Vassar College Economics Working Paper # 10

system of equations to a pair of equations in $\hat{P}_A$ and $\hat{P}_N$ which describe two loci of price combinations that clear the agricultural and non-agricultural markets. Consider first the non-agricultural market equilibrium. Equations (3) and (4) together yield:

$$\hat{P}_N = \frac{1}{1-b_2c_1}(b_1c_1\hat{P}_A + b_3c_1\hat{I} + b_4c_1\hat{\bar{X}}_A + b_5c_1\hat{M} + c_2\hat{W} + c_3\hat{P}_R). \tag{5}$$

When agricultural price inflation rises, non-agricultural sector inflation must also rise in order to keep the N-market in equilibrium (provided that the price elasticity of supply in this sector is greater than zero). This relationship is illustrated in Figure 1 by the NN schedule. The slope of the NN line is equal to $\frac{1-b_2c_1}{b_1c_1} > 0$. Points lying to the right of the of the schedule depict excess demand for the N-good whereas points to the right depict excess supply. Increases input costs cause the NN line to shift to the right. Provided that $c_1 > 0$, an increase in real agricultural output, investment, or money stock creates excess demand for the N-good, and also shift of the NN line to the right.

Turning to the agricultural sector, solving equations (3) and (4) for $\hat{X}_N$ and substituting this into (2), and by further substitution from (1), we obtain the combinations of $\hat{P}_N$ and $\hat{P}_A$ which clear the agricultural market:

$$\begin{aligned}\hat{P}_A = \frac{1}{a_1(1-b_2c_1)+a_4b_1}[&-a_2(1-b_2c_1)\hat{P}_N + (1-b_2c_1-a_4b_4)\hat{\bar{X}}_A - a_3(1-b_2c_1)\hat{P}_A^* - a_3b_4\hat{I} \\ &- (a_5(1-b_2c_1)+a_4b_5)\hat{M} - a_4b_2(c_2\hat{W}+c_3\hat{P}_R)].\end{aligned} \tag{6}$$

In figure 1, A-sector equilibrium is depicted by the AA line. An increase in P_N creates excess demand for A-good, which is eliminated by an increase of the price of A-good.[13] Excess demand for and excess supply of the A-good are represented by the points lying below and above the AA schedule, respectively. Increases in world agricultural price, investment demand, or money stock cause the AA line to shift to the north, and increases in N-sector input costs cause it to shift to the south. The effect of a change in agricultural output is, however, ambiguous.

Static local stability requires AA line to intersect the NN from above. Following the Keynesian-structuralist approach, we assume that agricultural price and non-agricultural output respond to excess demand in the respective markets. The Jacobian matrix of the excess demand functions is:

[13] We demonstrate below that the slope of the AA line is positive when the local stability condition is satisfied.

$$J = \begin{pmatrix} a_1 & a_2c_1 + a_4 \\ b_1 & -(1 - b_2c_1) \end{pmatrix}$$

Since a_1 and b_2 are both negative and c_1 in non-negative, the trace condition for local stability is satisfied. Secondly, the determinant of the Jacobian matrix, $-a_1(1 - b_2c_1) - a_2b_1c_1 - a_4b_1$, must be greater than zero for stability. It is easier to interpret the determinant condition once it is rewritten as:

$$\frac{1 - b_2c_1}{b_1c_1} > -\frac{a_2(1 - b_2c_1)}{a_1(1 - b_2c_1) + a_4b_1}$$

The left hand side of this inequality is the slope of the NN curve and the right hand side is the slope of the AA curve. Thus, local stability requires the AA line to intersect the NN curve from above.

More light is shed on the shapes of the AA and the NN schedules by the following limits:

$$\lim_{c_1 \to 0} \left.\frac{dP_A}{dP_N}\right|_{NN} = \infty \qquad \lim_{c_1 \to \infty} \left.\frac{dP_A}{dP_N}\right|_{NN} = -\frac{b_2}{b_1} > 1.$$

As c_1 approaches to zero approximating the case of fixed mark-up, N-good price is exclusively determined by wage and imported input prices and the NN line becomes vertical. The slope of the AA line is determined, among other factors, by the price elasticity of N-sector supply. Again we calculate the following limits:

$$\lim_{c_1 \to 0} \left.\frac{dP_A}{dP_N}\right|_{AA} = -\frac{a_2}{a_1 + a_4b_1} > 0 \qquad \lim_{c_1 \to \infty} \left.\frac{dP_A}{dP_N}\right|_{AA} = -\frac{a_2}{a_1} < 1.$$

The determinant condition of local stability implies that when $c_1 = 0$, $a_1 + a_4b_1 < 0$. These limits demonstrate that the slope of the AA line varies directly with price responsiveness of N-sector supply, but it is always less than that of the NN line.

I.3. Intersectoral Terms of Trade: Comparative Statics

Using Figure 1 we analyze in this section graphically the impact of changes in agricultural output growth, input costs, investment demand money stock and world agricultural prices on the domestic terms of trade.[14] In figure 1, the 45-degree line indicate identical A- and N-good inflation rates and, hence, constant domestic terms of trade. At any point

[14] Algebraic statement of the comparative statics is presented in the appendix.

below this line non-agricultural inflation exceeds the agricultural and the terms of trade change in favor of the N-sector. Conversely, points above the 45-degree line indicate terms of trade moving in favor of the A-sector.

Suppose that the AA and NN lines intersect initially at point E, where we have constant terms of trade. First, consider the impact of an increase in world agricultural inflation, $\hat{P}_A^*$. The impact is illustrated in Figure 2. The AA schedule will shift up to $A'A'$, creating excess demand in the A-market. Consequently, both $\hat{P}_A$ and $\hat{P}_N$ rise, shifting the equilibrium to point F, where A-sector inflation is higher than that of the N-sector. Thus, terms of trade turn against N-sector. Changes in input prices, on the other hand, influence terms of trade in the opposite direction. An increase in wage or intermediate import cost inflation shifts both the NN and the AA lines to the right. New equilibrium is established at G, the intersection of the $A''A''$ and $N''N''$ lines in Figure 2. In comparison with point E, the terms of trade are now in favor of N-sector.

