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PRICES AND OUTPUT IN THE MEXICAN ECONOMY: EMPIRICAL TESTING OF ALTERNATIVE HYPOTHESES

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Prices and Output in the Mexican Economy: Empirical Testing of Alternative Hypotheses

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I) Introduction

The trajectory followed by the Mexican economy over the last two decades, leading to the current crisis, can be fully understood only if it is seen in the perspective of a continuing debate between two schools of thought. Each school comprises radically different sets of policy recommendations aiming to achieve fast, steady and healthy rates of growth and development. These conflicting visions, which find their roots in different bodies of economic theory, have led to disagreements between policy makers and economists over the years, both within and outside the government.

On one side, a classical monetarist vision is derived from a world of near perfect competition, smooth convexities, significant price elasticities and frictionless price and wage adjustments. Inflation becomes essentially a monetary phenomenon and its control is identified with the elimination of public deficits. Output is not affected by demand shocks, except in the short run, while the high price sensitivity of the balance of payments, both the current and capital accounts, requires that both the exchange rate and the internal interest rate be left practically endogenous so as to avoid major deviations from PPP or from the interest rate parity condition. Free trade, both in goods and capital, and a restricted state interventionism complete this conservative set of beliefs.

At the other end of the spectrum, one finds a mixture of

keynesian and structuralist concepts which are derived from the negation of the basic assumptions mentioned above for the classical model. Output becomes determined by demand while prices are not significantly affected by it, at least within a fairly wide range. Input costs are the ones that have a considerable impact not only on the price level but also on its dynamics, because rigid income claims easily give rise to inflationary spirals which are generally passively accomodated on the monetary side. On the other hand, the demands for goods and money are assumed to have small or nul interest elasticities, while the sensitivity of the current account to changes in the exchange rate is thought to be insignificant. Capital flows are believed to be interest inelastic although they are considered extremely volatile and essentially speculative. Strong protectionism and a heavy dose of state interventionism are the two basic additional beliefs.

The policies followed in the past reflect uneasy compromises between the two schools of thought. On the one hand, trade protection had been somewhat reduced a few years ago while the concept of free capital mobility had been left untouched until the magnitude of the crisis forced the government to impose exchange controls. On the other hand, government spending, state interventionism and public deficits have risen dramatically in the last decade.[1/] With the hard-currency cushion provided by oil

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1/ Public spending as a proportion of GNP went from 22.1 in 1970 to 40.6% in 1981 while the deficit (also as a proportion of GNP) rose from 2.2 to 9.8% in the same period.

exports, it was thought that the economy could be pushed along at sustainable growth rates on the order of 8.0 to 10.0% a year, even in the middle of a world wide recession. Meanwhile, the exchange rate was left practically untouched from September 1976 to January 1982, as a way to secure faster control over inflation.

As to the interpretation of what went wrong, the two groups could not get further apart. The classical-monetarist side identifies excessive government deficits as the main cause of inflation, while the strong levels of demand, together with the freezing of the exchange rate, are held responsible for the current account disequilibrium. Excessive government participation in the economy is seen as a source of productivity losses and a serious threat to further growth. Capital flights are finally explained as a normal response of rational individuals to the upcoming crisis and to the government's apparent lack of control over the situation. The stabilization package favored here includes the usual set of IMF policies, demand restraints, reduction in public deficits, interest rate and exchange rate liberalizations, and the like.

On the keynesian-structuralist side, the blame is put on the excessive degree of openness in the economy, which on the real side led to current account disequilibria, and on the financial side led to inflation. The story here is the following: free capital mobility has obliged the central bank to raise internal rates in parallel with international interest rates, hence giving rise to a

cost-push inflationary spiral of the type which has become popular in the structuralist literature.[2/] Moreover, inflation has been aggravated by additional supply shocks, particularly the stagnation of the agricultural sector and the introduction of the value added tax in 1980. On the other hand, the lack of exchange controls, which allowed massive capital flights, the fall in oil prices and the higher cost of debt servicing, altogether , brought the economy to the verge of bankruptcy. The way out of the crisis, in this interpretation, lies in higher protection, strict exchange controls, a new freeze of the exchange rate coupled with lower interest rates and mandatory price controls, a go ahead for government spending and further state intervention in order to bolster investment and output, while neutralizing as far as possible the harmful effects of speculative private capital flows. Seen from this angle, an IMF type of stabilization program would have unbearable impacts on output and employment while letting most of the adjustment burden fall on wage earners . Moreover, it would hardly be successful in reversing or even stopping capital flows.

While some of the issues involved in this controversy are certainly no easy matters, like the role of the state in production or the impact of protection on long term growth potential, other fundamental questions —in particular the ones concerning price and output formation— should be more accessible to empirical investigation.

2/ See for example Cavallo (1977), Bruno (1979) and Taylor (1981).

Among the doubts which one would particularly like to address are the following:

a) To what extent has inflation been demand fueled?
b) Has money been active or passive?
c) How significant is the impact on prices of supply side elements like interest rates, agricultural output or changes in taxes?
d) How sensitive is output to changes in demand and how permanent are these impacts?
e) Have wages been exogenous or endogenous in the inflationary process?

Some of these issues have been dealt with in the literature, but the evidence is yet fragmentary and in many cases unclear or controversial. While Blejer (1977) and Marcos (1982), on the basis of econometric estimates of monetary models, and Salas (1979) and Leiderman (1982), with vector autoregression techniques, find substantial impacts of money on inflation, Ros (1980) and Jimenez and Roces (1981), on the basis of extensive surveys of industrial pricing in Mexico, report little evidence of demand sensitivity for prices. On the other hand, Ruprah (1983) and Davila, Ize and Morales (1983), using bivariate tests, find that the causality relation between money and prices is either weak or bidirectional, while significant feedback effects are also reported by Leiderman. On the output side, Barro (1979) reports that money, even when fully anticipated, has a significant impact on GDP while Hanson (1980) and Leiderman reach opposite conclusions. Finally, Davila, Ize and Morales find that wages have a

strong causal impact on prices while the evidence in favor of the inverse relationship is much weaker. They also find that internal interest rates are significantly affected by foreign rates, that there is weak support for the hypothesis of interest rate causality on prices and no clear evidence of inflation having been fueled by agricultural factors.

In this paper, alternative models of price and output formation are derived, estimated and statistically compared for the mexican economy. The most adequate among these is then used as a basis for analyzing some of the issues discussed above, in particular the role of demand and supply shocks in the recent behavior of prices and output. A wider and more comprehensive perspective is thus obtained on the classical monetarist vs keynesian-structuralist debate, as well as on the underpinnings and potential solutions of the current crisis.

Section two presents the foundations of the models, while section three deals with empirical estimates and statistical tests. Section four presents some simulations, offers an interpretation of the crisis and synthesizes the main conclusions.

II) Alternative specifications of price and output determination

II-a Some common grounds

Two different types of models will be specified here on some common grounds. In the classical monetarist model, firms are assumed to be competitive and output is determined on the supply side, while prices are determined by demand. In the keynesian

structuralist model output is determined by aggregate demand while prices are obtained on the supply side, as a result of a mark-up pricing rule.

The economy is assumed to produce a single non competitive good with the following Cobb-Douglas production function:

$$Y_t = A_t \, K_t^{\alpha_0} \, L_t^{\alpha_1} \, Z_t^{\alpha_2} \, X_t^{\alpha_3} \, , \qquad (1)$$

where Y is output, A is a technological paremeter, K is capital, L is employment, Z are imported intermediate goods and X is a weather factor. K and X are considered exogenous. Production may require time so that inputs which are needed to produce a good sold at t have to be acquired at time $t-\tau$. Working capital may thus be needed and requires proper financing at the interest rate R. If W are wages and P^E the peso price of imported inputs, the total variable - cost of goods sold at t would then be:[3/]

$$TC_t = (1+R)^{\tau} \, (W_{t-\tau} \, L_t + P^E_{t-\tau} \, Z_t) \, . \qquad (2)$$

The mean production time is assumed to be less than a year, so that $W_{t-\tau}$ and $P^E_{t-\tau}$ can be taken as simple geometrical averages of wages and prices at t and t-1:

$$W_{t-\tau} = W_t^{1-\tau} \, W_{t-1}^{\tau} \, , \qquad (3)$$

$$\tau \in [0,1] \, ,$$

$$P^E_{t-\tau} = (P^E_t)^{1-\tau} \, (P^E_{t-1})^{\tau} \, . \qquad (4)$$

3/ For simplicity, inputs used to produce a good sold at t are dated at t although they are acquired at $t-\tau$.

