OUTPUT AND INFLATION IN ARGENTINA (*)
1950-80

by

Roberto A. Domenech (**)

(*) This paper is based in the author's doctoral dissertation submmited to the Department of Economics at Brown University.

(**) IEERAL-Fundación Mediterránea and Universidad Nacional de Córdoba, Argentina.

OUTPUT AND INFLATION IN ARGENTINA, 1950-80

I. INTRODUCTION

Ever since Keynes wrote **The General Theory** fifty years ago, theoretical and empirical research on business cycle fluctuations has evolved in well-established albeit controversial schools of thought: the Keynesian school, the Monetarist school, and the more recent New Classical approach to the business cycle.[1/]

Although there is consensus among these three approaches concerning the medium-run equilibrium of the macroeconomy, they involve controversial views of the short-run dynamics between steady states. These disagreements, in turn, bear important and, in cases, dramatic implications for the effectiveness and optimality of policy responses to avert or smooth out undesired business fluctuations in market economies.

The controversial issues that sepparate the views of macro economists concerning short-run fluctuations can be succintly described in the following points. The propositions accepted by the New Classical School can be summarized as:

NC1) On average, the unemployment rate or rate of growth of real output is totally insensitive to demand management policies, and

NC2) There are no expected social costs in terms of unemployment or growth in real output arising from a policy which is understood will reduce the rate of monetary growth.

The propositions accepted by the Keynesian School can be summarized as:

K1) In an economy with underemployment of labor and capital, an increase in aggregate demand will increase output and employment without raising the rate of inflation,

K2) Both money-financed and bond-financed fiscal policies are effective in raising the rate of growth of output and lowering the unemployment rate, and

K3) There is a significant social cost, in terms of unemployment and loss of real output, of policies to reduce the rate of inflation.

The propositions accepted by the Monetarist School can be summarized as:

M1) Past rates of growth of the stock of money supply are the only systematic factors determining the rate of inflation. Contrary to the Keynesian view, a restrictive fiscal policy without a reduction in the rate of monetary growth, or a restrictive monetary policy without a reduction in the fiscal deficit, cannot reduce the rate of inflation, and

M2) There is a significant social cost in terms of lost output and a rise in unemployment of a known monetary policy which attempts to reduce the rate of inflation.

The goal of this research is to address these controversial issues by studying the short-run fluctuations of output and inflation in the case of a specific economy. Our case of study will be the Argentine economy which, according to its structural characteristics, can be

categorized within the semi-industrialized subgroup of less-developed countries.

Although the meaning of the word "semi-industrialized" originally stems from the observation that the industrial sector in economies like Argentina's is not self-sufficient, there are other features associated with the structures of these economies that parallel this one in importance.

Self-sufficiency of the industrial sector is meant here not only to imply that the process of industrialization is incomplete and deficient but also, and perhaps more importantly, in the sense that industrial output is nontr ded and, consequently, the generation of exchange that is essential for the importation of industrial inputs does not depend on the level of this sector's output.

Another important structural feature in the inexistence of well developed capital markets. This has resulted in financial repression and complicated mechanisms of credit rationing. As a consequence, fiscal deficits are ostly financed by Central Bank loans. This implies little or no independence between fiscal and monetary policy.

Given these structural features, a fourth view of short-run fluctuations of inflation and real output has been advanced, especially in studies of the inflationary processes in Latin American countries. This position emphasizes the stagflationary effects of exchange rate devaluations. The propositions of this import-price approach can be summarized as:

IRP1) Exchange rate devaluations inflict a contractionary effect on real output while they accelerate inflation, and

IRP2) The social costs emerging from recurrent exchange rate devaluations can be prevented by incomes policies and measures oriented to achieve self-sufficiency of the manufacturing sector.

The strategy followed here will be to present a general theoretical framework that depicts in a simple way the medium-run equilibrium of the macroeconomy and that does not preclude, a priori, any of the alternative explanations that account for the short-run dynamics of the macroeconomy.[2/]

In order to assess the explanatory power of these theories, testable hypotheses corresponding to each school of thought will be derived and will be subject to empirical corroboration. Since, the underlying structure of the economy under study will be shown to depart from those of the industrialized economies, it will be of interest to determine the extent to which such structural differences impose additional constraints that must be explicitly incorporated into the analysis.

The interest in the Argentine case is also based on its poor economic performance as is clearly reflected in its postwar economic record. During the period, 1950-80, average annual growth in real per capita income was 1.7 percent and average annual inflation was about 60 percent. High, volatile, and persistent inflation has coexisted with rather erratic and low growth in real output. This phenomenon of chronic inflation does not fall into either the mild inflationary or the hyperinflationary processes that are more

familiar in the literature. Rates of inflation ranged from about ten percent to about one hundred percent per annum, although lower and higher levels have also been observed. Nevertheless, the rate of inflation neither stabilizes around a level below ten percent, nor accelerates to hyperinflation.

The rest of the paper is organized as follows. Setion II presents the analytical framework and Section III derives and tests the controversial hypotheses. The final section summarizes the conclusions.

II. THEORETICAL FRAMEWORK

The Steady State of the Macroeconomy

The macroeconomy is described by two relationships. The first equation models the supply side of the economy and postulates that the inflation rate depends on the gap between current output and its full employment or capacity level, and on a function ϕ_t, the meaning of which will be later related to alternative theories of expectations formation and to the economy's short-run dynamics of adjustment. This can be formalized as:

$$(1) \quad p_t = \phi_t + \alpha x_t ,$$

where p_t is the rate of inflation of the price level, P_t, $x_t = y_t - y^c$, where y_t is the natural logarithm of real output,

y^c_t is the natural logarithm of real capacity output, α is a parameter, and t is time.

In what follows we keep in mind that, by Okun's Law, there is a relationship between the Okun Gap, x_t, and the unemployment rate, U_t. Therefore, the analysis can be conducted in terms of either variable. From (1) we can write an equivalent expression for real output:

$$(1a) \quad p_t = g_1 + \phi_t + \alpha y_t ,$$

where $g_1 = -\alpha y^c$.

