, moreover, stemming inflation is quite difficult unless expectations about future price movements can be lowered drastically.

Non-monetary factors, also affect the general price level. Cost-push factors operating through intermediate input and unit labor costs are more important in transmitting overall inflationary pressures (including those which arise from the role of expectations in the wage bargaining process) than previous studies, such as Harberger (1963), have maintained. Real changes in per capita GDP (and other indices of current activity), in labor productivities, in demands (final and intermediate) facing sectors relative to capacity, and in the distribution of factoral income and of sectoral product have significant effects, as do foreign-sector policies. However government minimum wages, although widely discussed in Chilean circles, do not have appear to have a very significant impact on wage changes once other prices are incorporated into the wage-change relations.

### 2.1.B.2 The importance of the foreign sector

The foreign sector plays a much more important direct role in labor, production and price relations in most developing economies (and probably in most small open developed countries) than is indicated in the model of Table 1. Four modifications of the counterparts of equations (1)-(4) for the modern sector need to be made to be made to reflect the impact of the foreign sector.

(i) Some imported intermediate inputs and raw materials are critical in the production process. The elasticity of substitutions between such imports and domestic factors may be low or zero. Especially in the disequilibrium exchange rate system common for many developing economies, the constraint on production and employment may not be the putty-clay stock of machinery and equipment, but the availability of these imported inputs. Equation (1) may require modification to reflect this possibility.

(ii) The derivation of equation (1) also needs to be modified due to the fact that technologies used in the modern sector are largely imported from developed countries with much different factor endowments. Very little choice may be available (or may be thought to be available) even ex ante for the capital-labor ratio of the developing countries. Therefore, the putty-clay response to expected relative prices is constrained to a choice among relatively capital-intensive technologies. What Eckaus (1955) calls the "factor proportions problem" limits the absorption of labor by the modern sector.

(iii) The discussion in Section 2.1.B.1 suggests that for many developing economies equation (3) should be replaced or modified by considerations relating to the real labor share in the traditional sector, government minimum wages and union pressures. If some version of equation (3) remains, however, one further modification needs to be made. In many developing economies an important and easily available index of inflationary expectations is the rate of change of the exchange rate. In addition to the history of past inflation, therefore, this variable (or some function of past values of it) should be included for such countries.

/(iv) In light



(iv) In light of the widespread importance of intermediate and raw material imports, if a variant of equation (4) is included, then it should be modified to reflect markups on imports as well as on labor. Changes in the international prices or in import policies, therefore, have direct effects on the domestic price level.

## 2.2 Product Market and Aggregate Demand

### 2.2.A Developed Countries

Equation (5) is the definition of net national product. Equations (6) through (10) describe the demand for real output.

Equation (6) is the consumption function. Real consumption depends upon expected real disposable income (approximated by a distributed lag of actual real disposable income) and net worth, in a variant of the life cycle hypothesis.

Equation (7) is the investment function. For the developed countries in which capital markets are well functioning so that the cost of capital is well identified, investment decisions are based on a comparison of the present value of the expected stream of income generated by the investment and the cost of investment. Simultaneous variables which enter into the investment decision, therefore, include the capitalization rate applicable to real assets and net national product in real terms. The appropriate tax rates also have a role.

Equation (8) defines total government expenditure as the sum of exogenous central government expenditures and endogenous local government expenditures. The latter respond fairly strongly to cyclical conditions of the economy.

Equation (9) is the import function and equation (10) is the export function for developed economies. Imports respond positively to the level of income and the domestic price level and inversely to the exchange rate (defined as the number of units of domestic currency per unit of foreign currency). Exports are assumed to respond directly to the exchange rate and inversely to the domestic price level.

### 2.2.B.1 Consumption in Developing Countries

For the developing economies, several hypotheses about private consumption behavior have been suggested. (i) Because of the existence of a large number of individuals at or near a subsistence income level, consumption may not be proportional to income even in the long run. If true, the high marginal propensity to consume at low income levels, ceteris paribus, may imply a relatively high multiplier. (ii) Retained business earnings (although not necessarily from corporations) are a relatively important source of savings. Therefore, a division at least between labor and non-labor income might be desirable. (iii) The marginal propensity to consume out of the income generated in some sectors -- especially those related to exports -- may be higher than elsewhere in the economy. The inclusion of a separate argument in the function for income from exports might be desirable. This modification would further increase the impact of the foreign sector on stabilization. (iv) If interest rates are controlled, then a policy oriented model would consider the direct effect of their decontrol on the rate of consumption. Controlled interest rates may also increase the substitution between foreign and domestic saving.

Finally, data problems may make it difficult to include non monetary assets in the measure of net worth <sup>1/</sup>. This distortion is not as great as it would be for the developed countries, because the stock of money balances represents a large percentage of privately held assets, perhaps as great as 40 per cent in nominal terms <sup>2/</sup>.

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1/ See Armando Gomez y Daniel Schlesinger (1971) for an attempt to estimate family net worth in Colombia.