Finally, given that the model produces yearly estimates, the price expectations process chosen here, expressed in log form, is particularly simple:[4/]

$$\Delta p^e_t = \mu \Delta p_t + (1-\mu)\Delta p_{t-1}, \qquad \mu \in [0,1]. \tag{5}$$

II-b The classical monetarist model

In the classical case, firms choose in the short run inputs so as to maximize their profits, $P_t Y_t - TC_t$, given (1).[5/] Input demands are easily derived in log form:

$$l^D_t = y_t + p_t - w_{t-\tau} - \tau \log (1+R_t) + \log \alpha_1 , \tag{6}$$

$$z^D_t = y_t + p_t - p^E_{t-\tau} - \tau \log (1+R_t) + \log \alpha_2 . \tag{7}$$

Substituting (6) and (7) back into (1) and using (3) and (4) one can then obtain after some algebraic manipulation the following supply function:

$$y_t = [a_t + \alpha_1 (1-\tau)(p_t - w_t) + \alpha_1 \tau (p_{t-1} - w_{t-1}) + \alpha_2 (1-\tau)(p_t - p^E_t) + \alpha_2 \tau (p_{t-1} - p^E_{t-1})$$

$$+ (\alpha_1 + \alpha_2)\tau [\Delta p_t - \log (1+R_t)] + \alpha_0 k_t + \alpha_3 x_t] / \alpha_4 , \tag{8}$$

where $\alpha_4 = 1 - \alpha_1 - \alpha_2$.

[4/] All variables in log form will be expressed in small case characters.

[5/] Since firms buy their inputs at time $t-\tau$ to produce and sell at t, it could be argued that these decisions should be based on the price which at time $t-\tau$ is expected to prevail at t. For greater simplicity and given that this would not alter substantially the final form of the equation, this point will be ignored.

Output is thus found to be an inverse function of the real wage and the real exchange rate, expressed as P^E/P . Furthermore, to the extent that production takes time, output should also depend on past real wages and exchange rates as well as on the real interest rate, in such a way that the coefficient of the latter should be equal to the sum of the coefficients of the former two.

Wages may however adjust endogenously to clear the labor market. If labor supply is a function of the expected real wage:

$$l_t^o = \beta_o + \beta_1 (w_t - p_t^e) , \qquad (9)$$

then, given the labor demand (6) and the price expectations process (5), the supply function may be rearranged and written as:

$$y_t=[A_0 a_t+\alpha_1\beta_1\tau(p_{t-1}-w_{t-1})+\alpha_1\beta_1(1-\mu)(1-\tau)\Delta^2 p_t+\alpha_2 A_0(1-\tau)(p_t-p_t^E)$$
$$+\alpha_2 A_0\tau(p_{t-1}-p_{t-1}^E)+\tau(\alpha_2 A_0+\alpha_1\beta_1)(\Delta p_t-\log(1+R_t))+\alpha_0 A_0 k_t+\alpha_3 A_0 x_t]/A_1 , \qquad (10)$$

where $A_0=1-\tau+\beta_1$, $A_1=(\alpha_1+\alpha_4)(1-\tau)+\alpha_4\beta_1$.

Output is now found to depend on price acceleration, which plays the role of a surprise term.

On the demand side, the demand for nominal money is defined as:

$$m_t^D = p_t + \gamma_o y_t - \gamma_1 \Delta p_t^e + b_t , \qquad (11)$$

where b_t is a trend term. Consider a monetary adjustment mechanism,

for example one of the type suggested in Khan (1980):[6/]

$$\Delta m_t - \Delta p_t = \gamma_2 (m_t^D - m_t) + \gamma_3 (m_t - m_t^e), \qquad (12)$$

and then solve for the price level, using (11) and some function for the expected money supply m^e. In line with the price expectations process, let this be:

$$\Delta m_t^e = \nu \Delta m_t + (1-\nu) \Delta m_{t-1}, \qquad \nu \in [0,1]. \qquad (13)$$

Using (5), the price equation may then be expressed as:

$$p_t = [(1-\gamma_1\gamma_2\mu)p_{t-1} + \gamma_2 m_t + \gamma_1\gamma_2(1-\mu)\Delta p_{t-1} + \Delta m_t - \gamma_3(1-\nu)\Delta^2 m_t - \gamma_0\gamma_2 y_t - \gamma_2 b_t]/\gamma_4, \qquad (14)$$

where $\gamma_4 = 1 - \gamma_1\gamma_2\mu + \gamma_2$.

Hence, prices follow the money supply, although with some inertia and subject to potential shifts in the velocity of circulation due to changes in inflation, output or the rate of money creation.[7/]

The systems of equations (10) and (14), and (8) and (14) are two alternative ways of formulating (with endogenous or exogenous wages) the core of the classical monetarist model. Note in particular that a monetary impulse has an impact on output if the nom-

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6/ An expression such as (12) indicates that real balances held by the public may rise (or fall) after an unexpected rise (or fall) in the nominal money supply. The induced short run monetary disequilibrium is then slowly absorbed as agents adjust their spending over time in order to converge to a long run equilibrium position.

7/ An alternative way of deriving a price equation would start from a goods market equilibrium condition and introduce a monetary disequilibrium term, $m-m^D$, as an argument in private spending. If the latter is also a function of income, the final form for the price equation is similar to the one derived above, except that government spending would now replace the rate of money creation. In the absence of large changes in the composition of public finance, the two models would be identical, except for the money acceleration term.

inal value of the wage rate, the exchange rate or the interest rate are not perfectly indexed on prices so that costs of production are altered. In the inverse case, a hike in costs will lower output unless higher prices are fully accomodated on the monetary side. This model can thus explain persistent deviations of output from its trend as well as being consistent with a passive money supply hypothesis.

II-c The Keynesian structuralist model

In the alternative paradigm firms choose inputs so as to minimize costs[8/], given (1) and exogenous sales expectations[9/]. It follows that:

$$l_t^D = y_t - w_{t-\tau} + \lambda_t + \log \alpha_1 \quad , \tag{15}$$

$$z_t^D = y_t - p_{t-\tau}^E + \lambda_t + \log \alpha_2 \quad , \tag{16}$$

where λ is the shadow price associated with the sales constraint. On the other hand, prices are obtained by adding a mark-up, ρ, over input costs:

$$P_t Y_t = (1+\rho_t) TC_t \, . \tag{17}$$

With (15) and (16) and using the expression of TC in (2) this may be

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8/ Note that structuralist price equations are usually derived from fixed coefficients production functions, introducing demand effects through changes in mark-up rates instead of changes in input costs as in the present formulation. This model is therefore not strictly structuralist in this sense.

9/ Given that firms make their production commitments at $t-\tau$, sales expectations are the ones existing at that time, which may differ from actual sales at t. As in the classical model, we will ignore this distinction.

rewritten, in log form as:

$$p_t = \tau \log (1+R_t) + \log (1+\rho_t) + \lambda_t + \log (\alpha_1 + \alpha_2). \qquad (18)$$

On the other hand, using (1), (15) and (16):

$$\lambda_t = \left[(1-\alpha_1 - \alpha_2)\, y_t + \alpha_1 w_{t-\tau} + \alpha_2 p^E_{t-\tau} - \alpha_o x_t - a_t\right]/(\alpha_1+\alpha_2) + \alpha_5, \qquad (19)$$

where α_5 is a constant. Finally, with (3) and (4) and substituting (19) into (18), the following price equation is obtained:[10/]

$$p_t = \left[-a_t + \alpha_1(1-\tau)w_t + \alpha_1 \tau w_{t-1} + \alpha_2(1-\tau)p^E_t + \alpha_2 \tau p^E_{t-1} + \tau\,(\alpha_1 + \alpha_2) \log (1+R_t)\right.$$

$$\left. + (1-\alpha_1 - \alpha_2)\, y_t - \alpha_o k_t - \alpha_3 x_t + (\alpha_1 + \alpha_2) \log (1+\rho_t)\right] / (\alpha_1 + \alpha_2). \qquad (20)$$

It can be noticed that, except for the mark-up term, this would be exactly the same supply equation as the one obtained in the classical model, but expressed now as a price equation instead of an output equation. It is worth noting, in particular, that the sum of the wage and foreign price coefficients should be equal to one, that the sum of lagged wages and foreign prices should be equal to the interest rate coefficient and that the output elasticity of prices should be related to the production function coefficients α_1 and α_2.