The second equation models the demand side of the economy and explains the Okun Gap as depending on its own value lagged one period, on the change in real balances, and on a fiscal policy variable:

$$(2) \quad x_t = \beta x_{t-1} + a (m_t - p_t) + b f_t ,$$

where m is the rate of monetary growth, f is a measure of fiscal policy, and β, a, and b are parameters. We can also write an alternative expression to (2) in terms of real output:

$$(2a) \quad y_t = g_2 + \beta y_{t-1} + a (m_t - p_t) + b f_t ,$$

where $g_2 = (1 - \beta) y^c$.

Next, alternative specifications of the model (1)-(2) are presented, reflecting the fundamental content of the four theoretical approaches that were considered in the first section.

The New Classical Approach and Rational Expectations

The New Classical Economics or equilibrium approach to the business cycle can be formalized by restricting the structural model of the macroeconomy (1)-(2) with two assumptions. The first, refers to the way economic agents forecast the rate of inflation. According to this school of thought agents form expectations rationally in the Muth (1961) sense. This is a very strong assumption that requires agents to instantly learn all relevant information including the knowledge of the model and the probabilistic distribution of all of the variables. Because optimizing agents do not forego any profit opportunity, forecast errors are white noise. More formally, the rationally expected rate of inflation is given as:

$$(3)\quad p_t^e = E_\tau(p_t / \Omega_t) \;,\; E_\tau(n_t, n_s) = \begin{cases} \sigma^2 & \forall\ t = s \\ 0 & \forall\ t \neq s \end{cases}$$

where the superscript e is used to denote the rational expectation of the relevant variable, $n_t = p_t^e - p_t$, is a serially uncorrelated forecasting error that is independent of p_t^e; Ω_t is the information set including all relevant information known at time τ, particularly the past history of all variables, the model, and its stochastic structure; and E is the mathematical expectation operator.

We can interpret $\not{p}_t$ in expression (1) as the Muth rational expectation of p_t. Combining (1) and (2) we obtain:

$$(4) \quad p_t = \phi_t + \alpha (\beta x_{t-1} + a(m_t - p_t) + b f_t) .$$

Taking expectations on both sides of (4), making use of $\phi_t = p^e_t$, and collecting terms we obtain:

$$(4a) \quad p^e_t = m^e_t + (1/a)(a x_{t-1} + b f^e_t) .$$

where p^e is the rational expectation of the inflation rate which is formed using information available at time $\tau < t$. Substituting for $p^e = \phi_t$ into expression (4):

$$(5) \quad p_t = m_t + h (m^e_t - m_t) + (\beta / a) x_{t-1}$$

$$+ h(b/a) (f_t - f^e_t) + (b/a) f_t ,$$

where $h = 1/(1+\alpha a)$.

According to expression (5), inflation depends on anticipated monetary growth, anticipated fiscal policy, a cyclical variable, and unanticipated monetary and fiscal policy. It is also clear from expression (5) that if monetary and fiscal policies are correctly anticipated the inflation rate would be determined by the rate of monetary growth with a unitary coefficient, the cyclical influence of output growth, and a function of the fiscal expansion.

The second tenet of New Classical Economics is that discretionary demand management policy is ineffective or, in other words, there is no way by which policy actions can systematically alter the natural or equilibrium level of real variables. Therefore, any deviations of real output from its

capacity level are assumed to have no structure. This is the content of the Policy Ineffectiveness Proposition and is a direct consequence of the strong assumption concerning expectations formation. Thus, under our interpretation of $\pi_t = p_t^e$ and using expressions (4a) for p_t and (5) for p_t^e to substitute into (1) we obtain:

$$(6a) \quad x_t = ah\,(m_t - m_t^e) + bh\,(f_t - f_t^e) .$$

Expression (6a) clearly describes the New Classical claim that only unanticipated policy actions could have an effect on real variables. We can also write from (6a) an alternative expression in terms of real output:

$$(6b) \quad y_t = y^c + ah\,(m_t - m_t^e) + bh\,(f_t - f_t^e) ,$$

which reproduces the same hypothesis embodied in (6a) above.

It can be clearly seen that either expression (6a) or (6b) describe the Policy Ineffectiveness Proposition, that is, the level of real output or its deviations from the capacity level are totally insensitive to demand management policy. Therefore, unemployment rates below the equilibrium level can only be due to rates of monetary expansion below the expected level or to a fiscal expansion below the expected level. This underestimation causes the expected price level used in wage negotiations to exceed the realized price level. Consequently, the real wage is above its equilibrium level and unemployment rises. However, this effect is only temporary and cannot persist in the subsequent

period because rational agents immediately learn that they have mistaken a nominal shock as a relative price change.

An important policy consequence of the New Classical approach can be clearly seen in the formal model. According to equation (4a), the expected rate of monetary growth changes the expected rate of inflation equiproportionally. This implies that a policy of reducing the rate of monetary growth that is announced and understood as such by the public should reduce the rate of inflation instantly without provoking the social costs of higher unemployment. Thus, according to the New Classical Economics school there is no trade-off in stabilizing the price level. This is contrary to the implications of the Monetarist, and Keynesian positions, as will be seen below.

The Monetarist School and Asymptotically Rational Expectations

In this section, the general model (1)-(2) is restricted under monetarist assumptions. The first monetarist assumption is that inflation is not closely related to the Okun Gap, $x_t=y_t-y^c$. Given real balances and, consequently, a level of aggregate demand, and given a positive Okun Gap, $x_t < 0$, the demand-pull effect on prices (caused by a positive Keynesian excess of demand) tends to be counterbalanced by the excess unemployment which dampens the wage-push pressure on prices. Formally, the monetarist interpretation is that the second term of the right-hand side of (1) is close to zero and can be neglected.

A second monetarist assumption is that a bond-financed fiscal policy has no real effects. This is nothing but the well-known crowding-out effect of fiscal expansion. On one hand, the increase in government expenditures and the higher stock of bonds have a positive effect on the Keynesian excess of demand. On the other, the increase in the interest rate that is necessary to absorb a higher stock of government debt has a counterbalancing negative effect on aggregate demand. Formally, the monetarist interpretation is that parameter b in equation (2) is approximately equal to zero and can be neglected.

The third monetarist assumption refers to the way agents form their expectations, that is, the monetarist interpretation of π_t in expression (1). Here, we adopt the hypothesis of asymptotically rational expectations advanced by Stein (1982). According to this hypothesis, economic agents change their expectations in a finite proportion of the deviations of the long-term expected inflation from the actual expected inflation. More formally:

$$(7) \quad \Delta p_t^* = c\,(m_t - p_t^*), \qquad \Delta p = p_t - p_{t-1},$$

where the long-term expected inflation is the trend in monetary growth and p_t^* denotes the asymtotically rational expected rate of inflation.