2/ The question also remains as to whether privately held government bonds should be counted as private wealth. See Barro (1974).

### 2.2.B.2 Investment in Developing Countries

For some of the more advanced developing countries, evidence exists which supports the use of the same basic formulation (e.g., Behrmar (1972b) considers investment by sectors). More generally, however, substantial modifications are needed to reflect special aspects of capital markets, social overhead capital, and international considerations:

(i) Domestic capital markets in developing economies often are not well functioning. Markets are very fragmented, especially between the traditional and modern sectors. In the modern sector legal limits on nominal interest rates frequently are effective so that credit rationing occurs in bank markets. Government planning organizations also often attempt to control the allocation of physical capital by nonmarket means.

The net result is that much of the domestically-financed investment does not pass through a capital market (or, at least not through "the" capital market). Instead it originates in retained earnings or in direct flows from the government. Government policy is often directed towards increasing the former source by changes in the terms of trade, by price ceilings, and foreign trade policies in favor of sectors in which investment is desired. Quite commonly industry is so favored over primary production, and import substitution or nontraditional exports are favored relative to traditional exports.

To capture these features, direct financial flows from the government and the results of quantitative allocations mechanisms need to be included in the investment function. To represent the impact of policies which work through altering terms of trade, a multisector model is required.

/ (ii) The development

(ii) The development literature emphasizes repeatedly the role of social overhead capital in the development process. Because of externalities and increasing returns to scale over the relevant range Rosenstein-Rodan (1961) and others maintain that the government must increase such social overhead capital in order to induce private investment. Birnberg and Resnick(1973) show that social overhead capital was an historically important element in export growth. The role of social overhead capital in determining the stream of expected net income from investment therefore should be made explicit.

(iii) International considerations may enter into investment decisions in two important ways.

First, a considerable portion of the capital stock originates from direct foreign investment in the modern sectors of many developing economies. One implication of this foreign ownership is that for such investment the relevant cost of capital reflects the opportunity cost in the international capital market (modified by local tax, repatriation and earnings regulations and expected exchange rate movements), not in the domestic market. Another implication is that net factor payments abroad may have a stabilizing influence if they are determined as a residual. (See Reynolds 1968)

Second, for many of the developing economies much of the machinery and equipment for investment in the modern sector is imported <sup>1/</sup>. This point is related to the factor proportions problem referred to above because of the concentration on developing relatively capital-intensive technology in the developed economies. It related to the disaggregation of imports referred to below. It also means that exchange-rate policy and other

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<sup>1/</sup> Díaz Alejandro (1972a) reports 75 per cent of investment of Colombian machinery and equipment was imported in 1975.

import policies have important roles in determining the cost of capital. Finally, it is possible that the quantity of imported capital goods may constrain real investment, if the elasticity of substitution between domestic and foreign investment goods is in fact very low and quantitative restrictions are an important component of trade policy, as in many developing countries. However, Behrman (1975a) provides evidence that the availability of imported machinery and equipment constrained investment in Chile <sup>1/</sup>.

### 2.2.B.3 Government Expenditure in Developing Countries

For developing economies current government expenditure often (but not always) are more centralized than in developed economies such as the United States. Nevertheless there remains a large, effectively endogenous component. The government is a relatively large employer in comparison to total modern-sector employment, the wage bill makes up a substantial portion of its expenditure, and cuts in this expenditure as part of stabilization policy would be extremely risky politically in most cases.

Government expenditures also generally are affected directly by foreign-sector conditions through the budget constraint. Taxes related to the foreign sector are a major source of variance in government revenues (see below). A further effect is through official capital inflows. The

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<sup>1/</sup> If the availability of foreign capital inflows (both official and private), directly or indirectly affects investment (e.g., see Areskoug (1974)), they should be included in the model as part of a reduced form of the investment equation and, through spillovers of frustrated demands, in the consumption-saving function. The theoretical framework for modelling such spillovers might follow Barro and Grossman (1975).

available evidence suggests (although not conclusively, see Mikesell and Zinser (1973)) that such flows are diverted partly to current government expenditures. These inflows may also lead to local inflationary problems, if they result in monetary creation instead of increased imports.

#### 2.2.B.4 The Import Equation in Developing Countries

For most developing economies, as in noted above, imports play a critical role in the provision of noncompetitive raw materials, intermediate inputs, and machinery and equipment capital goods for the modern sector.

Moreover, because many of these imports are noncompetitive and because import substitution policies often have reduced competitive imports to a low level, the price and exchange rate elasticities usually are thought to be low, while measured income elasticities, are high. However, for Chile estimated elasticities suggest that the 63 per cent drop in the price level deflated exchange rate (between 1946 and 1973) implied ceteris paribus increases in imports of 57 percent for secondary consumption goods, 88 percent for transportation related investment goods, 18 percent for intermediate goods and 50 percent for services (Behrman 1975a and b).

To capture the differential impact of the various types of imports on growth and stabilization, as well as these differential responses to different components of income, and price indices, some disaggregation is necessary.

