Structural Aspects of Turkish Inflation, 1950-1979

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Abstract

This paper analyzes inflationary processes in Turkey through the use of three regression models with successively more general structures. The empirical results indicate that aggregate output is responsive to unexpected changes in the money supply, but that the magnitude of this response depends on the nature of the foreign exchange regime. The relationship between the money supply and prices is not proportional, but depends on inflationary expectations and the nature of foreign exchange availability. One interesting result is that stabilization policies, especially at times of foreign exchange crises, have little short-run impact on prices, but reduce output growth significantly. In addition to the aggregate analysis, the paper also explores some structural issues concerning the roles of the agricultural and non-agricultural sectors and the relationship between stabilization policies and relative prices.
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Summary

This is a preliminary study on the dynamics of inflation in Turkey. It attempts to analyze the inflation process through the use of three models with successively more general structures. The results indicate that aggregate output is responsive to unexpected changes in money supply but that the magnitude of this response depends on the nature of the foreign exchange regime. The relationship between the money supply and prices is not proportional but depends on inflationary expectations and the nature of foreign exchange availability. An important result is thus that monetary stabilization policies, especially at times of foreign exchange crises, will have little short-run impact on prices but will reduce output growth significantly.

To test the validity of structural models of inflation, money-output-price relationships are investigated separately for agricultural and non-agricultural sectors. Unexpected money supply growth leads to increases in both sectors' output growth rates (with a lag of one year in agriculture). However, in the agricultural sector, these output increases do not have any effect on agricultural prices (because of government intervention in agricultural price determination). The net result of these policies is that an increase (or decrease) in the unexpected money supply leads to relative prices turning in favor of (or against) agriculture.

The last section of the paper analyzes the impact of relative price changes on the aggregate inflation rate. It is shown that due to
government policies of subsidizing agricultural prices, changes in relative prices do not necessarily create cost pressures, but instead lead to increases in the domestic component of the money supply. The resulting system is unstable, with any monetary shock leading to accelerating inflation.

Annex A discusses the basic characteristics of the foreign exchange markets and tries to justify the assumption made in the text that foreign exchange availability as exogenous. In Annex B the wage and price behavior of manufacturing and trade sectors are investigated. This annex supplies the microeconomic justification for the assumptions made in the main text about the impact of foreign exchange regimes, public sector behavior, and the behavior of the wages.

The results indicate that structural factors have to be taken into account in formulating macroeconomic policies. However, at least in the case of Turkey, some of these structural factors are created by the policies of the government.
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I. INTRODUCTION

Inflation has been one of the major problems of the Turkish economy in the postwar period. Although inflation rates were lower than in some Latin American countries, in the last few years they have reached record levels. What is more significant is the fact that they have been continuously accelerating in the last decade. After relatively low levels of inflation in the early 1950s inflation rates shot up to about 25% in 1958. After a successful stabilization policy, the decade of the sixties was a period of relative price stability. Starting in 1970, however, inflation rates again accelerated reaching almost 100% in 1980.

Scarcity of previous studies on the Turkish inflation and especially the lack of alternative inflation models necessitate a two stage approach to the modeling of the inflationary dynamics in Turkey. First stage would essentially be the development of alternative models and analyzing their performance in light of the Turkish experience. The second stage would be the development of a macro model in light of the findings of the preliminary study. This paper constitutes the first stage, which attempts to provide the framework on which a more realistic macro model can be developed.

Inflation studies in LDCs have been based on two different approaches. In the literature, these have been termed as the monetarist and the structuralist approaches. The naive monetarist model was first formulated and tested by Harberger (1963). Later Vogel (1974) and more recently, Sheehey (1980) have tested the naive monetarist model for Latin American countries. The results of all these studies have shown that there is an almost one to one correspondence between the growth of the money supply and the inflation rate. In Turkey, two major studies of inflation have used the same framework. Kizilyalli (1978) tested the Harberger equation and obtained
similar coefficients to those observed in Latin American studies, and Akyuz (1973) tested a demand for money function directly and found a stable demand for money function for Turkey.

The success of the naive monetarist model in explaining the rate of inflation both in Turkey and in other LDCs has led to a crude form of monetarism where policy prescriptions are based primarily on the control of the money supply. Furthermore, the strong relationship between the money supply and the inflation rate has led to the minimization of the costs of monetary stabilization policies.

The second approach to the explanation of inflation in LDCs has been the structuralist model.1\ The general framework of such models can be summarized as follows: An excess supply of money will lead to an excess demand for goods and services. Moreover, the excess demand for goods and services will be eliminated partially by price increases and, at least in the short run, partially by increases in the supply. The supply response, however, will not be identical in all the sectors. Agriculture (and sometimes the export sector) does not show a supply response to changes in the money supply while the urban manufacturing sector responds partially by increasing output. Output expansion in the industrial sector increases employment and thereby the demand for food from the agricultural sector. Since agricultural output does not respond to this increase in demand, relative prices turn in favor of agriculture and foodstuffs. Higher food prices lead to higher wage demands and through higher wages, into higher industrial prices. Reductions in money supply growth as a stabilization policy will not lower the inflation rate but will lead to reductions in output growth. In this approach, firms

\[1/\text{ See Wachter [1976] and Kirkpatrick and Nixon [1976] for a summary of the structuralist models.} \]
determine their prices with a markup on costs, but adjust their output to the level of demand. The tradeoff between the money supply and industrial output is worsened by the lack of an output response in agriculture. Furthermore, if foodstuffs are imported, this limits the foreign exchange available to import necessary intermediate and capital goods which in turn limits the rate of growth of industrial output.

Similar arguments exist for chronic foreign exchange bottlenecks. A devaluation to increase exports also increases the costs of capital and intermediate goods prices which are then passed on as higher product prices. Attempts by labor to maintain their real wages cause further increases in the price level. Higher domestic prices initiated by a nominal devaluation make a real devaluation very hard to achieve. Again, increasing prices if not accommodated by the expansion of the money supply lead to reductions in output and not in prices.¹/

Within the same framework, Bruno [1978] and Taylor [1981] have further argued that monetary deflation might have a direct supply effect in addition to its demand reducing effect. In most LDCs, lack of alternative liquid assets and greater reliance on bank credits for working capital needs make output more dependent on the availability of credit. Cost increases cause the firms to seek greater credit to finance the same level of production. Reductions in the growth of the money supply are implemented through credit restrictions which in turn ration the firms, which are then forced either to cut production or obtain credits from the curb market at very

¹/ This issue is identical to the fixprice-flexprice distinction made by Hicks [1965, 1974]. The agricultural sector behaves in a flexprice way while industry and labor have fixprice behavior. This type of differentiation by markets and its importance in the analysis of inflation has led to similar models for developed countries. See Nordhaus [1976] for a model along these lines.
high rates of interest which increases their costs even further. Thus, credit rationing also influences output due to working capital bottlenecks in addition to its effect through reduced demand.

The predictions and the policy implications of the naive monetarist and the structuralist models are very different. However, within the monetarist framework, recent models have eliminated some of the differences between the two models. These neo-monetarist models by distinguishing between expected and unexpected changes in the money supply, relax the assumption of exogenous output growth. Studies by Lucas (1973), Barro (1980), Hanson (1980), and Fernandez (1977), found a relationship between the unexpected money supply and output. The same relationship has also been observed by Fry (1978a) and Neftci (1980) for the Turkish economy. The neo-monetarist models meet some of the structuralist critiques and yield results that approximate the structuralist models in the short-run but in the long-run they give the same results as the naive monetarist model. However, the neo-monetarist models do not take into account the differential sectoral responses and the impact of resulting relative price changes on the inflation rate. While the neo-monetarist model provides a framework to analyze the output-money interactions, it does not explicitly take into account the causes and implications of relative price changes which form the basis of many structuralist models.

Given the large number of studies of structuralist models, none so far has been attempted for the Turkish economy. When the Turkish experience is analyzed, however, the need for a structuralist model of the Turkish economy becomes more apparent. Figure 1, for instance illustrates the behavior of money supply growth, the inflation rate and relative prices. The price index (P) is the implicit GDP deflator and the money supply (MS) is
currency plus demand and time deposits, which are in continuous growth rates (first difference of logs). For relative prices, there is no consensus in the literature as to the "best" relative prices that should be used. Because of this ambiguity, two different definitions have been employed. One of these is the ratio of the agricultural deflator to the non-agricultural deflator (TT_u), and the second is the ratio of the agricultural deflator to the manufacturing industry deflator (TT_m). They both take the value of 1.00 in 1968. In Figure 1, the left vertical axis measures the relative prices while the right vertical axis measures the percentage rates of growth in the money supply (MS) and the inflation rate (P).

Upon closer examination, Figure 1 reveals that the three series are quite similar in their cyclical behavior. Up to 1957, we see high rates of monetary expansion, accelerating inflation, and terms of trade (TT_m) that are in favor of agriculture. Then, starting in 1958, both MS, P, and TT_m all decrease at a rather rapid rate. Actually, the decline in TT_m starts in 1957. Then from 1960 to 1970, the rate of inflation is quite low. The growth of the money supply, although increasing over this period, it also relatively low. TT_m up to 1968 is around 100, which is quite low as compared to the early fifties and seventies. From 1968 on, money supply growth and inflation begin to accelerate until 1979. Also, starting in 1968, the terms of trade move again in favor of agriculture. TT_m goes up from an average of 100 in the sixties to 139 in 1977. TT_m begins to decline in 1978 and 1979 but is still high compared to its value of the 1960s. Although the relationships are not perfect, the long run behavior of the three series is quite similar. Periods of high money supply growth and high inflation are also periods during which the terms of trade have been in favor of agriculture. This relationship seems to give at least some support to the structuralist approach.
Figure 1

Inflation, Money Supply and Relative Prices

- TTU: Ratio of agricultural to non-agricultural prices
- TTM: Ratio of agricultural to industrial prices
- TESMT: Money supply growth rate
- PHNT: Rate of inflation
Given the close association among the three series, the extent and the importance of the controversy becomes obvious. Looking back at the literature on inflation, the two conflicting models can be taken as partial analyses of a more complex phenomenon.

If we take into consideration just the money supply and prices, and disregard the behavior of the terms of trade, then the analysis reduces to the monetarist model. The terms of trade become an unimportant issue that is determined by relative excess demands in the two sectors. On the other hand, if we assume that causality runs from the terms of trade to inflation, while the money supply just accommodates price changes, then a structuralist model seems more appropriate.

The purpose of this study is to analyze the Turkish inflation in the 1950-79 period using these alternative models. Rather than simply building one model and testing it with the Turkish data, alternative models and their results will be analyzed.

In section II, an aggregative model is analyzed. The naive version of the monetarist approach is tested in section II.A. In section II.B, a neo-monetarist model is developed to analyze the interaction between the money supply and output. In addition to the money supply, the impact of foreign exchange bottlenecks are also integrated into the output equations. In section II.C simultaneous estimation of price and output equations are made, and reduced form coefficients of money supply growth on the inflation rate are obtained.

The structuralist model that is developed for the Turkish economy is presented in section III. However, in this section a different estimation procedure from the Latin American studies is developed.

The empirical tests of the structuralist models, unlike those of the
monetarist model, have not been designed explicitly to test the crucial assumptions. What has been done is to take a simple monetarist model and add to it the variables that are said to be significant. More specifically, all studies start from the following basic monetarist specification first used by Harberger [1963].

\[
\hat{P} = \alpha_0 + \alpha_1 \hat{M}_S + \alpha_2 \hat{M}_{S-1} - \alpha_3 \hat{Y} + \alpha_4 \hat{A}
\]

\( \hat{\cdot} \) \( \equiv \Delta \ln, \) i.e. growth rates

- \( \hat{P} \) is an aggregate price index
- \( \hat{M}_S \) is the money supply
- \( \hat{Y} \) is the real output
- \( \hat{A} \) is a proxy for the cost of holding money

Equation (1) claims that changes in the money supply cause changes in prices, given the rate of growth of output. Structuralist models start from Equation 1 and add to it variables such as the relative price of food, import prices and/or wages. The significance of the coefficients of these variables is then interpreted as evidence for the validity of the structuralist models of inflation.\(^1\) It is argued that if these variables are found to be significant, then the simple relationship between the money supply and prices is not valid, and other cost push elements such as import prices have an independent effect on inflation.

In a more recent study, Bhalla [1981] tested this extended monetarist model for a number of underdeveloped countries and found that import prices and the relative price of food had significant coefficients for

large majority of countries. The extended model (which he calls "hybrid") was a better predictor of inflation than the simple monetarist model of Equation (1). However, in his estimates, the introduction of the structural variables affect the coefficients of money supply variables indicating at least the existence of collinearity if not interdependence between the money supply and the structural variables.

The main shortcoming of just adding more variables to the equation is that it does not directly lead to tests of assumed behavior of different sectors. These reduced form estimates do not tell us the specific characteristics and assumptions underlying the structuralist models. Therefore, simply adding variables to the monetarist equation does not do justice to the structuralist arguments concerning the origin and control of inflationary dynamics. What is needed is a) a disaggregated model that explicitly takes into account different adjustment patterns in different markets, and the subsequent behavior of relative prices, and b) the channels and the process by which the relative prices affect the general rate of inflation.

The structuralist model in section III is developed to answer these questions. In sections III.A and III.B, price and output equations are estimated separately for the agricultural and non-agricultural sectors to test the hypothesis of differential price and output response. In section III.C, the behavior of relative prices and their relationship to money supply growth is analyzed. In section III.D, the impact of relative prices on the inflationary process is investigated. It is argued that relative prices, unlike those specified in the structuralist models, affect the inflation rate through the money supply. This also explains the mechanism of money supply growth in the Turkish economy. The conclusion summarizes the main conclusions
and outlines the suggestions for further research.

Throughout the study, the foreign exchange markets are not explicitly integrated into the models but are assumed to be exogenous. The reasons for this assumption are discussed in Annex A.

The aggregate results, especially the impact of foreign exchange availability and the government behavior would be strengthened if further microeconomic evidence can be supplied to support them. In Annex B, the pricing behavior in public and private manufacturing and trade sectors are analyzed. In case of private manufacturing, it is shown that restrictive trade regimes increase the gross markups. This result indicates that, given a cost increase prices will increase at a faster rate under restrictive regimes supporting the results obtained by the output equations. Furthermore, these results together with the pricing in the trade sector show the redistributive impact of trade regimes which need to be further analyzed in more detailed studies. The behavior of wages together with public sector pricing support the assumptions in the text, that cost push effects of relative price changes are not evident in wage equations but are absorbed by the public enterprises. The data base of the study is presented in Annex C.
II. AGGREGATIVE MODEL

In this section, an aggregative inflation model will be presented for the Turkish economy. In section II.A, the naive monetarist model given in equation (1) will be analyzed. In section II.B, interactions between money supply and output growth will be investigated. In the last section, a simultaneous equation model is estimated, and the reduced form derived to observe the impact of money supply changes on prices and output.

Price (P) and output (Y) series used in this study are the implicit GDP deflator and GDP, respectively. The money supply (MS) is defined as M₂ which consists of currency, demand deposits and time deposits. Expected prices are assumed to be generated adaptively by using past prices. The expected price level is generated by the following equation:

\[
Pe = (1-\Upsilon)P_{-1} + (1-\Upsilon)\Upsilon P_{-2} + (1-\Upsilon)\Upsilon^2 P_{-3} + (1-\Upsilon)\Upsilon^3 P_{-4} + (1-\Upsilon)\Upsilon^4 P_{-5}
\]

The Istanbul consumer price index has been used for the generation of expected prices. In this adaptive expectation formulation, it is impossible to determine the value of the \( \Upsilon \) coefficient a priori. For the purpose of this study, values ranging from 0.0 to 0.9 are given to \( \Upsilon \) and ten expected price series were generated.¹ Then each regression is run with these ten series and the value of \( \Upsilon \) that yields the highest \( R^2 \) is chosen. In our sample of years, the best results were consistently obtained with \( \Upsilon = 0.1 \) and the nature of the equations did not yield a significant difference in terms of rankings of \( \Upsilon \)'s with different values.² The value of

1/ When \( \Upsilon \) equals 0.0, then \( Pe \) reduces to \( P_{-1} \).