Coefficient c is a function of structural frictions in the economy and indicates the speed of adjustment of the expected rate of inflation to nominal shocks. Stein (1982)

develops this theory in more detail pointing out the existence of four structural lags in the mechanism of expectation formation. First, there is a link between the current rate of monetary growth, m_t, and the expected rate of monetary growth, Em_t. This lag in the transmission mechanism depends upon the public's assessment of the permanent or transitory nature of monetary innovations. This is the well-known problem of credibility that, among other things, depends on the consistency of monetary and fiscal policy.

Second, there is a lag between the time in which an average rate of monetary growth, Em_t, is accepted and the time in which the public forms an expectation of inflation, Ep_t. This lag arises as long as agents posses different information sets and, consequently, do not share a common opinion.

Third, when there is uncertainty in the economy and agents are risk averse, a lag between the expected rate of inflation, Ep_t, and the risk-adjusted anticipated rate of inflation, p^*_t, is generated. The response of output to changes in expected prices is discounted by a factor that depends proportionally upon the amount of risk and risk aversion.

Fourth, the existence of long-term wage contracts creates an additional lag before the risk-adjusted anticipated rate of inflation can be incorporated into nominal labor costs at the time wage negotiations occur.

All of these structural frictions are subsumed under the expectation mechanism postulated in equation (7). It should be noted that the relevance of each type of lag is a matter

that depends on the economy's structure. In fact, one should expect that they vary for different economies. It is also possible that longer lags due, for example, to lack in the credibility of a given policy, are compensated with shorter lags due to, let us say, the existence of generalized mechanisms of indexation in the economy.

Next, we can interpret the function ϕ_t in expression (1) as the asymptotically rational expectation of the inflation rate. Assuming no relationship between the contemporaneous Okun Gap and the inflation rate for the reasons explained above, equation (1) can be restricted as:

$$(8) \qquad p_t = p_t^* ,$$

where p_t^* is the asymptotically rationally expected rate of inflation and its dynamic path is given by (7).

Turning now to the expression for the Okun Gap, we make use of two assumptions to obtain the Monetarist specification. The first is that fiscal policy has negligible effects on real output. This implies that the structural coefficient b in expression (2) is close to zero. The second is that there are two forces that transmit monetary growth to price increases: one is a demand-pull effect and, the other, is the effect of price expectations. This requires more explanation.

On the one hand, a rise in the rate of monetary expansion initially raises real balances because prices are assumed to change differentially, that is, with a lag. The rise in real balances shifts the economy's aggregate demand

function upwards and increases the Keynesian excess of demand for goods and services. This is the demand-pull effect of a money supply increase.

On the other hand, the asymptotically rational anticipated rate of inflation changes slowly in the same direction as the change in the rate of monetary growth. Therefore, the actual rate of inflation increases by more than the anticipated rate of inflation. The forecast error causes a fall in real wages inducing firms to expand employment and output.

The two monetarist assumptions discussed above allow us to parametrize expression (2) for the Okun Gap and obtain:

$$(9a) \quad x_t = \beta x_{t-1} + d_1 (m_{t-1} - p_{t-1}) ,$$

or, alternatively, an expression for real output:

$$(9b) \quad y_t = g_2 + \beta y_{t-1} + d_1 (m_{t-1} - p_{t-1}) ,$$

where $g_2=(1-\beta)y^c$. Note that, as in the case of the monetarist expression for the inflation rate, no contemporaneous variables appear on the right-hand side of either expression (9a) or (9b).

The change in real balances of the previous period is the variable that embodies the monetarist transmission of a nominal shock to the real sector. It is important to note that the hypothesis of asymptotically rational expectations plays a crucial role in this transmission mechanism. The expectational error lies in structural frictions existing in

the economy and is gradually eliminated as anticipations converge on the actual rate of inflation. The speed at which this adjustment process in expectations takes place is an empirical question and we can expect that it varies for economies with different structures. An important point here is that the faster expectations adjust to nominal shocks, the smaller should be the effect upon real macroeconomic variables such as output and employment. In this regard, the Monetarist transmission mechanism gives an intermediate explanation of the effects of nominal shocks upon the real sector that falls between the New Classical Economics and Keynesian poles, a point to which we shall return later.

The Keynesian School and Wage Inflation

We turn now to the Keynesian specification of the general model (1)-(2). In this case, it is hypothesized that the underlying rate of inflation is given by the inflation in nominal wages. Thus, we can interpret the function ϕ_t in equation (1) as the economy-wide rate of wage inflation, w_t. Then, expression (1) can be specified as:

$$(10) \qquad p_t = w_t + \alpha x_t.$$

The Keynesian school also gives an important role to the influence of exogenous disturbances, such as supply shocks, in affecting the rate of inflation. Therefore, we can easily consider this effect by slightly changing our interpretation

of the function ϕ_t to account for non-systematic factors. Thus, equation (10) can be rewritten as:

$$(11) \quad p_t = k_1 w_t + \alpha x_t + v_t,$$

where k_1 is a constant mark-up over wages and v_t denotes exogenous disturbances.

An important feature of the Keynesian specification of the inflation rate equation is the inclusion of a variable that captures the influence of the state of the economy (Okun Gap) upon the inflation rate. It will be shown later that this is a major difference with the monetarist explanation of the dynamics of inflation.

Expression (2) for the Okun Gap is consistent with the Keynesian view since both monetary and fiscal policy variables can affect real macro variables when the economy is in a situation of unemployment or real output is below capacity. This view is fundamentally opposed to the tenets of New Classical Economics which states that there is no way by which the policymaker can systematically alter the course of real output and the rate of unemployment from their equilibrium values. The Keynesian expression for the Okun Gap is given as:

$$(12a) \quad x_t = \beta x_{t-1} + a (m_t - p_t) + b f_t ,$$

or equivalently for real output:

$$(12b) \quad y_t = g_3 + \beta\, y_{t-1} + a\,(m_t - p_t) + b\, f_t,$$

where $g_3 = -\beta\, y^c$.