Thirdly, consider a decline in A-sector output growth. This change shift the NN line to the left $N'N'$, but its impact on the AA line is ambiguous. If income elasticities of demand are sufficiently low (precisely, if $1 - b_2c_1 > a_4b_4$), then the AA line shifts to the right and the terms of trade rise. New equilibrium is denoted in Figure 2 as point H. Note, however, that the above condition is sufficient but not necessary. The necessary condition is that the excess demand for the A-good created by the decline an $\hat{\bar{X}}_A$ should not be compensated more than fully by the decline in demand originating from the N-sector.[15]

Next, consider the impact of an increase in rate change of money stock growth which creates excess demand in both sectors. In this case the AA schedule shifts to the left and the NN to the right. The direction of change in the terms of trade is indeterminate. As shown in the appendix, the outcome depends on relative elasticities of demand for each sector's product with respect to money stock, A-good price, N-good price and the elasticity of N-sector supply with respect to own price. Here, for illustrative purposes, we consider the special case of fixed mark-up, a favorite of structuralists. When $c_1 = 0$, as shown in figure 3, the NN schedule is vertical. N-sector price is determined exclusively by cost factors. An increase in money stock does not affect the NN line since output adjustment eliminates excess demand in this sector. As the AA line shifts to the left, the terms of trade change unambiguously in favor of A-sector. The new equilibrium on Figure 3 is at point G, the

[15] See the appendix for the algebraic exposition.

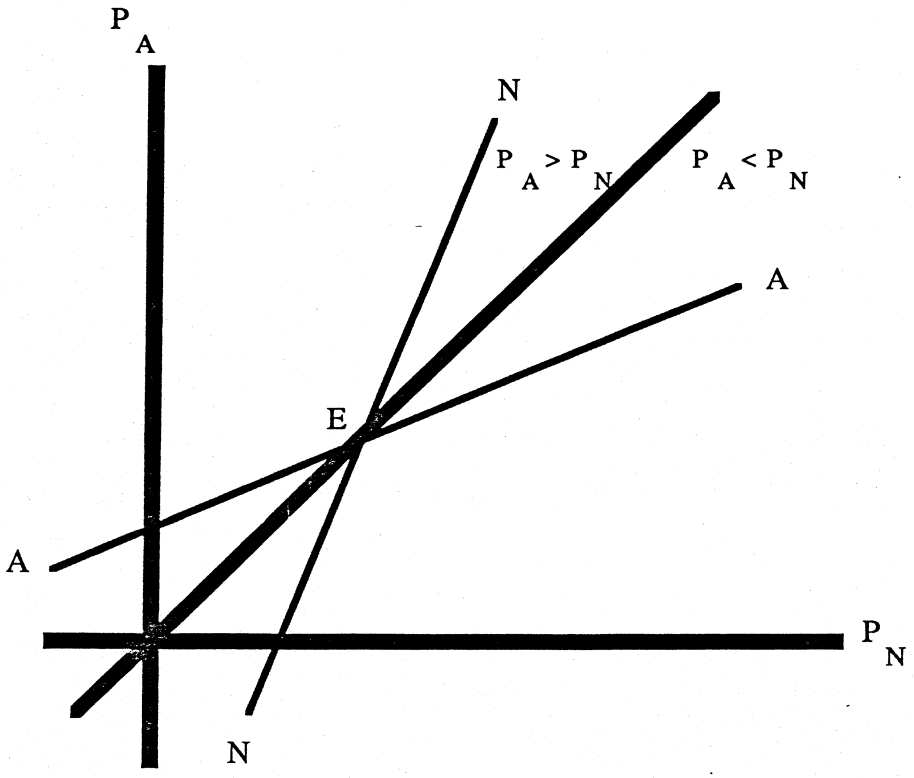


Figure 1

Along the 45-degree line sectoral inflation rates are equal and terms of trade are constant. At point E both markets are in equilibrium. Points lying to the right of the 45-degree line indicate terms of trade turning in favor of N-sector, and to the left, in favor of A-sector.

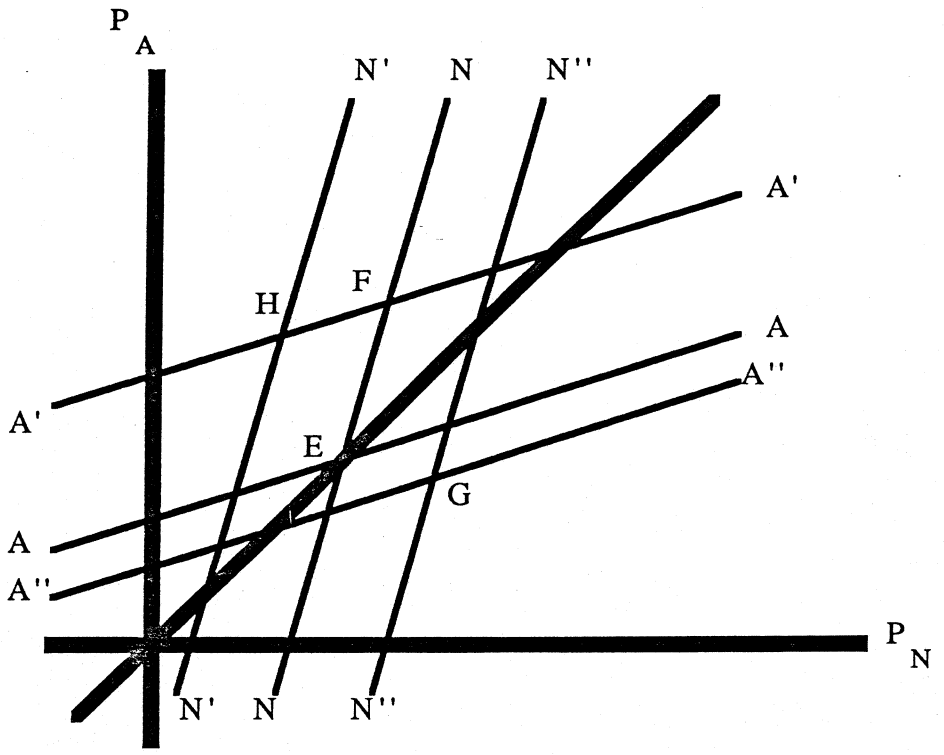


Figure 2

The economy is initially at equilibrium point E, where sectoral inflation rates are equal and terms of trade is constant.

Comparative statics:
(i) A increase in the rate of A-good world price inflation; NN line is not affected but AA line shifts to A'A', and equilibrium is reestablished at point F. Terms of trade change against N-sector.

(ii) An increase in wage or intermediate import inflation: AA and NN lines shift to A"A" and N"N". The new equilibrium is at point G, where N-sector inflation is higher than that of the A-sector; terms of trade change in favor of N-sector.

(iii) a decline in agricultural output growth: NN schedule shifts to N'N' and AA schedule shifts to A'A' (provided that the condition mentioned in the text is met). New equilibrium point is H, where terms of trade shift against N-sector.