2/ However, rankings of \( \Upsilon \) are sensitive to the sample period. If the last three years are dropped, the best \( \Upsilon \) turns out to be 0.3.
0.1 for \( \Psi \) implies a very short memory where the major determinant of expectations becomes the previous year's price. The impact of past prices (\( P_{-2} \) to \( P_{-5} \)) turn out to have minimal influence. Although not identical, \( \hat{P}_e \) turns out to be very close to \( \hat{P}_{-1} \). Throughout the study, \( \hat{P}_e \) will be generated by assuming \( \Psi = 0.1 \).

In Turkey nominal interest rates have changed too infrequently to be used as the measure of the cost of holding money. For similar reasons, most studies of LDCs have used past changes in the rate of inflation as a proxy for the cost of holding money. For example, Harberger and others have employed \( (\hat{P}_{-1} - \hat{P}_{-2}) \) as the cost of holding money. More recently, Nugent and Glezakos (1979) have used changes in expected inflation as the proxy. In this study, the same variable will be used. The cost of holding money (\( A \)) will be defined as \( (\hat{P}_e - \hat{P}_{e-1}) \).

The variable that has consistently turned out to be significant in price equations has been an index of import prices. Almost all studies which have used import prices have found it to be significant even when used together with money supply variables. Moreover, year to year relationship between the money supply and import prices is not strong enough to cause multicollinearity and the associated problems.

The import prices used in this study are the domestic prices of imports inclusive of the import tax, which are the domestic user cost of imports.

\[
(3) \quad \text{IMP} = (\text{IMP}_d e)(1+tx)
\]

where \( \text{IMP}_d \) is the dollar price index of imports,
\( e \) is the exchange rate against dollars,
\( tx \) is the average tax rate for imports.
The final issue to be analyzed involves the sample period. The study covers the period from 1950 to 1979. 1954 is dropped from the sample period due to an unusual decline in agricultural output. In 1954, agricultural output and GDP decline by 15 and 3.5 percent, respectively. As will be explained in section III.A, prices were not affected by this decline due to government intervention. Since there is no other decline in the GDP series of this magnitude, 1954 was eliminated from the sample. Due to lags, actual estimation starts in 1952 giving us 27 observations. Unless otherwise specified all equations have 27 observations.

A. The Naive Monetarist Model

In this section, the naive monetarist model specified in Eq. (1) is tested. This equation is estimated with and without the import price variable, and the t statistics are given in parentheses. The hat over the variable indicates that it is the growth rate (i.e. $\hat{\Delta}m$).

(1) $P = 0.004 + 0.748 MS + 0.310 MS_{-1} - 1.387 \hat{Y} + 0.236 (Pe - Pe_{-1})$

$.09$ $(4.00)$ $(1.43)$ $(3.69)$ $(1.20)$

$R^2 = 0.8054; D.W. = 1.62; F = 22.76$

(1a) $P = 0.003 + 0.728 MS + 0.161 MS_{-1} - 1.101 \hat{Y} + 0.124 (Pe - Pe_{-1}) + 0.143 IMP$

$.80$ $(4.73)$ $(.87)$ $(3.63)$ $(.74)$ $(3.37)$

$R^2 = 0.8738; D.W. = 1.54; F = 29.08$

The results in terms of explained variance indicate a significant relationship. The $R^2$'s are higher than those obtained by Kizilyalli (1978)
who tested the same model. The difference is mainly due to the period of
coverage (1950-74 vs. 1950-79) and the definition of the cost of holding
money.

The results show that the coefficient of the current money supply
variable is close to 1 while that of the lagged money supply variable is not
significant. The changes in money supply complete their effect within one
year and are almost fully reflected in price changes. The coefficient of
income is very close to -1 which is also in accordance with the monetarist
theory. The lagged money supply and the cost of holding money proxy are both
insignificant. As is the case with most underdeveloped economies, import
prices do play a significant role in the determination of the domestic price
level. A comparison of equations (1) and (1.a) indicate that import price
changes have direct effects on the inflation rate and this effect does not
work through the money supply. The inclusion of IMP does not change the
coefficients of the money supply, (MS), indicating that the direct link
between money supply and import prices is not strong, at least contemporane-
ously.

These results are contradictory to the findings of Vogel (1974), and
Diz (1962) for some Latin American countries but support the more recent
findings of Sheehy (1980). Vogel and others found long lags in the effect of
money supply on prices and concluded that monetary stabilization policies will
be harder to implement due to length of time required for them to have their
full effect. Sheehy, using data similar to ours, found that in most cases
monetary policy had a much faster impact. This is what is observed in Turkey
also. According to our estimates, changes in money supply will have a rapid
and significant effect on prices.

The implications of the naive monetarist model are quite straight-
forward. There is almost a one to one relationship between the money supply growth and the inflation rate. Faster growth of the money supply will lead to higher inflation rates predominantly within one year. This relationship also implies that when confronted with high inflation, reductions in money supply growth will lead to a rapid reduction in the rate of inflation. Therefore, monetary stabilization policies should be very effective in the short run to lower the rates of inflation.

B. Money-Output Relationship

The policy implications of the naive monetarist model indicate that inflation rates can be quickly reduced with no cost in terms of output. This is mainly due to the assumption that output growth is determined exogenously. If, on the other hand, output growth is related to money supply growth, then the policy implications derived from the naive model will have to be revised. In this section, the relationship between money supply and output growth will be analyzed.

Following the previous work by Barro (1980) and Hanson (1980) for Latin American countries and Fry (1978), and Neftci’s (1980) work on Turkey, output growth will be primarily explained by unexpected changes in the money supply.

We will assume that nominal output is adjusted to the expected change in nominal demand. We will further assume that the expected change in nominal demand is defined to be the expected change in the money supply (MSe). This expected change in nominal demand will be equal to the expected change in real demand plus the expected change in prices. Symbolically:

\[
\text{MSe} = \hat{Y}e + \hat{Pe}
\]
\( \hat{Y} \) is the expected change in real demand
\( \hat{P} \) is the expected change in prices.

In this formulation, the expected growth rate of output will equal the actual rate of output if the expected money supply is equal to the actual money supply. If, on the other hand, the actual money supply is different than expected, the firms react partially to the unexpected component of the money supply. Actual growth of output will be given by the expected growth of output (\( \hat{Y} \)) plus a function of the difference between actual and expected growth of the money supply.

\[
(4) \quad \hat{Y} = \hat{Y} + \lambda(\hat{MS} - \hat{MSe})
\]

where \( \lambda \) is the adjustment coefficient.

When we substitute equation (3) into equation (4), we get the following relationship.

\[
(5) \quad \hat{Y} = \hat{Y} + \lambda(\hat{MS} - \hat{Y} - \hat{P})
\]

or

\[
(6) \quad \hat{Y} = (1 - \lambda)\hat{Y} + \lambda MS - \lambda \hat{P}
\]

From equation (6) it is possible to estimate the \( \lambda \) by making further assumptions about \( \hat{Y} \) and \( \hat{P} \).

Inflationary expectations will be assumed to be generated adaptively. Expected price series that have been generated in equation (2) will be used in this section as well.

The nature of the expected output series is more complicated. The easiest way would be to assume that \( \hat{Y} \) is a constant determined by long run
trends in savings and technological change. In other words, one can take \( \bar{Y} \) to be the long-run natural rate of growth of the economy. If this formulation is used, then the actual growth rate will be the long-run natural growth rate plus the component generated by fluctuations in monetary policy.

The assumption of a constant natural growth rate, however, does not take into account two major characteristics of many LDCs. First, LDCs go through periodic foreign exchange crises which are usually not observed in developed economies. Second, a large part of the gross domestic product originates in agriculture whose output is largely dependent on exogenous natural events.

Larger agricultural output and its dependence on weather conditions imply that agricultural output is subject to large unexpected fluctuations, and these fluctuations will have a large effect on GDP growth. In estimating the output equation, these fluctuations will significantly lower the explained variance. In general, it is difficult to separate the effects of weather conditions on output from those of other causes. However, in 1954 agricultural output declined by 15 percent, which was much greater than the normal fluctuations due to weather conditions. To adjust for this unusual event, 1954 has been eliminated from the estimates.

Analysis of the role of foreign exchange crises is more complicated. Since 1950, the Turkish economy has always experienced a shortage of foreign exchange. Imports have been a small percentage of GDP but have consisted of necessary capital and intermediate goods, which have been rationed through various mechanisms. However, the degree of rationing and the quantity of imports have varied over this period. Although we have no quantitative measure of foreign exchange bottlenecks, some rough indicators can be developed to observe the variation in import shortages. These indicators are
discussed in Annex A. From the discussion in the Annex, it is possible to divide the 1950-79 period into two segments depending on the availability of foreign exchange.

a) Periods when foreign exchange have not been a major bottleneck:
   1950-55, 1959-63, 1971-76

b) Periods of foreign exchange crisis:
   1956-58, 1964-70, 1977-79

Out of this 30-year period, 12 years have been periods of shortages and only 18 have been years of sufficient foreign exchange.1/

The integration of foreign exchange bottlenecks into the output equation can be done in various ways. Bottlenecks either affect firms' expected growth rates or their expectations about prices. Since in the above formulation expected output is estimated by using the expected price series, the changes in expected output growth will mean that expectations have changed.

Now, our basic output equation (4) was,

\[
(4) \quad Y = Y_e + \lambda(MS - MSe)
\]

where

\[
MSe = Y_e + Pe
\]

The Pe series are generated by adaptive expectations with fixed weights. This assumes that people only use past prices in forming their expectations. In normal times, this assumption is both reasonable and convenient. In times of serious foreign exchange crises however, it is hard

1/ Of course the selection of years has a degree of subjectiveness. But there should be a broad consensus on this selection.
to assume that people do not revise their expectations about future prices upward. Shortages of imported goods, black markets and hoarding all lead people to expect higher prices. Furthermore, the probability of a devaluation—that is, a rise in import prices—also increases. All these indicate that expected prices generated by an adaptive expectations formula will underestimate the actual expectations in times of foreign exchange crises. Taking this into account a distinction will be made between actual expected inflation $\hat{Pe}^a$; and what is obtained from the adaptive scheme $\hat{Pe}$; where

$$\hat{Pe}^a = (1 + \delta D_{fe}) \hat{Pe}$$  

Here $D_{fe}$ will be a dummy variable that takes the value of 0 for years of sufficient foreign exchange and 1 for years of foreign exchange crisis. When foreign exchange is sufficient, actual expected inflation $\hat{Pe}^a$ will be equal to the adaptive formulation of the expected inflation $\hat{Pe}$. When there is a crisis $\hat{Pe}^a$ will be greater than $\hat{Pe}$ by the amount $\delta$. If we substitute equation (7) into equation (3), we get

$$\hat{MSe} = \hat{Ye} + \hat{Pe} + \delta D_{fe} \hat{Pe}$$

Substituting this into equation (4) gives us:

$$\hat{Y} = (1 - \lambda)\hat{Ye} + \lambda(\hat{MSe} - \hat{Pe}) - \lambda \delta D_{fe} \hat{Pe}$$

The estimate of equation (8) is presented below:
The constant term in Eq. (8) is \((1-\lambda)\hat{Y}e\). \(\hat{Y}e\) is then estimated by substituting the \(\lambda\) obtained as the coefficient of \((\hat{MS} - \hat{Pe})\). The long-run growth rate of the economy \((\hat{Ye})\) given by this equation is 6.4 percent.

The results also indicate that there is a short-run tradeoff between the money supply and output. A 10 percent change in the unexpected money supply will change output by 1.72 percent. However, this tradeoff does not exist in the long run. As seen from equation (1.a), expansion of the money supply will increase prices as well. Changes in prices will increase inflationary expectations which will, in future periods, lead to lower growth rates. In the long run, as expectations catch up with money supply growth, the tradeoff between money supply and output disappears. Thus, it is the unexpected component of the money supply that has an effect on output. Since expectations are assumed to be formed adaptively, growth rates above the long run natural rate require accelerating money supply growth. This way, adaptively generated expected inflation will stay below money supply growth.

Foreign exchange crises change these results significantly. In a crisis, actual expected inflation will be higher than \(\hat{Pe}\). The \(\hat{\delta}\) estimated from equation (8) is .70, which means that \(\hat{Pe}\) is 70 percent higher than would be predicted by past prices; that is, if \(\hat{Pe}\) is 10 percent, at times of foreign exchange crisis, \(\hat{\delta}\hat{Pe}\) will be 17 percent. Thus, to achieve the same rate of growth, the money supply has to grow at a much faster rate in times of crisis. To put it in another way, with the same money supply growth and past price increases, output growth will be much lower when there is a crisis. Thus, given the past prices and money supply, there are two rates of long-run

\[
(8) \quad \hat{Y} = 0.053 + 0.172(\hat{MS} - \hat{Pe}) - 0.120 D_{fe} \hat{Pe}
\]

\[
R^2 = 0.4061; \quad D.W. = 2.42; \quad F = 8.21
\]
growth. At times of ample foreign exchange, the long-run growth rate of the economy will be significantly higher. The impact of a foreign exchange crisis on output will depend on the level of inflationary expectations.

Monetary stabilization policies will have differential impact depending on the level of inflationary expectations and foreign exchange availability. With high inflationary expectations and a foreign exchange crisis, reductions in the money supply will lead to much greater reductions in the output growth rates. Foreign exchange crises, at least in the short-run, can be partially alleviated by large inflows of foreign aid or borrowing. If the stabilization attempts are implemented together with large inflows of foreign exchange, then the output reduction will be much lower. Higher imports will eliminate the negative impact of expectations caused by the foreign exchange crisis, i.e. \( D_{fe} \hat{Pe} \) will be zero. This relationship does explain why the 1958 stabilization package had a rapid impact with little reduction in output growth. Large inflows of aid lowered the expected inflation rate, and the output loss due to the stabilization package was minimized.

C. Money-Output-Price Relationship

In the last two sections, price and output equations are specified separately, using ordinary least squares. However, equations (1.a) and (8) form a simultaneous equation system that has to be estimated simultaneously. The forms of the two equations are as follows:

\[
\hat{Y} = \beta_o + \lambda M_S - \lambda \hat{Pe} - \lambda \delta D_{fe} \hat{Pe}
\]

(8)
(1.a) \[ \hat{P} = \alpha_1 \hat{MS} - \alpha_2 \hat{Y} + \alpha_3 \hat{IMP} + \alpha_4 \hat{MS}_{-1} + \alpha_5 (\hat{Pe} - \hat{Pe}_{-1}) \]

where \( \beta_0 \equiv (1-\lambda) \hat{Pe} \)

These two equations are estimated simultaneously by using three stage least squares and the results are presented below.