A useful interpretation of this equation may be given by rearranging

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10/ Additional constant terms are put together in a.

terms as follows:

$$[\alpha_1 (1-\tau)(w_t - p_t) + \alpha_1 \tau (w_{t-1} - p_{t-1}) + \tau (\alpha_1+\alpha_2)(\log(1+R_t) - \Delta p_t) + (\alpha_1+\alpha_2)\log(1+\rho_t)]$$

$$= [\alpha_0 k_t + \alpha_3 x_t + a_t] - [\alpha_2 (1-\tau)(p^E_t - p_t) + \alpha_2 \tau (p^E_{t-1} - p_{t-1}) + (1-\alpha_1-\alpha_2) y_t] . \quad (21)$$

The terms on the left hand side are claims over income from wage earners, financial capital and firm owners. On the right hand side, the terms of the first bracket define the productivity of the economy while those in the second bracket give the level of economic activity, y, and the current account disequilibrium, through the real exchange rate. What this condition then says is that any ex-ante excess of total income claims over productivity is bound to depress output, and hence employment, or else to aggravate the balance of payments disequilibrium,[11/] or to do both unless it is accomodated ex-post by rises in prices which restore claims to equilibrium levels. Any combination of inflation, balance of payments disequilibrium and recession may thus be obtained as a result of a supply shock. Note also that to the extent to which the economy is sufficiently open for the real interest rate parity condition to hold, the real interest rate should then be set exogenously by the foreign real rate. Increases in that rate, such as the ones which

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11/ A fall in output allows for equilibrium to be restored because marginal productivities of labor and imported inputs rise as production falls, hence allowing for higher unit payments for those inputs. On the other hand, a fall in the real exchange rate causes a higher deficit in the current account and hence a larger inflow of borrowed foreign funds which raise, at least temporarily, the available income to be shared.

have been occurring recently in the US, may therefore cause a combination of inflation, recession and balance of payments problems in small open economies with structural rigidities in income claims; Mexico may have been a case in point.

An alternative and more keynesian formulation of this price equation can also be obtained if we assume that firms adjust their prices with some inertia, for example, such that:

$$p_t = \delta p_t^* + (1-\delta)\ p_{t-1} \quad , \ \delta \in [o,1] \ . \qquad (22)$$

Where p^* is given by (20). Note that the lagged price adjustment now implies that changes in inflation alter systematically the effective rate of mark-up and hence the distribution of income.[12/] This was not true in the pure structuralist version.

On the demand side, following usual keynesian thinking, output is obtained in the goods market. If private spending depends on income, and there exists an accelerator effect related to investment and a monetary disequilibrium term, $m - m^D$, the output equation may be expressed, after substituting m^D by its expression in (11), as:

$$y_t = \varepsilon_o \Delta y_{t-1} + \varepsilon_1 \Delta p_t^e + \varepsilon_2\ g_t + \varepsilon_3\ (m_t - p_t) + c_t \ . \qquad (23)$$

The systems of equations (20) and (23), and (22) and (23)

12/ Substituting p* obtained from (17) in (22), written in levels instead of logarithms, yields the following expression:

$$P_t Y_t = (1+\rho_t)\left(\frac{P_{t-1}}{P_t}\right)^{\frac{1-\delta}{\delta}} (W_t L_t + P_t^E Z_t),$$

which clearly shows that the effective mark-up rate, $(1+\rho_t)\left(\frac{P_{t-1}}{P_t}\right)^{\frac{1-\delta}{\delta}}$, varies with the inflation rate.

are again two alternative ways of formulating, without and with keynesian inertia, the keynesian structuralist model. As with the classical model, the impact of monetary shocks on prices and output depends essentially on the degree of indexation of nominal costs to prices. In particular, in the case of full indexation, where real wages, the exchange rate and interest rates are kept constant, it can be seen from (21) that output is defined uniquely on the supply side and (23) then shows that a monetary impulse should be reflected in the long run in a fully proportional variation in prices. The behavior of the model is therefore quite monetarist. However, as the degree of indexation falls, the output effect becomes dominant while the price effect is reduced.[13/] One the other hand, the impacts on prices and output of autonomous changes in costs depend on the degree of monetary accomodation. In particular, if one wants to stabilize output, increases in nominal costs should be fully accomodated.

The types of behavior exhibited by the classical and structuralist models are thus very similar, with the essential difference lying in their structural rather than reduced form. A proper testing of hypothesis should therefore imply an estimation of simultaneous structural equations. This point is addressed next.

III) Estimates and statistical testing

III-a Some estimation adjustments and additional restrictions

The models are estimated with yearly data over the period 1961-1981.[14/] The proxy used for the weather variable is agricultural

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13/ Note that in this model a rise in demand always implies, ceteris paribus, a rise in prices, independently of the degree of capacity utilization. A model of the fix-price variety would on the other hand require that mark-ups rise systematically as capacity utilization falls.

14/ Some additional information about the series used is given in the Appendix.

output, y^{AG}. Since this variable is correlated with total output, it is not included in the output equation of the classical model.[15/] On the other hand, since the supply of agricultural goods in year t is a function of agricultural output in t-1, that variable is introduced with a lag in the structuralist price equation. Due to lack of data, capital and technological growth, k_t and a_t, had to be jointly approximated by two trend terms, linear and quadratic. Finally, trend terms were also added in the classical price equations and the structuralist output equations in order to capture any systematic shifts of the functions over time.

Before going to the results, it should also be noticed that it is possible to derive some expected orders of magnitude for the coefficients α_1 and α_2. With a Cobb-Douglas production function with constant returns and perfect competition, one would expect these coefficients to be approximately equal to the average ratios of the wage and import bills over GDP. In the case of Mexico and for the period under consideration, the wage bill stayed close to 35.0% of GDP for the whole period, while imports varied between 8.0 and 15.0%. Such ratios suggest a range of 1 to 1.5 for the output elasticity of prices in the structuralist equation (20). However, with positive rates of mark-up, pure profits -in excess of capital costs- should retain some of the shares that would otherwise go to labor and imports. In such case, the real values of α_1 and α_2 could be somewhat higher and hence the output price elasticity smaller.

15/ The lack of additional adequate proxies for the weather factors precluded the use of instrumental variable techniques to overcome this limitation.

On the other hand, if α_1 and α_2 have the orders of magnitude we have just considered, one would expect that the sum of the wage coefficients in the structuralist price equation should be al least twice as large as the sum of the foreign price coefficients. However, if there exists a substantial tradable sector whose prices follow international levels, foreign prices should have a larger weight. The ratio of those coefficients could then point out the presence of a significant tradable sector , or a sector which behaves like one.

III-b Results

OLS estimates of the output and price equations for the classical model appear in table 1. Starting with the output equations, it can be noticed that the version with exogenous wages, equation (8), is quite satisfactory. All the signs are correct and seven out of the eight estimated coefficients are significant at the 5.0% statistical level.[16/] The value of the real interest rate coefficient, 0.209, is very close to the sum of the lagged coefficients on real wages and the real exchange rate, as expected. Also, the ratio of the coefficients on current and lagged real wages is very similar to the ratio on current and lagged values of the real exchange rate.[17/] Note finally that the quadratic time trend has a negative sign, which would seem to reflect a falling trend in the rate of growth, perhaps due to productivity losses. This result deserves further investigation and is clearly a matter for preoccupation.