Policies to regulate imports are widely though to be among the most potent available to the governments of developing countries in their quest towards growth, distribution and stabilization objectives. Among the policies often utilized are multiple exchange rate systems, tariffs, direct government imports, prior import deposits and quantitative restrictions <sup>1/</sup>.

<sup>1/</sup> In some developing economies considerable smuggling exists in attempts to avoid these policies.

Clearly in a policy oriented model these policies should be included explicitly in the import function.

Quantitative restrictions frequently are used to maintain a disequilibrium system with overvalued exchange rate (s) and severe foreign-exchange constraints. Disequilibrium is allowed to persist because of the perceived negative distribution, inflationary and political effects of devaluation and widespread convictions about inadequacies of allocation by prices. The existence of strong vested interests in the disequilibrium system (e.g., owners of factors in import-substitution subsectors, the recipients of import licenses, or the government bureaucracy) also help to perpetuate the continuance of these systems. Due to the apparently substantial excess demand, perpetuated in part by the control themselves,<sup>1/</sup> controls generally are relaxed when foreign exchange becomes available from export booms or increased capital inflows. The import functions need to be modified, therefore, not only to include the above-mentioned policy tools, and foreign prices, but also the availability of foreign exchange in a system of disequilibrium exchange control.

#### 2.2.B.5 The Export Equation in Developing Countries

The correct specification of the export function, or functions, is a critical component of a stabilization model for most developing economies. Fluctuations in the value of exports from developing economies, according to the structuralists and a large number of others (e.g., Heller (1954) and Higgins (1968)), are a major source of instability

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<sup>1/</sup> See H. Bruton (1969)  
See A. Musalem (1971)

for these countries. Not only do such variations directly affect total aggregate demand, they also change aggregate demand through the government deficit because of the dependence of government revenues on international trade revenues. Furthermore, they may alter production in the modern sector because of the low elasticity of substitution for critical imported inputs and a short run foreign-exchange constraint. The holders of this view conclude that general fiscal and monetary policy will not be very effective in stabilization attempts. Instead emphasis must be placed on exchange rate and tax policies directly related to exports. Some observers further conclude that movements towards less dependence on the foreign sector is desirable in order to lessen its destabilizing influence.

MacBean (1966), summarizes a variety of previous work on export based instability and suggests that the above-hypothesized strong relationship between export instability and overall instability is exaggerated. Diaz Alejandro (1972a) reports substantially more variation in Colombian imports than in exports, and in exports than in GDP. Mathieson and McKinnon (1974) even conclude that there is some slight indication that "outward-looking" trade policies may increase stability. MacBean (1966) posits that two factors lie behind the lack of a strong relationship between domestic variables and export fluctuations: (i) the low value of the foreign-trade multiplier in part because of repatriation of factor returns to foreign owners and because of leakages into taxes on exports and (ii) the distributed lag nature of reactions to change in exports.

Such studies challenge the once-conventional wisdom about the destabilizing influence of international markets. The issue is far from resolved, however, because of the failure of such studies to specify adequately the structure (including the lags in responses mentioned above) of the

/developing economies.



developing economies. Even the strongest doubters of the importance of international market fluctuations, moreover, grant that export variations probably are destabilizing in those cases in which exports are very concentrated in a few products.

To effectively capture the important, short run role of exports, it seems best to divide them into two (or more) categories which differ substantially in exchange rate and tax-subsidy treatment: traditional (largely primary products) and nontraditional (often industrial products).

The traditional exports are often major sources of government revenues. In addition to their "world" price, some element of market power (perhaps within the framework of international commodity agreements) may need to be represented.

Far from being taxed, many non-traditional exports presently receive substantial subsidies in hopes of diversifying sources of foreign exchange and gaining entry into faster-growing markets, without causing a decline in "world" price. Many studies have shown a substantial positive response to these subsidies, and a corresponding decline in response to overvalued exchange rate. Referring once again to Chile, Behrman (1975a) and (1975b) shows that the 63 per cent drop in the price level deflated nominal exchange rate between 1946 and 1972 caused, ceteris paribus, drops in exports of 100 per cent from industry, 50 per cent from small- and medium-scale mining, 32 per cent from agriculture, 19 per cent from large-scale mining, and 13 per cent for exports from services. These results also suggest that the foreign-sector regimes increased dependence on the traditional exports (i.e., those from large-scale mining) despite a number of stated intentions to encourage diversification. The response to uncertainty in relative prices was widespread, although not generally large in magnitude, implying

/that there

that there was a significant, but not substantial, payoff in terms of reducing balance of payments difficulties, to the sliding-peg exchange-rate policy of 1965-1970.

In the case of Colombia various studies show that "minor" exports, i.e. non coffee, non petroleum exports were extremely responsive to changes in the effective exchange rate (elasticities of 2 to 4 are reported in Diaz Alejandro (1972c), Musalem (1970) and Sheahan and Clark (1972)). The system of effective devaluations initiated in 1967 is generally considered responsible for the enormous jump in the proportion of minor exports in a much higher total export figure <sup>1/</sup>.