(8b) \[ \hat{Y} = 0.046 + 0.234 \hat{MS} - 0.234 \hat{Pe} - 0.234(0.439) D_{fe} \hat{Pe} \]
\[ (6.71) (4.17) (4.17) (1.93) \]
\[ R^2 = 0.3795; \text{D.W.} = 2.55 \]

(1.b) \[ \hat{P} = 0.756 \hat{MS} - 1.39 \hat{Y} + 0.132 \hat{IMP} + 0.249 \hat{MS}_{-1} + 0.089 (\hat{Pe} - \hat{Pe}_{-1}) \]
\[ (6.02) (4.17) (3.65) (1.63) (0.65) \]
\[ R^2 = 0.8653; \text{D.W.} = 1.73 \]

Results of the simultaneous estimation are not radically different from the single equation estimates, although there are some differences. The coefficient of adjustment (\( \lambda \)) increases to 0.234 from 0.170. The adjustment coefficient \( \delta \) reduces to 0.439 from 0.70. The long-run growth rate \( \hat{Ye} \) obtained from the constant term is now 6 percent. In the price equation, the coefficient of income is higher and the significance level of the lagged money supply increases.

Given the simultaneous equation system, the impact multiplier of exogenous variables on the inflation rate will be given by the reduced form of the system. If equation (8) is substituted into (1.a), the following reduced form is obtained.

(9) \[ \hat{P} = Q_0 + Q_1 \hat{MS} + Q_2 \hat{Pe} + Q_3 D_{fe} \hat{Pe} + Q_4 \hat{MS}_{-1} + Q_5 \hat{IMP} \]
where

\[ Q_0 \equiv -\alpha_2 \beta_0 \]
\[ Q_1 \equiv \alpha_1 - \alpha_2 \lambda \]
\[ Q_2 \equiv \alpha_2 \lambda \]
\[ Q_3 \equiv \alpha_2 \lambda \delta \]
\[ Q_4 \equiv \alpha_4 \]
\[ Q_5 \equiv \alpha_3 \]

In this reduced form \( (\hat{Pe} - \hat{Pe}_{-1}) \) variable is dropped due to its insignificance. If the structural coefficients obtained are substituted into equation (9), the following impact coefficients are obtained:

(10) \[ \hat{P} = -0.064 + 0.431 \hat{MS} + 0.325 \hat{Pe} + 0.143 \hat{D}_{fe} \hat{Pe} + 0.249 \hat{MS}_{-1} + 0.132 \hat{IMP} \]

The policy implications of the above reduced form are significantly different from those obtained by using the naive monetarist model. The net effect of money supply growth on prices is much lower than those obtained from standard single equation estimates. Expansion of the money supply affects prices through two channels. First is the direct effect through higher demand. The second is a negative effect through greater output or supply. In the short run, given zero inflationary expectations, and disregarding the effect of long-run output growth \( Q_0 \), a 10 percent increase in the money supply will only lead to about a 4.3 percent increase in prices. Assuming sufficient foreign exchange availability, expansion of the money supply will have a large impact on output without leading to high rates of inflation for a considerable period. However, in the longer run, the growth of output will begin to
decline as inflationary expectations begin to increase. The length of the period with low inflation and high output growth will depend also on the foreign exchange bottlenecks. If no bottlenecks are encountered within this expansionary phase, the phase itself will last longer. Foreign exchange crises, by increasing inflationary expectations, lower the growth rates and increase the rate of inflation. Therefore, the relationship between the money supply and prices depend both on past prices (Pe) and the availability of foreign exchange.

These results can be used to explain the Turkish experience since 1950. In the early fifties, inflationary expectations were low and the country had ample stocks of foreign exchange. High money supply growth in these years led primarily to high output growth rates with low inflation rates. By mid fifties, however, inflationary expectations began to increase and foreign exchange bottlenecks were encountered. These developments led to faster inflation rates with approximately the same levels of money supply growth. The stabilization policies undertaken in 1958 reduced the money supply growth and large inflows of foreign aid, especially after 1959, eased the foreign exchange crisis. The output reduction due to monetary deflation was minimized and the inflation rate decreased rapidly.

The 1960-64 period was characterized by low rates of money supply growth and inflation. After 1965 the same process was repeated but this time under a foreign exchange shortage, and therefore the output response to money supply growth was lower. The inflationary expectations generated adaptively begin to catch up with money supply growth, but workers remittances led to ample foreign exchange inflows eliminating the shortages and increasing the growth rate. In the early seventies, we observe a situation similar to the early fifties but with a higher rate of inflation. The differences in the
inflation rate between the two periods are due to the higher levels of inflationary expectations in the 1970's. In 1977, foreign exchange crisis started, and in the last three years, prices increased at faster rates than the money supply, due to both high Pe and the foreign exchange crisis.

This framework explains the behavior of inflation in Turkey for the last 30 years, but its implications for monetary stabilization policies are quite different from those in the naive monetarist approach. At times when the expected rate of inflation is high and a foreign exchange crisis exists, the standard monetarist prescription is devaluation to ease the foreign exchange constraint, and monetary restraint to lower the rate of inflation. The results of equation 10 indicate that such policies will have very little short-run impact on prices but a very large impact on output. Depending on what happens to the balance of payments and import availability, it might take a long period of time to bring the inflation rate down to reasonable levels. During this period, output growth will be low or even negative. Therefore, the costs of monetary stabilization policies can be higher than predicted from the single equation models usually used as a basis for these policies. Foreign exchange inflows, such as aid, turn out to be very important in lowering the rate of inflation by maintaining higher output growth in spite of lower growth of money supply. Foreign aid lowers the expected inflation and leads to lower inflation.

All these results indicate that foreign exchange availability plays a crucial role in determining inflation rates. Furthermore, at least in the case of Turkey, the naive monetarist relationship between the money supply and prices does not provide an adequate framework for analyzing the important relationships. It is very important to consider the supply side of the economy.
III. **A STRUCTURALIST MODEL**

In the introductory section, it was pointed out that the agricultural terms of trade have moved together with the rate of inflation and the growth of the money supply. The aggregative model does not take into account the diverse movements observed in different sectoral prices. Furthermore, the importance of the role played by relative prices in understanding the dynamics of Turkish inflation cannot be analyzed within the single sector model.

The essence of structuralist models is the differential response of agricultural and industrial sectors to money supply shocks. This different response leads to changes in relative prices which in turn, through wage and other cost push adjustments, lead to faster rates of inflation, which under accommodating monetary policy lead to the acceleration of inflation. Failure to accommodate with the money supply leads to lower output rates. Testing the validity of the structuralist model first requires the verification of the assumption of differential price responses. In sections A and B, price and output equations are estimated for agricultural and non-agricultural sectors. In section C the behavior of relative prices and their determinants are investigated. In the last section feedbacks from relative prices to the inflation rate are analyzed. In this analysis the interaction between relative prices and money supply growth rather than relative prices and inflation is emphasized. Unlike the structural models for Latin America, relative prices rather than being a cost push element turn out to affect mainly the money supply in Turkey. This behavior is due to the governments subsidizing agricultural products and inputs to the rest of the economy. Higher prices paid to the farmers are not fully reflected as higher food and input prices for workers and firms. This subsidy is financed primarily by
borrowing from the Central Bank. The changes in relative prices lead to a higher money supply directly rather than inducing an increase in costs. This behavior is analyzed by decomposing the sources of money supply growth.

A. Price and Output in the Agricultural Sector

According to most writers on LDCs, the behavior of the agricultural sector is very different from that of the industrial sector. Agriculture in such countries is characterized by primitive technology and low supply response and is subject to the vagaries of natural forces. In most of these countries uneven land distribution, absentee ownership and other structural factors also contribute to the relative backwardness of agriculture. In the case of export crops, the prices are to a large extent determined by world demand and supply. It is on the basis of these features of agriculture that the structuralists argue that any increase in demand for these products will lead to price rather than output response. Furthermore, the impression given by these writers is a stagnant agricultural sector unable to meet the growing demand for food caused by the expansion of the industrial sector.

The agricultural sector is crucial in any model of the Turkish economy. Most of Turkish manufacturing industry uses the outputs of the agricultural sector as inputs. Industries which depend on agriculture for inputs such as food, textile, wood products, tobacco and beverages accounted for about 70% of industrial output in 1950 and close to 45% in 1979. Changes in agricultural prices and the terms of trade imply that input prices have increased more than output prices squeezing the profit margins in industry. To the extent that wages are more sensitive to agricultural prices, changes in relative prices in favor of agriculture will lead to a further squeeze of profits through increased labor costs. Furthermore, a large portion of the
industry is owned by the government, and changes in relative prices lead to deficits in state economic enterprises, which can contribute significantly to the growth of money supply.

Recent studies on Turkish agriculture show that the assumption of a stagnant and unresponsive agriculture is misleading.\(1/\) A series of studies on supply response in agriculture have all concluded that the area planted of any crop is very sensitive to the relative prices of the crops.\(2/\) A change in relative prices lead to significant changes in relative outputs of different crops. This highly elastic supply response is true not only for cash crops such as cotton, but also for the traditional crops such as wheat.

Another set of studies tested the assumption of economic rationality and profit maximizing behavior of farmers.\(3/\) Their findings also indicate that the assumption of profit maximizing behavior on the part of farmers cannot be rejected. The input mixes and adoption of new technologies are sensitive to relative prices. More recent and more tentative studies about optimal crop patterns also support the hypothesis of rational behavior given the input and the output prices.\(4/\) However, none of these studies have explicitly tested for the aggregate response of the agricultural sector to aggregate demand changes.

In view of these results indicating a pattern of behavior contrary to that assumed by the structuralists, treating agriculture as a bottleneck sector, at least in the case of Turkey, is not very realistic, and there is

\(1/\) See Somel (1979) for a summary of findings.

\(2/\) The studies of Gurkan (1979), Ekmekcioglu and Kasnakoglu (1979), Imrahorooglu and Kasnakoglu (1979) are recent examples.


\(4/\) Cakmak (1980).
little reason to expect radically different price and output responses from Turkish agriculture when compared to the rest of the economy.

However, one issue needs to be explicitly analyzed in the Turkish context: the government interference in the agricultural sector through the use of support prices. Every year the government announces the minimum price of a large proportion of agricultural products. For some products, the government is the only buyer (beets, tea, etc.), and for others the government buys a large portion of the output which is sufficient to ensure that market prices do not fall below the support prices.

Given the governments determining role in agricultural price formation, the important question is to what extent political and other variables influence the government's price decisions. It is quite possible that the governments do not set the prices at levels much different than what they would have been if the prices were determined solely by market forces. Government's interference with agricultural prices does not necessarily imply that prices have been insensitive to market forces.

On the other hand, there is partial evidence that political factors might have played an important role in the determination of agricultural prices. Erguder (1980), in his analysis of support prices for wheat and tobacco found that prices tended to go up in politically critical times such as before elections. Gurkan (1979) while not directly testing for political influences, found that government intervention was successful in generating price, and to some extent income, stability for agricultural products.

In addition to domestic excess demands and government policies, another important influence on agricultural prices is the behavior of agricultural prices in the world market. Since most agricultural products are also exported, world prices will have a significant effect on domestic
prices. In order to see the impact of money supply, agricultural output and world prices on domestic agricultural prices a simple equation for the implicit agriculture deflator will be estimated. The estimated equation takes the following form:

\[
P_a = r_0 + r_1 MS + r_2 MS_{-1} - r_3 Y_a + r_4 (Pe - Pe_{-1}) + r_5 Paw
\]

where \( P_a \) and \( Y_a \) are implicit agricultural deflator and real agricultural output respectively. \( Paw \) is the U.S. agricultural price index multiplied by the exchange rate used for agricultural exports, and standardized to have a value of 100 in 1968 to be compatible with other indices. In the estimation, 1954 is dropped from the sample due to an unusual decline in agricultural output. The estimated equation is given below:

\[
\hat{P}_a = -0.086 + 0.997 MS + 0.007 MS_{-1} - 0.355 (Pe - Pe_{-1}) + 0.117 Y_a + 0.225 Paw
\]

\( R^2 = 0.8042; \ D.W. = 1.83; \ F = 17.25 \)

The results for equation (11) are quite different from the price equation estimated for the GDP deflator. The constant is negative indicating the decreasing velocity of circulation due to slower growth of the agricultural sector relative to the rest of the economy. The coefficient of the money supply is equal to one. World agricultural prices also have a significant effect on domestic prices.

On the other hand, the coefficients of agricultural output (\( Y_a \)) and the cost of holding money (\( Pe - Pe_{-1} \)) variables have both lower levels of significance and have opposite signs than expected. The lack of significance
of the output variable is especially surprising. Agricultural output has shown major fluctuations within this period. All expectations lead to the conclusion that these major agricultural shortages or surpluses should lead to changes in agricultural prices. The absence of such a relationship and a negative coefficient for \((\hat{P}_e - \hat{P}_{e-1})\) can only be explained by including government policies on support prices.

The governments interfere in the pricing of agricultural products to ensure that supply constraints or surpluses do not play an important role on the prices. In times of shortages governments, both through support prices and through the use of stocks, prevent agricultural prices from increasing to levels that would have occurred. In the same way in periods of good harvests support prices are kept at a high level so that prices do not decrease due to an excess supply.

At the same time, a negative coefficient for \((\hat{P}_e - \hat{P}_{e-1})\) taken by itself implies that acceleration of the inflationary expectations reduce the growth of prices in agriculture. In times of accelerating inflation, the governments are reluctant to increase agricultural prices. In times of decelerating inflation, governments tend to increase agricultural prices. Partially, agricultural prices are used as policy tools to control inflation. Only when inflation accelerates, is the growth of agricultural prices lowered. Furthermore, serious attempts at stabilization have been associated with reductions in the rate of increase in agricultural prices. This has been accomplished by both granting lower increases in support prices and using a lower exchange rate for the exports of agricultural exports. Especially in times of major devaluations, the exchange rate for agricultural products has not been increased by the full amount of the devaluation thus limiting the increase in domestic agricultural prices.
Equation (11) is a strange equation in the sense that the money supply which is used as a measure of demand has a very significant effect on prices while output which is a measure of supply does not have any impact. This is the opposite of what would be expected if both demand and supply play a role. All these considerations lead to the conclusion that governments have significantly intervened in the determination of agricultural prices. Unfortunately, there is no simple way in which the political influences can be separated from those of the market forces. All that can be said at this point is that there is substantial evidence indicating that agriculture prices might not be determined solely by market forces.

The second part of the analysis of the agricultural sector is the relationship between agricultural output and the money supply. As pointed out earlier, there is now strong evidence that outputs of individual crops are sensitive to relative prices. However, there is no study which tests the hypothesis regarding the aggregate supply response to demand. In this section, the same simple model of output will be used to test for the supply response in agriculture with the following adjustments.

In the industrial sector, output can be increased in the short run by hiring more workers and adjusting capacity utilization. On the other hand in agriculture the output increase will come by increasing the acreage under cultivation and using more fertilizers and herbicides. The adjustment in total acreage will be small and will come from either using marginal lands or land that would have been left fallow. Intensity of cropping can be changed by increasing inputs such as fertilizers and herbicides, by planting more seeds on the same land, and by increasing the labor intensity. Within the confines of this study, disaggregation as to the causes of the output increase will not be attempted.
There is one major difference in the specification of the output equation in agriculture as compared to industry. In industry, it is possible to increase output in the short-run by adjusting the capacity utilization and hiring more workers. In agriculture, the decision to plant and the intensity of cropping have to be decided one period before the output comes in the market. In terms of the calendar years, the decision on the quantity of output has to be based on the expectations held a year earlier. There is also a second point which is purely empirical. Adjustment of expectations due to foreign exchange shortages was done by adding the variable $\Delta_{fe} Pe$ to the output equation. This variable has consistently turned out to be insignificant in agricultural output estimates. This implies that foreign exchange shortages do not affect the decisions of agricultural producers, which could be due partly to the lower import content of agriculture and partly to the priority given to the imports for agriculture.

