MACROECONOMETRIC MODEL BUILDING IN LATIN AMERICA: THE MEXICAN CASE

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1. INTRODUCTION

Walras' great vision of describing mathematically the functioning of a complete economy has been realized in our time.[1] With the advent of social accounting, the Keynesian macroeconomic shortcut, and the computer, the construction of big mathematico-statistical representations of national economies has been made possible. The first macroeconomic models appeared during the 1930s and 1940s as descriptions of the advanced economies. The models of the developing economies began appearing during the 1950s, but it was not until the second half of the 1960s that macromodels were constructed for the Latin American economies. Since then, they have proliferated rapidly.

At the beginning, some of the macroeconometric models for developing economies did not differ much from those of the mature, industrialized economies. Their general structure and the specification of the individual equations was similar, if not identical, to the pioneer models. This is perfectly understandable. However, the usefulness of these models for alternative policy simulations or forecasting was limited. They were not faithful representations of their economies and could not be expected to follow their movements very closely.

More recently, however, stimulated by the post-Keynesian theorizing on economic growth and development, and by the efforts of econometricians to tailor their models better to the features of each country, the LDC models have begun to differ from those of the advanced economies. The differences intend to represent variety in economic development, behavior, technology, and institutions that characterize the developing economies, as well as the economic peculiarities of the country in question. This does not mean that the structure and specification of the LDC models are (or are expected to be) totally different from those of the advanced nations. After all, the anatomy and physiology of all economies are essentially the same. The difference seems to be in size, complexity, refinement of market mechanism, and speed with which the macroeconomic organs function, using as the standard of comparison those of the advanced economies. Macro

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[1] Walras had a micro vision; modern econometric models have been aggregative. The basic principle, however, is the same in both cases, and modern models are now moving strongly in a micro-economic direction.

bottlenecks, which are most useful for econometric specifications, appear in different parts of the system—agriculture being a typical example. Latin American models, being the last to appear so far, have received the benefits of these efforts for more faithful econometric portrayal.

The purpose of this paper is to present the Mexican econometric model that we have developed at the Department of Econometric Research on Mexico of Wharton EFA[2] and to make some general comments on econometric model building for the developing economies. Applications of the Mexican model will also be included.

2. Some Preliminary Considerations of Model Building for the Developing Economies

The best procedure for model specification of developing economies is to try to translate into econometrics their characteristic features. These have been elaborated extensively by the development theorists in their efforts to distinguish conceptually the LDC from the MDC.[3] A brief listing and discussion of these distinctive traits seem a natural way to start. This list can be considered as a kind of descriptive model, or standard, which should help in the specification of the Mexican model, and in evaluating the specifications of other macroeconometric models of developing economies in which we may be interested. For this reason, the list will be supplemented with some features peculiar to the Latin American economies and, particularly, to the Mexican economy.

Since the differences between the LDC and the MDC arise from their relative position in the development race, all of the traits listed are also present, in some degree, in the advanced countries. That is why there is a fundamental similarity in the models of both kinds of economies. Moreover, social accounting systems, whose entries are to be explained by macromodels, are essentially the same in layout for all market economies. This is a recognition not only of the basic underlying similarity between the LDC and the MDC, but also of the accounting source of similarity between their models. Accordingly, both types of macromodels attempt, with their equations, to explain consumption, investment, exports, imports, production, prices, and so on. Consequently, the differences which we are listing below should be seen as traits that are only more apparent and pronounced in the LDC but not totally absent in the MDC. However, they do call for differences in the models, through endogenization of some variables, or through new, special equations, or through different specifications for the common ones.

In the list that follows, two related features of the developing economies, one external, the other internal, seem to be dominant: (1) their comparative overall productive backwardness vis-à-vis the MDC, and (2) the relative unevenness of their productive sectors, when compared internally. In the literature, (1)

[2] One of the main purposes of this department (DIEMEX) has been to determine the extent to which econometric tools can be applied to developing countries. The cases of Mexico and Peru have been explored so far.

[3] We take these common abbreviations, less developed (LDC) and more developed country (MDC), from the development literature. See, for example, E. E. Hagen, *The Economics of Development* (Homewood, Ill.: Irwin, 1968), p. 6. By an LDC, we understand here an economy in transition, active in the process of growth, not a stationary one.

has also been called supply deficiency, output constraint, technological backwardness, and so forth, (2) has been called "dualism," sectoral gaps, traditional versus modern sectors, agricultural versus industrial sectors, regional or structural imbalance, and so on. Most of the other features and problems of the developing economies seem to arise from these two. The external problems of capital and technological imports, exports of primary goods, balance-of-payments problems, as well as the internal problems of maldistribution of income, rural-urban labor migration, the big economic role of the government, existence of overcapacity in the modern productive sectors, and in some cases, even inflation, can be traced to them.

Supply Deficiency

If we take the Keynesian view that the main characteristic of industrialized nations is their possession of a developed and efficient productive sector, and that their short-run problem is the recurrent deficiency in aggregate demand, we can say, by contrast, that the main trait of developing countries is their comparative deficiency in aggregate supply.[4] Agricultural supply, still bound to old-fashioned productive methods, is very much the result of the whims of the weather. Industry is relatively underdeveloped, concentrated on a few products (automobiles and steel are the favorites in Latin America), subject to bottlenecks in physical (raw materials or machinery) or technological (operative know-how, organizational knowledge) inputs, and likely to be affected by political events. Services are comparatively small, hampered, too, by lack of skilled technicians and adequate capital equipment.

This does not mean that the developing countries have no short-run problem of aggregate demand. They do, and they need the Keynesian tools to keep their existing productive capacity as fully utilized as possible, without undue inflationary pressure. However, their crucial problem is to enlarge that productive capacity in order to make employment, income, and demand possible. They have before them the example of the MDC and of recent productive successes, like Russia and Japan. Internal social demands arising from growing expectations also contribute to making supply enlargement their basic economic concern.

The process of economic growth, then, is central in the developing economies, and it should be captured in their economic descriptions. Other characteristics and processes are, one way or another, connected with growth. Those connections should be given special importance in model building. Growth of inputs, especially capital, which is the bottleneck in developing economies, should be given special attention. Labor migration from the rural to the urban productive sector should also be considered. By the same token, the determinants or major constraints of these capacity-enlarging inputs, normally frozen into the assumptions of the short run, should be examined and made to play their part, if possible, in the main process of development.

[4] The Keynesian problem was why factories and machines shut down in a rich country or the paradox of poverty in the midst of plenty. The developing nations' problem is how to bring machines and factories to the country or how to break the ancestral condition of poverty by importing superior productive methods.

Besides, the actual duration of the "long-run" process of growth of the LDC has been reduced substantially when compared with that of the MDC. The former are essentially importing from the latter the scientific industrial revolution. This takes less time to accomplish. A statistical sample of a decade from an LDC probably compresses growth processes that took from thirty to forty years in the economic history of the MDC.

Capital Accumulation and Its Financing

The first binding constraint of development is capital, the nonhuman input. The task of circumventing this bottleneck has become the responsibility of both private and public sectors. Governments of some developing economies have tried not only to provide the capital for infrastructure, but to contribute to the addition of productive capacity as manufacturers and entrepreneurs. The Mexican economy is a clear example, with its three-hundred "empresas descentralizadas y organismos de participacion estatal." The Japanese government at the start of the big capacity-creating efforts of the Meiji restoration provides another one.[5]

With the exception of the socialist developing economies, capacity creation, however, has been the responsibility of the private entrepreneur. Private investment has been the larger flow in the accumulation of capital in plant and equipment. Public investment, in the form of roads, irrigation projects, communication, and other infrastructure, has supported these direct productive efforts. Private and public savings (surplus in current account) have been the sources of financing funds for the investment flows. The first source, in the LDC especially, has been explained as arising from the unequal distribution of income, as we will see below. The second is constrained by the low taxing ability of most of the developing countries.

Nevertheless, internal savings are not necessarily the first stumbling block met by the LDC in accumulating capital. The lack of enough foreign reserves can be their binding constraint.[6] Since they cannot produce the plant and equipment necessary for new industries, capital imports from the MDC become the only way to grow industrially. Thus, exports and external finances arise as crucial means of payment for capital accumulation and capacity enlargement.

Exports of Primary Goods

Since agricultural and extractive production are predominant, and manufactures and services are being developed, the LDC is an exporter of primary products. Its main exports are limited in number and frequently consist of one or two agricultural or mineral exports. Coffee represents 40 percent and 60 percent of the total merchandise exports of Brazil and Colombia, respectively; sugar accounts for more than 70 percent of Cuban exports; and copper accounted for 76 percent of Chilean goods exports in 1969. Agricultural exports, due to defi-

[5] M. Baba and M. Tatemoto, "Foreign Trade and Economic Growth in Japan: 1858–1937," in *Economic Growth, the Japanese Experience Since the Meiji Era*, L. R. Klein and K. Ohkawa, eds. (Homewood, Ill.: Irwin, 1968), p. 169.

[6] H. B. Chenery and A. M. Strout, "Foreign Assistance and Economic Development," *American Economic Review*, Vol. LVI, No. 4, Part I (September, 1966), pp. 680–733; or Hagen, *op. cit.*, pp. 366–71.

ciencies in irrigation infrastructure, ineffective pestilence controls, inadequate fertilizers, and acts of God, are subject to wide fluctuations. In the long run, prices of primary goods are believed to be deteriorating in relationship to the prices of the capacity-creating imports (capital goods and technical services) that the LDC need from the MDC.[7]

The capacity to import, then, of the developing country is constrained to a large extent by the value of its exports. The analysis and quantification of this bottleneck is indispensable for the econometric understanding of the developmental process. Equally important here is the transmission of cycles of the MDC to the LDC. To the instability of supply of the primary exports, demand instability should be added. Primary exports depend on the demand-oriented imports of the industrial countries. Instability in effective demand, the Keynesian problem, is felt in the export position of the developing countries and is carried through to capital imports and the expansion of the LDC supply.