## 2.3 Financial Markets and Assets

### 2.3.A A Simple Model of Financial Markets in Developed Countries

The financial market for the developed economies in Table 1 is patterned on the extensions of Tobin's portfolio equilibrium model by Ando (1974) and Branson (1974). Equations (11)-(14) are demand functions of private-sector asset holders for four imperfectly-substitutable assets: equities, government bonds, foreign securities and money. Equation (15) is the definition of the rates of return (with a fixed zero rate of interest for money) and income (with a transactions demand for money). The nominal supplies of money and bonds and the interest rate foreign securities of a given risk are assumed to be exogeneous.

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<sup>1/</sup> Non coffee exports grew from \$ 117 million or approximately 25 per cent of exports in 1966 to 671 million or 55 per cent of exports in 1974 or over 28 per cent per year. While Calvo and Escandón (1973) and Cabarroty and Spillane (1974) attribute much of the growth up to 1969 or 1971 as simple maintenance of market share, one must point out that market share would not be maintained without appropriate incentives to export, i.e. conversion of the world price into an appropriate local currency value.

All assets are gross substitutes. Domestic asset-holders must hold given quantities of equities and government bonds, which are not traded internationally. Domestic asset-holders face an elastic supply of foreign securities at an interest rate fixed internationally. They are free to trade between money and foreign securities. Any purchase of the latter implicitly reduces domestic foreign exchange by an identical amount, and its effects on domestic money supply are completely sterilized.

Equations (16)-(18) are relations between holding and capitalization, real and nominal, and holding and international rates for the three respective nonzero return assets. Equations (19)-(22) are simple hypotheses about the formation of expectations. Equation (23) determines the market value of real assets by capitalizing the expected stream of income from existing assets.

Branson (1974) analyses a similar model for developed countries. His main results are: (1) The inclusion of non-internationally-traded assets restores the effectiveness of monetary policy as measured by the possibility of altering rates of return on such domestic assets relative to foreign securities. (2) The relative impact of open-market operations on domestic-asset rates depends on which asset is the instrument of open-market operations.

For the developing economies a number of changes need to be made. As is discussed above, asset markets are generally fragmented, function poorly and are relatively unimportant in channeling investible funds. Dualism is a common feature, with changes in the organized market having but limited impact on the unorganized sector. Government-bond markets and private-security markets both generally are quite small.

Monetary policy usually is limited in scope, especially internally. Central banks are hesitant to undertake substantial open market operations in the very narrow bond market. In some case the Central Bank does act as a development bank, making lines of credit available to favored sectors. The nominal money supply is not only dependent upon such credit or rediscount operations, but on de facto or de jure obligations to finance the government deficit and on foreign exchange movements. Among the monetary instruments which might be included in a complete model of the financial sector are marginal and average reserve requirements, rediscount rates, prior deposits on imports, and exchange rate(s). Also important are interest rate ceilings, and quantitative restrictions on internal credit and on international capital flows. The use of this latter group of policies may require that relations in the model be modified to reflect rationing due to quantitative variables. Uncertainty about future quantitative policies also may complicate the formation of expectations in equations (19)-(22).

The foreign sector impinges on the financial markets in a number of important ways. As is indicated in the previous paragraph, foreign exchange movements have substantial impact on the domestic money supply and the major discretionary monetary operations are in the foreign sector <sup>1/</sup>.

With fixed, effective exchange rates it may be difficult to pursue an independent monetary policy, for domestic credit expansion will largely "leak out" via an offsetting drop in international reserves and money <sup>2/</sup>.

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<sup>1/</sup> This discretion may be limited to the short run, especially if the government attempts to maintain overvalued exchange rates.

<sup>2/</sup> Borts and Hanson (1975) discuss the extent to which this view is correct.

Money expansion may have to be linked with effective devaluation. Foreign direct ownership or domestic capital in the modern sector often is important, so equation 22 or 23 must be modified so that only the value of the domestically owned portion of the capital stock enter into domestic portfolio decisions.

In a few developing countries, such as Mexico, the interest rate in the international market may effectively create a liquidity trap for the organized monetary market. In general, however, the international interest rate does not peg the domestic rate for at least one of three reasons:

(i) Quantitative restrictions on capital movements break the link between domestic and international capital markets. (ii) The existence of Bransonian internationally-nontraded assets which are not perfect substitutes for internationally-traded assets permits some independence in interest rate movements. (iii) Risk premia may be dependent upon the debt income ratio. (Hanson (1974)).

While some of these features have been incorporated in various models of less developed countries, particularly the interrelation between money supply, the foreign sector and the government deficit, this area remains one of the weak points of such model. Too little is known about the functioning of domestic capital markets to permit an adequate specification, though the information accumulated through the BID Capital Markets program may improve future models.

#### 2.4 Identities and Miscellaneous Relations

Equations (24)-(28) define disposable income, private savings, income from capital and the balance of payments surplus. For the developed countries these definitions are basically self-explanatory. Note that capital gains on existing assets arise because of changes in the capitalization rate or changes in the expected stream of income from these existing assets due to varying economic conditions. They do not, of course, include additions

/to real

to real assets from current net investment. For the developing countries the major special problem is the evaluation of capital gains because of the narrow markets for internal equities.