It must be noticed that the inclusion of the contemporaneous change in real balances in (12a)-(12b) derives from different causes than those discussed in the previous section. In the keynesian case, there is no explicit theory of expectations and the contemporaneous change in real balances captures the effect on real output through an expansion of aggregate demand. As can be seen by a comparison of expressions (9a)-(9b) with expressions (12a)-(12b), there are no substantial differences between the Keynesian and Monetarist specifications of the Okun Gap equation. This is a consequence of the closer views these two schools of thought hold regarding the dynamics of the unemployment rate and real output. The crucial controversial issue hinges on the dynamics of the inflation rate.

The Price of Imports and Stagflation

Changes in the prices of intermediate and capital goods imports in semi-industrialized economies may imply a dynamics of output and inflation that departs from the three models discussed above.

In small-open economies, where domestic and foreign markets are fully integrated, a rise in the relative price of imports with respect to the price of domestic output shifts demand toward domestic output which may lead to an expansion

of output. However, in economies where the domestic and foreign markets are isolated because of the existence of restrictions on imports, such as tariffs, outright prohibitions, quotas, etc., and, at the same time, the so-called "essential" imports of intermediate and capital goods are not restricted. Therefore, a rise in import prices can have a contractionary effect on output while it may also contribute to an acceleration in the rate of inflation. Since the local price of imports is the dollar price times the exchange rate, the stagflationary effects just described may come from an increase in either of these two components.

An alternative specification of the general macroeconomic framework given by (1)-(2) can be accordingly derived. The first underlying assumption adopted to specify the import-price model is that capacity output shifts in response to a change in the relative price of imports during the previous period. Therefore, there is an additional channel through which output can change. In formal terms, is assumed that, in the short run, (the log of) capacity output behaves according to:

$$(13) \quad y^c_t = b_1 + b_2 (p^i_{t-1} - p_{t-1}) ,$$

where $b_1 > 0$ and $b_2 < 0$ are parameters, and p^i is the rate of inflation in imports of capital goods. This relationship embodies the hypothesis that capacity output declines when the inflation of imported capital goods is higher than price inflation and, conversely, it increases when the difference is negative.

A second assumption is that, given the capital markets constraint, fiscal policy does not have independent effects on aggregate demand and, therefore, monetary policy affects aggregate demand and output through a change in real balances during the previous period. The rationale behind this lagged response lies in adjustment costs. Restricting equation (2a) with these assumptions yields:

$$(14) \quad y_t = g_4 + \beta\, y_{t-1} + d_2\,(m_{t-1} - p_{t-1}) + (1-\beta)b_2\,(p^i_{t-1} - p_{t-1}),$$

where $g_4 = (1-\beta)\, b_1$.

On the supply side, we need to model price equation (1) giving content to function ϕ_t. First, is assumed a mark-up mechanism from import costs to prices. Therefore, ϕ_t can be interpreted as being proportional to the rate of inflation of import goods. Second, according to (13) the inflation rate of imports has an additional effect on the economy-wide inflation rate through changes in capacity output. Therefore, substituting for y^c and for the function ϕ_t into (1) yields:

$$(15) \quad p_t = -\alpha b_1 + (k_2 - \alpha b_2)\, p^i_{t-1} + \alpha\, y_t + \alpha b_2\, p_{t-1},$$

where k_2 is a constant.

Note that there are two effects of changes in import prices on the inflation rate, both with positive signs. Therefore, a necessary condition for a stagflationary effect resulting from import inflation will be that $\beta < 1$ in (14).

In that case, an increase in the relative price of imports will cause real output to contract and the inflation rate to accelerate. Of course, this need not be the case when this effect is outweighed or offset by other effects on real output as specified in (14).

III. EMPIRICAL ANALYSIS

The Competing Hypothesis on the Dynamics of Real Output

The policy ineffectiveness hypothesis inherent in the New Classical model is embodied in equation (6b) which can be equivalently rewritten as:

$$(16) \quad y_t = y^c + \delta (m_t - m_t^e)$$

where $\delta = ah$ and the term containing unanticipated fiscal shocks has been dropped by making use of the assumption that fiscal shocks are not independent of monetary shocks given the nature of capital markets in Argentina.[4/]

The striking implication deriving from expression (16) is that an announced policy designed to reduce inflation will not cause adverse effects on the level of real output with the accompanying social costs. The empirical relevance of this hypothesis lies in the statistical significance of the coefficient on unanticipated policy shocks, namely, coefficient δ should be significantly different from zero

if the economy is to follow a short-run path of adjustment in accordance with the New Classical view.

Contrary to the New Classical Economics, the Monetarist school claims that there is a short-run tradeoff between the speed at which inflation is reduced and a rise in the unemployment rate or, alternatively, a fall in real output. This is the hypothesis embodied in equation (9b). This Monetarist specification for real output fundamentally differs from its New Classical counterpart. The change in real balances captures the explicit manner in which unanticipated inflation affects the level of real output in the following period.

The Monetarist hypothesis is that inflationary expectations adjust slowly in response to monetary innovations, thus generating a serially correlated forecast error. Therefore, at a given rate of monetary growth, the forecast error is only partially eliminated period after period. Since the policy change will be perceived but only partially transmitted to price expectations, there will be an explicit effect on the actual level of real output. The persistence of this forecast error and, consequently, of the deviation of real output from trend depends on the economy's structure, including both the information set and the behavior of economic agents. Statistically, the change in real balances in the previous period should be a significant variable explaining the ups and downs of real output, that is, coefficient d_1 should be positive and significantly different from zero.

Another hypothesis related to short-run fluctuations in real output in semi-industrialized economies is concerned

with the stagflationary effects of import price increases, particularly the effects of exchange rate devaluations. This hypothesis, embodied in equation (14), postulates that changes in the relative price of capital goods imports are inversely related to changes in capacity output. Thus, in economies like Argentina that depend heavily on this type of imports, capacity output fluctuates in response to changes in the prices of these imported inputs. Moreover, the coexistence of fixed exchange regimes and expansionary macroeconomic policies may generate wide fluctuations in the real exchange rate. The more conventional real balance effect on aggregate demand is also incorporated as one of the factors that explains the dynamics of real output.

The empirical relevance of the hypothesis embodied in the import-price model can be tested by determining the statistical significance of the coefficient of the differential inflations. If the estimated coefficient $\beta_3=(1-\beta)\ b_2$ in (14) is significantly different from zero and negative, the real world facts will be consistent with this view.