External Debt and Foreign Investment

As a corollary of the constraint posed by its export earnings, the developing country tends to rely on its capital-account imports to finance its efforts to grow. Normally, this is accomplished by incurring external debt. Debt service increases as a proportion of export earnings but eventually the added capacity should repay for itself by increasing exports and/or reducing imports by at least the amount of debt and interest incurred.[8]

Foreign direct investment is the other item of capital account sought by the LDC to finance their capital imports. In spite of its economic advantage in solving simultaneously the savings and foreign-currency gaps, foreign investment has political and historical drawbacks (excessive profits, low wages) that limit its use. Some Latin American countries are trying, however, to enlarge it, while legislating ways of reducing its harmful aspects. Recently, in the case of Brazil, large inflows of foreign investment seem to be one of the main causes of a spectacular increase in the rate of growth. This achievement has been associated with a shift in the composition of exports—moving away from traditional goods to manufactures —and has also been associated with a reduction of the rates of inflation.[9]

Foreign aid, the third element in capital accounts, does not now make a substantial contribution toward the deficit balance of LDC's current account. Its importance, however, is clear, being a way in which the MDC, or the international organizations supported by them, can perform the function of spreading their technology (or share their productive surpluses) at minimum cost to the developing nations.

[7] R. Prebisch, "The Economic Development of Latin America and Its Principal Problems," *Economic Bulletin for Latin America* (February, 1962), pp. 1–22.

[8] Hagen, *op. cit.*, p. 365.

[9] Some writers believe that inflation per se is not the main hindrance to growth. They claim that the fluctuations in the rate of inflation are the problem. See R. A. Krieger, "Inflation and Growth: the Case of Latin America," *Columbia Journal of World Business*, Vol. V. No. 6 (Nov.–Dec. 1970).

Income Distribution

The characteristic unevenness of the developing economies shows in income distribution. The contrast between the "haves" and "have-nots" is more notable in the LDC. It also plays a role in development. Savings and investment are essentially done by the recipients of nonwage income. On the other hand, the size of the internal market for consumption goods is determined by wage earners. Income distribution, then, plays a crucial role in investment and consumption by influencing the flow of internal savings available, while at the same time tending to limit the size of the internal market for consumption demand. It is also useful in understanding import substitution in light durable consumer goods, as a common strategy of supply enlargement in the LDC.

Population

Rapid population growth can be interpreted as another characteristic of the LDC, resulting from their uneven adoption of modern technique and outlook. Their adoption of modern medicine has substantially reduced the death rate—especially among infants. Birthrates, however, continue at traditionally high levels. Abatement of this condition must await the eventual adoption of values and views of the MDC on family size, education of children, and the process of urbanization. Migration, in principle, should also be considered. In most of the Latin American countries, however, its role is not significant.

Internal Labor Migration

Internal labor migration is another consequence of the unevenness in the agricultural and industrial sectors in the LDC. Rural labor migration to the cities is mainly caused by the difference in productivities and wages between these sectors. In the Mexican case, for example, the ratio of urban-rural labor productivity is approximately 5:1. Uneven capital accumulation stands at the bottom of the process. A Mexican urban worker has eight times more real capital to work with than does his rural counterpart. This problem calls for exploration of its demographic aspects in order to gain a better understanding of what is involved for econometric purposes.

Labor Force and Population

Since models for developing countries should be cast in a long-term framework, the growth of human input requires consideration. Enlargement of the labor force depends on economic and demographic factors. Production functions, converted into labor-requirement functions, and capital-labor ratios have been used for short-run, demand-oriented determination of employed labor. Population growth, with sex and age composition, are, on the other hand, the long-run supply determinants of the working force. In the LDC, the rapid growth of population makes the supply approach indispensable. "Development with unlimited supplies of labor" (and especially when the supply of labor is clearly outmatching the periodic supply of capital) calls for particular attention on the part of the econometrician.

Growth of the skilled and technical part of the labor force is the second important constraint on capacity creation of the LDC in addition to capital. Essentially, this growth is related to education and, particularly, to technological education. This aspect, so evident and so important, is difficult to introduce explicitly in statistical models.

Prices, Wages, and Money Supply

Inflation is an unsolved, worldwide problem, but in the developing countries, it appears in its extreme form. Brazil and Chile, with annual price increases of 30 percent or more, are two well-known examples. The severity of the problem in the LDC, and especially in Latin America, has had two main explanations in the literature: (1) structural imbalance in the productive sector (agricultural versus industrial), and (2) government monetary excesses.[10]

However, production bottlenecks, as well as rises in import or export prices, can explain the start, but not the persistence and high rates, of Latin American hyperinflations.[11] The prolongation and aggravation of the process requires the addition of other reinforcing factors, namely excessive growth of the money supply, the appearance of the price-wage spiral, and recurrent devaluation. In other words, structural imbalance can explain inflation; hyperinflation requires a monetary explanation.

Since, generally speaking, organized labor has not been politically independent or strong in Latin America, the price-wage vicious cycle has not been the basic pressuring force. This does not mean that the LDC's unions have not learned from hyperinflation. They have, but their reactions have, in general, been patient and modest. In Mexico, for example, they endured substantial real-wage reductions during the 1940s and early 1950s. The main fuel, thus, has come from the activity of the government printing presses. This governmental tendency arises from growing deficits caused by lack of taxing power (rooted, in turn, in political weakness) and the growing public expenditures required by growth and welfare programs. The third self-preserving mechanism, periodic devaluation, enters both as a result and a further cause of the inflationary process. Internal inflation erodes the capacity to import development goods, the pace of growth is retarded, and a devaluation is in order to move the economy again. This gives a new impetus to inflation and the mechanism of periodic devaluation is incorporated into the process.

Overcapacity

A paradox common to the LDC is the existence of particular pockets of overcapacity in the midst of general supply limitation. It appears essentially in the modern productive sectors, and it can be larger than that of the MDC's corresponding sectors. Some examples are the automobile industries in Argentina, Chile, and Mexico; other cases are the Mexican poultry industry and its hotel

[10] These two opposite schools, the structuralists and the monetarists, are very well represented in *Inflation and Growth in Latin America*, W. Baer and I. Kerstenetzky, eds. (Homewood, Ill.: Irwin, 1964).

[11] See W. A. Lewis, "Closing Remarks," in Baer and Kerstenetzky, *op. cit*, p. 24.

industry.[12] There are several reasons for this: (1) inaccurate demand estimates, due to lack of statistical information or the cost of gathering it; (2) the mirage of protectionism and the entrepreneurial desire to control the new market; and (3) the oversized plant and equipment available in the MDC.

Length of Lags

Based on observation of the behavior in the LDC, it seems that the time delays, or lags, between economic impulse and economic reaction differ from those of the MDC. With regard to private consumption, impulsiveness or lack of careful consumer planning may very well produce shorter income-consumption lags. In investment, the reverse may be true, because of the much larger construction and installation periods. The decision lag is perhaps shorter here, due to lack of long investigations and planning, but the implementation lag is certainly longer, even when the smaller size of investment goods in the developing economy is considered. Demographic processes are probably longer, due to poorness of communications, illiteracy, and traditional inertia.

Government and Political Change

The role of the government in the economy is usually bigger in the developing country. In most cases, the degree of economic intervention and direct participation in economic life is larger than in the MDC. It is not unusual, then, to find the government of the LDC with more economic instruments at its disposal than its MDC counterpart has. Also, it is common to find these governments as one of the larger (if not the largest) of the industrialists or merchants. When this is the case, a cyclical element is introduced in the economy which coincides with the political cycle: this arises not only from the stop-and-go nature of government investment at each administrative change, but also from the impact on private investment, which normally takes a waiting position during political changes.

3. The Mexican Model

The Mexican macroeconometric model presented here is the latest one in a succession of versions developed in an ongoing project of research on Mexico at Wharton EFA. This version, V, has been produced by enlargements and modifications of the earlier attempts. The purpose of these additions and changes has been to incorporate successively, as we were able to secure more and better data, additional aspects of the economy, and to respecify equations as we tried to approximate more closely the actual workings of the economy.

Each successive version was an attempt to make the model closer to what we consider to be the defining characteristics of the Mexican economy. Owing to limitations of space, we will not give here a full explanation of the theoretical

[12] "Weeding Out Auto Plants," *Business Week*, May 22, 1971, p. 36, and "Crecimiento Desordenado en la Industria Avicola," *Excelsior*, May 9, 1971. A recent general statement of overcapacity in the Mexican economy can be found in A. J. Yarza. "El Futuro del Proceso de Industrializacion en Mexico," *El Trimestre Economico*, No. 151 (July–Sept., 1971), pp. 87–88.

and institutional justification of the behavioral equations. For that, the interested reader is referred to the full document presented at the Cuernavaca conference. We will, however, list briefly the main features that we have tried to incorporate, which are those of section 2, plus those peculiar to the Mexican economy:

1. Internal and external sources of instability: the impact of the political climate on the economy and the dependence on foreign trade; the internal and external sources of inflation.

2. The dominant role played by the federal government as infrastructure builder and entrepreneur; public finances.

3. The general unevenness in economic life as exemplified in functional income distribution, in rural versus urban production, in federal versus non-federal taxation.

4. The rapid demographic processes resulting in high population growth, urbanization, or rural-urban labor-force migration.

5. The proximity to the U.S. markets with its effects on international labor migration, tourism and border transactions, and trade in general.

6. The development process of creating capacity, through capital and technological imports, in the context of general capital limitations and abundance of unskilled and semiskilled labor.

7. The comparatively shorter decision-making horizon in all economic processes, resulting in shorter lags vis-à-vis the MDC.

8. The simplicity of economic organisms and behavior when compared with those of the MDC.

The rest of this section consists of the nomenclature and the full listing of the equations of the model. The list contains 143 equations, 40 of which are behavioral; the rest are accounting and other identities. The behavioral equations have been estimated by the ordinary least squares method; the 10 containing distributed lags were estimated by fitting a polynomial of third degree with two end-point restrictions.

We list now alphabetically the symbols used and their meanings. The symbols are of two kinds: simple (consisting of only one letter) and compound (consisting of two or more letters and numbers). In the case of the compound symbols, the final letters and numbers have the following meaning:

Ending in *C*	Current billion pesos
Ending in *R*	Real billion pesos of 1950
Ending in *DC*	Current billion dollars
Ending in *L*	Per worker of the productive sector in question
Ending in *N*	Per capita
Ending in %	Annual rate of change
Ending in 1, 2, or 3	Lags of one, two, or three previous years

All predetermined variables (exogenous or lagged endogenous) are underlined. The only exceptions to these rules are two compound symbols: *L*1 and *L*23, rural and urban labor force. The number endings here do not mean lags, but primary and secondary plus tertiary productive sectors, respectively. They are not, thus, underlined. The abbreviations NIA and BOP mean National Income Accounts and Balance of Payment Account.