16/ The significance level refers to one tailed tests unless noticed otherwise.
17/ The hypothesis that the ratio of the coefficients is equal to one, cannot be rejected at the 5.0% confidence level.

TABLE 1

ESTIMATION OF THE CLASSICAL MODEL
(1961 - 1981)

OUTPUT EQUATIONS

	C	t	t^2	p_t-w_t	$p_{t-1}-w_{t-1}$	$p_t-p_t^E$	$p_{t-1}-p_{t-1}^E$	$\Delta p_t-\log(1+R_t)$	R^2	SER	DW
(8) y_t	4.363 (4.4)*	0.274 (7.0)	-0.001 (5.8)	0.197 (3.3)	0.106 (1.8)	0.249 (3.6)	0.112 (1.3)	0.209 (2.1)	0.999	0.012	1.819

	C	t	t^2	$p_{t-1}-w_{t-1}$	$p_t-p_t^E$	$p_{t-1}-p_{t-1}^E$	$\Delta p_t-\log(1+R_t)$	$\Delta^2 p_t$	R^2	SER	DW
(10) y_t	5.127 (5.4)	0.160 (5.2)	-0.001 (3.5)	-0.035 (0.4)	0.309 (3.6)	-0.149 (1.5)	-0.210 (1.5)	0.234 (2.0)	0.999	0.014	1.933
(10)[a] y_t	5.616 (10.6)	0.161 (11.4)	-0.001 (7.4)		0.295 (5.4)			0.067 (0.9)	0.999	0.015	1.529

PRICE EQUATIONS

	C	t	p_{t-1}	Δp_{t-1}	m_t	Δm_t	$\Delta^2 m_t$	y_t	R^2	SER	DW
(14) p_t	-5.582 (1.2)	-0.018 (0.6)	1.443 (8.6)	0.183 (0.5)	-0.288 (1.3)	-1.070 (2.3)	0.020 (0.1)	0.823 (1.2)	0.999	0.031	1.629

	C	t	m_t	m_{t-1}	m_{t-2}	m_{t-3}	y_t	y_{t-1}	y_{t-2}	R^2	SER	DW	Restriction $\chi^2_{t_2}$
(14)[a] p_t	40.897 (7.1)	0.334 (4.3)	1.116 (1.9)	-0.420 (0.5)	0.802 (1.1)	-0.926 (1.6)	-4.201 (4.1)	1.004 (0.7)	-2.454 (2.0)	0.994	0.070	1.646	
(14)[b] p_t	40.799 (7.0)	0.266 (5.5)	0.873 (1.6)	-0.136 (0.2)	0.712 (1.0)	-0.449 (1.1)	-3.865 (3.9)	0.650 (0.4)	-2.433 (2.0)		0.071	1.275	0.578 0.066

*/ t-Statistics in parentheses.

(14)[b] Restricted equation: $\sum_{i=2}^{5} \hat{\alpha}_i = 1$, coefficients on m_{t-1} for i=0,1,2,3.

The endogenous wage version, equation (10), gives somewhat poorer results since the signs of the lagged terms and of the real interest rate are wrong, although not significant. The equation was estimated again dropping these terms, $(10)^a$, which would correspond to a value of $\tau=0$ in the theoretical formulation. However, the price acceleration term in the reduced version is no longer significant and the D.W. statistic drops -- from 1.933 to 1.529, which indicates that the new specification is also rather weak. Therefore, this would seem to indicate that wages have not cleared the labor market in that period, but have instead varied exogenously, probably as a reflection of a bargaining process involving trade unions, the government and firms.

The classical price equation (14) comes out with a very poor fit; most of the coefficients are either not significant or have the wrong sign or magnitude. A different lag structure was estimated by substituting the values of p_{t-1} and p_{t-2} in a recursive form to obtain a new equation, $(14)^a$, in m_{t-i} and y_{t-i} for i=0, 1, 2, 3 in the money term and i=0,1,2 in the output term. This new price equation looks slightly more adequate. The signs on current money and income are correct, with coefficients that are statistically significant. The sum of the money coefficients is not statistically different from one, as required for homogeneity reasons. The unrestricted and restricted, $(14)^b$, equations are reported in table 1, as well as the t and χ^2 statistics to test the restriction. However, the lagged money terms failed to be

significant in both estimations[18/] and the D.W. statistic in the unrestricted model falls in the indeterminacy region, while the same statistic for the restricted model points out the presence of serial correlation.

The classical models were finally estimated jointly by three stage least squares. The algorythm used for that matter failed to converge under normal operating conditions, casting again some doubt as to the adequacy of the overall specification of the model.

The results obtained for the structuralist and keynesian price equations are reported on table 2. The OLS unrestricted estimate of the structuralist version, equation $(20)^a$, shows a robust specification except for the agricultural output term which has the wrong sign but is not significant. The equation was therefore reestimated after dropping that term. The new estimation, equation $(20)^b$, is very similar to equation $(20)^a$. All coefficients are significant at least at the 5.0% level and have correct signs. The sum of wage and foreign price coefficients is not significantly different from one, while the value of the interest rate coefficient is not significantly different from the sum of the lagged wage and foreign price coefficients. The value of the income coefficient, 0.949, also falls within the expected range. The ratio of the sum

18/ Note also that the size of the current money coefficient in the unrestricted model, which is larger than one, could be an indication of some immediate overshooting of prices in response to a monetary impulse. Nevertheless that conclusion is not solid because the t value indicates that the coefficient is not significantly different from one.

TABLE 2

ESTIMATION OF THE STRUCTURALIST-KEYNESIAN MODELS

(1961 - 1981)

PRICE	EQUATIONS C	t	t^2	w_t	w_{t-1}	p_t^E	p_{t-1}^E	y_t	y_{t-1}^{AG}	$\log(1+R_t)$	p_{t-1}	D_{80}	R^2	SER	DW	Durbin h	Restriction t_{χ^2}
(20)[a] p_t	-6.511 (2.6)*	-0.239 (3.2)	0.001 (2.3)	0.356 (6.9)	0.171 (2.8)	0.278 (3.8)	0.268 (4.2)	0.965 (4.1)	-0.019 (0.2)	0.592 (2.4)		0.036 (2.3)	0.999	0.012	2.781	---	---
(20)[b] p_t	-6.265 (3.3)	-0.246 (4.2)	0.001 (3.5)	0.353 (7.9)	0.169 (2.9)	0.281 (4.2)	0.265 (5.9)	0.949 (4.7)		0.588 (2.5)		0.036 (2.5)	0.999	0.011	2.730	---	---
(20)[c] p_t	-3.653 (2.7)	-0.341 (11.9)	0.002 (12.0)	0.300 (12.0)	0.216 (5.0)	0.281 (5.7)	0.203 (9.5)	1.043 (7.0)		0.419 (7.7)		0.033 (2.2)	---	0.012	1.991	---	1.279 0.114
(20)[d] p_t	-2.813 (2.0)	-0.347 (13.8)	0.002 (14.2)	0.329 (13.4)	0.223 (6.1)	0.267 (6.7)	0.181 (10.0)	1.000 (6.6)		0.404 (9.4)		0.035 (3.3)	---	0.015	1.566	---	1.345 0.048
(22)[a] p_t	-5.557 (2.1)	-0.171 (2.1)	0.001 (1.2)	0.284 (6.4)		0.349 (5.4)		0.966 (4.2)	-0.165 (1.0)		0.484 (4.8)	0.016 (0.9)	0.999	0.014	---	1.399	---
(22)[b] p_t	-4.270 (1.9)	-0.236 (4.7)	0.001 (3.7)	0.282 (6.4)		0.367 (5.9)		0.891 (4.1)			0.406 (6.5)	0.021 (1.3)	0.999	0.014	---	0.930	---

TABLE 2
(Cont.)