The Competing Hypotheses Concerning the Dynamics of Inflation

The Monetarist school argues that inflation is primarily a monetary phenomenon, thus, past rates of monetary growth are the fundamental determinants of inflation. This view is in disagreement with the New Classical Economics position and, particularly, contrary to the Keynesian and the

import-price models. The New Classical Economics hypothesis is that monetary growth affects the rate of inflation with a unitary coefficient as can be seen in equation (5). At the other extreme, Keynesians argue that there is no systematic relationship in the short run between monetary growth and inflation. Instead, Keynesians emphasize a causal relationship from wages to prices the nature of which depends on the state of the labor market. This is the content of the Keynesian equation (10) for the rate of inflation derived in Section II.[5/]

The import-price model emphasizes the economy's structural dependence on "essential" imports and highlights the role of prices of these goods. Thus, very similarly to the Keynesian hypothesis, the underlying rate of inflation is affected by two forces. On the one hand, a presumably non-competitive environment allows firms to mark-up prices according to increases in the costs of imported inputs. On the other, cyclical fluctuations of real output and capacity utilization may also exert inflationary or deflationary pressures.

The monetarist position can be formalized using the specification of the general model derived in a previous section. Equation (7) embodies the hypothesis of asymptotically rational expectations and is reproduced here for convenience:

$$(17) \quad p^*_{t+1} - p^*_t = c\,(m_t - p^*_t).$$

Letting the anticipated and actual rates of inflation in (17) be equal at time t=0, we can write:

$$(17a) \quad p^{*}_{1} - p_{0} = c\,(m_{0} - p_{0}).$$

Approximating (17) for $t > 0$, collecting terms, and making use of (8) we obtain:

$$(18) \quad p_{t} = (1-c)\,p_{t-1} + c\,m_{t-1}.$$

This monetarist reduced form expresses the rate of inflation as a weighted average of the rate of inflation and the rate of monetary growth during the previous period. Contrary to this view, the New Classical school claims that the contemporaneous rate of monetary growth affects the rate of inflation with a unitary coefficient. This is expressed in equation (5) above and is, naturally, the content of the Policy Ineffectiveness Proposition.

The fundamental disagreement between Keynesians and Monetarists hinges on the dynamics of the rate of inflation. The Keynesian hypothesis that we are interested in testing is based on Modigliani and Papademos (1976) and Tobin (1975). These neo-Keynesian authors claim that as long as the unemployment rate does not fall below a critical or non-inflationary level, the inflation rate can be expected to decline or, at least, not to accelerate. Two crucial propositions of the Keynesian school warrant this result. First, prices and wages are sticky in the short-run and they respond inversely to excess supply in the commodities and

labor markets. Second, the economy's underlying rate of inflation is the inflation in unit labor costs. The policy implication of this neo-Keynesian position is that demand management policy can be used to close the gap with full employment without accelerating inflation.

The Keynesian reduced form for the inflation rate is given by equation (11). According to this view, given a situation where output is below full employment, $x_t = y_t - y^c < 0$, such that the unemployment rate is above its non-inflationary level, monetary and fiscal policy actions can alter the path of real output toward its full employment level without accelerating the rate of inflation. Since wages and prices are sticky in the short-run, inflation is independent of the direct short-run effects of monetary and fiscal policy actions. This is clearly seen in equation (10) or (11). Therefore, demand management policies can affect real output as was modeled in the Keynesian reduced form (12b), in this expression, both monetary and fiscal variables appear on the right-hand side. It is only when the unemployment rate has fallen below its non-inflationary level that expansionary policies will encounter a tight labor market provoking an acceleration of wage inflation which, in turn, will be marked-up in prices. According to this, we can test the Keynesian hypothesis by determining the statistical significance of cyclical fluctuations in output and the acceleration of wage inflation when policy variables also enter into the explanation of the acceleration of inflation.

The assesment of the empirical relevance of the hypothesis on inflation embodied in the import-price model

can be easily accommodated to the preceding discussion. Expression (15) for the inflation rate closely resembles the Keynesian view embodied in expression (11) in that it explains the dynamics of inflation through a mark-up mechanism and the influence of the state of the economy. Therefore, in addition to the cyclical movements of real output, we can test the statistical significance of the acceleration of import price inflation when policy variables also enter into the set of explanatory variables.

Next, we test the hypotheses confronted in the preceding discussion. In the first place, we carry out tests to determine the validity of the New Classical, Monetarist, and import-price hypotheses regarding dynamics of real output. Second, we test the Monetarist, Keynesian, and import-price hypotheses regarding the dynamics of the rate of inflation.

Tests of the Competing Hypotheses Concerning the Dynamics of Real Output

Before going into the testing procedures themselves, it is necessary to address an observational equivalence problem. Following Sargent (1976), it is possible to show that if the monetary authority follows a money supply rule that depends on past rates of monetary expansion, past inflation, and past rates of growth, the New Classical, Monetarist, and import-price expressions derived for real output are observationally equivalent, that is, the data cannot distinguish one from another. This identification problem is formally shown in Appendix A.

In order to surmount this identification problem, monetary growth is decomposed into its anticipated and unanticipated parts. For this purpose we follow here a two-stage procedure used in Barro (1977, 1978). This entails first obtaining a direct measure of the unanticipated policy shock and then using this variable to test the competing hypotheses.

A forecast of the rate of monetary growth was obtained by including all relevant information available to economic agents that helps to predict the current rate of monetary growth. It was found that the best predictors of the rate of monetary growth included two sets of independent variables: first, past rates of monetary growth, m_{t-i}, which capture persistent effects in the money growth process; and second, past fiscal deficits, f_{t-i}, which capture the resource motive for money creation. The OLS regression chosen for decomposing monetary growth into its anticipated and unanticipated parts was (t-statistics in parentheses):[6/]

$$
\begin{aligned}
(19)\quad m_t = {} & \underset{(4.0)}{.383} + \underset{(5.0)}{.483}m_{-1} + \underset{(.45)}{.048}m_{-2} + \underset{(.81)}{.086}m_{-3} + \underset{(1.26)}{.136}m_{-4} \\
& - \underset{(-2.23)}{.242}m_{-5} - \underset{(.53)}{.050}m_{-6} + \underset{(2.91)}{.224}f_{-1} - \underset{(-.72)}{.068}f_{-2} \\
& + \underset{(1.22)}{.097}f_{-3} - \underset{(-1.32)}{.107}f_{-4} - \underset{(-.12)}{.012}f_{-5} + \underset{(.48)}{.039}f_{-6}.
\end{aligned}
$$

$$
\bar{R}^2 = .68 \qquad D\text{-}W = 1.99 \qquad h = .87
$$

Additional lags of the dependent variables were not statistically significant. The residuals of regression (19), denoted by e_{t-i}, i=1, 2, ..., were taken as the true realizations of unanticipated monetary growth, that is, $e_{t-i} = m_{t-i} - m^{e}_{t-i}$, and used for hypothesis testing below.