A condensed flow chart of this model and, in fact, a very condensed version of this whole paper, can be found in Abel Beltran del Rio, "Mexico: an Economy at the Crossroads," *Wharton Quarterly*, University of Pennsylvania, Fall 1971.

LIST OF VARIABLES

B

BFR Balance of productive factors in NIA
*BFR** Balance of productive factors in BOP
BGR Balance of goods in BOP
BGSFR Balance of goods, services and factors or net foreign demand in NIA
*BGSFR** Balance of goods, services and factors or net foreign demand in BOP
BGSR Balance of goods, tourism and border transactions in NIA
*BGSR** Balance of goods, tourism and border transactions in BOP
BOTR Balance of other items in current account in BOP
BTBR Balance of tourism and border transactions in BOP

C

CGR Public consumption
CITR Domestic or internal aggregate demand
CMC Capacity to import or current earnings deflated by import price-index
COCDU *COCOP* multiplied by *DUMRS*
COCOP Domestic, physical consumption of copper (millions of tons)
COCOT Domestic, physical consumption of cotton (millions of bales)
COLEA Domestic, physical consumption of lead (millions of tons)
COMET Domestic, physical consumption of nonferrous metals: lead, copper and zinc (millions of tons)
CPR Private consumption
CPRN Private consumption per capita (thousands of 1950 pesos per person)
CR Consumption

D

DBGEDC Public external debt
DBGER Public external debt
DC Depreciation
DDBGR Change in public external debt
DGDPR Change in gross domestic product
DGR Public depreciation
DIPRN Disposable personal income per capita (thousands of 1950 pesos per person)
DIUDC Disposable personal income in the U.S.
DIUR Disposable personal income in the U.S.
DPEUEJ Change in export price index, *PEUEJ*, of main exporting countries to Mexico
DPGNP Change in GNP price deflator
DPR Private depreciation
DR Depreciation
DUMBR Dummy for government restrictions to the bracero program, 1.0 for 1965–1968; 0.0 elsewhere
DUMCU Dummy for U.S.' suspension of sugar buying from Cuba; 1.0 for 1960–1968; 0.0 elsewhere
DUMDV Dummy for aftereffects of devaluation of 1954; 1.0 for 1956–1961; 0.0 elsewhere
DUMPO Dummy for political change in Mexico: presidential transitions and other major political events; 1.0 for 1952–1953, 1958–1959, 1964–1965, and 1961–1963; 0.0 elsewhere
DUMRE Dummy for census revisions of labor data; 1.0 for 1960–1968; 0.0 elsewhere.
DUMRS Dummy for U.S.' trade protection to its nonferrous metal producers; 1.0 for 1958–1968; 0.0 elsewhere
DUMTFE Dummy for exceptional federal exports tax collection; 1.0 for 1955–1956, 1961, and 1967; 0.0 elsewhere

DUMTPC Dummy for exceptional federal nontax collection; 1.0 for 1965; 0.0 elsewhere
DUX23P Change in idle urban productive capacity
DX1PRU Change in rural potential population productivity
DX231P Gaps between urban and rural potential population productivity

E

EAADC Net production of gold and silver
EAAR Net production of gold and silver
EAGR Main agricultural goods exports: cotton, coffee and sugar
EBRR Labor exports or bracero earnings
EBRRL Labor exports or bracero earnings per Mexican worker (thousands of 1950 pesos per worker)
ECOFR Exports of coffee
ECOPR Exports of copper
ECOTR Exports of cotton
EGC Goods or merchandise exports
EGDC Goods or merchandise exports
EGER Goods exports, explained by equations in the model
EGMFR Manufactured goods exports
EGR Goods or merchandise exports
*EGSFR** Exports of goods, services and factors or total trade exports
ELEAR Lead exports
EMETR Nonferrous metals exports: lead, copper and zinc
EOGR Other goods exports
EOTDC Exports of other items in current account
EOTR Exports of other items in current account
ESUGR Sugar exports
ETBR Tourism and border exports
EZINR Zinc exports

F

FBGFC Domestic banking credit to the federal government
FBGFR Domestic banking credit to the federal government
FRDC Foreign reserves
FRR Foreign reserves

G

GC Public expenditure
GDPC Gross domestic product
GDPR Gross domestic product
GNPC Gross national product
GNPR Gross national product
GNPUDC U.S. gross national product
GNPUR U.S. gross national product
GR Public expenditure
GSC Government surplus or deficit

I

ICHR Inventory investment
IGGR. Government fixed, gross investment
IGOER. Federal organizations and enterprises fixed, gross investment
IGR Public gross, fixed investment
IPR Private gross, fixed investment
IPUSF U.S. index of industrial production of food and beverages (1957–1959 = 1.0)
IR Gross fixed investment
ITR Investment

K

KGF1R Federal government capital stock in the rural sector
KGR Government capital stock
KPR Private capital stock
KR Capital stock
K23R Private and federal government capital stock in urban sector

L

L Labor force (millions of workers)
L1 Labor force in rural or primary sector (millions of workers)
L1NRU Rural labor participation rate: ratio of labor force over population in rural sector
L23 Labor force in urban or secondary and tertiary sectors (millions of workers)
L23NB Urban labor participation rate: ratio of labor force over population in urban sector

M

MCAPR Capital goods imports
MCONR Consumption goods imports
MFR Factor imports
MGC Goods or merchandise imports
MGR Goods or merchandise imports
*MGSR** Imports of goods, services and factors or total trade imports
MIGR Government payments of interest to foreign bond holders
MOTDC Imports of other items in current account
MOTR Imports of other items in current account
MPGR Imports of production goods
MPPR Private payments of profits to foreign stockholders
MRDC Imports of raw materials and fuels
MRR Imports of raw materials and fuels
MTBR Imports of tourism and border transactions

N

N Population (millions of persons)
NG Population rate of growth
NIC National income in NIA
NIC: National income generated by the model
NIR National income
NNPC Net national product
NRUL Rural population (millions of persons)
NURB Urban population (millions of persons)
NURBN Ratio of urban to total population
NWIC Nonwage income

P

PCFMB Ratio of Mexican over Brazilian price of coffee
PCOFB Brazilian price of coffee (dollars per hundred lbs.)
PCOFM Mexican price of coffee (dollars per hundred lbs.)
PEEU European (EEC plus EFTA) export price index (1953 = 1.0)
PEJP Japanese export price index (1960–1962 = 1.0)
PEUEJ Weighted export price index of main exporting countries to Mexico (U.S., Europe and Japan), weights of 1968
PEUS U.S. export price index (1958 = 1.0)
PGNP GNP price deflator (1950 = 1.0)
PGNP% GNP price deflator rate of change
PM Imports price index (1950 = 1.0)
PM% Imports price index rate of change
PRCDU *PRCOP* multiplied by *DUMRS*
PRCOP Domestic, physical copper production (thousands of tons)
PRCOT Domestic, physical cotton production (thousands of tons)
PRLEA Domestic, physical lead production (thousands of tons)
PRMET Domestic, physical nonferrous metals production: lead, copper and zinc (thousands of tons)
PSGMP Ratio of Mexican over Philippines price of sugar
PSUGM Price of Mexican sugar (dollars per hundred lbs.)
PSUGPH Price of Philippines sugar (dollars per hundred lbs.)

R

RDPAV Paved roads (thousands of kilometers)
REX Rate of exchange (dollars per peso)

S

SBGSFR	Discrepancy between NIA and BOP data on balance in current account
SDBFR	Discrepancy between NIA and BOP data on balance of factors
SDBGSR	Discrepancy between NIA and BOP data on balance of goods and services
SDNIC.	Discrepancy between NIA data and the model's identity of national income
SDTFNC	Discrepancy between two data sources used on federal indirect or nonincome taxes

T

T	Time (1948 = 1.0)
TC	Total taxes and nontaxes
TFC	Federal government taxes
TFEC.	Federal export taxes
TFIC.	Federal income taxes
TFMC.	Federal import taxes
TFMGC	Rate of taxation on imported merchandise
TFNIC	Federal indirect or nonincome taxes
TFNIC.	Federal indirect or nonincome taxes
TFOC:	Other federal taxes
TFPAC.	Federal nontax income: "productos, derechos y aprovechamientos"
TFSC.	Federal sales taxes: "ingresos mercantiles"
TNFC	Nonfederal taxes: D.F., state and local
TNIC	Total indirect or nonincome taxes
TNIC%	Total indirect taxes rate of growth
TR	Total taxes and nontaxes
TRDGR	Total taxes plus public depreciation

U

UXRP	Idle capacity
UX1RP	Rural idle capacity
UX23RD	*UX23RP* multiplied by *DUMRE*
UX23RP	Urban idle capacity
WIC	Wage income
WMAC	Daily, average minimum wage rate (current pesos per worker)
WMRC	Daily, minimum rural wage rate (current pesos per worker)
WMUC	Daily, minimum urban wage rate (current pesos per worker)
WRC	Yearly, average wage rate (thousand current pesos per worker)
WRC%	Yearly, average wage-rate rate of growth
WRCA	Unit labor cost or ratio of average wage rate to labor productivity
WRCA%	Unit labor cost rate of change
WRFUDC	U.S. hourly manufacturing wage rate (dollars per worker)
WRMMUC	Ratio of daily, minimum urban wage to U.S. hourly manufacturing rate converted into current pesos

X

X1R	Rural production
X1RL	Rural labor productivity (thousands of 1950 pesos per worker)
X1RP	Potential rural production or rural capacity
X2R	Secondary production
X3R	Tertiary production
X23R	Urban production
X23PBD	*X23PNB* multiplied by *DUMRE*
X23PNB	Potential urban population productivity (thousands of 1950 pesos per urban person)
X23RL	Urban labor productivity (thousands of 1950 pesos per worker)
X23RP	Potential urban production or urban capacity
XRP	Potential production or capacity