The equation for agricultural output is specified as follows:

\[
Y_a = (1 - \lambda) \hat{Y}_{ae} + \lambda (\bar{MS}_{-1} - \hat{Pe}_{-1})
\]

where $\hat{Y}_{ae}$ is the expected long-run growth rate for agricultural output. $\lambda$ is the coefficient of adjustment to unexpected changes in the money supply. The estimated agricultural output equation is given below. The constant term in this equation is $(1-\lambda) \hat{Y}_{ae}$.

\[
\begin{align*}
Y_a &= .004 + .377 (\bar{MS}_{-1} - \hat{Pe}_{-1}) \\
&= .004 + .377 (\bar{MS}_{-1} - \hat{Pe}_{-1}) \\
\ (\ 26) &\ (3.34) \\
R^2 &= .3085; \ D.W. = 2.01; \ F = 11.16
\end{align*}
\]
The output equation for agriculture does not perform as well as the equations for both GDP and non-agricultural output. The coefficient $\lambda$ is both very high and significant. On the other hand, the constant term which is $(1-\lambda) Y_{ae}$ is not significant. This could be due to large fluctuations in agricultural output caused by weather conditions. Since they are not taken into consideration in this equation, there is a large unexplained variance around the trend growth rate, making it insignificant.

A simultaneous equation system is not estimated for the agricultural sector because there is no link between agricultural output and prices. The results of our estimations for the agricultural sector can be summarized as follows. There is a one to one relationship between the money supply and agricultural prices. In addition, world agricultural prices have a significant impact on domestic prices. Agricultural output, on the other hand, is responsive to unexpected changes in the money supply, but with a lag. However, this output response does not effect the agricultural prices. These results indicate that agricultural prices are subject to significant government intervention. Although there is a strong relationship between the money supply and agricultural prices, government intervention casts suspicion on the relationship.

B. Price and Output in the Non-Agricultural Sector

We shall now turn to an investigation into the behavior of non-agricultural prices and output. Again we will use the same price and output equations used for the aggregate model. The objective is to analyze the interactions among money supply, prices and output. The price series now is the non-agricultural GDP deflator ($P_n$) and the output series is the real non-agricultural GDP ($Y_n$).
Again 1954 will be excluded from the sample to conform to the results of the agricultural sector. The arguments are current and lagged money supply (MS and MS$_{-1}$), non agricultural output ($Y_n$), cost of holding money ($P_e - P_e_{-1}$) and import prices (IMP). The price equation is estimated both with and without the import prices to observe its impact.

\begin{align}
(13) \quad \hat{P}_n &= 0.067 + 0.973 \hat{M}S - 0.050 \hat{M}S_{-1} - 1.692 \hat{Y}_n + 0.180 (\hat{P}_e - \hat{P}_e_{-1}) \\
& (1.60) \quad (5.20) \quad (.23) \quad (4.75) \quad (.88) \\
R^2 &= 0.8309; \quad D.W. = 1.86; \quad F = 27.02
\end{align}

\begin{align}
(14) \quad \hat{P}_n &= 0.049 + 0.903 \hat{M}S - 0.171 \hat{M}S_{-1} - 1.268 \hat{Y}_n + 0.113 (\hat{P}_e - \hat{P}_e_{-1}) + 0.169 \hat{I}MP \\
& (1.53) \quad (6.36) \quad (1.03) \quad (4.41) \quad (.73) \quad (4.20) \\
R^2 &= 0.9080; \quad D.W. = 1.54; \quad F = 41.47
\end{align}

The results of equations (13) and (14) are very good and the coefficient of the money supply has the expected value of 1. Import prices are very significant and they also seem to affect the coefficient of the output variable. Non-agricultural output ($Y_n$) is very significant and in eq. (13) has the coefficient of 1.692, bigger than the expected value of one. However, this coefficient drops to 1.268 with the inclusion of import prices. The results again indicate that there is a strong relationship between the money supply and non-agricultural prices.

The output equation is also the same one developed for the aggregate output in section II.B. This equation is given below:

---

1/ Inclusion of 1954 does not change any of the coefficients of the non-agricultural price and output equations.
(15) \[ \hat{Y}_n = (1 - \lambda) \hat{Y}_{ne} + \lambda (\hat{MS} - \hat{Pe}) - \lambda \delta \hat{D}_{fe} \hat{Pe} \]

where \( \hat{Y}_{ne} \) is the expected long run growth of the non-agricultural output. \( \lambda \) is the adjustment coefficient of output to unexpected changes in the money supply. \( \delta \) is the coefficient by which actual expectations are underestimated by the adaptively generated expectations at times of foreign exchange crises. The estimated equation is as follows:

(15) \[ \hat{Y}_n = .063 + .217 (\hat{MS} - \hat{Pe}) - .168 \hat{D}_{fe} \hat{Pe} \]

\[ (9.97) \quad (4.19) \quad (4.24) \]

\[ R^2 = .6315; \quad \text{D.W.} = 2.50; \quad \text{F} = 20.57 \]

The constant term in the equation is \((1 - \lambda) \hat{Y}_{ne}\). The results of the output equation is quite good and in terms of explained variance it does better than the output equation for the GDP. All the coefficients are significant.

Equations (14) and (15) form a two equation system which has to be estimated simultaneously. These two equations are estimated simultaneously by using three stage least squares. The results are as follows:

(14.a) \[ \hat{Y}_n = .054 + .282 \hat{MS} - .282 \hat{Pe} - (.282)(.436) \hat{D}_{fe} \hat{Pe} \]
\[ (9.63) \quad (6.18) \quad (6.18) \quad (3.05) \]

\[ R^2 = .5925; \quad \text{D.W.} = 2.38 \]

(15.a) \[ \hat{P}_n = .093 + .977 \hat{MS} - .200 \hat{MS}_{-1} - 1.91 \hat{Y}_n + .025(\hat{Pe} - \hat{Pe}_{-1}) + .137 \hat{IMP} \]
\[ (3.06) \quad (9.07) \quad (1.74) \quad (5.77) \quad (.22) \quad (4.66) \]

\[ R^2 = .8860; \quad \text{D.W.} = 2.19 \]
These results indicate that simultaneous estimation does affect most of the coefficients. When the results are analyzed, they are very similar to those obtained for the aggregate equations. Long-run output growth of the non-agricultural sector is estimated from the constant term and is 7.5 percent, which is higher than that of GDP. Output responds strongly to unexpected changes in the money supply. In the price equation, simultaneous estimation increases the coefficient of the income variable substantially to 1.91 which indicates the importance of output on prices.

The net impact of the money supply on prices can be derived by substituting Eq. (14.a) into (15.a) and solving for the independent variables. In this reduced form, the coefficients will yield the net impacts.$^{1/}$

$$
(16) \quad P_n = -0.010 + 0.438 \hat{MS} + 0.539 \hat{Pe} + 0.234 D_{fe} \hat{Pe} + 0.137 IMP
$$

The coefficient of $\hat{MS}$ shows the net effect of money supply growth on inflation. It is the direct effect through increased demand minus the indirect effect through increased supply. The coefficient of $\hat{Pe}$ and $D_{fe} \hat{Pe}$ show the effects of inflationary expectations on prices indirectly through output. The coefficient of import prices shows its direct effect on prices.

In the non-agricultural sector, expansion of the money supply, other things being constant, increases the prices only by about 0.438 which is low. At periods of zero inflationary expectations and ample foreign exchange, expansion of the money supply will lead primarily to output increases rather

$^{1/}$ This is derived exactly the same way as the reduced form for the aggregate price equation in section II.C. Lagged money supply and cost of holding money are excluded from this reduced form.
than price increases. Again, like the aggregate economy, this output growth cannot be maintained in the long run because inflationary expectations catch up with the growth of the money supply. When compared with the aggregate economy, the short run tradeoff between monetary expansion and output is greater, and the impact of foreign exchange crises on expectations and output is much greater in the non-agricultural sector.

On the other hand, the costs of monetary stabilization policies will fall mainly on the non-agricultural sector. If the stabilization policies are implemented at times of foreign exchange shortages and high inflationary expectations, their effect will be very small on prices but very large on output. Prices will increase both due to high inflationary expectations and the foreign exchange crisis. If at the same time a major devaluation is undertaken, then prices will increase due to higher import costs as well. Reduction in money supply growth will have a minor impact on the level of inflation in the short run because other influences are very large, but output will be greatly reduced. On the other hand, if the monetary stabilization policies are undertaken together with large inflows of foreign aid to ease the foreign exchange shortages, then the negative impact of inflationary expectations on output will be much smaller, and the reduction in the inflation rate will be greater. But monetary restraint alone will lower a high inflation rate over a quite long time period and the output growth within this time period will be very low.

C. Behavior of Relative Prices

Comparison of the price equations for agricultural and non-agricultural sectors show some significant differences. For purposes of comparison, the price equation for the agricultural sector (eq. (11)) and the
reduced form price equation (eq. (16)) for the non-agricultural sector are presented below.¹/

\[(11) \quad \hat{P}_a = -0.086 + 0.997 \hat{MS} + 0.225 \hat{P}_{aw} \]

\[(16) \quad \hat{P}_n = -0.010 + 0.438 \hat{MS} + 0.539 \hat{P}_e + 0.234 D_{fe} \hat{P}_e + 0.137 \text{IMP} \]

The basic difference between the two price equations are caused by the role of output in these two sectors. In the non-agricultural sector, the expansion of the money supply increases both the demand and to a lesser extent the supply of output and this supply increase has a price decreasing effect. In the agricultural sector, the supply response has no effect on prices. This is primarily due to government intervention in the determination of agricultural prices. Whatever the objectives of the government intervention might have been, the net result reduces to a price equation which yields a one-to-one relationship between the growth rate of the money supply and agricultural prices. That is, ceteris paribus, a ten percent increase in the money supply (omitting the constant term) leads to about a 10 percent increase in agricultural prices.

On the other hand, a similar change in the money supply will lead to a much lower price increase in the non-agricultural sector due to the changes in output. Therefore, the response of the prices in the two sectors will be different given the same change in the money supply.

The second difference is the impact of foreign prices. In the non-

¹/ Since there is no feedback from the agricultural output to agricultural prices, the coefficient of money supply in the price equation is equivalent to the reduced form coefficient in the non-agricultural price equation.
agricultural sector, world prices have their impact by changing costs of imported inputs and capital goods. Domestic prices change because costs are changing. The agricultural sector is the export sector of the Turkish economy. World agricultural prices effect domestic prices directly because export prices in the world market partially determine the domestic prices. Furthermore, the coefficient of world agricultural prices ($P_{aw}$) is larger than the coefficient of import prices. These two series, $P_{aw}$ and IMP generally move together, but have also shown some variation over the period in question.

Assuming for a moment that both the changes in international prices and inflationary expectations are zero, any change in the money supply will have a disproportionate effect on the prices of the two sectors. While agricultural prices increase at the same rate as the money supply, non-agricultural prices will increase by only half as much. Thus, any initial change in the money supply, other things being constant, will turn relative prices in favor of agriculture. Agriculture prices will increase at a faster rate than the non-agricultural prices.

However, relative prices will not stay in favor of agriculture in the longer run. Higher prices caused by the initial money supply increase will lead to higher price expectations which will increase the prices only in the non-agricultural sector, reversing the initial change in the relative prices. That is, unexpected increases in money supply turn the relative prices in favor of agriculture while unexpected decreases in money supply will turn the relative prices against agriculture. For the relative prices to stay in favor of agriculture, money supply has to increase at an accelerating rate.

Starting from low rates of inflation, expansionary monetary policy will lead the relative prices to move in favor of agriculture, mainly due to output increases in the non-agricultural sector. On the other hand, monetary
stabilization packages which reduce the growth of the money supply, especially at times of high inflationary expectations and foreign exchange crises, will reduce agricultural price increases much more than the reduction in the rate of growth of non-agricultural prices. At such times, relative prices will move in favor of the non-agricultural sector.

The second influence on relative prices is the behavior of international prices. $P_{aw}$ is determined by world agricultural prices and the exchange rate used for agricultural exports. $IMP$ on the other hand is determined mainly by world prices of industrial goods and fuels, exchange rates used for imports and the average tax rates on imports. Changes in any of these variables will change the $P_{aw}/IMP$ ratio. Use of multiple exchange rates, changes in international relative prices and tax rates will influence this ratio. Also, the coefficient of $P_{aw}$ is greater than $IMP$ indicating that changes in world agricultural prices have a greater impact on domestic agricultural prices.

The explanation given above fits the behavior of relative prices (TTu) drawn in Fig. 1. In the early 1950s inflationary expectations were quite low due to low rates of inflation in the late fourties, while money supply growth was quite high. This led to higher output and lower price increases in the non-agricultural sector, turning the relative prices in favor of agriculture. Inflationary expectations began to increase after 1954 and foreign exchange shortages became more acute after 1956. These factors then reduced the output growth in the non-agricultural sector. In 1958 and 1959 the growth of the money supply was reduced while inflationary expectations were very high. This unexpected decrease in the money supply reduced $\hat{Yn}$ and turned the relative prices against agriculture. Lowered inflationary expectations and the easing of the foreign exchange shortages in 1960 and 1961
again increased TTu. The 1960s were a period of both low money supply growth, low inflation and steady relative prices, but against agriculture. As the money supply began to increase at a faster rate and the foreign exchange bottleneck relaxed, \( \hat{\gamma} \) began to increase at faster rates from 1968 on to the middle 1970s. Together with the accelerating money supply, relative prices again turned in favor of agriculture. Inflationary expectations began to catch up with money supply growth after 1975 and the foreign exchange crisis started in 1977. Both these factors reduced \( \hat{\gamma} \), and starting in 1978, in spite of very high rates of money supply growth, relative prices began to decrease.

The process outlined above is almost identical to the structuralist argument. Money supply growth leads initially to higher relative agricultural prices. Once inflation starts, monetary deflation reduces the output in the non-agricultural sector. Since inflationary expectations are formed by both agricultural and non-agricultural prices together, increases in expected prices will be higher than the price increases in the non-agricultural sector, at least initially. If the money supply does not accommodate this increase in the expected prices, the growth rate of non-agricultural output will decline.

However, the reasons for this process are very different than those presented by the structuralists. At least in case of Turkey, it is not the supply rigidities in agricultural output that generate the changes in the relative prices, but active government intervention to minimize the supply fluctuations in agricultural output. Whatever the original objectives of the government intervention were, the net result is that the agricultural supply response is not translated into lower prices as is the case in the non-agricultural sector.
Our first result is that agricultural and non-agricultural price and output equations are significantly different from each other. The aggregate price and output equations are a weighted sum of these two sectors with weights changing over time. Thus the coefficients obtained for the aggregate equation are determined by the average weights which will be very sensitive to changes in the sample period.

The second result is that although the reasons are different, relative price movements have been in accordance with the assertions of the structuralist models.

D. Relative Prices, Money Supply and Inflation

In the last section, the determinants of relative price changes are analyzed. To complete the structuralist argument, two additional issues have to be clarified. The first issue is the nature of the effects of relative prices on the inflation rate. The second issue involves the question of what determines the growth of money supply, which up to now has been assumed to be exogenous. In this section it will be argued that, at least in the case of Turkey, these two issues are related. The growth of the money supply in Turkey is determined to a large extent by the level of relative prices. More specifically, money supply growth has been greater when the relative prices have been in favor of agriculture. There is a two way interaction where money supply growth leads to high relative agricultural prices and high relative prices lead to faster growth of the money supply. It will also be shown that this process is a direct result of the policies followed by the Turkish governments since 1950.

The monetary base in an open economy is created by the central bank's acquisition of both domestic and foreign assets. The domestic assets
are the net domestic credits given by the central bank and foreign assets are the net reserves of gold and foreign exchange. The money supply is then defined as:

\[
MS = m(CR + RS)
\]

where \( m \) is the money multiplier, \( CR \) is the domestic component, and \( RS \) is the foreign component of the monetary base.