Hypothesis Testing

Two testing procedures will be used. The first is to embed the New Classical, Monetarist, and import-price models and construct F-tests taking the embedded model as the unrestricted model and each of the alternative specifications as the restricted models. Thus, acceptance of the null hypothesis implies that the parameters excluded in the restricted specification are not significantly different from zero.

This type of tests may, in cases, be ambiguous because two or more hypotheses can be accepted or rejected. Therefore, a second supplementary procedure is to discriminate between the alternative models on the basis of the goodness of fit by looking at the adjusted R^2 coefficients, t-statistics of the estimated coefficients, and the Akaike Information Criterion (AIC). This criterion consists in selecting the model for which the expression AIC = -2log(L)+2k is a minimum, where L is the likelihood function and k the number of estimated parameters.[7/]

In order to implement the estimation we assume that real capacity output in the expresions (9b) and (16) for the Monetarist and New Classical specifications follows a non-linear trend that depends upon time, that is,

$$(20) \quad Y^c = Ae^{st},$$

where Y^c is capacity output and A and s are parameters. Log-linearizing (20) and substituting for $y^c = \log(Y^c)$ into (16), we obtain an estimatable expression for the restricted New Classical model for real output:

$$(21) \quad y_t = \beta_{10} + \Sigma_{i=0}^{n} \delta_i e_{t-i} + \beta_{13} t,$$

where $\beta_{10} = \log(A)$, $\beta_{13} = s$, and δ_i's, i=0, 1, 2, ... n, are the coefficients on unanticipated nominal shocks, e_t.

The inclusion of lagged values of unanticipated monetary growth in (21) is intended to reflect the existence of persistence effects emphasized by Lucas (1975) and Sargent (1976). These persistence effects arise from the impact of shocks on stock variables that are carried forward into future periods and/or from the existence of adjustment costs due to changes in labor inputs.

Substituting the hypothesis (20) into (9b) we obtain an estimatable expression for the monetarist model for real output:

$$(22) \quad y_t = \beta_{20} + \beta_{21} y_{t-1} + \beta_{22} (m_{t-1} - p_{t-1}) + \beta_{23} t,$$

where $\beta_{20} = (1-\beta)\log(A)$, $\beta_{21} = \beta$, $\beta_{22} = d_1$, and $\beta_{23} = (1-\beta)s$.

The unrestricted model for real output is obtained embedding in one single expression all of the explanatory variables that enter into each of the alternative

specifications, that is, the change of real balances during the previous period, contemporaneous and lagged unanticipated monetary shocks, the relative price of imports, and the lagged dependent variable. Formally:

$$(23) \quad y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 (m_{t-1} - p_{t-1}) + \Sigma_{i=0}^{n} \delta_i e_{t-i} + \beta_3 (p^i_{t-1} - p_{t-1}) + \beta_4 t.$$

Using the unanticipated monetary shocks, e_i, estimated from expression (19), we can estimate equations (14), (21), and (22), and construct an F-test for each of the restricted models.[8/] The first test is to determine the validity of the New Classical exclusion restrictions in (23) which implies $H_o: \beta_1 = \beta_2 = \beta_3 = 0$ against $H_1: \beta_1, \beta_2, \beta_3 \neq 0$. The second test is to determine the validity of the Monetarist exclusion restrictions which implies $H_o: \delta_i = \beta_3 = 0$ against the alternative $H_1: \delta_i, \beta_3 \neq 0$. And the third test is to determine the validity of the exclusion restrictions of the import-price model which implies $H_o: \delta_i = \beta_4 = 0$ against the alternative $H_1: \delta_i, \beta_4 \neq 0$.

The estimated results are reported in Table 1 and were obtained by using Argentine quarterly data for the period 1952:3 - 1980:4. Estimation was carried out by using a maximum likelihood iterative technique (MLIT) to eliminate serial correlation in the error term.[9/]

According to the t-statistics, it can be observed that the data give unambiguous results in that the coefficients of the unanticipated monetary shocks, δ_i, i=0, 1, 2, ..., 6,

Table 1: Real Output Model
(Argentina, 1952:3-80:4)

Parameter	Unrestricted	New Classical	Monetarist	Import-Price
β_0	2.668	8.821	2.206	.0892
	(3.955)	(394.1)	(3.587)	(.903)
β_1	.6988	-	.7502	.9914
	(9.130)		(10.73)	(94.7)
β_2	.0338	-	.0317	.0278
	(2.148)		(2.354)	(1.901)
δ_0	.0115	.0054	-	-
	(.487)	(.231)		
δ_1	-.0093	.0090	-	-
	(-.304)	(.401)		
δ_2	.0514	.0398	-	-
	(1.732)	(1.754)		
δ_3	-.0254	-.0004	-	-
	(-.857)	(-.020)		
δ_4	.0106	.0072	-	-
	(.362)	(.313)		
δ_5	-.0020	.0146	-	-
	(-.069)	(.625)		
δ_6	.0298	.0274	-	-
	(1.275)	(1.129)		
β_3	-.0104	-	-	-.0112
	(-1.002)			(-1.072)
β_4	.0026	.0090	.0023	-
	(3.782)	(31.57)	(3.533)	
$\bar{R}^2$	.979	.976	.978	.975
D-W	2.038	2.201	2.049	2.155
AIC	-	-363.2	-379.4	-365.8
F(q,N-K)	-	4.65	1.21	2.97

Notes: t-ratios in parentheses. See the text for an explanation of AIC.

and that of the relative price of imports, $\beta_3=(1-\beta)b_2$, are not significantly different from zero, whereas the coefficient of the change in real balances during the previous period, β_2, is positive and significantly different from zero at the 5 percent level. Estimation with longer and shorter lags of unanticipated monetary shocks was also carried out with no changes in the results. This shows that the data is consistent with the monetarist hypothesis.