LIST OF EQUATIONS

I. Generation of Aggregate Demand

IA. Generation of Domestic Demand

Private consumption per capita

(1) $$CPRN = \underset{(2.337)}{0.10488} + \underset{(3.6918)}{0.39560}\,DIPRN + \underset{(32.0987)}{0.34350}\,\underline{DIPRN1} + \underset{(1.0605)}{0.11960}\,\underline{DIPRN2}$$

$$\sum_{i=0}^{2} w(i) = 0.8587 \quad = \text{sum of distributed lag coefficients}$$

$$R^2 = 0.9877 \quad S.E. = 0.0215 \quad DW = 2.0793 \quad F(2, 13) = 603.3416$$

Public consumption

(2) $$CGR = \underset{(-4.817)}{-0.68719} + \underset{(32.961)}{0.60410}\,TR$$

$$R^2 = 0.9837 \quad S.E. = 0.2247 \quad DW = 1.2862 \quad F(1, 17) = 1086.4641$$

Private gross, fixed investment

(3) $$IPR = \underset{(3.111)}{1.37563} - \underset{(-2.702)}{0.76030}\,\underline{DUMPO} + \underset{(2.521)}{0.05611}\,\underline{KPR1} + \underset{(2.3973)}{0.18120}\,DGDPR + \underset{(5.2569)}{0.34350}\,\underline{DGDPR1} + \underset{(4.6544)}{0.33410}\,\underline{DGDPR2}$$

$$\sum_{i=0}^{2} w(i) = 0.8588$$

$$R^2 = 0.9552 \quad S.E. = 0.4816 \quad DW = 2.0697 \quad F(4, 11) = 80.9639$$

Public gross, fixed investment

(4) $$IGR = \underset{(-0.405)}{-0.16872} + \underset{(3.310)}{0.83383}\,DDBGR + \underset{(4.907)}{0.40620}\,TRDGR + \underset{(2.636)}{0.20362}\,FBGFR$$

$$R^2 = 0.9765 \quad S.E. = 0.3603 \quad DW = 2.1081 \quad F(3, 15) = 250.3858$$

Investment of federal government organizations and enterprises

(5) $$IGOER = \underset{(3.004)}{0.62296} + \underset{(10.581)}{0.32234}\,\underline{FBGR1} + \underset{(5.6944)}{1.35670}\,DDBGR + \underset{(2.1109)}{0.5008}\,\underline{DDBGR1}$$

$$\sum_{i=0}^{1} w(i) = 1.8575$$

$$R^2 = 0.9185 \quad S.E. = 0.3766 \quad DW = 1.2617 \quad F(3, 12) = 57.3715$$

Inventory changes

(6) $$ICHR = \underset{(1.889)}{0.31206} + \underset{(2.061)}{2.5922}\,DPGNP + \underset{(2.5810)}{0.05210}\,DGDPR + \underset{(6.1489)}{0.07080}\,\underline{DGDPR1} + \underset{(4.3152)}{0.06330}\,\underline{DGDPR2} + \underset{(1.6367)}{0.03730}\,\underline{DGDPR3}$$

$$\sum_{i=0}^{3} w(i) = 0.2235$$

$$R^2 = 0.8515 \quad S.E. = 0.1610 \quad DW = 2.0251 \quad F(3, 12) = 29.6755$$

Private consumption

(7) $$CPR = CPRN \times N$$

Consumption

(8) $$CR = CPR + CGR$$

Gross, fixed investment

(9) $$IR = IPR + IGR$$

Investment: gross fixed plus inventory changes

(10) $$ITR = IR + ICHR$$

Public investment net of federal organizations and enterprises investment

(11) $$IGGR. = IGR - IGOER.$$

Domestic aggregate demand

(12) $$CITR = CR + ITR$$

IB. Generation of Foreign Demand

1B(i). Exports

Exports of cotton

(13) $$ECOTR = 1.74205 - \underset{(-5.489)}{3.41745}\ \underline{COCOT2} + \underset{(3.683)}{0.52469}\ \underline{PRCOT1}$$
(8.999)

$R^2 = 0.6156$ $S.E. = 0.1944$ $DW = 1.7479$ $F(2, 16) = 15.4124$

Relative price of Mexican to Brazilian coffee

(14) $$PCFMB = \underline{PCOFM}/\underline{PCOFB}$$

Exports of coffee

(15) $$ECOFR = \underset{(1.883)}{0.64692} + \underset{(5.044)}{0.77732}\ \underline{ECOFR1} - \underset{(-1.566)}{0.44755}\ \underline{PCFMB}$$

$R^2 = 0.5741$ $S.E. = 0.1076$ $DW = 2.3463$ $F(2, 16) = 13.1329$

Relative price of Mexican to Philippines sugar

(16) $$PSGMP = \underline{PSUGM}/\underline{PSUGPH}$$

Exports of sugar

(17) $$ESUGR = \underset{(-1.087)}{-0.13087} + \underset{(2.831)}{0.44480}\ \underline{IPUSF} + \underset{(4.814)}{0.20956}\ \underline{DUMCU} - \underset{(-1.872)}{0.27291}\ PSGMP$$

$R^2 = 0.9311$ $S.E. = 0.0441$ $DW = 2.6200$ $F(3, 15) = 82.1127$

Exports of nonferrous metals: lead, copper and zinc

(18) $$EMETR = \underset{(0.351)}{0.27415} - \underset{(-8.258)}{0.56093}\ \underline{DUMRS} + \underset{(1.083)}{1.57891}\ \underline{PRMET} - \underset{(-0.221)}{0.20054}\ \underline{COMET}$$

$R^2 = 0.8974$ $S.E. = 0.1062$ $DW = 2.4087$ $F(3, 15) = 53.4719$

Exports of lead

(19) $$ELEAR = \underset{(-0.888)}{-0.19166} - \underset{(-4.113)}{0.16455}\ \underline{DUMRS} + \underset{(3.241)}{3.03442}\ \underline{PRLEA} - \underset{(-1.000)}{0.61904}\ \underline{COLEA}$$

$R^2 = 0.9228$ $S.E. = 0.04596$ $DW = 1.6541$ $F(3, 15) = 72.7337$

Consumption of copper in the period of U.S. restrictions

(20) $$COCDU = \underline{COCOP} \times \underline{DUMRS}$$

Production of copper in the period of U.S. restrictions

(21) $$PRCDU = \underline{PRCOP} \times \underline{DUMRS}$$

Exports of copper

(22) $$ECOPR = \underset{(2.297)}{1.13451} - \underset{(-2.106)}{1.09724}\ \underline{DUMRS} - \underset{(-2.306)}{16.04651}\ \underline{PRCOP} + \underset{(2.627)}{19.88620}\ PRCDU + \underset{(1.717)}{7.69851}\ \underline{COCOP} - \underset{(-2.552)}{11.75707}\ \underline{COCDU}$$

$R^2 = 0.9088$ $S.E. = 0.04806$ $DW = 2.1233$ $F(5, 13) = 36.8633$

Exports of manufactured goods

(23) $$EGMFR = \underset{(-6.711)}{-1.17954} + \underset{(9.114)}{0.00052}\ GNPUR$$

$R^2 = 0.8201$ $S.E. = 0.10685$ $DW = 0.6438$ $F(1, 17) = 83.0712$

Tourism and border exports

(24) $$ETBR = \underset{(-5.071)}{-2.39964} + \underset{(1.947)}{0.02245}\ \underline{RDPAV} + \underset{(7.854)}{0.75075}\ \underline{DUMDV} + \underset{(7.039)}{0.00238}\ DIUR$$

$R^2 = 0.9594$ $S.E. = 0.1888$ $DW = 2.5961$ $F(3, 15) = 142.8593$

Exports of labor per worker

(25) $$EBRRL = \underset{(8.407)}{0.09415} - \underset{(-3.551)}{0.01248}\ DUMBR - \underset{(-2.947)}{0.07318}\ \underline{WRMMUC} - \underset{(-3.322)}{0.01846}\ X1RL$$

$R^2 = 0.9152$ $S.E. = 0.0038$ $DW = 1.8624$ $F(3, 15) = 65.7711$

Production of gold and silver

(26) $$EAAR = (\underline{EAADC} \times \underline{REX})/PGNP$$

Exports of zinc

(27) $$EZINR = EMETR - ELEAR - ECOPR$$

Exports of agricultural goods

(28) $$EAGR = ECOTR + ESUGR + ECOFR$$

Exports of goods explained by the model

(29) $$EGER = EAGR + EMETR + EGMFR$$

Exports of other goods

(30) $$EOGR = [(\underline{EGDC} \times \underline{REX})/PGNP] - EGER$$

Exports of goods

(31) $$EGR = EGER + EOGR$$

(32) $$EGC = EGR \times PGNP$$

Exports of labor: bracero earnings

(33) $$EBRR = EBRRL \times L1$$

Other exports in trade account

(34) $$EOTR = (\underline{EOTDC} \times \underline{REX})/PGNP$$

U.S. gross national product

(35) $$GNPUR = (\underline{GNPUDC} \times \underline{REX})/PGNP$$

U.S. disposable personal income

(36) $$DIUR = (\underline{DIUDC} \times \underline{REX})/PGNP$$

Total trade exports: goods, services and factors

(37) $$EGSFR^* = EGR + EBRR + EAAR + EOTR + ETBR$$

IB(ii). Imports

Imports of consumer goods

(38) $$MCONR = \underset{(1.295)}{0.23921} + \underset{(2.222)}{0.00426}\,CR + \underset{(2.4134)}{0.11120}\,FRR + \underset{(3.9358)}{0.1233}\,\underline{FRR1} + \underset{(1.6357)}{0.07370}\,\underline{FRR2}$$

$$\sum_{i=0}^{2} w(i) = 0.3082$$

$R^2 = 0.6926$ $S.E. = 0.1209$ $DW = 2.1126$ $F(3, 12) = 12.2677$

Imports of capital goods

(39) $$MCAPR = \underset{(7.625)}{1.78374} - \underset{(-5.197)}{0.13774}\,X2R + \underset{(2.656)}{0.23077}\,FRR + \underset{(4.9568)}{0.33850}\,IR + \underset{(0.7785)}{0.0430}\,\underline{IR1}$$

$$\sum_{i=0}^{1} w(i) = 0.3815$$

$R^2 = 0.9218$ $S.E. = 0.1449$ $DW = 2.7021$ $F(4, 11) = 45.1882$

Imports of raw materials and fuels

(40) $$MRR = (\underline{MRDC} \times \underline{REX})/PGNP$$

Tourism and border imports

(41) $$MTBR = \underset{(-6.497)}{-1.05262} + \underset{(16.955)}{0.26925}\,CMC$$