Equation 29 is the tax function (net of transfers). For developed economies the major complication behind this simple representation often is the treatment of the corporation income tax. Therefore income from capital is included as an argument in this function in addition to total personal income.

In developing economies conditions differ with regard to tax collections. (i) The traditional sector is not monetized. (ii) Within the modern sector wages represent a smaller function of output than in developed countries, making withholding difficult. (iii) Literacy is relatively low. (iv) Systematic accounting systems are not widely used. (v) The legitimacy of government revenue collection is less widely accepted and the tradition of voluntary compliance is less strong. (vi) Lack of resources, low civil service pay, and traditional social relations often make efficient and honest tax collection very difficult.

As a result, the relative importance of alternative source of tax revenues differ from patterns in developed countries. General personal and corporation income taxes are much less important. Instead dependence is greater on import and export taxes, indirect taxes and taxes on income generated by foreign-owned corporations. Taxes related to the foreign sector are much more significant because generally they are relatively simple to administer and more difficult to evade. This greater dependence on the foreign sector adds to the difficulties of stabilizing these economies because balance of payment considerations may conflict with the use of taxes for stabilization purposes. The more regressive nature of the

/tax structures

tax structures with its greater dependence on indirect taxes, moreover, implies less "automatic stabilization" from the tax system than in more developed countries. Thus it might be appropriate to disaggregate the tax system (See Behrman 1975c for example).

Equation (30) is the government budget constraint which Christ (1968) and others emphasize repeatedly. In a closed economy or in an economy with balance of payments equilibrium, this relation need not appear explicitly. The model already contains the private sector accounts and a full recording of transactions between the private and government sectors. If the private sector accounting identities are satisfied, so must be those for the government sector.

## 2.5 Level of Aggregation

The model of Table 1 for the developed economies is presented on a very aggregative level. Actual empirical utilizations of such models often are on a more disaggregate level. The currently frequently-encountered hypothesis that a major source of inflation in the United States and in some other more developed economies is the combination of sectoral shortages with short-run rigidities points to the need for at least some disaggregation.

For the developing countries, we have already discussed the need to separate the labor market. In addition Hansen (1973b) argues that disaggregation is much more important than in developed countries since much of the direct policy impact is on relative prices. The estimation of Chilean sector relations (Behrman (1975) provides support for this claim. There is a great deal of heterogeneity across sectors in technological substitutabilities and in both the degree and the time path of behavioral responses to economic variables. Relative prices play major roles in both short-run and long-run resource allocation decisions. Both capacity-utilization and capacity-creation

/decisions respond

decisions respond significantly to these prices. Possibilities for substantial increases in capacity utilization and for factor substitution do exist <sup>1/</sup>.

To ignore the role of the price system and these other characteristics when conducting analysis and giving policy presumptions, therefore, may be costly in terms of foregoing the use of some policy tools, overemphasizing the role of "key factors" and creating incentives for misallocations. And yet the dominant macroeconomic frameworks utilized for analysis of development problems for the most part do assume that these factors can be ignored. For example, in the Chilean case, ODEPLAN (Oficina de Planificación Nacional, National Economics Planning Office) has utilized relative rigid fixed-capital-coefficient and/or foreign-exchange-saving gap models as the basis for planning and prediction <sup>2/</sup>. On the other hand, policy tools have included price ceilings, quantitative restrictions on international trade and on credit, and multiple exchange rates at overvalued levels.

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<sup>1/</sup> Estimated sectoral elasticities of substitution between capital and labor range from 0.0 to 0.9. The adjustment periods for substitution between primary factors are fairly long in several cases in which the long-run elasticities are high. For most sectors in the short and medium runs, therefore, the results provide some support for the assumption of limited flexibility which underlies Eckaus' (1955) technological explanation of the existence of under-or unemployed labor, the structuralist analysis of inflation, and the use of fixed coefficients in input-output based models.

Limited flexibility, however, is not the same as no flexibility. Some primary factor substitution apparently is always possible in response to relative price changes.

<sup>2/</sup> For example See Harberger and Selowsky (1966) or ODEPLAN (1970).



## 2.6 The effects of Macroeconomic Policy in Models of Income Determination

To explain how the developed country model works, as well as to obtain a qualitative simulation of the impact of policy variables, it is useful to perform two hypothetical experiments, an increase in the money supply and an increase in government spending, and trace out their effects on the major variables in the system.

In the developed country model a once and for all increase in the stock of money, realized through the open market purchase of government bonds (Eq. 30), tends to change interest rates (Eq. 14 and Eq. 16) and to the extent the holding rate falls, stimulates demand for investment goods (Eq. 7) (We neglect the foreign sector, changes in taxes and any possible wealth effects from a change in the ratio of money to bonds). Demand for labor and output rise, stimulating second round demands of households, government, and investors (taxes also rise, which may have second order effects on government bonds and private wealth). Unemployment falls (Eq. 1 and Eq. 2) and prices rise because of the direct effect of unemployment (positive in Eq. 4) and the indirect effect on wages (Eq. 3) and prices (Eq. 4). The extent of the price rise relative to the rise in output depends on the ratio (lagged?) of aggregate demand to the labor force.