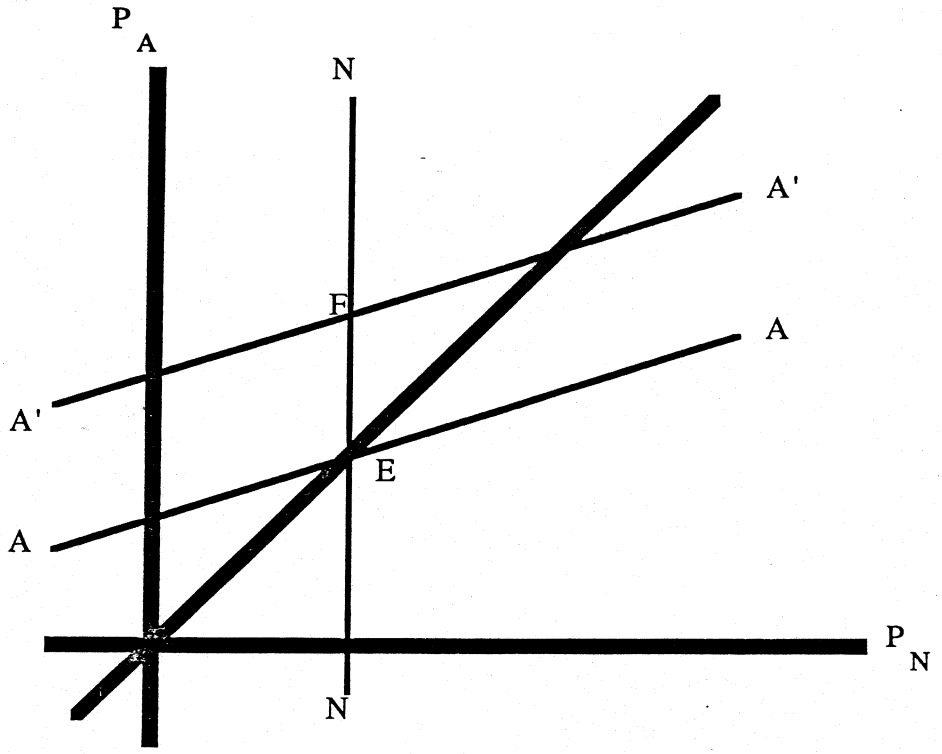


Figure 3

With fixed mark-up the NN line is vertical. In this case, an increase in nominal money stock growth of leaves the NN schedule unchanged but shift the AA line to the left. At the new equilibrium point F, N-sector inflation exceeds the A-sector inflation and terms of trade move against N-sector.

intersection of NN and $A'A'$ schedules.[16]

I.4. Some Extensions

In the preceding analysis we have ignored two issues which have been of considerable interest to macroeconomists: the effects of income redistribution, and supply-side effects of monetary growth on prices. We now relax two assumptions of the model and discuss briefly some of the implications.

How do comparative static results of a wage increase change when propensities to consume out of wage and profit incomes are different? In investigating the implications for our model, the most convenient strategy is to split the question into two. First, suppose that the propensity to consume out of wage income is greater than that out of profit income, but that the relative shares of A- and N-goods in each consumption bundle are identical. In this case, *ceteris paribus*, an increase in wage rate creates a demand-pull effect in the N-good market in addition to the cost-push effect discussed earlier. Increasing demand for N-goods exacerbate the price increase in this sector and, at least partially, offset the supply-side output decline. Consequently, there is a smaller decline in the demand for A-good. Graphically, rising wage-profit ratio strengthens the rightward shift of NN schedule but weakens the rightward shift of the AA schedule. Although the mechanics are more complicated, the comparative statics result does not change. An increase in wage rate still leads to lower terms of trade. Secondly, suppose that on the margin workers allocate more of their incomes to A-good in comparison to the profit recipients. Income redistribution from profits to wages now lowers the magnitude of the rightward shift the NN line and furthermore cause the AA line to shift to the left which makes possible the deterioration of terms of trade against the N-sector. Thus, the terms of trade may now move in either direction.

Next, consider the supply-side effects of a decline in money stock. Lower money supply makes it more expensive for firms to finance working capital and impose cost-push pressures on the N-sector (Cavallo, 1981). Working capital effect, therefore, offsets the demand side effect of monetary contraction on N-good price, exert inflationary pressures in this sector, and makes it more likely for the terms of trade to change in favor of the N-sector.

[16] The analysis of the impact of a change in investment is similar since, again, in both sectors excess demand is created.

II. AN APPLICATION: DOMESTIC TERMS OF TRADE IN TURKEY

In this section we apply the model developed above to the case of Turkey. The discussion is organized as follows. We first provide a background by describing the behavior of the terms of trade and related macro variables for Turkey,[17] and briefly summarize the existing interpretations of the Turkish experience. The results of econometric testing are reported and discussed in section II.2.

II.1. The Data and Some Interpretations

According to the World Bank classification, Turkey is a middle-income, oil-importing, developing country. Although agriculture was once the mainstay of the economy, its relative importance has gradually declined. Between 1950 and 1980, agricultural and non-agricultural real output grew at the average rates of 2.8 and 6.6 percent (see Table 1), respectively, and the share of agricultural output declined steadily, from 45 percent of the gross domestic product down to 24 percent. The share of non-agricultural employment did not rise in tandem, however. A disproportionately high percentage of the labor force is still employed in the agricultural sector. Despite improved schemes of irrigation, fertilization and mechanization since 1950s, the rate of growth of agricultural output has been quite erratic reflecting its dependence on weather conditions.[18] Non-agricultural output, on the other hand, behaved in a much more predictable manner. It experienced three growth cycles between 1950 and 1980, each one lasting for approximately a decade and each one slowing down (end of 1960s) or coming to a halt (ends of 1950s and 1970s) with a foreign exchange crisis. During this period, inflation was a recurrent problem for Turkey. Turkey underwent two inflationary episodes between 1950 and 1986. The first one started in 1955 and lasted until 1959. The second inflationary bout dwarfs the first in magnitude as well as duration. The inflation rate started rising again after 1970, reached its peak of 104 percent in 1980, and fluctuated between 30 and 50 percent afterwards. Except for a temporary decline in 1976–1977, the rate of inflation remained above 25 percent throughout the post-1970 period. In comparison, the years of 1950–1954 and 1960–1970 were periods of price tranquility.

The terms of trade were relatively stable during the years of 1950–1956 and 1960–1972

[17] Data sources are described at the end of the paper.

[18] See appendix B for the time series of the economic indicators discussed in this section.

(excluding 1954, which was a year of a severe drought and more than 10 percent decline in agricultural production), which overlap, by and large, with periods of price stability.[19] Between 1950 and 1956, rate of change of terms of trade fluctuated within a 7 percent band and between 1960 and 1970 within a 5 percent band. When inflation escalated during 1957–1959, however, terms of trade were volatile, exhibiting a sharp increase and then a decline. A similar sequence is also observed in 1970s: in 1973, terms of trade turned in favor of agriculture, and remained so until 1976, and then started declining. Between 1979 and 1984, they moved in favor of the non-agricultural sector, albeit with wide fluctuations. Thus, we observe a coincidence of stable terms of trade and low rate of inflation. During inflationary periods, on the other hand, the terms of trade seem to follow an inverted 'U' pattern. In the first half of the inflationary period they changed dramatically in favor of the agricultural sector, and subsequently, in the second half, declined precipitously against this sector.