According to equation (17), changes in money supply are then determined by changes in the monetary base times the changes in the money multiplier. Previous studies by Akyuz (1973) and Keyder (1978) have shown that almost all the changes in the money supply can be attributed to changes in the monetary base. That is, the money multiplier has been quite stable and the long-run change in \( m \) can be taken as exogenous. It can be shown that in a small open economy with fixed exchange rates, the foreign component of the monetary base is endogenous and is not a policy variable.\(^1\) Changes in the domestic component of the monetary base, through changes in excess demands for goods and services, will lead to changes in reserves, changing the foreign component, which now becomes an endogenous variable. The exogenous, or the policy variable, is the domestic credit creation.

The argument advanced in this section is that, in the case of Turkey, it is more reasonable to treat the foreign component as exogenous and argue that the domestic component is to a large extent determined by the level of domestic relative prices.

The reasons for these assumptions are the economic policies followed

\(^1\) See Blejer and Fernandez (1980) for a study that endogenizes the foreign component of the monetary base.
by the successive Turkish governments. First, imports and changes in reserves are to a large extent determined by capital inflows such as foreign aid, borrowing and workers remittances which can be taken as exogenous. Second, governments systematically have subsidized agricultural and other products. Therefore it is from these policies that the endogenity of domestic credit creation is derived.

It was indicated in the previous sections that governments interfere in the determination of agricultural prices. They also interfere by subsidizing the agricultural inputs to the users. Thus, the price changes in the agricultural sector are not fully reflected to the buyers of agricultural products. The main point of this section is to show that higher relative prices for agriculture lead to deficits in the public sector. This is due to direct subsidies to agriculture, losses of other SEE's and the deficits by the central government. These deficits are then financed from the central bank which increases the domestic component of the monetary base.

Relative agricultural prices influence the economy through three major channels. First, the agricultural sector is the major supplier of inputs into the non agricultural sector, especially manufacturing. The share of industries that primarily depend on agriculture for their inputs such as food, tobacco, textiles, wood and cork constituted about 70% of large scale manufacturing in 1950 and this ratio is 45% in 1979. Food prices both directly and indirectly through manufactured foodstuffs, are also important in the determination of wages. Changes in relative prices in favor of agriculture imply that manufacturing industries at least partially did not

1/ The assumption of exogenity of reserves is in the same spirit as assuming the foreign exchange crises as exogenous. The reasons for this assumption is given in Annex A.
pass on the cost increases in terms of higher prices. However, in private manufacturing, food, and other two digit industries, a profit squeeze is not evident.\footnote{1} Markups in the private manufacturing industry only change with foreign exchange regimes which do not change with relative prices.

On the other hand the public sector is far more influenced by the changes in agricultural prices. Government enterprises are heavily involved in both trading and processing agricultural products. In the case of cereals, TMO (Soil Products Office) each year sets the minimum prices and buys close to 15% of cereal output. Then TMO sells it back both to domestic customers or to the rest of the world. TMO also has a monopoly in exports and imports of cereals. For cotton, figs, raisins, olive oil, and hazel nuts, agricultural sales cooperatives (which are quasi-governmental agencies), play an important role in exporting and partially processing these commodities. For sugar beets and tea state economic enterprises (the Sugar Corporation and Caykur) are the sole buyers and processors. For tobacco, state monopolies are the biggest buyers and sole producers of cigarettes domestically. The monopolies administration is also the biggest exporter of tobacco. The Milk Corporation and Meat and Fish corporations again are the largest processors of both milk and meat domestically.

Hence, government agencies are the biggest buyers, exporters and processors of agricultural commodities. Changes in relative prices in favor of agriculture to a large extent involve increasing the input prices of these agencies, but not increasing the product prices. A major part of the adjustment to relative price changes are undertaken by these agencies.

The net result of this absorption have been large losses incurred by

\footnote{1}{See Annex B on the manufacturing industry. Results of two digit industries are from Aksoy (1878).}
these agencies. These losses are financed either by central government revenues or more generally by borrowing from the Central Bank. Agricultural price increases are not passed on to both the firms and workers as higher input and food prices. Furthermore, since agricultural products are exported, higher domestic agricultural prices with a fixed exchange rate lead to losses in exporting agricultural products. These losses are also financed primarily through borrowing from the Central Bank.

The second impact of relative prices is on the general balance of government including the non agricultural state economic enterprises. This impact is based on the nature of taxation in Turkey. The government in Turkey does not directly tax the agricultural sector. After the abolition of the agricultural tax (Asar) in 1925, the agricultural sector has not been taxed directly. In terms of indirect taxes, it is hard to quantify the total tax burdens by different sectors, but it is probably less on agriculture. Furthermore, relative shares of direct taxes have continuously increased in the last two decades and now constitute 60% of government tax revenues. This change in relative shares of different taxes indicate that tax burdens in the agricultural sector either has declined or at least has not increased significantly over time. On the other hand, tax collection in Turkey has shown a significant increase and tax effort has been high. Taxes as a percentage of GNP has increased from about 10% in 1950 to more than 22% by 1979. Although not definitive, it is possible to say that almost all of this increase in tax burdens has come from the non agricultural sector.

Historically, especially in the pre 1950 period, the agricultural sector constituted the largest sector in the economy. To make up for the lack of direct taxation of agriculture, the government priced industrial goods (mostly produced by the government) higher levels than world prices while
agricultural prices have been kept equal to or lower than the world prices. The tax base effectively has been the higher priced industrial goods. Since agricultural sector supplies the exportables, and industrial goods are imported, keeping an overvalued exchange rate made these price differentials easier to maintain in terms of Turkish liras. This structure of relative prices has enabled both the state economic enterprises and the private sector to generate funds for their own expansion and also pay the taxes for central and local governments to undertake a high level of infrastructure and social investments.

Transition to a democratic regime after 1946 and the desire to develop the agricultural sector which employs the majority of the population led to deviations from the historical policies and patterns. Starting especially in the early 1950's, governments, both for political support from the agricultural population and to accelerate agricultural growth, began to use support prices as a policy tool to increase agricultural incomes.

Changes in relative prices in favor of agriculture distort the historical balances and patterns of accumulation and taxation. Transfer of income from the non-agricultural sector and the state lead to losses by SEE's and lack of funds to carry out their investment plans. These gaps in financing investments can only be met from the general tax revenues. However, these tax revenues have to be collected from the non-agricultural sector that is already being squeezed by the changes in relative prices. Also central government expenditures have to be reduced to create funds for SEEs.

Given these developments, higher relative prices create a crisis of distribution in the economy that can be solved by governments' reducing their expenditures both in investment and other areas. The government's attempt to maintain or increase its real rate of spending and maintain real investments
by SEE's can only be done by resorting to deficit financing. The money supply growth arises from the inability of the governments to have both higher relative prices, and at the same time, maintain the real level of spending and investment by the central government and SEEs.

Given the institutional framework of the Turkish economy, the impact of relative prices is significantly different than that of the structuralist models. The major difference lies in the fact that price increases in agriculture both have political influences and are partially subsidized to the users. The direct link from agricultural prices to wages and industrial prices generally posited by the structuralist writers is partially broken by government subsidies. A change in agricultural prices lead to both cost increases and partially to growth of the money supply. From the existing data it is not possible to measure the magnitude of these two effects. Looking at credits to subsidizing agencies and their deficits does not solve this problem either. These agencies subsidize both domestic and international users of these products. When agricultural prices increase with fixed exchange rates, domestic prices can be higher than international prices. By exporting these goods SEEs also incur losses, and these losses can be very large. In the following figure, the ratio of international prices in T.L. \((P_{aw})\) to domestic agricultural prices \((P_a)\) is given. This ratio is an index that takes the value of 100 in 1968. The movements of \(P_{aw}/P_a\) given in fig. 2 show large fluctuations.

When compared to long run trends, the years between 1953-1957 and after 1974 are periods where domestic agricultural prices have been much

---

1/ Chu and Feltenstein (1978) argue that this relationship is also observed in Argentina. However, they do not directly link the deficits to relative agricultural prices.
FIG. 2: DOMESTIC AGRICULTURAL PRICES (IN T.L.)
higher than world prices. At these periods, exporting agricultural products has led to greater losses by the exporting agencies.

The net result of the above explanation is that, ceteris paribus, higher relative prices for agriculture lead to deficits in the public sector. This is due to direct subsidies and to losses by other SEEs and deficits by the central government. These deficits are financed by borrowing from the central bank, which increases the domestic component of the monetary base.

To observe the structure of central bank credits, three major components will be identified. These are institutions that subsidize agriculture (ASI), other public agencies (OPS) and the private sector. Institutions that subsidize agriculture are (a) SEEs that process agricultural products such as the soil products office, the sugar corporation, the tea corporation and meat and fish corporation, (b) state monopolies and (c) agricultural sales cooperatives. The central government and other SEEs are all classified as other public agencies. In the following table average shares of these three groups are given for different time periods.

Shares have generally been relatively constant over this thirty year period. The only change is the reduction in the share of public sector after 1960. On average, the public sector as a whole has received about 80% of central bank credits. Thus we can assume that there has been no major structural change with respect to the distribution of the central bank credits.

---

1/ Partial evidence for this is given in Annex B, by the markups in the public manufacturing sector.
Table I
The Distribution of Central Bank Credits by Sectors
(Percentages)

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<tbody>
<tr>
<td>OPS</td>
<td>42.20</td>
<td>43.24</td>
<td>35.49</td>
<td>35.56</td>
<td>38.46</td>
</tr>
<tr>
<td>ASI</td>
<td>40.85</td>
<td>42.73</td>
<td>37.34</td>
<td>35.81</td>
<td>39.44</td>
</tr>
<tr>
<td>Private Sector</td>
<td>16.95</td>
<td>14.03</td>
<td>27.17</td>
<td>28.63</td>
<td>22.10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.00</strong></td>
<td><strong>100.00</strong></td>
<td><strong>100.00</strong></td>
<td><strong>100.00</strong></td>
<td><strong>100.00</strong></td>
</tr>
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</table>

Source: Central Bank, Monthly Bulletins.

The effects of the higher relative agricultural prices will not be fully reflected in central bank credits contemporaneously. The losses and deficits, and the subsequent borrowing from the central bank, will occur with a time lag. We will assume that this lag is one year.

The link between relative prices and domestic credit creation is derived from government policies. The relationship will hold if there has been no switches in government behavior. Within the 1950-79 period there have been two major policy changes that have to be taken into account. These are the stabilization package of 1958-59 and the oil price increase of 1973-74.

In 1958-1959, a major stabilization package was implemented where government spending was drastically reduced and subsidies to SEEs were eliminated through price increases for their products. The 1973-1974 oil price increase led to a policy shift in the opposite direction. Oil price increases in 1973 were not passed on to the users until 1975, and then were only partially passed on. During these two years the government subsidized the oil prices which led to greater deficits and borrowing from the central bank than would be predicted only from relative prices. These two years the central bank credits did grow.
at a faster rate to subsidize oil use in addition to subsidizing the agricultural output.

These two policy shifts will be represented by two separate dummy variables. For the stabilization attempts, a dummy variable \( (D_s) \) which takes the value of one for 1958 and 1959 and zero for all other years will be used. For the oil price increase another dummy variable \( (D_o) \) which takes the value of one for 1973 and 1974 and zero for all other years will be used. The equation for the growth of central bank credits \( (\dot{C}_K) \) is given below:

\[
\dot{C}_K = -1.036 + 1.143 \, T_{Tu-1} - 0.200 \, D - 0.162 \, D_o
\]

\[
(17) \quad (4.36) \quad (8.16) \quad (4.21) \quad (3.49)
\]

\[ R^2 = 0.8139; \quad D.W. = 2.26; \quad F = 34.99; \quad N = 28 \]

The results of this simple equation are quite good. All the coefficients are highly significant. The results indicate that when the relative prices turn in favor of agriculture, central bank credits increase at a faster rate due to the reasons discussed above. \( T_{Tu} \) is an index that takes the value of 1 in 1968. When \( T_{Tu} \) is about 1, domestic credits will grow about 10 percent per year. When \( T_{Tu} \) increases (moves in favor of agriculture), the rate of growth of credits increase almost proportionately. However, it is not possible to identify the structural coefficients and the exact magnitudes of the effects of different components discussed above.

The results of eqn. (17) together with the discussion of relative prices in the previous sections imply a very unstable economic structure and accelerating inflation. Any exogenous change in either the money supply or the agricultural prices starts a chain reaction. Higher relative prices lead to expansion of central bank credits which in turn lead to expansion of money supply. Higher money supply growth lead to higher agricultural prices while
non agricultural prices increase by less due to output growth in this sector. Even higher relative prices lead to further expansions of central bank credits and the money supply. This movement leads to higher price expectations, higher non agricultural prices and lower rates of growth. At the same time, foreign exchange bottlenecks start and output growth decreases even more. This process continues until a stabilization package is introduced. Within this acceleration, there are attempts to control money supply growth by reducing government expenditures and by adjusting SEE prices. These attempts tend to be temporary as long as relative prices stay in favor of agriculture.

The exogenous shocks can come through the foreign component of the monetary base. Fry (1978b) in a study of the money supply mechanism in Turkey has argued that initial shocks given by changes in reserves due to the Korean War in 1951 and workers' remittances in the late 1970s were the originating causes of money supply accelerations. However, he then argues that given the initial shock and the growth in prices and output, governments then tried to accommodate this increase in nominal output growth. The analysis here indicates that given the real spending objectives of the government, the growth of central bank credits will increase due to higher relative agricultural prices, usually caused by the external shocks. Governments have tried unsuccessfully to lower the growth of the money supply in the 1950-79 period. There were serious attempts in 1954, 1972 and 1978 which were unsuccessful in lowering the money supply growth. These policies were attempted in periods where the relative agricultural prices had been high. The only periods of slow monetary growth are also periods of low relative agricultural prices.
IV. CONCLUSIONS

As pointed out in the introduction, this study is a preliminary attempt in modeling the Turkish inflation since 1950. The scarcity of previous studies and the lack of alternative models necessitated a two stage approach to the modeling process. The first stage is to observe the Turkish experience in light of three models which will provide the framework for the second stage. The second stage would then be the development of a macro model in light of these preliminary findings. This study constitutes just the first stage.

The initial structuralist critique of the naive monetarist model can be summarized under two main points. The first point is the exclusion of the output response to money supply changes, which are excluded from the naive monetarist model by its construction. The second critique involves the exclusion of the structural factors such as the differential behavior of the different sectors and the effects of the resulting relative price changes on the inflation rate. This dimension is also excluded from the monetarist model by its aggregative nature. However, as pointed out in the introduction, the structuralist writers did not develop a consistent model to test their hypotheses.

On the other hand, neo-monetarist models provide a framework to analyze the first structuralist critique. These models show that there is a strong relationship between the output and the money supply, as has been stressed by the structuralist writers. However, they have also demonstrated that the output response is not to the money supply but to the unexpected component of the money supply. In this framework, expected money supply and expected inflation is analogous to the cost increases emphasized by the structuralist models. Therefore, the use of the neo-monetarist instead of the
naive monetarist model effectively eliminates the first structuralist critique.

However, the second structuralist critique involving the differential sectoral response and its implications is not met by the neo-monetarist model. However, these issues can be investigated by using the framework supplied by the neo-monetarist approach.

This paper is an attempt to develop an inflation model that incorporates the structural elements of the Turkish economy which takes into account the main points emphasized by the structuralist writers. Of course, one basis for choosing one model over another is the amount of information supplied by it as compared to other model. For this reason, the Turkish experience is analyzed by using the three models.