$R^2 = 0.9409$ $S.E. = 0.1446$ $DW = 1.1732$ $F(1, 17) = 287.4587$

Private payments of interest and dividends abroad

(42) $$MPPR = \underset{(1.938)}{0.16413} + \underset{(8.120)}{0.01082}\,X23R$$

$R^2 = 0.7830$ $S.E. = 0.12409$ $DW = 0.8460$ $F(1, 17) = 65.9364$

Public payments of interest abroad

(43) $$MIGR = \underset{(-1.996)}{-0.06879} + \underset{(9.854)}{0.05542}\,DBGER$$

$R^2 = 0.8422$ $S.E. = 0.07264$ $DW = 0.6560$ $F(1, 17) = 97.0940$

Imports of production goods

(44) $$MPGR = MCAPR + MRR$$

Imports of goods

(45) $MGR = MPGR + MCONR$

(46) $MGC = MGR \times PGNP$

Imports of factors of production

(47) $MFR = MPPR + MIGR$

Other imports in trade account

(48) $MOTR = (\underline{MOTDC} \times \underline{REX})/PGNP$

Total trade imports: goods, services and factors

(49) $MGSFR^* = MGR + MTBR + MFR + MOTR$

Weighted price index of main exporting countries to Mexico

(50) $PEUEJ = 0.63\ \underline{PEUS} + 0.25\ \underline{PEEU} + 0.04\ \underline{PEJP}$

Annual change in price index of main exporting countries to Mexico

(51) $DPEUEJ = PEUEJ - \underline{PEUEJ1}$

Price index of imports

(52) $PM = \underset{(12.371)}{1.32176} + \underset{(4.696)}{3.92619}\ TFMGC + \underset{(2.6029)}{5.03750}\ DPEUEJ + \underset{(1.1100)}{2.15990}\ \underline{DPEUE1}$

$$\sum_{i=0}^{1} w(i) = 7.1973$$

$R^2 = 0.7684$ $S.E. = 0.1331$ $DW = 0.9219$ $F(3, 12) = 17.5894$

Rate of change of import price index

(53) $PM\% = (PM - \underline{PM1})/\underline{PM1}$

Capacity to import: export earnings deflated by import price index

(54) $CMC = [(EGSFR^*) \times PGNP]/PM$

IB(iii). Balance of Trade or Net Foreign Demand

Balance of goods

(55) $BGR = EGR - MGR$

Balance of tourism and border transaction

(56) $BTBR = ETBR - MTBR$

Balance of goods and services

(57) $BGSR^* = BGR + BTBR$

Balance of factors

(58) $BFR^* = EBRR - MFR$

Balance of other items in trade account

(59) $BOTR = EOTR - MOTR$

Balance of trade: goods, services and factors

(60) $BGSFR^* = BGR + BTBR + BFR^* + BOTR + EAAR$

Balance of goods and services in NIA (conciliation)

(61) $BGSR = BGSR^* + \underline{SDBGSR}$

Balance of factors in NIA (conciliation)

(62) $BFR = BFR^* + \underline{SDBFR}$

Balance of trade: goods, services and factors in NIA

(63) $BGSFR = BGSR + BFR$

IC. Total Aggregate Demand

Gross national product

(64) $GNPR = CITR + BGSFR$

(65) $GNPC = GNPR \times PGNP$

II. Generation of Value-Added Output

Output originating in primary sector

(66) $$X1R = 1.54792 + 0.17425\,CPR + 1.15516\,EAGR$$
$$(2.167) \quad (30.559) \quad (4.070)$$
$$R^2 = 0.9816 \quad S.E. = 0.4133 \quad DW = 1.2108 \quad F(2, 16) = 489.6113$$

Output originating in secondary sector

(67) $$X2R = -4.16634 + 0.63336\,IR + 0.35448\,CR$$
$$(-6.160) \quad (4.113) \quad (9.552)$$
$$R^2 = 0.9965 \quad S.E. = 0.5996 \quad DW = 1.0393 \quad F(2, 16) = 2534.3875$$

Output originating in tertiary sector

(68) $$X3R = -2.06446 + 0.59023\,ETBR + 0.57309\,CR$$
$$(-4.317) \quad (2.557) \quad (52.772)$$
$$R^2 = 0.9980 \quad S.E. = 0.5303 \quad DW = 1.2959 \quad F(2, 16) = 4510.9609$$

Gross domestic product

(69) $$GDPR = X1R + X2R + X3R$$

(70) $$GDPC = GDPR \times PGNP$$

Annual change in gross domestic product

(71) $$DGDPR = GDPR - \underline{GDPR1}$$

Gross domestic urban product

(72) $$X23R = X2R + X3R$$

III. Capital Formation

Capital stock in the urban sector

(73) $$K23R = -4.43803 + 0.97649\,KR$$
$$(-47.108) \quad (899.786)$$
$$R^2 = 1.000 \quad S.E. = 0.1444 \quad DW = 0.3752 \quad F(1, 17) > 999$$

Private capital stock

(74) $$KPR = IPR + 0.90\,\underline{KPR1}$$

Public capital stock

(75) $$KGR = IGR + 0.95\,\underline{KGR1}$$

Capital stock

(76) $$KR = KPR + KGR$$

Capital stock of federal government in rural sector

(77) $$KGF1R = KR - K23R$$

Private depreciation

(78) $$DPR = 0.10\,\underline{KPR1}$$

Public depreciation

(79) $$DGR = 0.05\,\underline{KGR1}$$

Depreciation

(80) $$DR = DPR + DGR$$

(81) $$DC = DR \times PGNP$$

IV. Creation of Capacity: Potential Value-Added Production

Rural capacity

(82) $$X1RP = -12.49223 + 4.41883\,\underline{KGF1R2}$$
$$(-8.144) \quad (17.487)$$
$$R^2 = 0.9442 \quad S.E. = 0.6933 \quad DW = 0.3739 \quad F(1, 17) = 305.7893$$

Urban capacity

(83) $$X23RP = 6.83255 + 0.81752\,\underline{K23R1}$$
$$(5.044) \quad (45.072)$$
$$R^2 = 0.9912 \quad S.E. = 2.1628 \quad DW = 0.4497 \quad F(1, 17) = 2031.5142$$

Capacity

(84) $$XRP = X1RP + X23RP$$

Unused rural capacity

(85) $$UX1RP = X1RP - X1R$$

Unused urban capacity

(86) $$UX23RP = X23RP - X23R$$

Unused capacity

(87) $$UXRP = XRP - GDPR$$

Annual change in used urban capacity

(88) $$DUX23P = UX23RP - \underline{UX23RP1}$$

V. Demography Processes and Labor Supply

Population

(89) $$N = \underline{NG} \times \underline{N1}$$

Urban-rural potential productivity gaps

(90) $$DX231P = (X23RP/NURB) - (X1RP/NRUL)$$

Ratio of urban to total population: urbanization

(91) $$NURBN = \underset{(208.854)}{0.36908} + \underset{(251.877)}{0.00849}\ \underline{T} + \underset{(7.6985)}{0.00280}\ DX231P + \underset{(12.4946)}{0.00360}\ \underline{DX231P1} + \underset{(8.8262)}{0.00290}\ \underline{DX231P2} + \underset{(3.5369)}{0.00150}\ \underline{DX231P3}$$

$$\sum_{i=0}^{3} w(i) = 0.0107$$

$$R^2 = 1.000 \quad S.E. = 0.0001 \quad DW = 5.5279 \quad F(3, 12) = > 999$$

Urban population

(92) $$NURB = N \times NURBN$$

Rural population

(93) $$NRUL = N - NURB$$

Annual change in rural potential productivity

(94) $$DX1PRU = (X1RP/NRUL) - (\underline{X1RP1}/\underline{NRUL1})$$

Rural labor participation rate

(95) $$L1NRU = \underset{(87.379)}{0.38528} - \underset{(-0.974)}{0.00196}\ \underline{DUMRE} - \underset{(-1.6638)}{0.32790}\ DX1PRU - \underset{(-3.8388)}{0.51720}\ \underline{DX1PRU1} - \underset{(-9.3369)}{0.54270}\ \underline{DX1PRU2} - \underset{(-2.7378)}{0.37870}\ \underline{DX1PRU3} - \underset{(-5.6660)}{0.00070}\ DUX23P - \underset{(-9.6770)}{0.00110}\ \underline{DUX23P1} - \underset{(-5.6311)}{0.00110}\ \underline{DUX23P2} - \underset{(-3.1876)}{0.00070}\ \underline{DUX23P3}$$

$$\sum_{i=0}^{3} w_1(i) = -1.7665$$

$$\sum_{i=0}^{3} w_2(i) = -0.0036$$

$$R^2 = 0.9867 \quad S.E. = 0.0013 \quad DW = 2.2905 \quad F(5, 10) = 223.1250$$

Rural labor force

(96) $$L1 = L1NRU \times NRUL$$

Urban potential productivity

(97) $$X23PNB = X23RP/NURB$$

Urban potential productivity in the revised data period

(98) $$X23PBD = X23PNB \times \underline{DUMRE}$$

Unused urban productive capacity in the revised data period

(99) $$UX23RD = UX23RP \times \underline{DUMRE}$$

Urban labor participation rate

(100) $L23NB = \underset{(36.351)}{0.68591} - \underset{(-20.934)}{0.12852}\ X23PNB + \underset{(8.301)}{0.10019}\ X23PBD - \underset{(-6.967)}{0.30454}\ \underline{DUMRE} + \underset{(4.700)}{0.00301}\ UX23RP - \underset{(-3.419)}{0.00242}\ UX23RD$