Turning to the other determinants of the terms of trade, until 1970 terms of trade and agricultural output growth rates moved together, but after 1970, they were inversely related. Similarly, terms of trade and money stock growth rates moved together until 1973 and in opposite directions afterwards. A more uniform relationship is observed between the rates of change of terms of trade and wage rate. There exists a significant inverse relationship between wage and terms of trade throughout the period. Finally, world prices of imported inputs and agricultural goods have noticeable independent effects on the terms of trade. Terms of trade were depressed during devaluations and immediately following periods. Apart from such episodes, however, they varied directly with the world agricultural price and inversely with imported price.

There have been relatively few attempts to explain the determinants of intersectoral prices in Turkey. Most of the available interpretations emphasized the role of political factors because the government has intervened extensively into the agricultural prices via support policies. These policies were first implemented in the 1930s with the governments decision to fix the price and guarantee the purchase of wheat, the basic staple crop in Turkey. Gradually, the price supports were extended to other crops, including other cereals,

[19] The terms of trade are calculated using the implicit GNP deflators. This method has come under criticism because does not distinguish between intersectorally traded and non-traded commodities. Yet it is appropriate for the purposes of this paper because our objective is to analyze the behavior of relative prices, not the change in purchasing power or welfare of income groups. For a discussion of these methodological issues, see Kumar (1989, pp. 28–31).

rice, opium, sugar beets, cotton and tobacco. Although the stated reasons for the price support policies were economic, mainly to stabilize the price and income levels and to change income distribution,[20] it is often claimed that political considerations arising from the electoral power of peasantry dominate the economic. Much of the evidence presented is, however, anecdotal. Dervişand Robinson (1978) attribute the improvement of terms of trade in favor of agriculture after 1968 to the political maneuvers of the ruling Justice Party. Varlier (1978) argues that agricultural prices increase faster in election years or years immediately preceding them. Ergüder (1980) tests econometrically the hypothesis that the real prices of wheat and tobacco rise in election years and finds supporting evidence only for tobacco.

The most comprehensive analysis of the terms of trade in which economic factors play a more important role is provided by Aksoy (1980, pp. 38–43). Aksoy applies a Harberger-type monetarist inflation model (Harberger, 1963) augmented by a new-classical output determination equation to the agricultural and non-agricultural sectors separately. His econometric results indicate that the impact of nominal money growth on the agricultural sector price is twice as high as that on the non-agricultural sector price. He concludes that a monetary shock causes the terms of trade to turn in favor of agriculture initially, but as inflationary expectations catch up in the N-sector, the increase in N-sector inflation reverses the upward trend in the terms of trade. The impact of expected rate of inflation rises during period of foreign exchange bottlenecks. In addition, he finds significant positive relationship between international and domestic agricultural inflation rates, and imported input inflation and non-agricultural inflation. We compare the results of our estimations with Aksoy's in the following section.

II.2. Estimation

In this section we estimate the impact of nominal wage, import prices, agricultural production, and monetary disequilibrium on the terms of trade in Turkey. The model presented above is modified in several directions in its application to the Turkish case. First, we add one-period lagged values of nominal wages and imports costs to capture the dynamics of price adjustment in the N-sector. Lagged value of money stock is also appended to the equation in order to capture stock adjustment process.

[20] For an survey of price support policies in Turkey see Somel (1979).

Secondly, we relax the assumption that demand for money is solely a function of real income, and add the expected rate of economy-wide inflation ($\hat{P}^e$), which measures the cost of holding money, as an explanatory variable to money demand function. An increase in the expected rate of inflation creates excess supply of money, similar to an increase in money stock. This implies that both the agricultural and non-agricultural inflation rates are positive functions of the *change* in expected rate of inflation ($\Delta\hat{P}^e$). The net impact on the terms of trade is ambiguous, although, as discussed before, the less responsive is the N-good supply to N-sector price, and the more likely it is that the terms of trade will rise with a positive change in the expected rate of inflation.

Three dummy variables are introduced to capture some peculiarities of Turkish economy. The first pertains to foreign exchange bottlenecks which were frequently encountered in Turkey. The government has consistently increased import restrictions during these crisis episodes. It has often been argued that increased protectionism from international competition makes larger mark-ups possible for the domestic producers (Aksoy, 1982, p. 91; Çağatay, 1984). Thus, we may expect an upward pressure on non-agricultural sector price during such periods. Observers of Turkish economy identify 1956–1959, 1965–1969 and 1977–1979 as the periods of foreign exchange crisis (Krueger, 1974; Aksoy 1982). In order to gauge the effect of foreign exchange shortages on the domestic terms of trade, we introduce the dummy variable D_F to the regression equation, which assumes the value of one during these periods and zero otherwise. If non-agricultural sector price increases disproportionately during these periods, then, the sign of the regression coefficient of this variable is expected to be negative. Since this method cannot measure the intensity of these crises, however, it should be taken only as a first approximation.

The second and the third dummies are proxies for the direct interventions of government into pricing. The second dummy stands for the impact of stabilization measures, implemented under the auspices of IMF and World Bank, on the terms of trade. These austerity programs may influence the terms of trade through two additional channels not captured by the explanatory variables of our model. The main target of these measures has been the budget deficit, the alleged source of inflationary pressures. Budget deficit, in turn, was attributed primarily to the high agricultural support prices and the operating deficits of the State Economic Enterprises. Consequently, lower agricultural support prices and the removal of price ceilings on the products of manufacturing sector public enterprises

have invariably been two of the essential components of the stabilization packages. During periods of stabilization, then, we expect a downward pressure on the terms of trade. Dummy D_S takes the value of one in periods of stabilization 1959, 1977–1982 and zero otherwise.

Third, we test the hypothesis of political determination of terms of trade by introducing a dummy variable D_E which takes the value of one in the years of parliamentary election and the year prior to election (excluding the years of military rule).[21] In light of the discussion of section II.2., its regression coefficient is expected to be positive.

The complete regression equation estimated in this paper is:

$$\begin{aligned}\hat{P}_A - \hat{P}_N = {} & \beta_0 + \beta_1 \hat{X}_A + \beta_2 \hat{P}_A^* + \beta_3 \widehat{\Delta X}_{-1} + \beta_4 \hat{M} + \beta_5 \hat{M}_{-1} + \beta_6 \Delta \hat{P}^e + \beta_7 \hat{W} + \beta_8 \hat{W}_{-1} \\ & + \beta_9 \hat{P}_R + \beta_{10} \hat{P}_{R_{-1}} + \beta_{11} D_F + \beta_{12} D_S + \beta_{13} D_E + \epsilon,\end{aligned} \tag{7}$$

where ϵ is the error term and the subscript -1 indicates one-period lag. Based on the acceleration hypothesis, investment spending is assumed to be a function of one-period lagged change in aggregate real output, ΔX_{-1}. In estimating equation (7) money stock, nominal wage and intermediate import price are taken as exogenous variables.