In the first stage, the naive monetarist model is tested both to have a benchmark and compare its results to the previous studies.

In the second stage, a simple neo-monetarist model is developed and tested. This model yields significantly different results than its naive version and shows that unexpected monetary expansions yield higher output growth and that monetary stabilization attempts initially will lead to output reductions more than reductions in the inflation rate.

At this stage, the first structuralist element is introduced to the neo-monetarist model. The foreign exchange bottlenecks, caused by the inability of the export sector to respond, is explicitly introduced to the output equations. It is shown that, money-output relationship is different under different degrees of foreign exchange availability. Given the same unexpected change in the money supply, the output growth will be lower with a foreign exchange crisis. Furthermore, the degree by which output growth is reduced will not be a constant but will depend on the level of inflationary
expectations. The underlying mechanism for this behavior is analyzed in Annex B where it is shown that at least in the manufacturing sector firms increase their markups under restrictive foreign exchange regimes.

In the third stage, this extended neo-monetarist framework is used to test the differential output and price response of agricultural and non-agricultural sectors. The results of this section generally support the structuralist arguments. The output response in the two sectors are both to the unexpected changes in the money supply but due to its nature, the agricultural sector response is lagged one year. However, the impact of output growth on the price increases is significantly different. Output growth in the agricultural sector has no impact on the prices of this sector. Furthermore, this price behavior is not due to the structural problems associated with the agricultural sector but is caused by the governments' interference in the price determination in this sector.

An unexpected increase in the money supply leads to faster growth of agricultural prices relative to the non-agricultural prices and an unexpected decrease in the money supply yields the opposite. Although the relative prices move the way hypothesized by the structuralists, the reasons for this behavior have more to do with government policies than the conditions of the agricultural sector.

The last section of the study, tries to analyze the impact of the changes in relative prices on the general inflation rate. In the case of the Turkish economy, there is little evidence on the cost push effects of relative price changes. On the other hand, again due to government policy, there is a relationship between relative prices and the domestic component of the monetary base. Higher relative agricultural prices are to a large extent subsidized by the governments and these subsidies are primarily financed from
the central bank credits. So that, changes in relative prices lead to changes in the domestic component of the monetary base. The relative price changes work through the money supply rather than creating cost push pressures.

The net results of this investigation indicate a very unstable economic structure, where any unexpected growth of the money supply lead to higher relative agricultural prices which in turn increase the money supply growth. These explosive movements in both the money supply and inflation rate are stopped by shifts in government policy which include various monetary stabilization policies.

These general results of this study can be summarized as follows. Foreign exchange markets are important in determining the output-money interactions so that they have to be explicitly introduced in any model of the Turkish economy. The behavior of output and prices will be different under different trade regimes.

The second major result of the study is that, the behavior of agricultural and non-agricultural prices are quite different. Since the aggregate price is a weighted sum of the two prices and these weights have been changing over this period, using aggregate series will yield incorrect results, especially in the predictions.

The third point is that, the money supply which is assumed to be exogenous in the previous studies and throughout this paper, is not fully exogenous but is determined in part by the level of relative prices. The partial endogenity of the money supply implies that the price and output equations have to be reformulated to include this endogeneity. However, further work is necessary to determine more precisely the endogenous and exogenous components of the money supply for the Turkish economy.

The last point of this study is the importance of the government
policies on the coefficients obtained throughout the paper. The coefficients of the price and output equations and the money supply mechanism do not just include the economic structure but are to a large extent also reflect the government policies that are followed in this period. As pointed out in the text, the coefficients will change with changes in government policies. Therefore, the analysis of alternative government policies cannot just take the coefficients as given. Therefore, to be able to analyze the impacts of alternative government policies, government behavior has to be explicitly included in future models of the Turkish economy. For example, if the government does not interfere with agricultural prices and does not subsidize its users, the coefficients of both the price equations and the money supply mechanism will change. To be able to obtain realistic predictions, government policies have to be explicitly modeled.
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# ANNEXES

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Annex A

A Note on Foreign Exchange Markets

Throughout the study, foreign trade has been assumed to be exogenous. For example, in the analysis of growth and inflation, the availability of foreign exchange was taken to be exogenous. The same assumption was extended to the foreign component of the monetary base. The reasons for this assumption are as follows.

First is the fact that the trade balance has always been in deficit in the 1950-79 period. The net capital inflows have been very large compared to the exports. Second point is that these capital inflows to a large extent can be taken as exogenous, because they are composed of foreign aid, foreign borrowing mostly by the government and workers remittances. None of these items are a direct result of policies implemented in Turkey. In the following Figure A.1, the ratio of trade deficit to exports are given, which show large fluctuations. Most of these fluctuations are caused by exogenous events. In the early fifties, the exports expanded due to the Korean war boom and the country still had foreign exchange reserves that can be drawn upon. Starting in 1953 the shortages appeared and were complemented by large flows of aid and foreign borrowing. These external flows began to be exhausted by 1956 and the country experienced a serious foreign exchange crisis. In 1958 a stabilization package was introduced and starting in 1959-60 large amounts of aid through the OECD consortium was obtained. These flows of aid and low output growth up to 1964 eased the foreign exchange shortages. In 1965 the crisis started again because capital inflows were reduced. After 1968 workers remittances started coming in and very high world demand in 1971-73 period helped to ease the foreign exchange crisis after 1970. In 1974 the reserves
FIGURE A.1
RATIO OF TRADE DEFICIT TO EXPORTS

YEAR
51 53 55 57 59 61 63 65 67 69 71 73 75 77 79
RATIO
0.0 0.5 1.0 1.5 2.0 2.5
were decumulated and large amounts are borrowed in 1975-76. In 1977 a crisis started in spite of high capital inflows and large amounts of aid.

To analyze such a sequence, we have to treat 1951-52 and 1970-73 periods as unusually high world demand. Periods 1959-63 and 1975-79 as periods of large and politically determined aid inflows. Periods after 1970 have the special inflows due to workers remittances. And there is the oil price increase after 1973. All these events are to a large extent exogenous. Given all these shocks to the system, it is more reasonable to assume that foreign exchange markets were exogenously determined. Furthermore, attempts to estimate import and export equations without all these dummy variables were unsuccessful.

The second point is the categorization of the foreign exchange availability. What is needed is a measure of the intensity of foreign exchange crises. Since 1950 Turkish economy has always experienced a shortage of foreign exchange. Imports have been a small percentage of GDP but have consisted of necessary capital and intermediate goods, which have been rationed through various mechanisms. However, the degree of rationing and the quantity of imports have varied over this periods. Although we have no quantitative measure of foreign exchange bottlenecks, some rough indicators can be developed to observe the variation in import shortages. In Figure A.2 an index of foreign exchange availability is presented. This is the ratio of real imports to real non-agricultural GDP. It has been standardized to have the value of 100 in 1968. As evident from this index import availability has varied considerably within this thirty-year period. It is unfortunately impossible to find whether import requirements have changed over this period. Imports as a percentage of non-agricultural GDP have increased in the early fifties, especially in 1952. Then from 1952 to 1958 we observe a
FIG. A.2: IMPORT AVAILABILITY

![Graph showing the import availability index from 1951 to 1979. The index declines sharply from 1951 to 1953 and then fluctuates until 1979.]}
continuous decline in import ratio. This reduction is due in part to quantity rationing which started in 1953, as well as import substitution in some basic industries such as sugar, textiles and cement. Starting in 1947 a major attempt was made to set up domestic plants in the basic consumer items. After 1952 these plants began to come on stream, reducing the demand for imports. However, after 1955, as the imports continued to fall in relative terms bottlenecks intensified. The years 1957 and 1958 were the periods when even the minimum import requirements could not be met. The stabilization package of 1958, together with flows of foreign aid, eliminated the foreign exchange bottleneck and the years 1959 to 1964 were periods of relative foreign exchange ease. From 1964 to 1970 imports were again very low and there was a continuous shortage of foreign exchange. Starting in 1970, a boom in the world economy and workers' remittances again eases the foreign exchange shortages. This ease continued until 1977 when again shortages appear. 1978 and 1979 are years of extreme foreign exchange crisis.1/

Using the above index and other information supplied by Krueger (1974) and others, it is possible to divide 1950-79 period into two segments depending on the availability of foreign exchange. Although one cannot measure quantitatively the intensity of shortages, it is possible to differentiate the period as years of relative ease or shortage of foreign exchange. The periods when foreign exchange has not been a major bottleneck are:

1950-55, 1959-63, 1971-76; and

the periods of foreign exchange crisis are:

1956-58, 1964-70, 1977-79

1/ The movement of this index is very close to the description given by Krueger (1974) for the 1950-72 period.
Out of this 30-year period, 12 years have been periods of shortages and only 18 years have been years of sufficient foreign exchange availability.

A second measure is to differentiate the period according to the trade regimes followed. This differentiation has been done by Krueger (1974) according to the degree of quantity rationing, which is discussed in Annex B. Periods of serious foreign exchange crises are also the periods of severe quantity rationing, but not vice versa.

The import availability index, the dummy variable based on periods of severe crisis and the dummy variable based on trade regimes were all used in the estimations. The worst results were obtained with the import availability index probably due to changes in import requirements over the 1950-1979 period. For the aggregate output equations, the best results were obtained with the dummy variable based on foreign exchange crises. The dummy variable based on foreign trade regimes yielded the best results in explaining the behavior of the markups in the manufacturing sector which is analyzed in Annex B. The reasons for this difference is not apparent but could be due to differential impact of foreign exchanges restrictions on different sectors. For the purposes of this study, two different dummy variables were used.
Wages and Pricing in Manufacturing and Trade Sectors

In the analysis of the structuralist models, it was pointed out that these models depend on a series of assumptions beyond the differential output and price response in agriculture and industry. The effects of relative price changes on the level of inflation work through wages, and the price behavior of the firms. These models assume that wages are primarily determined by agricultural prices and the excess demand in the labor markets have little impact on wages. Firms base their price decision on prime costs of which wages are the primary component. The wage increases are passed on as higher prices with a constant markup. Output is then adjusted to clear the markets.

An increase in the money supply, creates an excess demand in the goods market. Firms in the industrial sector increase their output to meet this demand while agricultural producers cannot change their output. Agricultural market are cleared by price increases. Increases in food prices lead to higher wage demands and firms pass on these wage increases as higher prices. Ceteris paribus, these price increases will reduce the demand and the firms will now reduce their output from the higher level attained after the initial demand increase. In order to maintain the initial increase in output, money supply has to increase even further, starting an inflationary spiral.

If the initial increases in prices and wages are met with a decrease in the money supply, the response will depend on the wage and price behavior. If the wages and prices are inflexible downwards, then reductions in money supply will not affect the prices, and markets will clear by reductions in output.

Thus, the major differences between the two approaches can be
reduced to be behavior of firms and labor under different levels of excess demand. If firm’s markups and wages are very sensitive to excess demand then monetary stabilization policies will have a large and rapid impact on prices. If on the other hand both wages and markups are insensitive to excess demand or are inflexible downwards then the reduction in the money supply growth will primarily effect the output rather than the prices.

This distinction is more evident in the IMF style stabilization programs, where along with credit ceilings and a devaluation, the prices of public goods and taxes are increased. The firms are faced with both an increase in costs and a reduction in demand. What happens to prices and output depend crucially on the behavior of markups and wages. If markups decrease significantly, then the cost increases will not be passed on as higher prices, and the consequent output reduction will be smaller. If wages also show higher response to lower labor demand, then increases in costs will be much smaller. The tradeoff between inflation and output to a large extent depend on impact the excess demand on the behavior of the markups and wages.

In the following sections, an attempt will be made to analyze the behavior of pricing in manufacturing and trade sectors, and wages in the manufacturing. For the manufacturing industry, there is information on different types of costs and output. For the trade sector, a rough estimate of markups is developed. The reasons for restricting the analysis only to two sectors are due to limitations of data on costs in the other sectors.

A. Wage Behavior

Any analysis of wage behavior in Turkey has to be limited by the lack of nationwide wage data. Information on wages is collected by two institutions. The most comprehensive wage information is collected by the Social Security Administration (SSK) which comprises the part of the labor
force that is covered by social security. Although this wage data is the most comprehensive, it also has major shortcomings. The coverage of enterprises has changed over time, where smaller enterprises have been brought under social security coverage. The coverage was limited to establishment employing 10 or more workers in 1950, but by 1979 establishments employing 1 worker was brought under social security coverage. In certain years large numbers of small enterprises with lower average wages have been included under the social security coverage. These years' wage changes are underestimated.

Furthermore, the social security data does not include bonuses and other payments in kind which, due to the tax laws, tend to be as large as the nominal wages, especially in recent years. For all these reasons, the wage data supplied by the SSK, cannot be used as a consistent series for the 1950-79 period, in spite of its wider coverage.

The second source of wage information is the annual surveys of manufacturing industries which include manufacturing firms that employ 10 or more workers. Wages are estimated by dividing the total wage payments by the number of employees. Total wage payments include the basic wage, bonuses and other payments in kind. In a way, manufacturing wages are the most consistent wage series available in Turkey. However, these series only include workers in large scale manufacturing enterprises which are the most organized parts of the labor force. They do not include small establishments in manufacturing, trade and services where the majority of the urban labor force is employed. Wages in organized and less organized sectors of the economy might behave differently over time. The only information available to check these differences is the manufacturing censuses of 1963 and 1970. These censuses contain information both on small and large scale manufacturing wages. Between 1963 and 1970, the ratio of wages in small scale enterprises to the
wages in large scale enterprises has been constant [Aksoy (1980)]. That is, they have grown at the same rate. If we assume that small scale industry wages are representative of the unorganized sector, then at least between 1963 and 1970 the relative wage structures have not changed significantly. Whether this stability can be generalized to other periods is another question that cannot be answered with available data.

In this study, manufacturing wages will be used as the wage series for the whole economy. As pointed out above, these series belong to the most organized sector of the labor force and will probably underestimate the effect of excess demand in the labor markets on the wages behavior.

Wage equations for most developed countries have been based on different variants of the Phillips curve which posit a relationship between changes in the nominal wages and some measure of excess demand in the labor markets. In almost all empirical studies, unemployment rate has been used as the excess demand variable. If wage determination is based on real wages, then expected inflation will also influence changes in the nominal wages.

Specifically in the Turkish context, unemployment data does not exist. The State Planning Organization does publish estimates of the unemployment rate but they are based on highly restrictive assumptions. For the purposes of this study, an indirect measure of labor market tightness will be developed. Since demand for labor is a derived demand, detrended non-

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1/ It is interesting to note that unemployment rates obtained from population censuses are much lower than the rates estimated by the SPO. Furthermore, information obtained from a recent survey of labor markets in three cities in Turkey show that the duration of job search is very low (maximum of 3 months), and the incidence of unemployment over the life of the workers was minimal. According to the preliminary and unpublished data, most workers had never been unemployed, and among those who had been unemployed, the maximum duration of unemployment was 3 weeks. This data does not fit at all with the very high unemployment rates estimated by the SPO.
agricultural output will be used to construct a proxy for the level of excess demand for labor (ED). ED will be defined as follows:

\[ (B.1) \quad ED = \ln \tilde{Y}_n - \ln Y_n \]

where \( \ln \tilde{Y}_n \) is the trend rate of growth of the non-agricultural output. In the 1950-1979 period the trend growth rate of non-agricultural output has been 7.1 percent.\(^{1/}\) Thus when output is greater than the trend level, labor markets are assumed to be tighter.\(^{2/}\) In the following Figure B.1 the ED variable is presented.