The results reported in **Table 1** also show that the goodness of fit as well as the estimated coefficients are not altered when we exclude unanticipated monetary shocks as explanatory variables for the level of real output. In fact, the adjusted R^2 for the monetarist specification is higher compared with those of the New Classical and import-price models. The AIC criterion also supports the monetarist hypothesis according to the computed values that are reported at the botton of **Table 1.**

The calculated F-statistics, reported in the last row of the table allows the rejection of the exclusion restrictions implied by the New Classical and import-price hypotheses, while, at the same time, allows the acceptance of the exclusion restriction of the Monetarist hypothesis, in both cases, at the 1 percent level of significance.[10/]

All the tests conducted are unambiguous in rejecting the joint significance of unanticipated shocks and import prices upon real output in Argentina and, therefore, in rejecting the New Classical and import-price hypotheses, whereas the data shows the consistency of the Monetarist hypothesis with the empirical evidence. This implies that in

Argentina money is not neutral in the short run and that economic agents adjust expectations gradually in response to policy shocks. However, it is necessary to test the controversial hypotheses on inflation dynamics before we can arrive at a more conclusive verdict on the dynamics of short-run fluctuations.

Tests of the Competing Hypotheses Concerning the Dynamics of the Rate of Inflation

Next, we test the hypotheses embodied in the Monetarist, Keynesian, and import-price models of inflation discussed in a previous section. The econometric strategy for hypothesis testing will be the same as that used to test the competing views on the dynamics of real output.

An implication of the monetarist reduced form (18) for the rate of inflation is that the change in the inflation rate from one period to next, $p_t - p_{t-1}$, should be positively correlated with changes in real balances during the previous period, $m_{t-1} - p_{t-1}$. We can formally derive this relationship by rearranging monetarist expression (18) as:

$$(24) \quad p_t - p_{t-1} = c (m_{t-1} - p_{t-1}).$$

Therefore, the relevant variable for testing the Monetarist hypothesis on the dynamics of inflation is the change in real balances during the previous period.

According to the Keynesian hypothesis, the acceleration of inflation in the short run does not depend on policy variables directly. We can see this by taking the first difference of equation (11) which yields:

$$(25) \quad p_t - p_{t-1} = k_1 (w_t - w_{t-1}) + \alpha (y_t - y_{t-1}) + v_{1t},$$

where $v_{1t} = v_t - v_{t-1}$. Expansionary fiscal or monetary policies can affect real output as long as its level is below capacity. This is precisely the hypothesis contained in expression (25).

The hypothesis on the dynamics of inflation implicit in the import-price model can be straightforwardly derived by taking the first difference of expression (15). This yields:

$$(26) \quad p_t - p_{t-1} = (k_2 - \alpha b_2)(p^i_{t-1} - p^i_{t-2}) + \alpha (y_t - y_{t-1}) + \alpha b_2 (p_{t-1} - p_{t-2}),$$

where $(k_2 - \alpha b_2) > 0$. This implies that the acceleration of inflation in imported goods contributes to accelerating the economy-wide rate of inflation.

In order to construct the F-tests, it is necessary to embed within one model the explanatory variables of inflation acceleration of the three alternative specifications (24), (25), and (26). The embedded model can be written as:

$$(27)\quad p_t - p_{t-1} = \pi_1 (m_{t-1} - p_{t-1}) + \pi_2 (w_t - w_{t-1}) + \pi_3 (y_t - y_{t-1}) + \pi_4 (p^i_{t-1} - p^i_{t-2}) + \pi_5 (p_{t-1} - p_{t-2}).$$

The restricted models of inflation acceleration and model (27) were fitted with Ordinary Least Squares to Argentine quarterly data for the period 1952:3-1980:4, using the exchange rate as a proxy for the price of imports. Results are reported in **Table 2**.

According to the t-statistics reported, there are only two variables that make a significant contribution to explaining the acceleration of inflation: the growth in real balances and one-period lagged inflation acceleration with positive and negative sings, respectively. However, when the two variables enter the regression, only the coefficient of the former is significantly different from zero, thus giving support to the Monetarist hypothesis.

The adjusted R^2's also support the Monetarist hypothesis. The AIC also supports the Monetarist hypothesis as indicated by the conmputed values reported at the botton of **Table 2**.

To supplement the conclusions from these discriminating tests, three F-tests were carried out. The first, was to determine the validity of the Monetarist exclusion restrictions which implies $H_o: \pi_2 = \pi_3 = \pi_4 = \pi_5 = 0$ against the alternative $H_1: \pi_2, \pi_3, \pi_4, \pi_5 \neq 0$. The second, to determine the validity of the Keynesian exclusion

Table 2: Inflation Acceleration Model
(Argentina, 1952:3-80:4)

Parameter	Unrestricted	Monetarist	Keynesian	Import-Price
π_0	0.0105 (.411)	.0091 (.371)	-.0034 (-.122)	.0012 (.043)
π_1	.5133 (4.900)	.5145 (5.107)	-	-
π_2	.0220 (.577)	-	.0585 (1.451)	-
π_3	-.1899 (-.317)	-	.3848 (.603)	-.1224 (-.227)
π_4	-.0209 (-.431)	-	-	.0122 (.233)
π_5	-.0672 (-.650)	-.0964 (-1.054)	-.2994 (-3.336)	-.3375 (-3.454)
$\bar{R}^2$	.247	.260	.102	.086
D-W	2.102	2.064	2.171	2.091
AIC	-	15.0	36.0	37.5
F(q,N-K)	-	0.32	12.44	13.24

Note: See notes to Table 1 and equation (27).

restrictions which implies $H_o: \pi_1 = \pi_4 = \pi_5 = 0$ against the alternative $H_1: \pi_1, \pi_4, \pi_5 \neq 0$. And the third, to determine the validity of exclusion restrictions of the import-price model which implies $H_o: \pi_1 = \pi_2 = 0$ against the alternative $H_1: \pi_1, \pi_2 \neq 0$. The calculated F-statistics are reported in the last row of **Table 2** and are unambiguous

in rejecting, at the 1 percent significance level, the restrictions imposed by the Keynesian and import-price hypotheses while they allow acceptance of the restrictions imposed by the Monetarist hypothesis.[11/]

All the above results indicate that the dynamics of the inflation rate is consistent with the Monetarist hypothesis. Thus, the joint results for output and inflation refute, unambiguously, the New Classical, Keynesian, and import-price hypotheses.