The available data cover the 1950–1985 period. A case may be made for excluding the post-1980 period from the sample, however, because 1980 is a turning point for Turkish economy. After this date, following the implementation of a set of stabilization policies, a major restructuring of the economy was attempted, the components of which included contraction of the domestic demand, reorientation of the economy towards export markets, and gradual liberalization of import regime and financial markets. These policies may have changed the values of underlying parameters of the economy. Due to the lack of sufficient observation points for the post-1980 period we are unable to perform a full structural stability test on all parameters. In order to err on the conservative side, we limit much of our estimation and discussion to the 1950–1980 period. As an initial step in gauging the effect of the 1980s transformation, however, we also estimate a version of (7) which includes an intercept dummy for the years 1980–1985 (D_L) over the 1950–1985 period and compare it with the estimates obtained for the shorter sample period.

The result of estimation for the 1953–1980 period are reported in columns (1) to (5) of Table 2. We first run the regression without the dummy variables and report the estimates

[21] These years are 1953, 1954, 1956, 1957, 1961, 1964, 1965, 1968, 1969, 1973, 1976, 1977 and 1983.

in column (1). In columns (2), (3) and (4), the import bottleneck, stabilization, and election dummies are introduced sequentially. Overall regression results are satisfactory. The adjusted coefficients of determination suggest that 75 percent of the variation of the rate of change of terms of trade can be explained by "macroeconomic" factors, including the foreign exchange and stabilization dummies. Stability of estimates also attests to the robustness of the specification of the regression equation.

One of the prominent features of the estimates is the strong negative influence of lagged wage inflation and the current intermediate import inflation on the rate of change of terms of trade. Elasticity estimate of import price variable is very stable, ranging in the from –0.2 to –0.3. Estimated elasticity of wage inflation is slightly more variable ranging between –0.5 and –0.8. A valid question may be raised regarding the consistency of the estimated coefficient of contemporaneous wage rate. We may anticipate positive covariance of contemporaneous nominal wage and the error term ϵ in (7) because of the inflationary consequence of an increase in terms of trade. For any given rate of N-sector inflation, an increase in terms of trade raises the overall rate of inflation.[22] In order to gauge the importance of this simultaneity bias we estimated equation (7) with instrumental variables method where we used expected rate of inflation and one period lagged excess demand (defined as deviations from logarithmic trend real output growth) as instruments for current wage inflation. These estimations indicate that the results reported in Table 2 are free from significant simultaneity bias introduced by the current wage rate.[23]

There also exists a significant link between international agricultural price and the terms of trade. An increase in international price puts upward pressure on agricultural price and changes domestic terms of trade in favor of agriculture. Estimated elasticity is 0.25, which is very close to Aksoy's findings (although he used domestic agricultural inflation as the dependent variable). These results indicate that, in spite of the government interventions, domestic agricultural price is not fully isolated from the international. The latter has a limited but significant effect on domestic agricultural prices. At this juncture, we can also discuss the impact of devaluations of domestic currency on the terms of trade. Major devaluations of the Turkish Lira took place in 1958, 1970 and 1980, which are

[22] This argument strictly follows the Latin American structuralist theory of inflation (Cardoso, 1981).

[23] Instrumental variable regressions are not reported here. They are available from the author upon request.

manifested by the spikes in the the time series of world agricultural price and import price in Appendix B, figures B2 and B3. According to our formulation, devaluation affects domestic terms of trade through two channels. First, it makes agricultural exports more competitive in the world market and raises domestic agricultural price. Secondly, it raises import price and creates cost-push effect on non-agricultural sector.[24] The impact on the terms of trade would depend on the relative strengths of these opposing forces. According to the estimation results, the sum of the coefficients of $\hat{P}_A^*$ and $\hat{P}_R$ is approximately zero, which suggests that the terms of trade are not influenced by devaluations.

Estimated coefficients of the dummy variables have the expected signs. In column (3) we first add import bottleneck dummy and find that terms of trade indeed decrease during foreign exchange bottleneck periods. This finding supports the contention that non-agricultural sector producers raise the mark-up during periods of foreign exchange crises. Similarly, columns (3) and (4) indicate that the terms of trade turn in favor of N-sector during stabilization periods. Note that the addition of this dummy lowers the values of coefficients of wage inflation and monetary growth. This is not surprising given the fact that stabilization measures included wage repression and monetary contraction. Stabilization dummy partially captures these effects as well. Still, it raises the explanatory power of the regression, as measured by the adjusted coefficient of determination, by 10 percent. The election dummy, however, turns out to be statistically insignificant. Note that this result does not necessarily mean that the incumbent party did not manipulate agricultural support prices in order to accommodate the rural electorate. Even if this were the case, it seems that politically motivated increases in agricultural prices did not help improving terms of trade in favor of agriculture, as N-sector prices readily followed suit. One such mechanism, although not explored in this paper, may be that wage demands increase with agricultural prices, which, in turn, raise the N-good price.

Both the current and one-period lagged money stock affect the terms of trade growth but in opposite directions. Estimated elasticities are approximately –0.5 and 1.0 for the current and the lagged changes, respectively. The negative contemporaneous impact of money supply seemingly contradicts the predictions of models based on fix-price non-agricultural and flex-price non-agricultural sectors. It is also not consistent with the studies of Turkish

[24] To the extent that non-agricultural good is tradable in the world market, a third channel of demand-push inflation in the non-agricultural sector would also be relevant. This effect would reinforce the cost-push effect.

inflation which link money supply growth to rising agricultural prices (e.g. Aksoy, 1982). This discrepancy disappears in the longer-run, however. Over two-years, rising monetary growth causes the terms of trade to change in favor of the agricultural sector. The long-run elasticity estimates reported in columns (2) to (3) range from 0.5 to 1.0. This result indicates that changes in nominal demand have a greater impact on the agricultural sector price than they do on the non-agricultural. This result is supportive of the basic structuralist hypothesis that A-sector price and N-sector output are more responsive to nominal demand shocks than their counterparts. It also follows that a monetary contraction, a major component of standard stabilization packages, is likely to create a significant adverse output effect in the non-agricultural sector.