$R^2 = 0.9674 \quad S.E. = 0.00241 \quad DW = 1.9357 \quad F(5, 13) = 107.9482$

Urban labor force

(101) $L23 = L23NB \times NURB$

Labor force

(102) $L = L1 + L23$

Rural labor productivity

(103) $X1RL = X1R/L$

Urban labor productivity

(104) $X23RL = X23R/L23$

VI. Income Distribution

VIA. National Income Breakdown: Wage and Nonwage Income

Average minimum daily wage rate (current pesos per worker)

(105) $WMAC = (\underline{WMRC} \times L1 + \underline{WMUC} \times L23)/L$

Ratio of minimum rural wage rate to U.S. manufacturing wage rate

(106) $WRMMUC = \underline{WMRC}/(\underline{WRFUDC} \times \underline{REX})$

Rate of change of wage rate

(107) $WRC\% = \underset{(1.305)}{0.01307} - \underset{(-2.530)}{0.00356}\ UX23RP + \underset{(18.430)}{1.68756}\ PGNP\%$

$R^2 = 0.9659 \quad S.E. = 0.0156 \quad DW = 1.3768 \quad F(2, 16) = 256.1040$

Average annual wage rate

(108) $WRC = (1.0 + WRC\%) \times \underline{WRC1}$

Wage income

(109) $WIC = WRC \times L$

Labor unit cost

(110) $WRCA = WRC/(GDPR/L)$

Rate of change of labor unit cost

(111) $WRCA\% = (WRCA - \underline{WRCA1})/\underline{WRCA1}$

Net national product

(112) $NNPC = GNPC - DC$

Model's national income

(113) $NIC: = NNPC - TNIC$

National income

(114) $NIC = NIC: + \underline{SDNIC:}$

(115) $NIR = NIC/PGNP$

Nonwage income

(116) $NWIC = NIC - WIC$

Disposable income per capita

(117) $DIPRN = [(NIC - TFIC.)/PGNP]/N$

VIB. Public Income and Finance

Federal income taxes

(118) $TFIC. = \underset{(-4.201)}{-1.27427} + \underset{(20.957)}{0.04001}\ NIC$

$R^2 = 0.9605 \quad S.E. = 0.6501 \quad DW = 1.0844 \quad F(1, 17) = 439.2012$

Federal export taxes

(119) $$TFEC. = \underset{(5.975)}{0.35076} + \underset{(7.625)}{1.02380}\,\underline{DUMTFE} + \underset{(11.527)}{0.06586}\,EGC$$
$$R^2 = 0.9038 \quad S.E. = 0.0811 \quad DW = 1.4300 \quad F(2, 16) = 85.5648$$

Federal import taxes

(120) $$TFMC = \underset{(-4.206)}{-1.45476} + \underset{(10.235)}{0.23801}\,MGC$$
$$R^2 = 0.8522 \quad S.E. = 0.5258 \quad DW = 0.8140 \quad F(1, 17) = 104.7648$$

Federal sales taxes

(121) $$TFSC. = \underset{(-4.317)}{-0.23470} + \underset{(31.564)}{0.00962}\,GDPC$$
$$R^2 = 0.9822 \quad S.E. = 0.1167 \quad DW = 0.7020 \quad F(1, 17) = 996.2786$$

Federal nontax income

(122) $$TFPAC. = \underset{(2.865)}{0.24270} + \underset{(15.392)}{0.00750}\,GDPC + \underset{(13.926)}{2.67050}\,\underline{DUMTPC}$$
$$R^2 = 0.9692 \quad S.E. = 0.1810 \quad DW = 2.6903 \quad F(2, 16) = 284.6804$$

Other federal taxes

(123) $$TFOC: = \underset{(5.696)}{0.7211} + \underset{(12.821)}{0.11610}\,TFC$$
$$R^2 = 0.9008 \quad S.E. = 0.2797 \quad DW = 2.2890 \quad F(1, 17) = 164.3864$$

Nonfederal taxes: D.F., state and local

(124) $$TNFC = \underset{(-6.827)}{-0.84372} + \underset{(42.213)}{0.37313}\,TFC$$
$$R^2 = 0.9900 \quad S.E. = 0.2730 \quad DW = 2.1512 \quad F(1, 17) = 1781.9036$$

Federal indirect or nonincome taxes

(125) $$TFNIC. = TFMC. + TFEC. + TFSC. + TFOC: + TFPAC.$$

(126) $$TFNIC = TFNIC. + \underline{SDTFNC}$$

Indirect or nonincome taxes

(127) $$TNIC = TFNIC + TNFC$$

Rate of change of indirect taxes

(128) $$TNIC\% = (TNIC - \underline{TNIC1})/\underline{TNIC1}$$

Federal taxes

(129) $$TFC = TFIC. + TFNIC$$

Taxes

(130) $$TC = TFC + TNFC$$

(131) $$TR = TC/PGNP$$

Average tariff on imports of goods

(132) $$TFMGC = TFMC./MGC$$

Public expenditure

(133) $$GR = CGR + IGR$$

(134) $$GC = GR \times PGNP$$

Public surplus or deficit

(135) $$GSC = TC - GC$$

Taxes plus public depreciation

(136) $$TRDGR = TR + DGR$$

Public foreign debt

(137) $$DBGER = (\underline{DBGEDC} \times \underline{REX})/PGNP$$

Annual change in public foreign debt

(138) $$DDBGR = DBGER - \underline{DBGER1}$$

Banking system credit to the federal government

(139) $$FBGFR = \underline{FBGFC}/PGNP$$

Foreign reserves

(140) $$FRR = (\underline{FRDC} \times \underline{REX})/\underline{PGNP}$$

VII. Price Formation

Rate of change of the general price index: GNP deflator

(141) $$PGNP\% = \underset{(4.007)}{0.01667} + \underset{(4.103)}{0.38848}\, WRCA\% + \underset{(2.680)}{0.32394}\, PM\% + \underset{(0.236)}{0.00746}\, TNIC\%$$

$R^2 = 0.9520$ $S.E. = 0.0100$ $DW = 2.3499$ $F(3, 15) = 119.8805$

General price index: GNP deflator

(142) $$PGNP = (1.0 + PGNP\%) \times \underline{PGNP1}$$

Annual change in the general price index

(143) $$DPGNP = PGNP - \underline{PGNP1}$$

4. Simulations

This final section is devoted to econometric results. We will present two long-term simulations of the Mexican economy obtained from model solutions. They cover the full six-year term, 1971–1976, of the new administration of President Echeverria. We provide actual figures for 1968–1970, to give a basis of comparison. It should be noted, however, that some of the figures for this previous period are preliminary or even our own estimates, given the unusual delay in the publication of data. We think, however, that they are good enough to be included.

Given the uncertainties that go with long-term simulations, we have followed two procedures to give empirical meaning to our results. First, we have used the available information at mid-1971 on the exogenous variables and adjustments of the behavioral equations to try to produce a realistic forecast for 1971. Secondly, for the rest of the period, 1972–1976, we have used two contrasting assumptions about the behavior of the federal government: one deflationary, the other expansionary. In this way, we expect to set up lower and upper bounds within which the real economy will probably move.

With regard to the contrasting assumptions from 1972 to 1976, we can summarize them in the following table. They represent divergent hypothetical policy packages that the administration could take in a single-minded pursuit of stability or high employment.

Essentially, the two policies boil down to different spending patterns by the federal government. Being the dominant economic agent, the federal impact is

Average Annual Growth of the Policy Variables: 1972–1976

	Deflationary Hypothesis	Expansionary Hypothesis
Fiscal Measures		
Government investment	7.5%	9.9%
Federal enterprise investment	6.8	9.9
Public works: highways	5.0	7.0
Government consumption	7.0	8.7
Monetary Measures		
Banking credit to federal government	7.0	15.0
External debt	7.0	10.0

critical in the system, and, as can be seen in the two tables which follow, it can turn the economy into different paths. In each table, there are two sections, I and II, in real and current billions of pesos respectively, for each simulation, containing a selection of the original computer print-outs. Reference to concepts in the tables will be made by section and line. Thus, for example, real gross national product and current inventory change are (I-2) and (II-14) in both tables.

Analysis of the Simulations

Since 1971 is the same in both projections, and since 1972 exhibits the same tendencies in both cases (more pronounced in one than in the other), we will analyze 1971–1972 first. Then, we will make a comparison of the divergent long-run patterns, 1973–1976. In the short run, the most striking facts are the following:

1. A sharp deceleration of economic activity in 1971 and a revival in 1972. This can be seen in the rates of growth of *GDPR* (I-1) and *GNPR* (I-2), the first one being the measure commonly used by Mexican economists.

2. A slowing down of the rate of inflation in 1971 and a tendency to grow again in 1972. See GNP deflator (I-21) and its rate of growth (I-22).

3. A consecutive improvement in the balance on current account in 1971 and in 1972. See (I-18).

These three basic facts are, of course, closely interrelated. The 1970–1971 recession is, in part, the normal result of Mexican political change and, in part, the effect of conscious effort on the part of the new administration to fight inflation and deterioration of the external position in 1970 by means of an austerity program. Another contributing external deflationary element is the 1969–1970 U.S. recession, whose lagged effects have been clearly felt in the sluggishness of exports. The U.S. inflation, on the other hand, has also contributed to Mexican inflation by filtering through imports, 65 percent of which come from there.

The two simulation patterns diverge after 1973. They can be summarized in four points:

1. The deflationary policy induces economic growth of 6–6.5 percent, as measured by gross domestic product (I-1); the expansionary policy produces 7–7.5 percent growth.

2. Deflation stabilizes and reduces the external deficit; expansion destabilizes and increases it, as measured by the real balance on current account (I-18). In fact, by the end of the period, the expansionary calculation projects a deficit of the magnitude of last year's -3.6 to -3.7 billion.

3. Deflation succeeds in breaking the inflationary growth; expansion keeps it going at approximately the 1970–1971 rates, according to the GNP deflator (I-21) and (I-22).

4. Deflation increases the rate of idle productive capacity; expansion tends to keep it constant, as shown by the ratio of unused capacity to gross domestic product, i.e., (I-23) divided by (I-1).