	C	t	t^2	w_t	w_{t-1}	p^E_t	p^E_{t-1}	y_t	y^{AG}_{t-1}	$\log(1+R_t)$	p_{t-1}	D_{80}	R^2	SER	DW	Durbin h	Restriction t_2 χ^2
(22)[c] p_t	-2.562 (1.6)	-0.272 (7.1)	0.002 (8.1)	0.259 (6.6)		0.352 (5.8)		0.848 (4.0)			0.390 (6.4)	0.021 (1.2)	---	0.014	---	0.233	1.058 0.029
(22)[d] p_t	-0.781 (0.4)	-0.232 (6.1)	0.001 (7.8)	0.252 (6.4)		0.298 (5.3)		0.580 (2.5)			0.450 (6.7)	0.020 (1.6)	---	0.016	---	0.180	0.076 0.001

*/ t-statistic in parenthesis.

(20)[a] Unrestricted OLS.
(20)[b] Unrestricted OLS.
(20)[c] Restricted OLS.
(20)[d] Restricted 3SLS, simultaneous with output equation (23)[b].
(22)[a] Unrestricted OLS.
(22)[b] Unrestricted OLS.
(22)[c] Restricted OLS.
(22)[d] Restricted 3SLS, simultaneous with output equation (23)[c].

of wage coefficients to the sum of foreign price coefficients stands however around one and is statistically different from its expected range, which should be above two. As mentioned before, this seems to indicate that there exists an important part of the mexican economy which behaves like a tradable sector and whose - prices are determined by foreign peso prices. It is also worth noting that the dummy variable for the introduction of the value added tax is significant and indicates that the tax switch boosted inflation by 3.5%.[19/] On the other hand, the quadratic term in - this equation is positive, which again seems to point out a growing inflationary trend, due to a fall in productivity, to rising profits margins or to some additional factors which could not be explicitely included.[20/] Finally, in terms of general fit, the D.W. statistic is somewhat higher, indicating negative serial correlation and the standard error of the regression, 0.012, is much lower than the one obtained in the classical model, 0.070.

The structuralist price equation was reestimated with all the restrictions imposed a priori in (20). The result, equation $(20)^C$, is very similar to the ones obtained without restrictions,

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19/ That results coincides with a time series intervention analysis carried out at the Banco de Mexico, see Guerrero (1982).

20/ One possible explanation could be a rising rate of taxation, since total public sector revenues rose from 16.0% of GDP in 1961 to 30.8% in 1981. To test this hypothesis, some fiscal variables were included in the equation; in one case sales tax income over GDP; in another total fiscal income over GDP. Both variables had the correct sign and an elasticity around one, which is what one would expect, atleast in the sales tax case if prices are set as a mark-up on top of taxes, but only the second was significant. The coefficient of the quadratic trend term was still, however, negative and kept the same order of magnitude as in the equations without taxes. It does not therefore seem obvious that increased taxation could explain the rising trend in inflation.

except that the D.W. statistic now falls in the serial correlation rejection range. On the other hand, the χ^2 statistic obtained from the likelihood ratio test indicates that the restrictions imposed on the model are globally adequate. A three stage fully restricted estimation was performed next, equation $(20)^d$. The structuralist price equation was estimated jointly with the output equation. The new estimation improves upon the efficiency of each of the estimators, yielding values that are very close to the ones obtained in the previous estimations.

The keynesian price equation was estimated next. The lagged price term fails to be significant, which appears to reject the hypothesis of price inertia. However, in order to use non-nested tests as an additional criterion to evaluate that hypothesis, the equation was reestimated dropping the lags in the independent variables, equation (22).

The structuralist output equations appear in table 3 estimated first by OLS, equation $(23)^a$, and then by 3SLS, estimated jointly with the structuralist price equation, $(23)^b$, and the keynesian price equation, $(23)^c$. All the explanatory variables have the correct sign although the rate of inflation failed to be significant in all but one case, equation $(23)^b$, where it is only marginally significant. The coefficient on public sector expenditure of around 0.100 seems small when compared to the size of the public sector in Mexico, roughly 40.0% of the economy. That result might

TABLE 3

ESTIMATION OF THE STRUCTURALIST-KEYNESIAN MODELS

	OUTPUT EQUATIONS								
	C	t	Δy_{t-1}	Δp_t^e	g_t	$m_t - p_t$	R^2	SER	DW
(23)[a] y_t	7.059 (29.9)*	0.039 (7.5)	0.511 (3.8)	0.103 (1.1)	0.059 (1.2)	0.185 (8.4)	0.999	0.012	2.133
(23)[b] y_t	6.864 (41.0)	0.034 (9.0)	0.446 (4.5)	0.101 (1.6)	0.100 (3.2)	0.190 (11.2)		0.011	1.862
(23)[c] y_t	7.137 (44.6)	0.043 (10.6)	0.481 (4.8)	0.006 (0.1)	0.042 (1.4)	0.169 (8.2)		0.010	2.208

*/ t-statistic in parentheses.
(23)[a] Unrestricted OLS.
(23)[b] Restricted 3SLS, simultaneous with price equation (20)[d].
(23)[c] Restricted 3SLS, simultaneous with price equation (22)[d].

find its explanation on the high degree of correlation between public sector spending and real balances, 0.928, and the existence of a crowding out effect on private expenditure. On the other hand, the D.W. statistic shows that there is no serial correlation, implying a robust specification of the equation, and the regression standard error of 0.011 is slightly better than the ones obtained in the classical models.

III-c Specification tests and forecasts

There is a need to gather additional criteria in order to positively discriminate among the different models. A useful tool to compare alternative model specifications is the non-nested test proposed by Davidson and MacKinnon (1981). The test compares competing models by nesting them in an artificially compounded model. Consider, for example, two models which purport to explain Y:

$$H_0 : Y_t = f(x_t) + u_t ,$$

and

$$H_1 : Y_t = g(z_t) + v_t ,$$

where x and z are two non-nested vectors of explanatory variables. The simplest possible test involving single linear equations consists in the estimation of the following regression:

$$Y_t = (1-\alpha)\ f(x_t) + \alpha\ \hat{g} + \varepsilon_t ,$$

where g is the fitted value of Y estimated with the set of regressors z. If H_0 is true, then $\hat{\alpha}$ should not be differente from zero. The test of H_1 can then be carried out by a similar procedure, inverting the roles of x and z.

Given that it was not possible to obtain simultaneous equation estimates for the classical models and that the 3SLS estimates for the structuralist keynesian models are not very different from the OLS estimates, the simple test described above was performed with the OLS estimates of each of the equations. The results appear in table 4. It is convenient to complement the statistical test on the hypothesis $\alpha=0$, with a test on the hypothesis $\alpha=1$, in order to obtain a better feeling of the degree of domination of one model over the other.

Given the poor results obtained in the estimation of the endogenous wage classical equation, output tests were only performed between the classical equation (8) and the structuralist equation (23). The classical equation does roughly as well as the structuralist, since H_0 is rejected in both cases, and the Null Hypothesis $\alpha=1$ cannot be rejected in either case. But looking now at the price equations, the classical equation is clearly dominated by the structuralist and keynesian versions. In both cases, H_0 is rejected when inserting (20) and (22) into (14), while the opposite is not true. The same result is also obtained between

TABLE 4

SPECIFICATION TESTS

H_0 \ H_1	(8)	(23)	(14)	(20)	(22)	(24)
(8) y_t	a b	3.19[d] 1.37				
(23) y_t	3.27[d] 1.71					
(14) p_t				26.12[d] 1.59	19.74[d] 0.01	13.52[d] 0.88
(20) p_t			1.62 10.94[d]		1.26 1.24	1.42 1.64
(22) p_t			0.74 10.48[d]	3.10[d] 0.85		0.19 2.17[c]
(24) p_t			0.34 8.86[d]	7.31[d] 0.64	5.65[d] 0.63	

a/ t-statistic for the Null Hypothesis $\alpha=0$.
b/ t-statistic for the Null Hypothesis $\alpha=1$.
c/ Statistically significant at the 5% confidence devel (one tailed test).
d/ Statistically significant at the 1% confidence level (one tailed test).

the structuralist and keynesian equations. The former thus comes out as a clear favorite.[21/]

As a last check on model specification, price and output forecast were obtained for 1982.[22/] The results are reported in table 5. The keynesian model does surprisingly well in terms of the inflation and output growth projections, while the structuralist model gives a very good output forecast but has a slight positive bias on the price forecast. The classical models do quite worse; output forecasts are much too low, while price forecasts are either too low or too high.