This measure of excess demand in labor markets does not take into account both the changes in urban labor supply growth and the changes in the rate of increase in labor productivity. This definition of labor market tightness gives the relationship between the growth rate of output and wage changes, which are easier to interpret than the other excess demand variables that can be generated for the Turkish economy.

The excess demand variable drawn in Figure B.1 does reflect the booms and recessions in the Turkish economy. Up to 1952, output growth is quite low, indicating a low demand for labor. Starting in 1953, output begins to grow at a faster rate and this continues until 1957. 1958 and 1959 are years where output grows around the trend rate of 7 percent. Then there is the recession from 1960 to 1967. Starting with 1968, output growth is again around the trend rate and this continues until 1972. From 1973 to 1978 output

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\(^{1/}\) The trend equation is, \( \ln Y_n = 2.90 + 0.071T \). \( R^2 = .9953. \)

\(^{2/}\) This measure is a variant of output gap that can be used in place of the unemployment rate. A similar measure has been used by Gordon (1977) which has yielded better estimates than the unemployment rate.
FIGURE B.1
EXCESS DEMAND IN THE LABOR MARKETS (ED)
growth is much higher than the trend rate and in 1979 this growth is reversed. There are two booms in the middle fifties and seventies. There is one recession in the early sixties and the beginning of one in 1979. Thus ED can be used as a rough proxy for excess demand in labor markets.

For inflationary expectations, the expected inflation \((P_e)\) series previously used in the study will also be used. The basic wage equation is:

\[(B.2) \quad \hat{W} = \beta_0 - \beta_1 ED + \beta_2 \hat{P}_e\]

In addition to excess demand and expected inflation, there have been two periods in the Turkish economy when the constitution has been suspended. These are the military interventions of 1960 and 1971. In both cases, the normal working of economic life has been suspended and military governments have taken over. Military governments, in order to stabilize the economy, have tried to restrain the wage increases. The unions and labor in general have not been able to resist large cuts in real wages. A dummy variable for military interventions \((D_m)\) will be used to account for these two years. \(D_m\) takes the value of 1 for 1960 and 1972 and 0 for all other years.\[1/\]

Wages in the public sector might behave differently than those in the private sector. To test this hypothesis wage equations are estimated separately for public and private sectors.

Wage equations are presented separately for the public \((W_p)\) and the private \((W_r)\) sectors and both with and without the dummy for military interventions \((D_m)\).

\[1/\] A dummy is placed on 1972 instead of 1971 because the impact of military governments in wage bargains are felt in 1972.
Private Sector

(B.2.a) \[ \hat{W} = 0.084 - 0.793 \text{ED} + 0.763 \hat{P} \]
\[ (4.28) \quad (2.72) \quad (5.74) \]
\[ R^2 = 0.6183; \quad \text{D.W.} = 1.79 \]

(B.3.a) \[ \hat{W} = 0.083 - 0.631 \text{ED} + 0.883 \hat{P} - 0.169 D \]
\[ (5.45) \quad (2.75) \quad (8.27) \quad (4.22) \]
\[ R^2 = 0.7808; \quad \text{D.W.} = 2.02 \]

Public Sector

(B.2.b) \[ \hat{W} = 0.072 - 0.568 \text{ED} + 0.833 \hat{P} \]
\[ (2.39) \quad (1.32) \quad (4.26) \]
\[ R^2 = 0.4442; \quad \text{D.W.} = 2.00 \]

(B.3.b) \[ \hat{W} = 0.071 - 0.420 \text{ED} + 0.943 \hat{P} - 0.155 D \]
\[ (2.63) \quad (1.03) \quad (4.99) \quad (2.19) \]
\[ R^2 = 0.5364; \quad \text{D.W.} = 2.21 \]

The inclusion of the dummy variable for military governments improves the fit of the estimation considerably, indicating that military interventions had a significant negative impact on wages.

The results of the wage equations are quite good. Nominal wages are determined by the expected inflation and the level of excess demand in the labor markets. The significance of ED is important because previous studies by Behrman and Mujica (1973) for Chile and Brodersohn (1980) for Argentina
have found the unemployment rates to be insignificant in wage determination. In Turkey, wages turn out to be significantly affected by a measure of excess demand or the rate of growth of output.

It was pointed out that ED is defined such that when the non-agricultural GDP grows at 7.1 percent, ED takes the value of 0. According to equation B.3.a, assuming zero expected inflation and 7.1 percent growth of output, nominal wages will increase at 8.3 percent. This implies that for approximately 1 percent increase in the output growth rate, nominal wages increase by 1 percent.\(^1\)

Expected inflation is the most important variable that determines the wage changes. The coefficients of \(\hat{\pi}_e\) are very close to 1, indicating that the expectations of inflation are almost fully passed onto wages.

The behavior of wages in public and private sectors are also different. Just as expected, wages in the public sector are less influenced by the level of excess. Also, explained variance of public sector wages is lower than that of the private sector, possibly due to the greater political influences.

If we sum up, wages in Turkey are determined by both the output growth rate and inflationary expectations generated by an adaptive expectations formula. Wages in the private sector are more influenced by excess demand than the wages in the public sector. Inflationary expectations are almost fully reflected into higher wages. Furthermore, military governments have been quite successful in restraining the wage increases.

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\(^1\) There is a possibility of a non-linear relationship between ED and wage changes which has not been taken into account in this estimation.
B. **Industrial Pricing**

The studies on the pricing behavior of manufacturing industries have tried to separate the effect of cost and excess demand on prices. The controversy has focused on whether the industrial prices are determined by a constant markup on unit variable costs or whether this markup varies with the level of excess demand. The nature of the data used, specification of functional forms and the definition of excess demand proxies have all contributed to the contradictory results obtained by different studies.\(^1\) In most of these studies, the basic price equation has been of the following form:

\[
(B.4) \quad P = (1 + k)(ULC + UMC) + h(ED)
\]

where

- \(P\) is the product price
- \(ULC\) is the unit labor cost
- \(UMC\) is the unit materials cost
- \(ED\) is a measure of excess demand.

The nature of the tests on the stability of the markups involve the coefficient of the excess demand variable. If it is significant, then the relation between costs and prices is not a constant but changes with the level of excess demand. If the coefficient is not significant, then prices change directly with costs irrespective of the level of excess demand. Constancy of the markup is called the cost pricing behavior.

The distinction between the formulation above and the general

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\(^1\) See Earl (1973) for a survey of these studies.
relation between prices and excess demand is fundamental. Price equation
given above can imply a positive relation between demand and prices and yet
the coefficient of the excess demand variable can be insignificant. If costs
vary procyclically (with excess demand) and the firms apply a constant markup
on costs, then excess demand will not have a direct effect on prices. The
above formulation does not try to test the general effect of excess demand on
prices but just its direct effect on prices.

This distinction is important in the sense that costs can change
autonomously due to changes in world prices (such as oil price shock, a
devaluation, etc.). It is important to be able to separate the direct effect
of demand beyond the cost changes on industrial prices. If the hypothesis of
cost pricing is accepted, then demand management can only change industrial
prices indirectly through the input prices, which leads to some form of the
Phillips curve. If, for example, demand restraint is undertaken together with
exogenous cost shocks, then cost pricing implies that prices will go up due to
cost increases and output will have to adjust to clear the markets.

Cost pricing depends crucially on two assumptions about the
existence of stocks. First it assumes that firms possess sufficient stocks of
capital and labor to satisfy changing demand. This is analogous to assuming
that the short-run elasticity of supply is infinite for the whole set of
firms. The fact that supply elasticities in labor and raw material markets
are less than infinite does not affect this assumption because their influence
is felt through the costs which these studies take as given. Still, the
assumption of infinite supply elasticity for all firms is rather strong and as
demand increases, capacity limits will be reached for many specific goods.
Price increases in such goods will lead to cost increases for firms using
these goods as inputs. Since firms base their prices on costs, a general
price increase will occur.

In an open economy, it will not be necessary to assume infinite supply elasticity for all firms, if imports are available at similar prices and their supply is reasonably elastic. Under these circumstances, specific shortages that appear as demand expands can be met by imports. This assumes that the economy possesses sufficient stocks of foreign exchange to satisfy these import demands, without changes in the exchange rate.

To sum up, cost pricing requires both stocks of capital (capacity) and labor and foreign exchange for the quantity adjustments to eliminate the fluctuations in excess demand. This is at least the necessary condition for cost pricing behavior.

Generally it is quite reasonable to expect a developed industrial economy to meet the necessary conditions required by cost pricing. These economies possess unused capacity, the ability to rapidly change that capacity, and sufficient foreign exchange reserves to accommodate sudden shifts in demand.

However, for most LDCs the necessary conditions for cost pricing do not exist. Most of these countries have chronic foreign exchange crises where the import demands are never completely satisfied. Therefore, the foreign exchange stocks necessary to alleviate specific shortages do not exist.

The second condition of low domestic supply elasticity is also reasonable. In these countries due to reasons associated with under-development, supply rigidities are prevalent. Therefore, one would expect firms not to be able to adjust their output as easily as hypothesized by the cost pricing theory. The range of goods produced domestically is much more limited. Many intermediate and capital goods are imported. Output adjustment to demand requires more imports structurally as well as cyclically. Any
change in output leads to corresponding changes in imports both due to specific shortages and because the intermediate goods are not produced domestically.

Therefore in an underdeveloped country we would expect (a) cost pricing mechanism not to work as observed in developed countries and (b) the condition of foreign exchange availability to play a crucial role in the pricing process.

In the Turkish case, there are two problems that arise in estimating price equations of the type defined above. These problems are caused by data availability and special characteristics of the Turkish economy.

The manufacturing sector in Turkey consists of both the public and the private enterprises, and the pricing behavior in these two sectors are radically different. Public sector prices are increased at discrete intervals which means that the prices are kept constant for long periods of time in spite of increasing costs. On the other hand, the price series available for manufacturing are aggregate series which are a weighted sum of both the public and the private sector prices. Using the same prices for each sector creates large biases while estimating an aggregate price equation involves summing two sectors with very different pricing behavior.

The growth of the nominal outputs given in Figure B.2 show large differences between the two sectors. It is hard to argue that these variations are caused only by the differences in the growth rates of physical output in the two sectors. Staggered price increases by the public sector firms are the main cause of the differences in the nominal output growth rates. In spite of the differences in the price changes between the public and the private sectors, there is only one price series available and that is for the total manufacturing. Also, there is no independent index of output
FIG. B.2: GROWTH OF NOMINAL OUTPUT

- PUBLIC SECTOR
- PRIVATE SECTOR

YEAR

NOMINAL OUTPUT

51 53 55 57 59 61 63 65 67 69 71 73 75 77 79

0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.0 0.1 0.2 0.3 0.4 0.5 0.6

0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.0 0.1 0.2 0.3 0.4 0.5 0.6
for the manufacturing sector. Output series are generated by deflating nominal output by the aggregate price index. Due to differences in price changes in public and private sectors, using the same price series leads to biased output series for the two sectors.\footnote{There is an index constructed by Ebiri et al. (1977) that uses public and private two digit industry weights to estimate separate public and private manufacturing price indexes. These adjusted series partially correct the biases. But intra two digit price change differences turn out to be as important as the inter two digit price change differences. The resulting output series for public and private sectors are still biased. This problem also exists in a recent study by Krueger and Tuncer (1981), which used the same series.} Output series generated this way show large fluctuations mainly caused by using the wrong price series. Thus all the other series generated by using the output figures such as productivity, unit costs, etc., turn out to be biased.

The first major problem that arises in industrial pricing studies is the proxy for excess demand. There is no consensus as to which variables are the right proxy for excess demand. The most commonly used variable has been the capacity utilization ratio in manufacturing. In cases where capacity utilization indices are not available, trend growth rate is assumed to be the capacity or potential output and deviations of actual output from this trend are taken as a measure of excess demand (Coutts, Godley and Nordhaus [1978]).

The use of capacity utilization indices, however constructed, assume that the output is mainly demand constrained. Supply constraints and other adjustment problems are assumed to be nonexistent. This might be a realistic assumption for most of the developed industrial countries but is highly unrealistic in the case of an underdeveloped country like Turkey. In the previous sections the role of foreign bottlenecks in the growth process was analyzed. It was shown that the growth path was significantly influenced by the availability of foreign exchange. In the last five years, energy...
shortages have also contributed to the low growth rates. Given the supply bottlenecks associated with the foreign exchange and energy, output growth cannot be taken as a measure of excess demand for Turkey. Especially in the last three years, capacity utilization indices generated by using output series indicate a lack of demand which is far from the truth. On the other hand, in periods where there is no foreign exchange bottleneck, the capacity utilization rate estimated by using the output series can be used as a proxy for excess demand.

Given all the problems associated with estimating the price equations in the form specified in equation (B.4), an alternative method which eliminates some of the problems will be presented.

If we look at equation (B.4), we observe that what is tested is the stability of the relation between costs and prices. The specific question is whether the relationship between costs and prices vary systematically with the measures of excess demand. It is possible to observe this variation without using the price and the physical output series.

If we rewrite the basic price equation given by equation (B.4), we get the following relationship for the cost pricing equation.

\[(B.5) \quad P = (1 + k)(ULC + UMC)\]

where \( k \) is the markup

- \( UMC \) is the unit inputs costs, i.e., \( WL/Q \)
- \( ULC \) is the unit labor costs, \( PM/Q \)

\( k \) is equal to

\[(B.5) \quad k \equiv \frac{P - ULC - UMC}{ULC + UMC}\]
The constancy of $k$ can be directly derived without using the price series. If we multiply both the numerator and the denominator by the physical output $Q$ we get:

\begin{equation}
(B.6) \quad k = \frac{PQ - WL - PMM}{WL + PMM}
\end{equation}

where $PQ$ is the nominal output

$WL$ is the total wage payments

$PMM$ is the cost of inputs.

In Turkey there is data for these three series that are supplied by the firms. It is possible to test the relationship between the markups and excess demand directly. Instead of regressing both costs and demand variables on prices, excess demand can be regressed directly on the markup.\footnote{Incidentally, direct estimation of the markup has other advantages. If costs also move together with the excess demand, then using both the costs and demand in the same equation will lead to multicollinearity problems.}

\section{B.1. The Private Sector Behavior}

In Figure B.3 the markups in large scale private manufacturing are presented.\footnote{The data are from annual surveys of manufacturing industries which cover the establishments that employ 10 or more workers. 1969 is estimated by Ebiri \textit{et al.} (1977).} From the figure it is possible to observe two properties of the markup series. First is their relative stability. Markups vary between .226 and .334. The second and probably more interesting observation involves the movement of the markups in different time periods. Markups are low in the period 1950 to 1952. Starting in 1953, and up to 1958, the markup stays high. They drop in 1959 and stay low until 1965. Markup jumps from .246 to
FIGURE B.3
MARKUPS IN THE PRIVATE SECTOR

Time

Markup

50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
.311 in 1965, and stays high until 1972. Again in 1973 markups start declining until 1975. In 1976 this decline is reversed and the markups attain their highest levels in 1978 and 1979.$^1$

There seems to be distinct levels of markups for different subperiods. These subperiods are not correlated by any measure of excess demand that has been constructed for both the manufacturing sector or the Turkish economy. Measures of capacity utilization, money supply growth or output growth are not correlated with the markups. Thus, it is possible to argue that the excess demand proxies utilized have no direct effect on prices.