These facts give support to the contention of some Mexican economists that rapid rates of growth of 7–7.5 percent tend to "overheat" the economy and to produce rising prices and growing external deficits. Slower rates of 6–6.5 percent, on the other hand, appear to be too sluggish, given past Mexican experience. If

TABLE 1
EXPANSIONARY SIMULATION, WHARTON-DIEMEX MACROMODEL, SELECTED VARIABLES
[full Echeverria term: 1971–1976]

			1968	1969	1970	1971	1972	1973	1974	1975	1976
			Section I: In Billions of 1950 Pesos								
1	Gross domestic product	*GDPR*	122.68	132.30	142.55	150.79	160.99	172.11	185.04	199.16	213.90
2	Gross national product	*GNPR*	120.42	130.21	141.14	150.86	162.22	174.49	188.65	204.00	219.76
3	Internal aggregate demand	*CITR*	123.70	133.83	145.99	155.13	166.42	178.82	193.07	208.77	224.73
4	Consumption	*CR*	99.98	108.11	118.71	127.23	136.35	146.56	157.74	170.22	183.30
5	Private per capita[1]	*CPRN*	1.96	2.05	2.18	2.26	2.33	2.42	2.51	2.61	2.72
6	Private	*CPR*	92.67	100.09	110.28	118.49	126.81	136.21	146.44	157.92	170.01
7	Public	*CGR*	7.31	8.02	8.43	8.75	9.54	10.35	11.30	12.29	13.28
8	Investment	*ITR*	23.72	25.73	27.29	27.90	30.07	32.27	25.32	38.55	41.43
9	Gross fixed investment	*IR*	21.70	23.50	25.21	25.66	27.84	29.90	32.85	35.72	38.32
10	Private	*IPR*	11.94	12.89	13.84	14.19	15.16	16.04	17.45	18.91	19.98
11	Public	*IGR*	9.76	10.62	11.37	11.48	12.69	13.87	15.39	16.81	18.35
12	Government	*IGGR.*	4.53	4.56	4.78	4.69	5.44	5.80	6.30	6.84	7.47
13	Fed. gov. enterprises	*IGOER.*	5.24	6.06	6.59	6.79	7.25	8.07	9.09	9.97	10.88
14	Inventory change	*ICHR*	2.02	2.22	2.08	2.24	2.22	2.36	2.48	2.83	3.11
15	Balance of trade (concil. NIA)	*BGSFR*	−3.28	−3.62	−4.85	−4.27	−4.20	−4.33	−4.42	−4.76	−4.98
16	Balance of factors	*BFR*	−2.27	−1.84	−1.44	−1.54	−1.63	−1.74	−1.90	−2.08	−2.28
17	Bal. goods and services	*BGSR*	−1.01	−1.79	−3.42	−2.72	−2.58	−2.59	−2.52	−2.68	−2.69
18	Balance of trade	*BGSFR**	−2.84	−2.32	−3.63	−3.04	−2.95	−3.11	−3.22	−3.57	−3.71
19	Total exports	*EGSFR**	11.27	13.18	13.41	13.56	14.75	15.59	16.76	17.50	18.37
20	Total imports	*MGSFR**	14.11	15.50	17.04	16.60	17.70	18.70	19.99	21.07	22.08
21	Price index: GNP deflator[2]	*PGNP*	2.78	2.82	2.95	3.06	3.21	3.37	3.50	3.64	3.78
22	Rate of change[3]	*PGNP%*	3.60	1.60	4.80	3.90	4.90	5.00	3.90	4.00	3.80
23	Unused capacity	*UXRP*	−0.02	3.70	3.51	6.40	7.10	7.71	7.47	7.60	8.64
24	Labor force[4]	*L*	14.86	15.38	15.78	16.31	17.01	17.87	18.39	18.87	19.26
			Section II: In Billions of Current Pesos								
1	Gross domestic product	*GDPC*	340.70	372.99	420.63	462.03	516.13	579.99	647.25	724.40	809.13
2	Gross national product	*GNPC*	334.41	367.10	416.47	462.24	520.06	588.02	659.89	742.03	831.30
3	Internal aggregate demand	*CITC*	343.51	377.31	430.80	475.31	533.53	602.60	675.35	759.36	850.13
4	Consumption	*CC*	277.64	304.78	350.28	389.84	437.13	493.87	551.78	619.13	693.39
5	Private per capita[5]	*CPRNC*	5.44	5.77	6.42	6.92	7.48	8.15	8.78	9.51	10.27
6	Private	*CPC*	257.34	282.19	325.41	363.04	406.55	459.01	512.25	574.42	643.14

7	Public	*CGC*	20.31	22.60	24.87	26.80	30.59	34.86	39.53	44.72	50.25
8	Investment	*ITC*	65.87	72.53	80.52	85.47	96.40	108.73	123.57	140.23	156.74
9	Gross fixed investment	*IC*	60.25	66.25	74.38	78.62	89.27	100.76	114.90	129.93	144.97
10	Private	*IPC*	33.15	36.34	40.84	43.47	48.60	54.04	61.05	68.79	75.58
11	Public	*IGC*	27.11	29.94	33.54	35.16	40.68	46.73	53.84	61.16	69.40
12	Government	*IGGC.*	12.57	12.86	14.10	14.35	17.44	19.53	22.05	24.88	28.25
13	Fed. gov. enterprises	*IGOEC.*	14.54	17.09	19.44	20.81	23.23	27.20	31.79	36.28	41.15
14	Inventory change	*ICHC*	5.61	6.27	6.14	6.85	7.13	7.96	8.67	10.29	11.77
15	Balance of trade (concil. NIA)	*BGSFC*	−9.10	−10.22	−14.33	−13.07	−13.47	−14.58	−15.46	−17.33	−18.83
16	Balance of factors	*BFC*	−6.30	−5.18	−4.24	−4.73	−5.21	−5.86	−6.65	−7.58	−8.64
17	Bal. goods and services	*BGSC*	−2.80	−5.03	−10.08	−8.34	−8.26	−8.72	−8.81	−9.75	−10.19
18	Balance of trade	*BGSFC**	−7.90	−6.53	−10.71	−9.31	−9.47	−10.48	−11.28	−12.99	−14.03
19	Total exports	*EGSFC**	31.30	37.17	39.57	41.56	47.28	52.54	58.64	63.64	69.50
20	Total imports	*MGSFC**	39.20	43.70	50.29	50.87	56.75	63.02	69.92	76.63	85.53

[1] Thousands of 1950 pesos.
[2] 1950 = 1.0.
[3] GNP price deflator rate of change in percent.
[4] Millions of persons.
[5] Thousands of current pesos.

TABLE 2
DEFLATIONARY SIMULATION, WHARTON-DIEMEX MACROMODEL, SELECTED VARIABLES
[full Echeverria term: 1971–1976]

			1968	1969	1970	1971	1972	1973	1974	1975	1976
			Section I: In Billions of 1950 Pesos								
1	Gross domestic product	*GDPR*	122.68	132.30	142.55	150.79	160.00	169.50	180.40	192.15	204.46
2	Gross national product	*GNPR*	120.42	130.21	141.14	150.86	161.02	171.60	183.67	196.69	210.10
3	Internal aggregate demand	*CITR*	123.70	133.83	145.99	155.13	165.12	175.49	187.22	200.21	213.48
4	Consumption	*CR*	99.98	108.11	118.71	127.23	135.76	144.87	154.60	165.37	176.66
5	Private per capita[1]	*CPRN*	1.96	2.05	2.18	2.26	2.33	2.40	2.47	2.55	2.63
6	Private	*CPR*	92.67	100.09	110.28	118.49	126.41	134.92	143.89	153.90	164.42
7	Public	*CGR*	7.31	8.02	8.43	8.75	9.35	9.96	10.71	11.47	12.24
8	Investment	*ITR*	23.72	25.73	27.29	27.90	29.37	30.62	32.62	34.83	36.82
9	Gross fixed invest.	*IR*	21.70	23.50	25.21	25.66	27.26	28.53	30.61	32.54	34.30
10	Private	*IPR*	11.94	12.89	13.84	14.19	14.98	15.39	16.15	17.13	17.85
11	Public	*IGR*	9.76	10.62	11.37	11.48	12.28	13.15	14.45	15.41	16.46
12	Government	*IGGR.*	4.53	4.56	4.78	4.69	5.31	5.72	6.14	6.51	7.09
13	Fed. gov. enterprise	*IGOER.*	5.24	6.06	6.59	6.79	6.97	7.43	8.31	8.90	9.36
14	Inventory change	*ICHR*	2.02	2.22	2.08	2.24	2.11	2.09	2.01	2.30	2.53
15	Balance of trade (concil. NIA)	*BGSFR*	−3.28	−3.62	−4.85	−4.27	−4.10	−3.89	−3.55	−3.52	−3.38
16	Balance of factors	*BFR*	−2.27	−1.84	−1.44	−1.54	−1.61	−1.69	−1.83	−1.97	−2.12
17	Bal. goods and services	*BGSR*	−1.01	−1.79	−3.42	−2.72	−2.49	−2.20	−1.72	−1.54	−1.27
18	Balance of trade	*BGSFR**	−2.84	−2.32	−3.63	−3.04	−2.85	−2.65	−2.30	−2.26	−2.04
19	Total exports	*EGSFR**	11.27	13.18	13.41	13.56	14.62	15.68	17.21	18.21	19.29
20	Total imports	*MGSFR**	14.11	15.50	17.04	16.60	17.47	18.33	19.51	20.47	21.33
21	Price index: GNP deflator[2]	*PGNP*	2.78	2.82	2.95	3.06	3.18	3.30	3.35	3.44	3.55
22	Rate of change[3]	*PGNP%*	3.60	1.60	4.80	3.90	3.90	3.80	1.70	2.70	3.20
23	Unused capacity	*UXRP*	−0.02	3.70	3.51	6.40	8.09	9.85	10.51	11.21	12.15
24	Labor force[4]	*L*	14.86	15.38	15.78	16.31	16.84	17.51	17.85	18.41	18.96
			Section II: In Billions of Current Pesos								
1	Gross domestic product	*GDPC*	340.70	372.99	420.63	462.03	509.03	559.02	605.06	661.92	726.07
2	Gross national product	*GNPC*	334.41	367.10	416.47	462.24	512.28	565.94	616.02	677.55	746.08
3	Internal aggregate demand	*CITC*	343.51	377.31	430.80	475.31	525.33	578.77	627.02	689.67	758.09
4	Consumption	*CC*	277.64	304.78	350.28	389.84	431.90	477.78	518.52	569.68	627.33
5	Private per capita[5]	*CPRNC*	5.44	5.77	6.42	6.92	7.40	7.91	8.28	8.78	9.34
6	Private	*CPC*	257.34	282.19	325.41	363.04	402.15	444.95	482.61	530.16	583.87