IV) The mexican crisis: causes and perspectives

IV-a An impulse analysis

The structuralist model comes out as the one that best fits the data overall. It was therefore selected to analyze the current mexican crisis, its causes and immediate perspectives. The 3SLS estimate of the structuralist price equation can be written in the form of equation (21) and then differentiated. The resulting

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21/ The structuralist equation also dominated and ad-hoc price equation formulated as a Koyck which included a constant, a trend term, money, wages, foreign prices and the interest rate as regressors. See the results in table 4 where the ad-hoc equation is numbered (24).

22/ In the case of the keynesian structuralist models 3SLS estimates were used and solved simultaneously. In the monetarist case OLS estimates had to be used since the algorythm for simultaneous estimation did not converge. Nevertheless, the price and output forecasts where still obtained simultaneously.

TABLE 5

INFLATION AND OUTPUT FORECASTS FOR 1982

Growth rate scenario for the exogenous variables (%)

	M_t	P_t^{E*}		R_t	W_t	G_t
		PW_t	TC_t			
1982	39.4	6.0	137.0	80.0	46.4	52.2

Inflation and output growth forecasts (%)

	Equation				Observed values
	(14)	(14)	(20)[d]	(22)[d]	
Inflation	66.1	50.6	68.4	61.8	60.0
	(8)	(10)	(23)[b]	(23)[c]	
Output growth	-3.7	-1.5	0.7	0.9	1.0

*/ The peso price of imported imputs P_t^E is composed by wold prices, PW_t, proxied by the PPI in the United States and the exchange rate, TC_t.

equation is:

$$[.329(\Delta w_t - \Delta p_t) + .223(\Delta w_{t-1} - \Delta p_{t-1})] + [.267(\Delta p_t^E - \Delta p_t) + .181(\Delta p_{t-1}^E - \Delta p_{t-1})]$$

$$+ .404[\Delta \log(1+R_t) - \Delta^2 p_t] + [1.0\Delta y_t - .347 + .002(2t-1)] + [.035\, D_{80}] + \varepsilon = 0,$$

where ε is a composite error term that picks up the estimation errors of the price and output equations and D_{80} is the tax switch dummy variable. The composite error term will be zero if the estimated - values of p_t and y_t were substituted in the expression for the observed values. Therefore in order for the difference equation to sum up to zero some values in brackets have to be positive and others negative. The ones that are positive at any given time could then be interpreted as positive impulses to the inflationary process, the negative ones as shock absorbers. However, some caveats in the analysis call for attention. First, simultaneous variations in all costs and money, hence keeping output constant, may give rise to an inflationary bubble whose origin cannot be traced out. This is the usual simultaneity problem found in time series causality analysis. A second problem is that inflation here is caused by a discrepancy between a sum of terms and productivity. Causality is thus hard to attribute to any particular component of the sum. Marginal changes might give some indications to locate the origin of the process, but even that is open to question since a shift in one of the terms may not "cause" inflation if an inverse shift in another term, which was supposed to compensate for it, did not occur; or else, if a third term also rose simultaneously. Causality analysis runs here

into an impasse from which there is no exit, unless some additional criteria are given, some value judgments or some optimal trajectories derived from the maximization of a social welfare function, for each one of the variables involved in the process. Deviations from these trajectories could then be said to have "caused" inflation in a more objective sense.

With these words of caution, the impulses on the inflationary process are presented in figure 1, together with a graph of inflation for the period 1962-1981. Demand factors are considered largely responsible for the inflationary bubbles of 1964, 1972-1974 and 1978-1981[23/]. Wages grew in real terms for most of the period; however, inflation remained in check up to 1973, because of the absorptive cushion provided by the rest of the components of the inflationary process. After the 1976 crisis, the tight wage policies followed by the new government caused the real wage to behave as an inflation absorber, and it wasn't till 1981 that this tendency was reversed. Foreign prices, through the exchange rate component, clearly have been the direct cause of the post devaluation inflationary bubble of 1976-1978. During the rest of the period, foreign prices absorbed inflationary pressures, particularly in the last part of the Lopez Portillo administration, 1979-1981. The overvaluation of the peso as a consequence of this policy, while probably effective in reducing immediate inflationary pressures, made the final day of reckoning certainly much worse, since it unavoidably led to a brutal exchange

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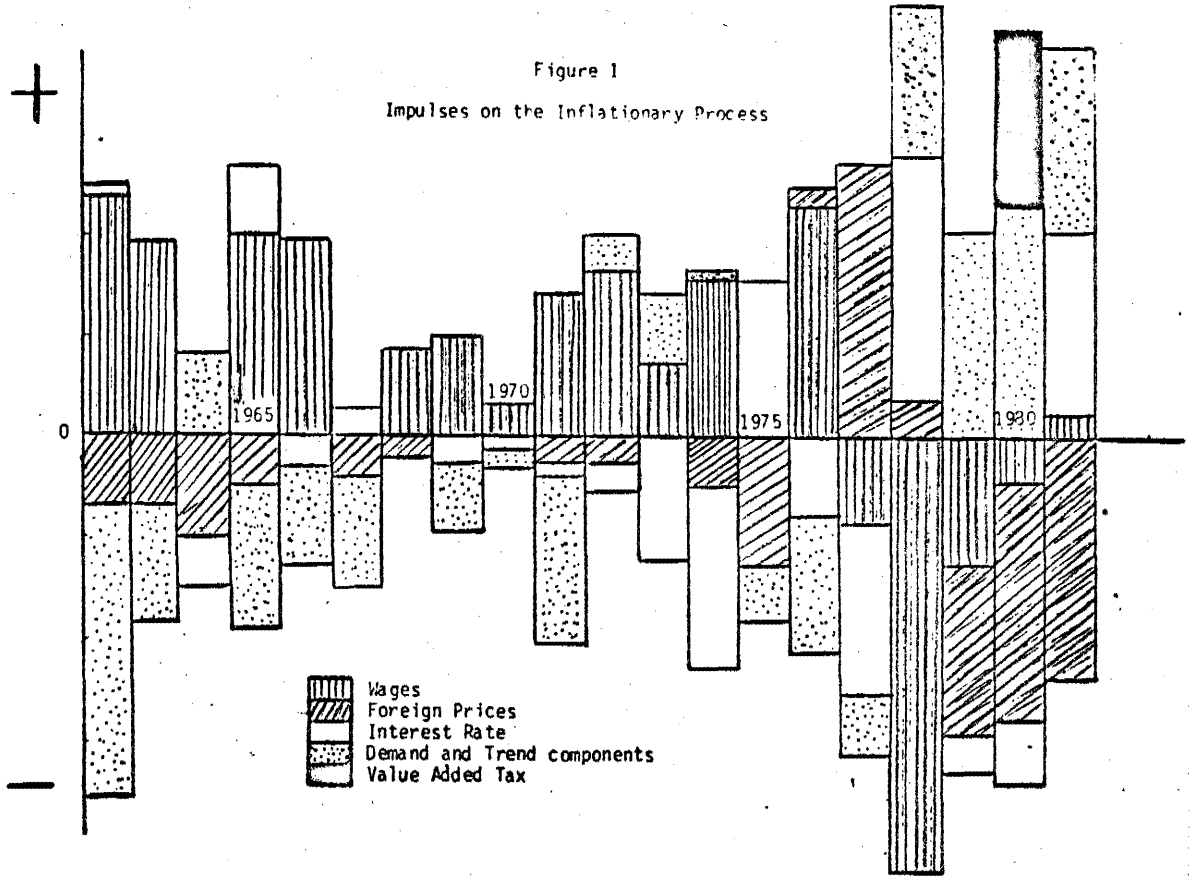
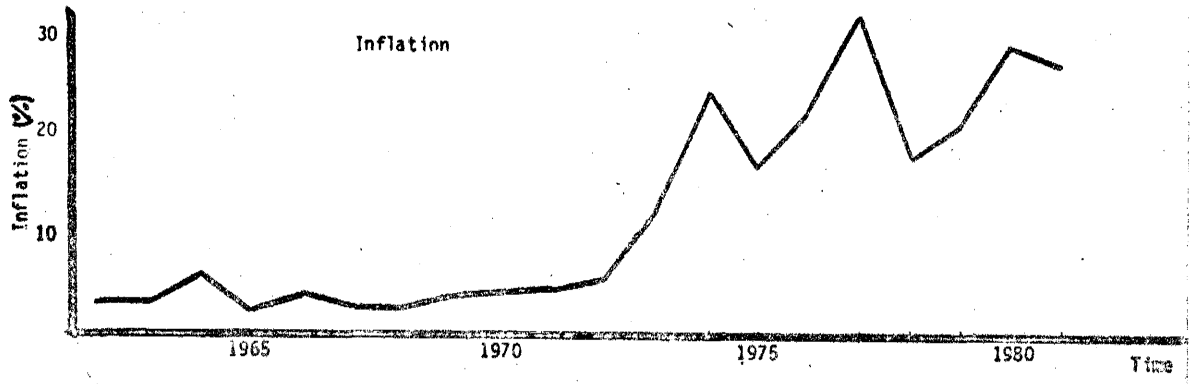
23/ Trend terms together with output are included in the demand factors, so as to relate actual to potential levels of economic activity.