An expansion of government demand, financed through bond sales, raises demand directly (Eq. 8) and indirectly, (Eq. 30 and 6) through the second round output - income effects. (We again neglect the foreign sector, changes in taxes and changes in wealth). The rise in bond sales raises interest rates and reduces investment, partially offsetting the increase in government spending. The fall in unemployment (Eqs. 1 and 2) has a positive direct and indirect effects on prices (Eqs. 3 and 4).

/In the developing

In the developing country model it is difficult to separate monetary policy from government spending, as there are no organized financial markets in which to buy or sell bonds<sup>1/</sup>. Aside from the use of government spending, about the only practical way to increase the money supply is through changes in bank reserves or central bank credits. In all three cases the effects of changes in money tend to be concentrated in certain sectors and affect their second round spending directly, owing to previous credit rationing, as compared to the more general effects of interest rate changes in developing countries. The more general effects of monetary policy in developing countries occur through such second round spending of income recipients on local as opposed to imported goods and on local intermediate purchases by the favored industries. To the extent that the favored industries and their suppliers are close to "capacity", and that fixed exchange rates are maintained, relative prices will tend to change and/or imports and capital flows will tend to vary, weakening the general impact of monetary policy on domestic output. While coordinated variation in effective exchange rates would permit greater independence in monetary policy, their coordination with monetary policy reduces the number of completely independent instruments.

Fiscal policy in developing countries is closely related to monetary policy, again because of the narrow financial markets. Variations in government spending, financed locally through variations in bank holdings of government debt, tend to cause inverse variations in credit which "crowd out" other local credit demand and produce offsetting effects in investment. On the other hand, variations in government spending, financed

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<sup>1/</sup> The lack of markets may reflect government attempts to sell bonds at low, fixed rates of return to banks, as well as causes due to the stage of development.

through foreign borrowing, have two pronged effect, through their indirect effect on reserves and money, as well as their direct effect on spending.

In developing economies both monetary and fiscal policy have their greatest effect on the modern sector. Their effect on the traditional sector occurs through variations in relative prices and in rural urban migration rates. The greater the gap between (expected) wages in the city and the average labor income in the country, the smaller will be the variation in relative prices and the greater will be the variation in migration rates. Thus, in a special sense, the rural sector also acts as a capacity constraint which affects the division of changes in aggregate demand between price and output effects.

## 2.7 Conclusions: Some General Points in Income Determination Models and Short-term Policymaking in Developing Countries

While conditions vary substantially across countries and modeling of certain aspects of the developing countries remains rudimentary, several important, general points or questions about income determination processes and countercyclical policy have appeared in our discussions.

(1) Supply variations in the traditional sector may cause cyclical variations, while countercyclical policies mainly affect the modern sector. More general policy tools must be developed.

(2) If the traditional sector determines the real wage for the modern sector and there is no money illusion, then the modern-sector labor market is very classical. Increased aggregate demand will not raise equilibrium employment and production, although they will affect these variables when urban unemployment is abnormally high. Decreases in aggregate demand will lower urban employment and slow migration. However much research remain to be done on the determination of labor's income in the traditional sector and its relation to urban wages through migration.

/(3) Changing international

(3) Changing international conditions and/or variations in government policy seem to be responsible for most of the cyclical fluctuations in developing countries, as opposed to the traditional view, expressed in developed country models that investment is the key<sup>1/</sup>. In addition to the oft described direct and multiplier effects of changes in world prices of exports or imports, variations in world prices tend to have indirect effects, through variations in international reserves and, correspondingly, the money supply. Government policy may respond to reserve losses and variations in conditions in the export and import competing industries; in addition variations in external financing may force variations in monetary emission. Variations in prices of non competitive raw materials and intermediate import may cause short-run fluctuations through either supply limitations or reduction of demand in other sectors. Finally, attempts to maintain disequilibrium exchange rates may lengthen the period of adjustment to external disturbances.

Given the importance of the foreign sector in generating cyclical fluctuations, some effort should be devoted to ensuring its correct specification in the income determination model. The various policies to reduce its impact should be closely studied and some effort made toward directing stabilization policies toward it. Some attempts have been made in the direction, both on the level of individual countries and in cooperation with other countries. However, stabilization problems often are viewed as less important than objectives such as growth and distribution. If a temporary foreign exchange surplus is available due to an export boom or increased capital inflows, for example, pressures are enormous to utilize

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<sup>1/</sup> But see Friedman (1965) and Okun (1970).

it to alleviate other problems. Only rarely do governments find it feasible to conserve such an excess for use when the next foreign exchange deficit occurs. Only when such governments are convinced that the costs to these fluctuations are large or that there are gains in other policy dimensions of increased stabilization, are more resources likely to be utilized for stabilization purposes.