IV. SUMMARY AND CONCLUSIONS

Short-run macroeconomic fluctuations can be modeled according to alternative theoretical approaches. These reflect conflicting views, each one involving different implications for the design of appropriate economic policies.

The New Classical Economics postulates that economic agents form expectations rationally and that fluctuations in the level of real output are solely due to expectational errors that are not serially correlated. Therefore, inflation can be reduced instantly with no adverse effects on the level of employment. The Monetarist School claims that inflation is primarily a monetary phenomenon and that due to the existence of some structural rigidities in the economy, it takes time for a policy for reducing inflation to have the desired effects. Consequently, there are negative effects on employment that cannot be avoided. The

Keynesian School holds that, when the unemployment rate is above some given non-inflationary level, wage inflation and supply shocks are the main determinants of the rate of inflation. Therefore, inflation is independent of the rate of monetary expansion and incomes policies can and should be used to attenuate, if not avoid, the social costs of unemployment. Non-monetarist approaches to inflation emphasize a number of structural constraints emerging from external-sector bottlenecks, non-competitive market structures, and other inflexibilities inherent in the productive apparatus of semi-industrialized economies. Thus, the inflationary phenomenon is, to a large extent, an inevitable consequence arising in the process of development to a mature economic system. Incomes policies and various forms of interventionism constitute the body of policy recommendations to stop inflation and accelerate growth.

In order to shed light on the controversial issues and, therefore, to provide sounder basis for the design of stabilization policies, the choice of a strategy for analyzing the problem is of fundamental importance. The approach followed here was to present a general medium-run equilibrium model of the macroeconomy that did not preclude, a priori, any of the antagonistic positions.

In order to study macroeconomic fluctuations we have modeled the simultaneous behavior of two variables: the price level or its rate of change, and the unemployment rate or the level of real output. Additionally, we have explicitly considered the role of expectations and modeled them according to alternative theories of their formation. The

model used here permitted us to derive alternative specifications that reflect the controversial explanations of short-run macroeconomic fluctuations given by four schools of thought. The general theoretical framework of analysis was parametrized according to the theoretical assumptions of each of these schools of thought. Testable hypotheses were derived and tested against the empirical evidence for Argentina. Consequently, a salient feature of the strategy used in this study was the confrontation of alternative theories with the same data set and after the contending hypotheses were derived from a common macroeconomic core.

The F-tests of the exclusion restrictions implied by each school of thought allowed unambiguous rejection of the New Classical and import-price hypotheses and acceptance of the Monetarist hypothesis in the case of the model for real output. In the case of the model for inflation acceleration, the F-tests allowed unambiguous rejection of the Keynesian and import-price hypotheses and acceptance of the Monetarist hypothesis. Additionally, the model-discriminating tests were also consistent with these results. The overall outcome of hypothesis testing showed that the Argentine quarterly data for the period 1951:1 to 1980:4 strongly support the monetarist short-run view that inflation expectations adjust gradually in response to monetary innovations and that these changes have an effect on the level of real output.

This evidence strongly supports the monetarist view and is consistent with the institutional features of capital markets in Argentina. Because capital markets are poorly

developed, the financing of fiscal deficits has largely relied on central bank loans to the government. Moreover, this empirical finding also bears an important implication for the design of disinflationary policies through monetary contraction. Since in Argentina monetary and fiscal policies can hardly be implemented independently of one another, reducing the rate of monetary expansion irrespective of the accompanying fiscal policy will not succeed in stopping inflation. Thus, an inconsistency between monetary and fiscal policies will be highly detrimental to the credibility of the monetary policy implemented. The shortage of credibility will undermine stabilization efforts and, ultimately, force the government to abandon a chosen monetary policy and validate inflationary pressures, even before an increase in interest rates could reduce aggregate demand and induce a compensatin(deflationary pressure on prices.

From the findings of this research, it cannot be concluded that the sole consideration of the appropriate use of economic instruments and knowledge of the determinants of economic fluctuations can solve complex problems like those that have affected an economy like that of Argentina. Nevertheless, this research does show that if not a sufficient condition, a necessary one is the knowledge of the theories that are consistent with the evidence and that are capable of explaining the behavior of economic aggregates.

Notes:

1/ Obviously, this is not the only distinction one could make concerning different approaches to the study of business cycles. However, no doctrinal arguments will be presented here justifying the adoption of one of them other than the specification of the set of assumptions that defines each school of thought.

2/ This strategy was proposed in Stein (1982) and empirically applied to the United States and Canada. (1) Dornbusch and Fischer (1981) presented a similar approach in order to analyze the short-run determinants of inflation and output although their empirical work is focused on the influences of money and wages on the inflation rate.

3/ It must be stressed once more that each school of thought may involve a wide range of positions, but the borderlines and definitions adopted here may not necessarily encompass all of them. The criterium used here is aimed at reflecting a synthesis of the fundamental points of each school that bear relevant policy implications such as the issues of policy effectiveness to stabilizing the price level and the social costs of eliminating unemployment.

4/ This is the interdependence of monetary and fiscal policy due to inexistence of well developed capital markets.

5/ This disagreement between Keunesians and Monetarists arises in a situation in which real output is below its capacity level.

6/ The sample period was 1950:4-1980:4.

7/ See Harvey (1981).

8/ The F-test is:

$$F(q,N-K) \sim \left[\frac{(SSR^{r} - SSR^{u}) / q}{SSR^{u} / (N-K)} \right]$$

where SSR^r is the sum of square residuals from the restricted model, SSR^u is the sum of square residuals from the unrestricted model, N is the number of observations, q the number of restrictions, and K is the number of parameters estimated in the unrestricted model.

9/ See Beach and MacKinnon (1981).

10/ The critical values for the three tests at the 1% (5%) significance level were 4.08 (2.72), 2.67 (2.04), and 2.67 (2.04).

11/ The critical values for the three tests at the 1% (5%) significance level were 3.99 (2.70), 3.99 (2.70), and 4.83 (3.09).