Figure 1

Impulses on the Inflationary Process





rate readjustment and hence to the hyperinflation that Mexico is now experimenting.

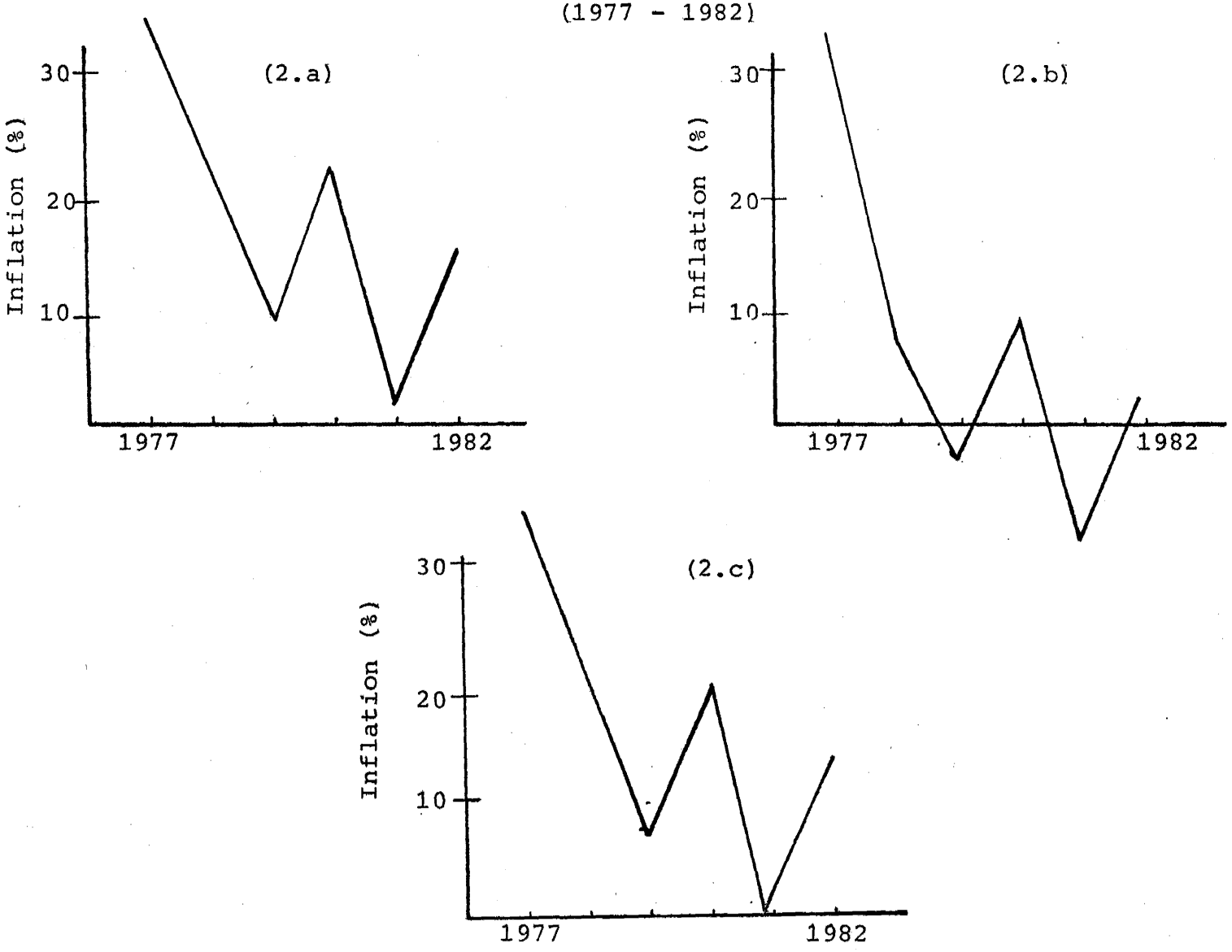
The rate of interest also appears to have been functioning as a shock absorber for most of the period. It does however seem to have added up to inflationary pressures in 1978 and 1981. But it should be noticed, that interest rate movements in those years, particularly in 1981, were mostly induced by the foreign interest rate explosion and the overvaluation of the peso. The latter led to capital flights which the monetary authorities tried to stop through the manipulation of the peso interest rates. Also, internal asset substitution restricted the supply of peso loans further boosting the peso interest rate. Interest rates could hardly then be held directly responsible since their behavior was determined, for the most part, by the inconsistencies surrounding fiscal and exchange rate policies. Before concluding this analysis, note finally that the 1980 tax switch did have a significant role as a generator of inflation, which was nearly as important as the demand impulse in that year.

IV-b Simulation exercises

Some simulation exercises were finally carried out both within the sample period and beyond. Three simulations for the Lopez Portillo administration, 1977-1982, are shown on figure 2. The first one, 2.a, assumes that real wages stay constant at their 1977 base level,

Figure 2

INFLATION SIMULATIONS
(1977 - 1982)



while the nominal exchange rate is fixed, output grows at 8.0% in 1978-1982 and the nominal interest rate is indexed at two thirds of the inflation rate. This set of assumptions is close to what really happened and gives a price trajectory which is fairly similar to the observed values, except for 1982, since no devaluations are considered. In that simulation the peso ends up with an 83.7% overvaluation in 1982.

Figure 2.b presents the same scenario as in 2.a, but with a more moderate growth rate. Output grows at 3.3% in 1977, slowing down to 2.6% in the following years. Inflation is reduced to 6.6% in 1978 remaining close to zero on average for the rest of the period. Simulation 2.c assumes that nominal wages and the real exchange rate are fixed, while keeping the rest of the assumptions as in 2.a. Inflation then tends to fall slightly faster over the period, except for 1980 where the tax switch still pushes it up substantially, but at the cost of a 39.4% cumulative fall in real wages.

This set of simulations clearly brings up one point; it was not possible to grow that fast without incurring inflation, overvaluation of the peso or radical real wage reductions. If all of these problems were to be avoided, growth rates for the period should have been much lower, probably about half of their actual values.

Another set of simulations was carried out for the period

1982-1984. These are shown on figure 3. The first one, 3.a, assumes that real income grows at 0.7% in 1982 and then grows at 5.0% a year in the period 1983-1984, real wages remain constant at their 1982 base level and the exchange rate goes from 58 pesos per dollar in 1982 to 135 in 1983 and is fully indexed thereafter.[24/] Finally, the nominal interest rate is indexed at two thirds of the inflation rate. In this scenario inflation rises from 68.4% in -- 1982 to 225.1% in 1984.

The second simulation, 3.b, keeps the same hypotheses except that economic growth is now 0.7% in 1982 and then zero over the rest of the simulation horizon. Inflation in 1984 is then slightly more than half of the value observed in the previous exercise.