On the other hand, the subperiods defined above are not random but correspond closely to the periods in which the Turkish government has followed different foreign exchange policies. Krueger (1974), has categorized the 1950-1972 period according to the foreign exchange regimes followed by the Turkish government. In times of foreign exchange availability, governments have followed liberal import policies and the list of goods imported under licenses are extended. When foreign exchange shortages appear, the governments restrict both the number of goods that can be imported and place these imports under more strict quantity controls. Krueger defines five phases of foreign exchange regimes that Turkey has experienced in the 1950-1972 period. Phase I starts by placing quantitative restrictions on foreign trade due to an unsustainable balance of payments deficit. In Phase II, the restrictions are still present but attempts are made by increasing tariffs, giving rebates on exports and initiating multiple exchange rates. Phase III is a transitional phase where exchange rates are adjusted and less reliance is

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$^1$ In 1969 the markup is the highest. Data for 1969 is not from the original survey but are constructed by Ebiri et al. (1977) which could explain this unusually high markup.
placed on quantitative restrictions. Phase IV is characterized by increased foreign exchange earnings and relaxation of foreign exchange controls.

This differentiation is quite subtle and the delineation of the exact timing of these phases is highly subjective. For the purposes of quantitative analysis it is hard to quantify the impact of four different phases. The only quantitative variable that can be used to measure the impact of foreign exchange regimes has to be a binary variable. For this reason, Phases I and II are grouped together because both entail foreign exchange restrictions and Phase IV is taken as a period of relatively little restrictions on imports.

If we classify the 1950-1979 period according to the level of markups, resulting periodization is remarkably similar to the classification by Krueger according to the foreign exchange regimes.\footnote{Krueger's classification ends in 1972. Periods after 1972 are my classification.}

<table>
<thead>
<tr>
<th>Classification by Krueger</th>
<th>Classification by Markup</th>
<th>Average Markup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td>Phase</td>
<td></td>
</tr>
<tr>
<td>1950 - Sept. 1953</td>
<td>(IV)</td>
<td>1950-1952</td>
</tr>
</tbody>
</table>

In the previous table, the relationship between foreign exchange regimes and markups are presented. The observed relationship between the two series is quite strong. There is one difference between the movement of the markups and the foreign exchange regimes as classified by Krueger. Krueger
argues that liberalization of imports started in 1970 after the devaluation, but the markups do not start decreasing until 1973. To test whether there is a significant relationship between the regimes and markups, a simple regression is estimated by using a dummy variable for the trade regimes. The dummy for regimes ($D_r$) takes the value of 0 for liberal phases (IV) and 1 for the regimes with quantitative restrictions (phases I, II). For the transitional phase III, $D_r$ takes the value of 0.5. In terms of years, $D_r$ takes the value of 0 for 1950-1953, 1960-1963, 1971-1976, 1 for 1954-1958, 1964-1969, 1977-1979 and takes the value of 0.5 for 1959 and 1970.

The simple regression of the markup ($k$) to $D_r$ is as follows:

\[
(B.7) \quad k = 0.267 + 0.036 D_r \\
(36.32) \quad (3.47)
\]

\[
R^2 = 0.3169; \quad D.W. = 1.24; \quad N = 30
\]

The markups under the restrictive regimes are significantly higher than those under a liberal trade regime.

It is possible to explain the observed relation between the foreign trade regimes and the markups in two different ways. The first explanation is the nature of the adjustment process to any disequilibrium. It was pointed out earlier that cost pricing implies the constancy of markups which require the availability of foreign exchange in addition to other stocks of inputs. Adjustments to demand shifts are made by adjusting the level of output. In times of foreign exchange and import restrictions, adjustments to any increase in demand such as an increase in the money supply, will be incomplete. Firms in trying to adjust their outputs, will require additional imported inputs. Lack of these inputs will constrain the firms from adjusting their output to the desired levels. The resulting gap will be met by increases in the
prices. Markups will increase with the demand at times when there is a foreign exchange bottleneck and stay constant when there is sufficient foreign exchange.

This hypothesis implies that output adjustment to aggregate demand such as money supply be smaller under import restrictions. This results was obtained for the non-agricultural sector as a whole in section III. However, for the manufacturing sector a similar equation did not yield significant results. That is, aggregate output equation does not hold for the manufacturing sector. This is due to high rates of import substitution even with foreign exchange shortages. Both in the late 50's and late 60's, which were periods of foreign exchange shortages, the output growth in the manufacturing sector was rapid due to import substitution. Thus we do not observe the relationship between output and foreign exchange in the manufacturing industry that we observe for the non-agricultural sector. 1/

Within this framework, expansion of demand will increase demand both for domestic and imported goods. With fixed exchange rates and import restrictions, unsatisfied import demand will shift to domestic goods. In these periods the demand for domestic goods will be greater than measured by aggregate demand variables. Thus, the excess demand proxies used might be inappropriate.

The second explanation involves the nature of competition and the rents enjoyed under liberal and restrictive trade regimes. In periods of restrictive regimes foreign competition is effectively eliminated. This enables the domestic producers of import substitutes to have greater monopoly

1/ There still is a relationship but the coefficients are not significant. Probably the use of money supply as a proxy for the nominal demand is not appropriate.
power than they would have under a more liberal import regime.

A point closely linked with the monopoly power is the existence of rents under import quotas. People who receive the quotas receive rents that they would not under either tariffs or free trade. As will be explained in the next section, margins on wholesale and retail trade decrease in times of restrictive regimes. It is quite likely that import restrictions change the relative strength of producing and trading sectors. The rents due to quotas are appropriated by the manufacturers at the expense of the trading sector, since they become the sole suppliers. Also import licenses are given to the producers rather than the traders when foreign exchange is scarce. In times of liberalized trade, foreign sources of supply are more available and the traders have a greater choice of suppliers. This reduces the monopoly power of the domestic producers and increases the bargaining power of the traders.

From the evidence, it is possible that the foreign trade regimes change the distribution of income by increasing the markups in the manufacturing sector and decreasing them in the trade sector.

Given that markups vary with foreign exchange availability, in times of liberal trade policies costs cannot be passed on fully. In the following graph, the shares of capital (KS), labor (LS), and intermediate inputs (MS) are given.\(^1\) It is evident from Figure B.4 that labor's share has been almost constant for the whole period. In times of high markups which imply high shares for capital, the share of labor also tends to the higher. Labor costs seem to be passed on as higher prices or that there seems to be little evidence that profits are squeezed due to higher labor costs. Also the share of labor tends to increase when the markups are increased, indicating probably

\(^1\) Capital's share KS is a function of the markup where \(KS = 1/(1+1/k)\).
FIG. 8.4: RELATIVE SHARES OF INPUTS (PRIVATE SECTOR)
both lower productivity growth and higher wage increases. The costs that are not passed on are the raw materials costs. In times of foreign exchange availability increases in raw materials costs cannot be fully passed on as higher prices.

B.2. The Public Sector Behavior

Compared to the private sector, public sector pricing is significantly different. Pricing policies of the public sector are to a large extent determined by the political factors. The general tendency has been to try to keep prices constant in spite of increasing costs. Then at certain intervals, depending on the financial situation of the public sector, prices are increased to cover the previous cost increases. Large fluctuations in nominal output of the public sector given in Figure B.2, are caused by the staggered price increases of the public enterprises.

The staggered price policy of the public sector implies that markups on costs will fluctuate. They will decrease as costs increase and prices are kept constant and will increase with the price increases. Markups for the public sector are given in Figure B.5. Markups increase in 1952 with the price increase, and until 1957 costs increase at faster rates than the price increases. In 1958 and 1959 prices are adjusted partially but the biggest increase comes in 1960 and 1961. Then the same behavior is repeated. Markups decline until 1964 where again prices are kept constant as costs increase. Starting in 1965 and until 1971 markups increase continuously. The behavior of the markups within the period 1965-1971 are quite different than that observed in the pre-1965 period.

The reasons for the change in public sector pricing behavior can be traced to a law that was passed in 1964. Previous to 1964, the pricing
FIG. B.5: MARKUPS IN THE PUBLIC SECTOR

MARKUP

YEAR

0.0 0.2 0.4 0.6 0.8 1.0

50 52 54 56 58 60 62 64 66 68 70 72 74 76 78

1.0 0.8 0.6 0.4 0.2 0.0
policies of SEE's were determined by the law numbered 3460 which stated that prices will be determined by the appropriate ministry with which the particular SEE was associated. The pricing policy of the SEEs were left primarily to the political decisions of the government. Political determination of the prices led to the behavior of staggered price increases observed in Figure B.5. In 1964 law 440 was passed where the political price decisions were eliminated and SEEs were given the power to determine their own prices. However, the same law also gave the right to the council of ministers to set the prices of "basic" goods. Basic goods were not defined in the law 440. Slowly, governments began to extend the definitions of the basic goods. In 1967, by an amendment, most of the goods produced by the public sector were redefined as basic goods. After the devaluation in 1970, in spite of the new law, prices were again determined primarily on a political basis. Thus the pricing behavior of the public sector has been the same except for the period 1964-1971.

Starting in 1971, the markups in the public sector continuously decrease until 1979, in spite of the price increases in this sector. As can be seen in figure B.2 from the growth of nominal output, there are large price increases in 1974, 1977 and 1979. However, these price increases have not been sufficient to counter the cost increases. Thus, unlike the previous periods, staggered price increases have lagged behind the cost increases in the 70's.

If we look at the determinants of the changes in markups given in Fig. B.6, just like in the private sector, labor costs have not been the major cause. At least labor costs have been passed on as higher prices for most of this period. However, in 1974 a change takes place and within the next 5 years, labor's share in output doubles. Labor's share increases from less
than 10 percent of output to about 20 percent. This is not caused by a shift in wage behavior but by employing more workers than necessary for political reasons. However, the major fluctuations in the markups are caused by not passing on the intermediate input price increases.

To sum up, public sector pricing has been dominated by political factors except for the period 1964-1971. Prices have been increased not in response to changes in costs but at politically determined periods. The behavior of the public sector enterprises shows a change in the mid 70's where even the large price increases have been unable to increase their profitability. Along with declining profits, unit labor costs (labor's share) have significantly increased for the first time since 1950. Therefore, it is possible to argue that post 1970 developments in the public sector indicate greater cost increases, especially labor costs and lower price increases.

The net result of our investigation is that, in the Turkish private manufacturing industry, prices are determined mainly by costs, and the variations in the markups are a function of the foreign exchange regimes. In times of restrictive trade regimes in which quantitative restrictions are placed on imports, markups on variable costs have been higher. When the quantitative restrictions are eased and trade is liberalized, markups tend to be lower, indicating that cost increases are not fully passed on as higher prices.

In the public manufacturing industry, prices have been politically determined for the 1950-1979 period except for the years 1965-1971. In these years price making decisions were given to the enterprises. Also there is a marked decline in the markups of the public sector throughout the 1970's. After 1975 markups decline to their lowest levels and reach their minimum value in 1979. This indicates a definitive shift in the behavior of the
FIG. B.6: RELATIVE SHARES OF INPUTS (PUBLIC SECTOR)
public sector in the last five years.

C. Trade Margins

Data for the margins in the wholesale and retail trade are not directly available, but a reasonable approximation can be made. From the national income statistics, value added in the trade sector is available. This value added is the difference between the buying and selling price of the goods multiplied by the quantity of the goods. The quantity of goods that are tradable are given by the outputs of the producing sectors of the economy. Since there is no trading on government services, they should be excluded from this output. If we take the sum of sectoral gross national product excluding the government and indirect taxes it will give us a proxy for the volume of goods that can be traded. If we divide value added in the trade sector by this sum of the sectoral outputs, we should approximate the gross margins (TM) for the trade sector.

Trade margins defined this way have one shortcoming that arises from the imputed outputs in GNP. Not all produced goods are traded. Some production especially in agriculture is for self-consumption. As the degree of monetization increases, the proportion of output that is traded also increases. This increase will be reflected in the trade margins that are estimated in the manner described above. There will be a secular increase in the measured trade margins with the decrease in self-consumption and the increasing monetization of the economy.

If we look at the measured trade margins, they increase secularly from .079 in 1950 to .165 in 1979. Furthermore, this increase is almost continuous, implying that the traded part of income has increased continuously within this period. Assuming monetization expands at a constant pace, this
secular movement can be expressed as a linear function of the time trend. If we estimate this relationship we get the following equation.

(B.8) \[ TM = 0.070 + 0.003 \, T \]
\[ (43.09) \ (32.70) \]
\[ R^2 = 0.9745; \ \text{D.W.} = 0.79 \]

From equation (B.8) it is evident that there is a constant growth of the estimated trade margins of .3 percent per year. In addition to this secular increase, there is also a cyclical movement as indicated by the very low Durbin Watson statistic. When the residuals of equation B.8 are analyzed, a clear pattern emerges. The residuals are related to the foreign exchange regimes that have been analyzed in the last section. When liberal import policies are in effect, residuals are positive indicating that in those periods trade margins are higher than predicted by the trend. When quantity restrictions are placed on the imports, the residuals are negative. That is, when imports are restricted, trade margins decrease, and when imports are liberalized, trade margins increase. To test the impact of trade regimes, equation (B.8) is re-estimated with the dummy variable for the trade regimes \( D_r \). \( D_r \) takes the value of 0 for periods of liberal regimes (Phase IV), 1 for regimes with quantitative restrictions (Phases I and II) and 0.5 for transitory regimes (Phase III).

(B.9) \[ TM = 0.081 + 0.003 \, T - 0.005 \, D_r \]
\[ (41.04) \ (36.83) \ (3.34) \]
\[ R^2 = 0.9822; \ \text{D.W.} = 1.46 \]

The coefficient of \( D_r \) is negative and highly significant. Trade
regimes have a significant impact on the margins in the trade sector. Inclusion of $D_r$ also increases the Durbin-Watson statistic considerably.

When this result is considered together with the behavior of the markups in private manufacturing, a clearer picture of the impact of alternative foreign trade regimes emerges. As pointed out in the last section, industrialists increase their markups when imports are subject to quantity restrictions. The opposite happens to the margins in the trade sector.

The trade regime changes the distribution of the monopoly power between the traders and the producers. When imports are liberalized, although there are restrictions on imports of domestically produced goods, their substitutes can usually be imported. This gives the traders alternative sources of supply and gives them the possibility of buying from the foreign producers with lower prices. However, when quantitative restrictions are placed, priority in granting import licenses is given to the producers. Furthermore, since foreign exchange is limited, substitutes for domestically produced goods are not given import licenses. Traders no longer have alternative supply sources but have to buy from the domestic producers. This increases the bargaining power of the domestic producers and reduces the power of the traders. With restrictive trade regimes, manufacturers can increase their markups at the expense of the trade sector. The opposite happens when the imports are liberalized. It should be noted however, that this explanation is one of the many that can be advanced. The data on trade margins are too crude for more definitive explanations. Furthermore, one can easily argue that the monetization was mostly completed by 1970, which implies that the trend might be measuring other influences. Therefore, the conclusions should be interpreted only as reasonable hypotheses.
Annex C

Data

Data for this study comes from the following sources.

a) Data for the deflators and GDP series are from State Institute of Statistics, National Income series.

b) Expected inflation is based on Istanbul Consumer Price series collected by the Chambers of Commerce and Published in the SIS monthly bulletins.

c) Data on money supply and Central Bank credits are from the Monthly Bulletin of the Central Bank.

d) Data on manufacturing industry wages, output and markups are from yearly manufacturing surveys published by the SIS.

e) Import price index is from World Bank sources up to 1968 and from SIS 1968 to 1979. Import tax rate is the ratio of import taxes from GNP accounts divided by the value of imports in T.L. from the SIS monthly bulletin.

f) World agricultural prices are U.S. Producers price index for farm products given in the Economic Report of the President, 1981. Exchange rate for agricultural exports is from Krueger (1974) for 1953-71. For 1972-79 period unpublished data from SPO is used. For 1950-52 period, the existing exchange rate of 2.80 to the dollar is used.
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