7	Public	*CGC*	20.31	22.60	24.87	26.80	29.75	32.83	35.91	39.52	43.46
8	Investment	*ITC*	65.87	72.53	80.52	85.47	93.43	100.99	109.40	120.00	130.77
9	Gross fixed investment	*IC*	60.25	66.25	74.38	78.62	86.72	94.10	102.66	112.09	121.80
10	Private	*IPC*	33.15	36.34	40.84	43.47	47.66	50.76	54.18	59.01	63.37
11	Public	*IGC*	27.11	29.94	33.54	35.16	39.07	43.35	48.47	53.08	58.44
12	Government	*IGGC.*	12.57	12.86	14.10	14.35	16.88	18.85	20.60	22.42	25.19
13	Fed. gov. enterprise	*IGOEC.*	14.54	17.09	19.44	20.81	22.19	24.50	27.87	30.66	33.24
14	Inventory change	*ICHC*	5.61	6.27	6.14	6.85	6.71	6.88	6.74	7.91	8.97
15	Balance of trade (concil. NIA)	*BGSFC*	−9.10	−10.22	−14.33	−13.07	−13.04	−12.83	−11.91	−12.12	−12.02
16	Balance of factors	*BFC*	−6.30	−5.18	−4.24	−4.73	−5.11	−5.58	−6.15	−6.80	−7.51
17	Bal. goods and services	*BGSC*	−2.80	−5.03	−10.08	−8.34	−7.93	−7.25	−5.75	−5.32	−4.51
18	Balance of trade	*BGSFC**	−7.90	−6.53	−10.71	−9.31	−9.07	−8.74	−7.71	−7.78	−7.25
19	Total exports	*EGSFC**	31.30	37.17	39.57	41.56	46.52	51.71	57.74	62.73	68.51
20	Total imports	*MGSFC**	39.20	43.70	50.29	50.87	55.59	60.45	65.45	70.51	75.76

[1] Thousands of 1950 pesos.
[2] 1950 = 1.0.
[3] GNP price deflator rate of change in percent.
[4] Millions of persons.
[5] Thousands of current pesos.

this is the case, the 6.5–7 percent range seems to be the golden mean. It is clear, however, that the unemployment problem, the most serious of the Mexican problems, will not be solved with this rate. If the labor force keeps growing at 3.5 percent (the rate of population growth), it is necessary to create approximately 552,000 jobs in 1971 to accommodate new workers alone, given the 1970 total labor force of 15.78 million. If we extend this calculation, Mexico will have 19.39 million people looking for work in 1976. Our high simulation estimates a figure of 19.26 million in I-24, and we can take this, for practical purposes, as a full-employment projection. Any calculation below this will result in unemployment. Our low projection, for instance, indicates an excess of labor supply of 300,000 workers in 1976, in spite of its being a 6.3 percent average-growth simulation. It should be noted that this number is probably an underestimate of unemployment. In his excellent econometric study, David Ibarra,[13] for example, compares a full-employment projection and a 6.2 percent projection and comes up with an estimate of 2.5 million workers in excess labor supply for 1976. His high figure (or full employment) is 18.76 million workers; his low (6.2 percent growth) is 16.29. In spite of these differences, there is here a basic agreement on the fundamental issue: a full-employment path is not compatible with internal and external stability, unless structural changes (in capital-labor ratios and import content of investment, to start with) are introduced into the system.

This is precisely what the new administration seems to have in mind in its plan of introducing labor-intensive investment programs in the rural sector, instead of traditional, large-scale capital-intensive projects. When implemented, these new projects may help to alleviate rural unemployment and reduce the migratory flow to the cities. The numerical solution, however, cannot be estimated yet because of the absence of information on the magnitude and nature of the projects.

The basic dilemma of the Mexican economy raises the broader question of stability versus employment for some of the Latin American economies. Argentina, Brazil, Colombia, Chile, and Peru, up to the end of the 1960s, have also been unable to combine growth with stability. The apparent inability of Mexico to achieve this joint objective, in spite of its favorable political, economic, and trade positions, makes it doubtful that the other countries will, at least in the next half decade, considering their demographic and political circumstances.[14]

The long-run comparison also yields some aspects, which although similar in direction, are different in magnitude. Private consumption and investment, exports and imports, and government finance are some cases in point. The fast-growth simulation produces a substantially higher private consumption per capita

[13] David Ibarra, "Mercados, Desarrollo y Politica Economica: Perspectivas de la Economia de Mexico," *El Perfil Economico de Mexico en 1980, Vol. I* (Mexico: Siglo Veintiuno Editores, 1970), Cuadro 24, p. 144.

[14] This doubt of reconciling high growth (5 percent or more) with external and price stability (5 percent or less) seems to be supported by the data. With the possible exception of Brazil, which has managed simultaneously to speed up its growth, reduce its inflation, and substantially increase its foreign reserves during the late sixties (very favorable international coffee prices, due to a large extent to the Brazilian coffee frost of 1969, has been one of the contributing factors to this happy state of affairs), high growth and stability, especially external stability, seem unattainable for the major developing Latin American economies at their present capacity-creation stage.

(I-5) than the slow case: 7.5 percent average rate of growth versus 6.8 percent for 1971–1976. This means that the size of the internal market—commonly blamed for the high industrial average fixed costs and for being the bottleneck of industrial development—can be enlarged by aggressive public investment. Apparently, the argument should be reversed in the long run: it is not the lack of consumption power that keeps Mexican industry small, with high fixed average costs. It is the lack of industrial growth, and especially efficient public industrial growth, that is mainly responsible for insufficient employment, income, and consumption. This is the case when the government assumes a leading industrial role, as in Mexico. Its initiative becomes the basic driving force of the system.

Private investment (I-10), a more passive element in capital formation, responds favorably to the better rate of economic growth stimulated by the government. In the fast calculation, it grows at an average rate of 7.1 percent compared with 4.7 percent in the slow case. In real terms, exports (I-19) and imports (I-20) differ slightly in the two simulations. In current prices, however, they differ substantially, as can be seen in (II-19) and (II-20). The net result is a much larger deficit in current account in the fast simulation (II-18). This shows that at the present stage of industrialization, Mexico's growth is partially financed by deficits in current account, of which productive imports take the largest share. The public deficit (not included in tables) grows at a much faster pace in the expansionary simulation. In 1976, it grows to −31.88 billion, in comparison with −22.73 billion in the slow case. In both cases, however, a fiscal impasse seems to be reached—especially in the fast simulation, where external and internal public debt are already growing at their limits. This clearly points toward the need for a fiscal reform that will permit sustained growth (somewhere between our two alternatives), while minimizing the impact on consumption and private investment. More progressivity in the higher levels of the income-tax scales seems to be a reasonable way of solving the fiscal impasse of Mexican growth.

We close the comparison by pointing out some facts that seem to remain basically unaltered in both simulations, during 1972–1976. The traditional Mexican structural imbalances in income distribution, in government finance, and in regional development stay almost unaffected.

1. The relative shares of labor and capital remain nearly constant, with labor getting one-third and capital two-thirds of national income. A slight gain for labor, however, appears in the expansionary economy. (Not shown in tables.)

2. The ratios of total and federal taxes to gross domestic product also remain essentially unaffected, 11 percent and 8.2 percent respectively. The nonfederal tax ratio stays at 2.7 percent in both simulations.

3. The urban-rural gap will result in almost constant productive shares, with the urban sector accounting for 89 percent, and the rural for 11 percent, of GDPR in both projections. The basic source and the consequences of this regional productive imbalance can be found in the capital formation and demographic tables, respectively (not included in this condensation). The disproportion in urban-rural capital-labor ratios will remain unaffected. On the average, the urban worker will have at least 7.5–8 times more real capital to work with than his rural

counterpart in both cases.[15] The effects of the continuation of the productive gap will be to maintain a steady migratory flow to the urban centers (Mexico City, Guadalajara, Monterrey and towns bordering on the United States), with the consequent pressures on city facilities, enlargement of the "belts of poverty" around metropolitan areas, and growth of urban unemployment and underemployment.[16]

A Final Word

In closing, we would like to formulate briefly our stand on some important questions commonly asked with regard to econometric models as empirical tools for the analysis of growth in the LDC's.

Specification of developing-country models poses a challenge in building a new macro theory, but why go to the next step and create formal statistical models? Since we are in the economic-model business, we have thought often about this question and have formulated answers to the frequent charges that LDC data are poor in quality and sparsely available, and that economic behavior is erratic or irrational.

Economists are masters at working with poor and inadequate data. The issue for econometricians is to make as much systematic sense as possible out of sparse, "noisy" data. The basic statistical materials for the developing countries are, in many respects, like those we had to work with twenty or thirty years ago in the industrial countries. Our MDC models now stand on firmer footing as a result of all the spadework of the intervening years.

Economic and social problems are so intractable that we should do everything possible to make gains in knowledge, no matter how modest. It is for modest, systematic gains that we are working with macromodels of LDC's. The most sophisticated methods must be applied to eke out precious gains. Much of the sophistication concerns the attempt to obtain estimates of parameters that are consistent in the statistical sense of the term. This is extremely important because the most useful application of macromodels of the LDC economies is in simulations of long-term growth patterns. In such studies, biases (lack of consistency) build up over time and can throw decade growth results far off track.

Methods of dealing in modern econometrics with "undersized" samples have been developed, and it is with these methods in mind that we have tackled the empirical task of implementing this measurement of the econometric structure of Mexico. We hope that it can set a pattern for future econometric research in the rest of Latin America.

[15] The actual capital-labor ratios result in 15 to 16 times more capital per worker in the urban than in the rural sector for 1972–76. We have halved them in order to account for the lack of data on private rural capital.

[16] It should be remembered that even the fast calculation does not reduce the present unemployment and underemployment rates—whatever they are in 1971. The only thing it does is to keep them constant over the period.