The third simulation keeps nominal wages as well as the exchange rate indexed at two thirds of the inflation rate, with the other assumptions as in 3.b. Inflation peaks now at 71.2% in 1983, falling to 28.1% in 1984. The cost, however, is a 23.0% cumulative reduction in real wages. The peso still ends up undervalued by 24.5% in 1984, as a result of the 132.8% devaluation of 1982-1983. The last simulation, 3.d, goes back to a fast output growth of 5.0% in 1983-1984, but indexes nominal wages and the exchange rate at only one third of the

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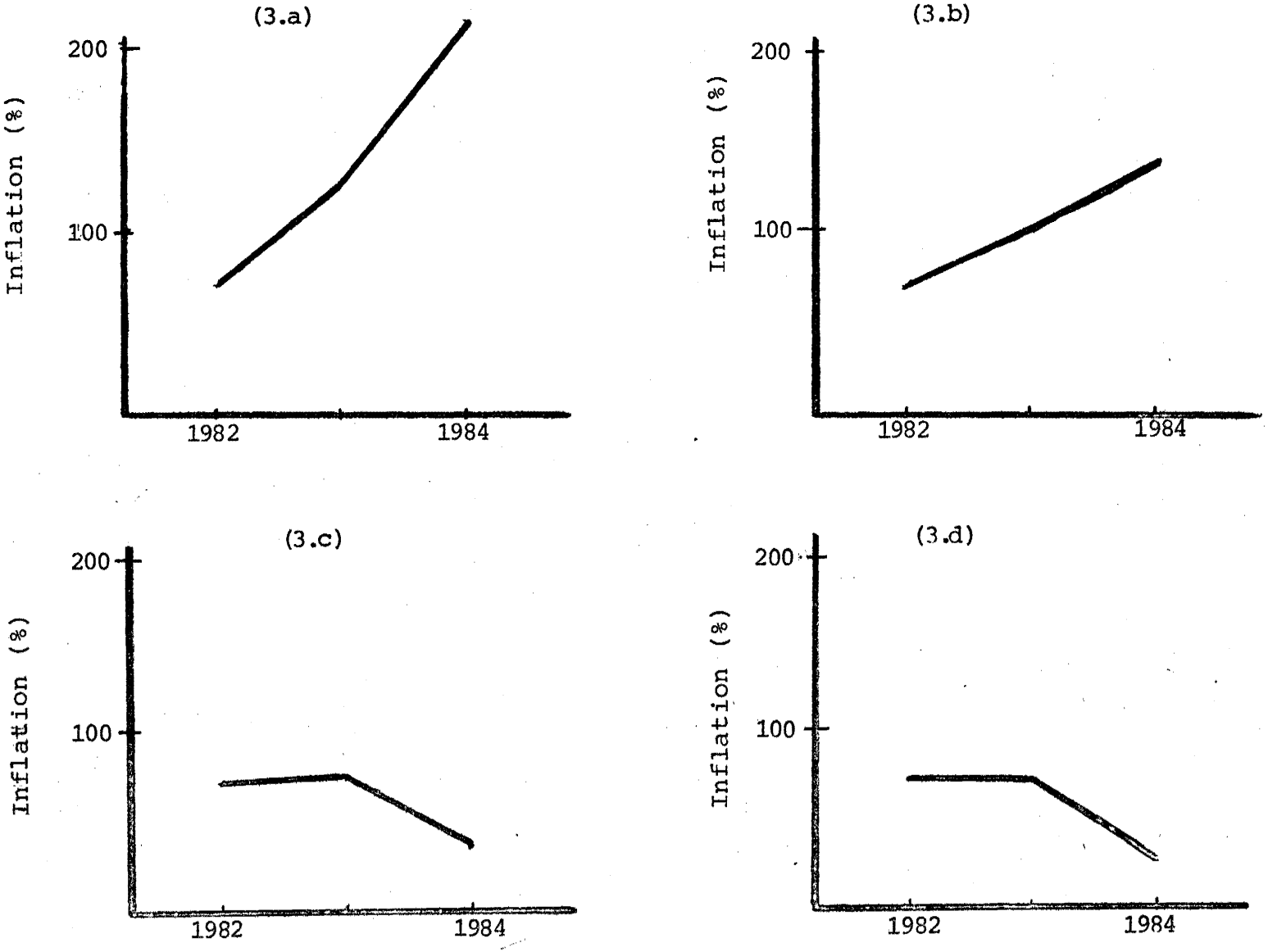
24/ The 1983 exchange rate of 135 pesos per dollar is a probable value to be observed by the variable given the observed rates at the time this paper was written; also it is presumably an approximate equilibrium value given the inflationary gap of Mexico versus the United States.

Figure 3

INFLATION SIMULATIONS
(1982 - 1984)



inflation rate. The price trajectory is very similar to the one obtained in the previons experiment, but now real wages take a 37.3% cumulative fall in 1984 and the peso ends up undervalued by 23.0%.

This set of simulations shows that if the only variables under the government's manipulation are wages and output, inflation could be brought down rapidly only at the expense of substantial real wage reductions, even in the zero growth case. They also suggest that there exists a crucial trade off between output growth, and hence employment, and real wages.

IV-c Conclusions

This paper estimates and compares four alternative models of price and output formation for the case of Mexico. The most satisfactory specification appears to be the one in which prices are determined on the supply side and output by demand. Since interest rates and other supply side elements, like wages, have an important impact on prices and given that wages come out largely as an exogenous variable, the structuralist view of the Mexican economy seems to be reinforced.

However, agricultural factors are not found to have a - significant incidence on prices, while aggregate demand, via changes in output, does have a significant role in explaining price dynamics. These two findings contradict some of the beliefs that identify

the keynesian or structuralist school in Mexico. The current crisis is in fact largely explained by a growth profile for the years 1978-1981 which is inconsistent with the claims on income simultaneously maintained by all sectors.

Among the other important findings of the study is an explanation of price inertia based on the existence of working capital rather than simple price stickiness or delayed adjustments by firms. This also tends to confirm the structuralist concept of a rigid income distribution since variations in inflation do not alter it systematically as would be the case in a keynesian type model based on lagged price adjustments. Another relevant finding, however, is that changes in foreign peso prices tend to have an impact on internal prices which go beyond what would be expected on the basis of pure cost increases for imported intermediate inputs. This phenomenon suggests the existence of an important tradable sector or a sector which behaves like such. Shifts in the real exchange rate are thus bound to have a significant impact on the distribution of profits across sectors.

An explanation as to why money could have seemingly permanent impacts on output was also found, a result that puzzled Barro in his study on the Mexican money-output relationship. This is because wages, the exchange rate and the rate of interest are not at all times perfectly indexed on prices. In particular, the overvaluation of

the peso allowed for a higher level of output to be maintained as long as foreign borrowing or oil exports could adjust to absorb - balance of payments disequilibria.

A last and particularly disturbing finding is that the inflationary process seems to be on an upwards trend, possibly due to a falling trend in productivity, to rising profit rates or to some additional factors not explicitely considered in the study. The validation and precise explanation of this phenomenon is a high priority topic for further research.

Appendix

The model is estimated with yearly data for the period 1961-1981. The variables are expressed as daily or monthly averages for the year. The sources are the following:

Y_t = Gross national product (1960=100), Producto Interno Bruto y Gasto, Cuaderno 1970-1979, Banco de México.

P_t = Implicit GNP deflator (1960=100), Producto Interno Bruto y Gasto, Cuaderno 1970-1979, Banco de México.

W_t = Hourly industrial wage for Mexico City, Trabajo y Salarios Industriales, Secretaría de Programación y Presupuesto.

PW_t = Producer Price Index (1967=100), Survey of Current Business, United States Department of Commerce.

TC_t = Exchange Rate, Indicadores Económicos, Banco de México.

R_t = Interest rate on loans, SIE, Banco de México.

M_t = Broad Monetary Aggregate, M4, SIE, Banco de México.

Y_t^{AG} = Agricultural GNP (1960=100), Producto Interno Bruto y Gasto, Cuaderno 1970-1979, Banco de México.

G_t = Public sector expenditure, Dirección General de Planeación Hacendaria, SHCP.

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