In our model, asymmetric market structures of agricultural and non-agricultural sectors underlie the differential responses of prices and outputs to the monetary shock. An alternative interpretation of the effects of change in money stock on relative prices is provided by new-classical macroeconomics according to which real output changes with unanticipated changes in money supply but is invariant to anticipated changes (Lucas, 1972; Barro, 1977, 1980).[25] An offshoot of this literature investigates, theoretically and empirically, the implications of new-classical hypothesis for relative prices.[26] These models predict that if sectoral supply and demand elasticities are different across the sectors, unanticipated monetary shocks lead to higher variability of relative prices due to differential output responses. In the context of this paper, new-classical hypothesis implies that terms of trade would turn against the sector which exhibits a greater output response to this disturbance. Anticipated changes in money supply, on the other hand, leave the output levels and the relative price unchanged. Although it is not stated in exactly these terms, this is the gist of Aksoy's (1982) explanation the relationship between the terms of trade and money stock in Turkey. He argues that an unexpected monetary shock raises output in the N-sector and price in the A-sector contemporaneously, and therefore turns terms of trade in favor of agriculture. But in the longer run, as inflationary expectations in the N-sector catch up, and the initial shift of terms of trade is reversed (and N-sector output turns to its, presumably, 'natural' rate).

[25] This hypothesis has been tested for Turkey by various authors and the evidence is mixed (Aksoy, 1982; Uygur, 1983; Abaan, 1987).

[26] For an overview of this literature, see Cukierman (1983).

Our approach does not preclude the new-classical invariance hypothesis. We test new-classical hypothesis separating the anticipated and unanticipated components of money stock growth using these as independent variables in the regression equation. We measure the anticipated and unanticipated money stock growth by predictions ($\hat{M}^e$) and residuals ($\hat{M} - \hat{M}^e$) of third-order autoregression of rate of change of money stock.[27] Estimation results are reported in column 5 of Table 2. These results do not support the new-classical hypothesis and are not in conformity with Aksoy's conclusions. First, unexpected changes in money stock indeed affect the terms of trade, but in contrast to Aksoy's argument this effect is negative. Secondly, and more importantly, anticipated changes in money stock have a stronger and statistically more significant impact on terms of trade than the unexpected monetary shocks. Thus, the effect of money on the terms of trade seems to be attributable to structural differences and rigidities rather than misperceptions of the public.[28] This final regression, however, sheds some new light to our earlier findings. If the lagged money supply variable of columns (1) to (4) may be interpreted as a proxy for expected changes in the rate of growth of money stock, then the observed dynamics of the response of terms of trade to monetary changes may be explained by the backward-looking expectations formation.

Estimation results with the expanded sample period is reported in column (6) of Table 2. Inclusion of the post-1980 period indeed lowers the explanatory power of the regression. The coefficient of 1980s dummy is negative and statistically significant, indicating an accentuated deterioration of terms of trade in this period relative to the pre-1980 era. Comparison of columns (4) and (6) show major differences in the estimated coefficients of the lagged wage and import price inflation, current money stock growth, change in the expected rate of inflation. Although other estimates indicate higher stability, we take believe that these differences warrant rigorous testing of structural change as more data become available.

[27] Expectations formed as such are called "partly-rational" because the predictions are unbiased but agents do not make use of the full information sets. McCallum (1976) shows that this method leads to consistent if somewhat inefficient estimators.

[28] The difference between our model and Aksoy's stems mainly from the specification of sectoral supply functions, which reflected in the reduced form equations as well. It should also be noted that we estimate the reduced form equation for terms of trade whereas Aksoy estimated sectoral inflation equations separately. Another difference is that Aksoy uses adaptive expectations hypothesis in generating expected inflation series.

III. CONCLUSION

Given the extensive direct intervention of the governments into the agricultural pricing process, it is probably not surprising that many researchers attempted to explain the movements of the intersectoral relative price in terms of the political power of landlords or peasants. This approach ignores that fact that the behavior of terms of trade reflects the movements of both agricultural and non-agricultural prices which, in turn, are influenced by a multitude of factors. One cannot conclude much about the terms of trade from a politically motivated increase in agricultural prices without information on the pricing mechanisms in the rest of the economy. Furthermore, it is misleading to concentrate on the agricultural sector as the driving force of the terms of trade. As suggested by Kumar (1989) for the Indian case, industrial sector may be the primary sources of changes in terms of trade.

In this paper we contributed to the literature on the terms of trade by identifying several macroeconomic determinants of terms of trade and, in the context of a two-sector model, demonstrated how these factors and the sectoral prices interact. Econometric estimation of the model for Turkey indicates significant positive impact of international agricultural price and money stock, and negative impact of wage rate and intermediate import price on the terms of trade. These results are consistent with the predictions of structuralist macro models, although we cannot make conclusive statements about the structure of the economy on the basis of reduced form estimates.

In this paper we show that much of the variation in terms of trade in Turkey can be explained by "economic" factors. We do not consider the emphasis on "economic" factors to be a substitute for the political economy approach, a salient characteristic of the literature. The statistical insignificance of our election dummy notwithstanding, political *deus ex machina* may still be important in explaining the behavior of relative prices. The incidence of "politics" on the domestic terms of trade remains a project to be pursued rigorously and recent developments in the political business cycle theory may provide further insights in this direction. More importantly, however, social/political power relationships underlie some of our explanatory "economic" variables, such as money stock and wages. Overlooking the political and social determinants of these variables seriously hinders understanding of the workings of the economy, and, even worse, makes policy recommendations irrelevant. We expect our approach and findings to be complementary to

the work of researchers deliberating the political economy of the terms of trade.

DEFINITION OF VARIABLES AND DATA SOURCES:

Average, agricultural and non-agricultural price levels are measured by the GNP deflators; sectoral and aggregate levels are obtained from National Income Accounts; wage rate is manufacturing sector annual average wage rate (Source: State Institute of Statistics (SIS), *Annual Reports*). Money stock is defined broadly as the sum of currency in circulation, sight and time deposits (Sources: Central Bank of Turkey, *Annual Reports*, *Monthly Reports*). World agricultural price is the product of nominal exchange rate and US agricultural wholesale price (Source: *Economic Report of the President*, SIS *Annual Reports*). Intermediate import price is the product of unit import price (inclusive of tariffs) in US $ and nominal exchange rate. (Sources: Aksoy (1982); SIS *Annual Reports*; World Bank, *World Tables of Economic and Social Indicators, 1960-1986.*)

TABLE 1: MAIN ECONOMIC INDICATORS 1952–1980
SUMMARY STATISTICS

	mean	s.d.
Rate of change of domestic terms of trade ($\hat{P}_A - \hat{P}_N$)	–0.0123	0.0959
Agricultural output growth rate ($\hat{X}_A$)	0.0282	0.0637
Non-agricultural output growth rate ($\hat{X}_N$)	0.0659	0.0334
World inflation rate of agricultural good ($\hat{P}_A^*$)	0.1940	0.2967
Wage inflation ($\hat{W}$)	0.2189	0.1856
Intermediate import price inflation ($\hat{P}_R$)	0.2543	0.4019
Money stock growth rate ($\hat{M}$)	0.2386	0.1455
Change in expected rate of inflation ($\Delta\hat{P}^e$)	0.0193	0.0140
Rate of growth of change in the level of output ($\widehat{\Delta X}$)	0.1527	0.8861