(4) The international capital market does not limit stabilization options in developing countries by fixing domestic interest rates <sup>1/</sup>. This is so because of the existence of Bransonian non-internationally-traded assets, because of quantitative restrictions and exchange rate variations which break the link between international and domestic markets, and because of variations in risk premia as international debts vary, relative to national product.

(5) Stabilization policies are limited by international creditors, by the lack of integrated and well functioning financial markets, and by the offsetting response of international reserves to domestic credit expansion. The last limitation is, of course, true only under fixed exchange rates, and monetary policy would be "more independent" under flexible rates, but exchange rate and aggregate demand policies are too often treated as independent policy investments.

(6) The partial equilibrium evidence of substantial technological and behavioral flexibilities suggests that models which assume too great rigidities (see the introduction) may distort the perceived choice set and over-emphasize the importance of "key" factors. The partial-equilibrium

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<sup>1/</sup> Macro theory suggests that fiscal policy would retain its potency under fixed rates, it is only monetary policy which is questioned. See Mundell (1968).

evidence of significant substitution possibilities and price responses suggest that macropolicies might have significant impact on aggregate variables. However, general-equilibrium simulations of the Chilean model indicate that these policies may have much less aggregate impact than partial-equilibrium analysis might suggest, due to overall resource constraints and indirect effects (such as those transmitted through the money supply-foreign exchange-price nexus).

A great deal of the effect depends on the size of an behavior within the traditional sector and its relation to the modern sector, and the difference between aggregate demand and capacity, factors which are not well described in existing models.

(7) Both the partial-equilibrium and the general-equilibrium analyses lend support to Hansen's (1973b) emphasis on the need for disaggregation to capture relative-price effects. The estimated partial-equilibrium relations are quite heterogeneous across sectors in regard to technological possibilities, behavioral responses, and patterns of adjustment. The general-equilibrium simulations suggest that policies may have much greater impact on the composition of aggregates than on their size, especially when the economy is near its capacity, as defined by existing institutions and behavior. To what extent institutions and behavior of individuals and policymakers should be taken as given remains a special dilemma for those who would venture into the tangle of income determination models of developing countries.

TABLE I  
Macroeconomic Model for Developed Economies

I. Labor Market, Supply Price and Wages

Demand for Labor

$$E = E(Z) \quad [1]$$

Supply of Labor and the Definition of Unemployment Rate

$$u = u(E, N) \quad [2]$$

Determination of Money Wage Level

$$\frac{W}{P} = W(u, L(\frac{P}{P_{-1}})) \quad [3]$$

Determination of Real Wage Rate and Price Level

$$P = W \cdot f(L(\frac{E}{Z}), u, u) \quad [4]$$

II. Product Market and Aggregate Demand

Definition of Net National Product

$$Z = C + I + G + X - IM \quad [5]$$

Consumption Function

$$C = C(Y, A) \quad [6]$$

Investment Function

$$I = I(z, r_k, \tau) \quad [7]$$

Government Expenditure

$$G = G_{ex} + G_{end}(Y, N, r_k) \quad [8]$$

Import Function

$$IM = IM(ER, P, Y) \quad [9]$$

Export Function

$$X = X(ER, P) \quad [10]$$





### III. Financial Markets and Assets

Demand for Real Assets

$$V = A \cdot f^V(r_k^h, r_b^r, r_s^h, Y) \quad [11]$$

Demand for Bonds

$$B/P = A \cdot f^B(r_k^h, r_b^r, r_s^h, Y) \quad [12]$$

Demand for Foreign Securities

$$\frac{S \cdot ER}{P} = A \cdot f^S(r_k^h, r_b^r, r_s^h, Y) \quad [13]$$

Demand for Money

$$M/P = A \cdot f^M(r_k^h, r_b^r, r_s^h, Y) \quad [14]$$

Definition of Net Worth

$$A = V + \frac{M + B + S \cdot ER}{P} \quad [15]$$

Relation Between Holding Rate and Capitalization Rate

$$r_k^h = r_k - \frac{r_k^e - r_k}{r_k} \quad [16]$$

Relation Between Real and Nominal Short-Term Interest Rates

$$r_b^r = r_b - \frac{P^e - P}{P} \quad [17]$$

Relation Between Holding and International Rate for Foreign Securities

$$r_s^h = r_s + \frac{ER^e - ER}{ER} \quad [18]$$

Generation of Expected Rate of Change of  $r_k$

$$\frac{r_k^e - r_k}{r_k} = F^k(L[\frac{\dot{r}_k}{r_k}]) \quad [19]$$

Generation of Expected Rate of Change of Prices

$$\frac{P^e - P}{P} = F^P(L[\frac{\dot{P}}{P}]) \quad [20]$$



#### Generation of Expected Rate of Change of Exchange Rate

$$\frac{ER^e - ER}{ER} = F^{ER}(L[\frac{ER}{ER}]) \quad [21]$$

#### Expected Income From Capital

$$\pi^e = F^{\pi}(\pi, P \cdot L[\frac{\pi}{P} - 1]) \quad [22]$$

#### Market Value of Capital

$$P \cdot V = \frac{\pi^e}{r_k} \quad [23]$$

### IV. Identities and Miscellaneous Relations

#### Definition of Disposable Income

$$P \cdot Y = P \cdot Z + r_b \cdot B - P \cdot T + r_s \cdot S \cdot ER \quad [24]$$