TABLE 2: DOMESTIC TERMS OF TRADE

	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	–0.094 (2.16)**	–0.062 (2.04)*	–0.041 (1.68)	–0.047 (1.85)*	–0.170 (3.12)***	–0.064 (2.09)*
$\hat{\tilde{X}}_A$	0.732 (2.56)**	0.749 (3.55)***	0.378 (1.85)*	0.496 (2.02)*	0.448 (1.64)	0.271 (0.87)
$\hat{P}_A^*$	0.269 (2.38)**	0.307 (3.69)**	0.283 (4.34)***	0.301 (4.43)***	0.283 (3.75)***	0.223 (2.43)**
$\widehat{\Delta X}_{-1}$	–0.004 (0.29)	–0.016 (1.95)*	–0.015 (2.33)**	–0.013 (1.90)*	–0.007 (0.90)	–0.001 (0.06)
$\hat{M}$	–0.238 (1.02)	–0.537 (2.54)**	–0.488 (2.84)**	–0.513 (2.96)**		0.090 (0.58)
$\hat{M}_{-1}$	1.255 (4.18)***	1.506 (6.51)***	1.088 (4.55)***	1.088 (4.54)***		0.461 (3.10)***
$\hat{M}^e$					1.036 (3.08)***	
$\hat{M} - \hat{M}^e$					–0.398 (2.17)*	
$\Delta \hat{P}^e$	–0.871 (2.59)**	–0.697 (2.43)**	–0.272 (1.04)	–0.140 (0.47)	–0.009 (0.02)	0.401 (2.055)*
$\hat{W}$	0.087 (0.41)	0.167 (1.05)	0.206 (1.65)	0.200 (1.61)	0.087 (0.62)	–0.117 (0.90)
$\hat{W}_{-1}$	–0.789 (3.02)***	–0.796 (3.94)***	–0.502 (2.70)**	–0.519 (2.78)**	–0.464 (2.23)**	–0.239 (0.99)
$\hat{P}_R$	–0.279 (3.35)***	–0.310 (4.95)***	–0.242 (4.44)***	–0.258 (4.53)***	–0.212 (3.61)***	–0.169 (2.45)**
$\hat{P}_{R_{-1}}$	0.037 (0.58)	–0.009 (0.19)	0.009 (0.23)	0.015 (0.38)	–0.008 (0.18)	0.096 (1.94)*

(Table 2 continued on the next page.)

TABLE 2 (cont.)

	(1)	(2)	(3)	(4)	(5)	(6)
D_F		–0.054 (3.32)***	–0.040 (2.93)**	–0.045 (3.05)**	–0.042 (2.53)**	–0.041 (2.03)*
D_S			–0.167 (2.95)**	–0.152 (2.56)**	–0.173 (2.64)**	–0.215 (3.71)***
D_E				0.025 (0.88)	0.023 (0.70)	0.052 (1.51)
D_L						0.157 (2.97)***
$AR(1)$	–0.258 (0.92)	–0.732 (3.89)***	–0.847 (6.30)***	–0.874 (6.63)***	–0.896 (7.59)***	–889 (6.00)***
R^2	0.69	0.80	0.88	0.88	0.85	0.71
$\bar{R}^2$	0.46	0.63	0.75	0.75	0.68	0.44
DW	1.88	2.09	1.42	1.47	1.23	1.86
SEE	0.070	0.059	0.048	0.048	0.054	0.068
SSR	0.074	0.048	0.029	0.028	0.036	0.074

t-statistics in parentheses.
*, ** and *** indicate statistical significance at the 10, 5 and 1 percent levels (two-tailed tests).
Estimation period: 1953–1980 in regressions (1)-(5) and 1953–1985 in regression (6).
Definition of variables: X_A: Real agricultural output; P_A^*: World agricultural price; X: Real aggregate output; M: Money stock; P: Average price level; W: Wage rate; P_R: Intermediate import price; D_F: Foreign exchange bottleneck dummy; D_S: Stabilization measure dummy; D_E: Election dummy; D_L: Post-1980 dummy; $AR(1)$: First-order autocorrelation coefficient; the circumflex denotes percentage rate of change; the superscript e denotes expected value; Δ denotes change; subscript -1 denotes one period lag.

APPENDIX A

In order to carry out the comparative statics analysis of terms of trade algebraically, rewrite equations (5) and (6) in a compact form as follows:

$$\hat{P}_N = \alpha_1 \hat{P}_A + \alpha_2 \hat{X}_A + \alpha_4 \hat{I} + \alpha_5 \hat{M} + \alpha_6 \hat{W} + \alpha_7 \hat{P}_R$$

$$\hat{P}_A = \gamma_1 \hat{P}_N + \gamma_2 \hat{X}_A + \gamma_3 \hat{P}_A^* + \gamma_4 \hat{I} + \gamma_5 \hat{M} + \gamma_6 \hat{W} + \gamma_7 \hat{P}_R$$

where α and γ coefficients are respective elasticities which have the following signs:

$$\alpha_1, \alpha_2, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \gamma_1, \gamma_3, \gamma_4, \gamma_5 > 0; \quad \gamma_6, \gamma_7 < 0; \quad \gamma_3 \gtrless 0.$$

Solving these equations for $\hat{P}_A$ and $\hat{P}_N$ and subtracting the latter from the former, we obtain the rate of change of terms of trade as:

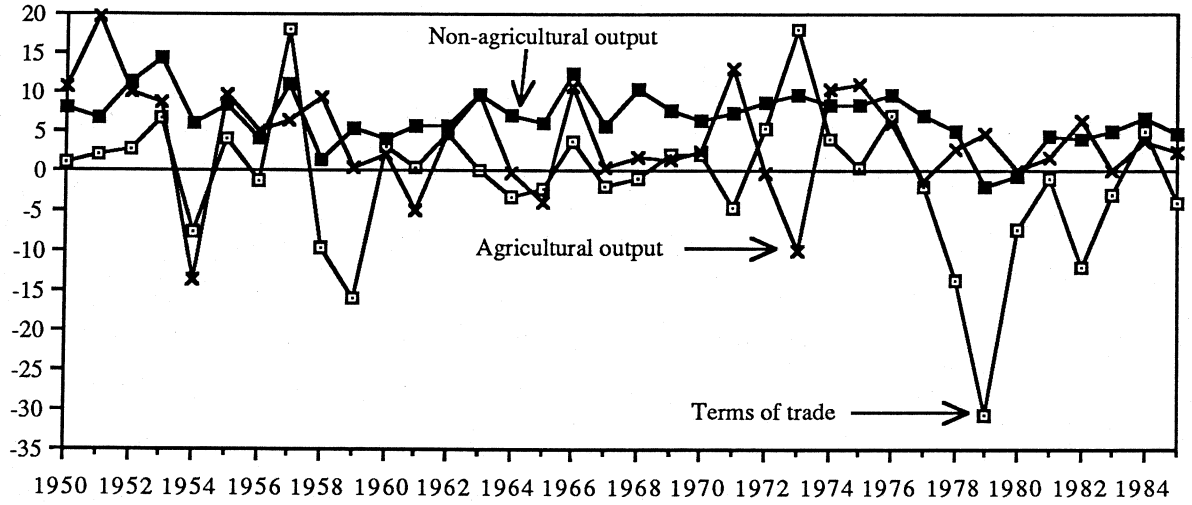
$$\begin{aligned}\hat{P}_A - \hat{P}_N = \frac{1}{1+\alpha_1\gamma_1}[&(\gamma_2(1-\alpha_1)+\alpha_2(\gamma_1-1))\hat{X}_A + \gamma_3(1-\alpha_1)\hat{P}_A^* + (\gamma_4(1-\alpha_1)+\alpha_4(\gamma_1-1))\hat{I} \\ &+(\gamma_5(1-\alpha_1)+\alpha_5(\gamma_1-1))\hat{M}+(\gamma_6(1-\alpha_1)+\alpha_6(\gamma_1-1))\hat{W}+(\gamma_7(1-\alpha_1)+\alpha_7(\gamma_1-1))\hat{P}_R]\end{aligned}$$

Note that $\alpha_1\gamma_1$ is positive by the stability condition. Given the signs of the parameters from (5) and (6):

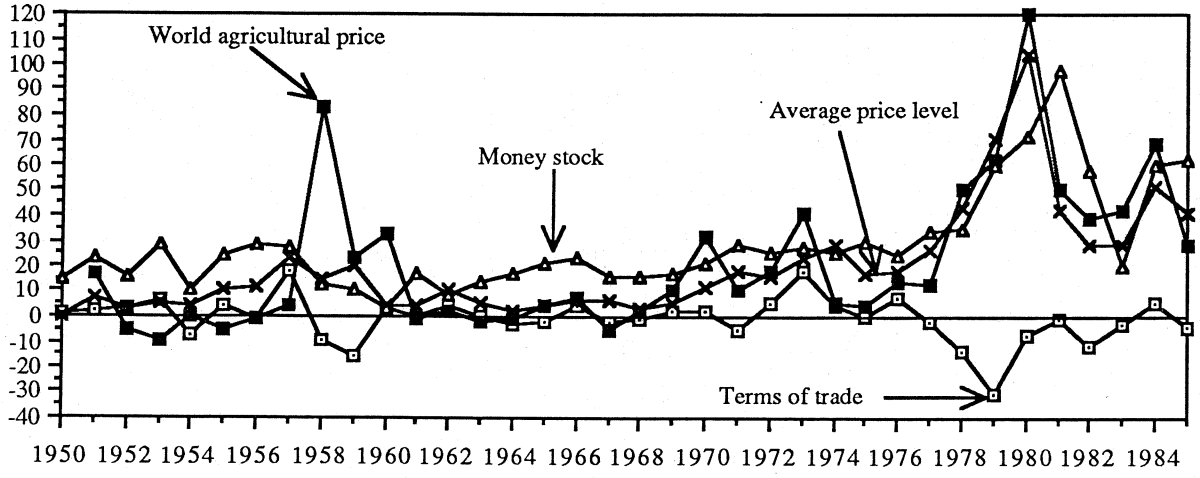
$$\frac{d(\hat{P}_A - \hat{P}_N)}{d\hat{P}_A^*} > 0; \quad \frac{d(\hat{P}_A - \hat{P}_N)}{d\hat{W}}, \frac{d(\hat{P}_A - \hat{P}_N)}{d\hat{P}_R} < 0; \quad \frac{d(\hat{P}_A - \hat{P}_N)}{d\hat{X}_A}, \frac{d(\hat{P}_A - \hat{P}_N)}{d\hat{I}}, \frac{d(\hat{P}_A - \hat{P}_N)}{d\hat{M}} \gtrless 0.$$

APPENDIX B: MAIN ECONOMIC INDICATORS (in rates of change)

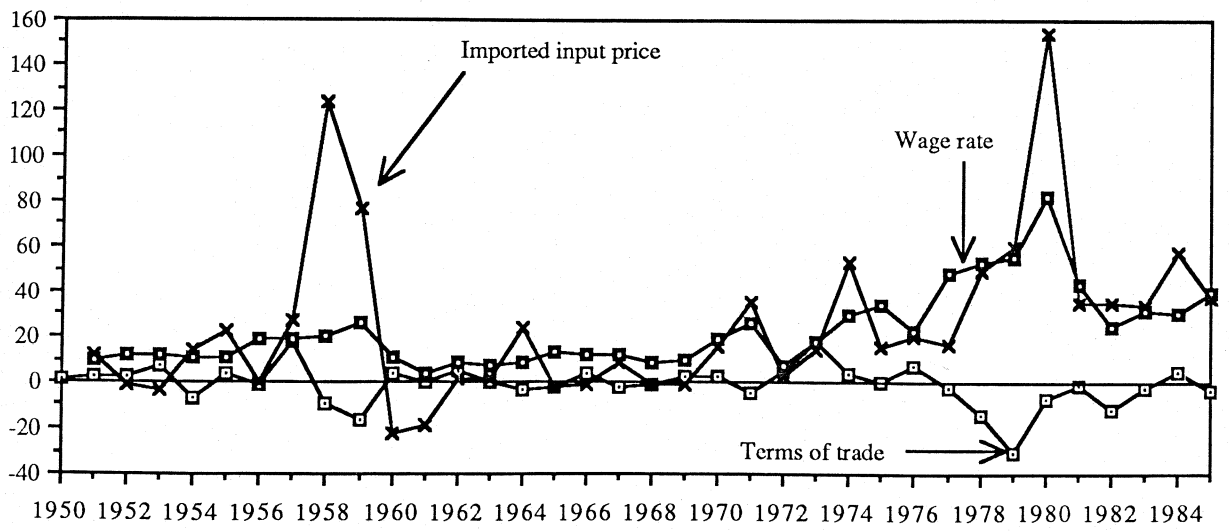
B1: Terms of trade, agricultural and non-agricultural output



B2: Terms of trade, average price level, world agricultural price, money stock



B3: Terms of trade, wage rate, imported input price



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