#### Definition of Savings

$$d(P \cdot A) = P \cdot Y - P \cdot C \pm d^*(P \cdot V) \quad [25]$$

#### Definition of Income from Capital

$$\pi = P \cdot Z - W \cdot E - \tau_c(P \cdot Z - W \cdot E) \quad [26]$$

#### Capital Gains on Existing Capital

$$d^*(P \cdot V) = d(P \cdot V) - P \cdot I \quad [27]$$

#### Balance of Payments Surplus

$$H = P \cdot X - P \cdot IM + r_s \cdot S \cdot ER - d(S \cdot ER) \quad [28]$$

#### Tax Function

$$P \cdot T = T(P \cdot Z + r_b \cdot B + r_s \cdot S \cdot ER, \pi, \tau) \quad [29]$$

#### Government Budget Constraint

$$dM + dB = P \cdot G - P \cdot T + r_b \cdot B \quad [30]$$



## V. Variable Definitions

A	: Net Worth of Consumers
B	: Government Debt Held by Private Sector
C	: Consumption in Constant Currency
$d^*_{PV}$	: Real Capital Gain on Existing Real Assets in Current Currency
E	: Employment in Manhours
ER	: Exchange Rate in Domestic Currency per Unit of Foreign Currency
$ER^e$	: Expected Exchange Rate in Domestic Currency per Unit of Foreign Currency
G	: Total Government Expenditures in Constant Currency
$G_{ex}$	: Exogenous Government Expenditures in Constant Currency
$G_{eod}$	: Endogenous Government Expenditures in Constant Currency
H	: Surplus on Balance of Payments in Current Currency
I	: Net Investment in Constant Currency
IM	: Imports in Constant Currency
L	: Lag operator
M	: Money Supply in Current Currency (Currency Plus Reserves)
N	: Vector Expressing Total Population and Its Structure
$\mu$	: Standard Mark-up Factor (i.e., the Ratio of Price of Output to its Minimized Cost of Production Expected to Prevail Under Normal Employment Conditions)
P	: Price Level for Output
$p^e$	: Price Level Expected to Prevail
$\Pi$	: Income from Real Assets in Current Currency
$\Pi^*$	: Expected Income from Existing Real Assets in Current (not future) Currency
$r_b$	: Nominal Rate of Interest on Government Debt
$r^x_b$	: Real Rate of Interest on Government Debt



$r_k$	: Capitalization Rate (in real terms) Applicable to Real Assets
$r_k^e$	: Level of $r_k$ Expected to Prevail
$r_k^h$	: Holding Rate (in real terms) Applicable to Real Assets
$r_s$	: Real Rate of Interest on Foreign Securities
$r_s^h$	: Holding Rate (in real terms) Applicable to Foreign Securities
S	: Foreign Securities Held by Private Sector
T	: Taxes in Constant Currency
$\tau$	: Tax Rates (Subscript "C" refers to Corporations)
u	: Unemployment Rate
V	: Market Value of Existing Real Assets in Constant Currency
W	: Nominal Wage Rate Per Manhour
X	: Exports in Constant Currency
Y	: Disposable Income in Constant Currency
Z	: Net National Product in Constant Currency





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SECRET

1. The purpose of this document is to provide information regarding the activities of the [redacted] in the [redacted] area.

2. The [redacted] has been observed in the [redacted] area, and it is believed that it is engaged in [redacted] activities.

3. It is recommended that the [redacted] be monitored closely, and that any further activities be reported immediately.

4. The [redacted] is believed to be a [redacted] organization, and it is believed that it is engaged in [redacted] activities.

5. It is recommended that the [redacted] be monitored closely, and that any further activities be reported immediately.

6. The [redacted] is believed to be a [redacted] organization, and it is believed that it is engaged in [redacted] activities.

7. It is recommended that the [redacted] be monitored closely, and that any further activities be reported immediately.

8. The [redacted] is believed to be a [redacted] organization, and it is believed that it is engaged in [redacted] activities.

9. It is recommended that the [redacted] be monitored closely, and that any further activities be reported immediately.

10. The [redacted] is believed to be a [redacted] organization, and it is believed that it is engaged in [redacted] activities.

11. It is recommended that the [redacted] be monitored closely, and that any further activities be reported immediately.

12. The [redacted] is believed to be a [redacted] organization, and it is believed that it is engaged in [redacted] activities.

13. It is recommended that the [redacted] be monitored closely, and that any further activities be reported immediately.

14. The [redacted] is believed to be a [redacted] organization, and it is believed that it is engaged in [redacted] activities.

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