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WAGES, PRICES, AND INFLATIONARY INERTIA

by

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1. Introduction

The notion that inflation includes an important inertial component has influenced the design of the disinflation policies adopted recently in Argentina, Brazil, and Israel. It was argued that anti-inflation policies are not likely to succeed unless they directly break the prevailing inflationary inertia (see, for example, Bruno (1986) and Dornbusch and Simonsen (1987)).

A common argument has been that an important inertial component is due to the presence of backward looking wage indexation. Since typically such indexation does not provide full compensation for past inflation, this inertial component implies that one should observe a negative association between real wages and inflation; i.e., declining real wages in periods of high and accelerating inflation. In fact, this is not always the case. There were substantial increases in real wages during major episodes of high and

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[1]An earlier version of this paper was presented at the Caesarea conference on The Theory of Dynamic Price Setting: Market Structure and Macro Implications, May 1987. We thank Olivier Blanchard, Allan Drazen and Joseph Zeira for comments.

accelerating inflation in Israel and in Argentina (see Helpman and Leiderman (1987)). Specifically, it is seen in Chart 1 that the rise of inflation in Israel from about 10-20 percent a year in the early 1970s to around 100 percent in the early 1980s was accompanied by a real wage increase of more than 20 percent, and the further acceleration of inflation to close to 400 percent in 1984 was accompanied by a further rise in real wages of about 16 percent.[2] This implies that wage developments have been governed to a large extent by factors other than backward looking wage indexation. These can take the form of informal agreements which provide for wage adjustments above and beyond past inflation, or they can be incorporated into nominal wage contracts which are based on expectations of future developments, especially those concerning prices.

This paper has two major objectives. First, to develop a model which can explain the observed positive association between real wages and inflation. Second, in view of the importance of inflationary inertia considerations in the design of recent stabilization programs, to examine the validity of some recent tests of inflationary inertia in light of this model. In order to achieve these objectives we start from Blanchard's (1986) formulation of nonsynchronized decisions by firms and workers and modify it in order to deal with the issues at hand.[3] In particular, we allow for changes over time in real wages, which is required for an analysis of the comovement of real wages

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[2]In the Chart the real wage corresponds to the yearly average per employee post, and inflation is measured by the percentage change in the CPI. The source for these series are various issues of the Annual Report by the Bank of Israel.

[3]Zeira (1986) has used a differently modified version of Blanchard's model in order to describe inflationary inertia, but he dealt with different issues.

and inflation. Our model abstracts from backward looking wage indexation.

In our model there is staggering in the setting of wages and prices, and there is monetary accomodation that supports the resulting price dynamics. The time pattern of inflation that emerges from this mechanism depends on real wages, the murkup, the real interest rate, and real spending. When these parameters are constant, perfect forsight leads to a constant rate of inflation, implying that there is no inflationary inertia. By inflationary inertia we mean a process in which inflation feeds upon itself, such as a process in which for constant fundamentals a particular level of past inflation leads to rising inflation for a limited period of time or forever.

In this model steady state inflation is higher the higher are real wages, the markup, real spending, or the lower is the real interest rate. Moreover, if real wages are rising over time, so is the rate of inflation, which fits the data reported in Chart 1. This implies also that autocorrelation of inflation rates may result from rising real wages, and that its existance does not necessarily imply the presence of inflationary inertia. Recall that in this model there is no inflationary inertia.

We provide a general equilibrium underpinning for these price-wage dynamincs. In our specification the equilibrium is not unique. In particular, the equilibrium level of real spendign and employment are not unique.

The paper is organized as follows. Section 2 describes the basic model of staggered price and wage setting. Section 3 derives its implications for the comovement of inflation and real wages and for inflationary inertia. General equilibrium underpinnings for this analysis are provided in section 4.

Section 5 uses the model to discuss tests of inflationary inertia. The implications of this model for disinflation and their relation to the recent stabilization programs are discussed in Helpman and Leiderman (1987). In Section 6 we provide concluding comments.

2. Wages and Prices

In this section, we develop the basic model of staggered determinations of wages and prices. As in Blanchard (1986), we assume that prices are set in even periods for a two-period time interval and nominal wages are set at odd periods for a two-period time interval. Labor is the only variable input in production. Let $d_t(p)$ be the demand curve faced by a representative firm in period t, where p is the price it charges for its product, and let $\phi(a)$ be its labor requirement for producing output a (i.e., the inverse of the production function). Then if w_t stands for the nominal wage rate set by workers in period t odd, and β_t stands for the one-period nominal discount factor in period t, the representative firm's decision problem can be written as:

$$(1)\quad \max_{p_t}\; p_t d_t(p_t) - w_{t-1}\phi[d_t(p_t)] + \beta_t\left[p_t d_{t+1}(p_t) - w_{t+1}\phi[d_{t+1}(p_t)]\right], \quad t \text{ even}$$

We assume oligopolistic competition amongst firms producing differentiated products. Preferences are of the Spence-Dixit-Stiglitz type with a constant elasticity of substitution σ. Hence, the demand function is

$$(1a) \qquad d_t(p) = \left[\frac{p}{P_t}\right]^{-\sigma} a_t \ , \quad \text{all} \quad t,$$

where P_t is a price index of the available varieties and a_t is real aggregate spending per-firm (see Appendix). Every firm has an identical demand and cost structure. Therefore, in a symmetrical equilibrium $P_t = p_t$, and the above described pricing decision implies:

$$(2) \quad p_t = \frac{R}{1+\beta_t a_{t+1}/a_t} [w_{t-1}\phi(a_t) + \beta_t(a_{t+1}/a_t)w_{t+1}\phi(a_{t+1})], \quad \text{for} \quad t \quad \text{even},$$

where $R=1/(1-1/\sigma)$ is the markup factor and $\phi(\cdot)$ is the derivative of $\Phi(\cdot)$, thereby representing marginal labor requirement. Marginal labor requirement is rising with output if and only if marginal costs are rising with output.

We assume that the nominal wage rate is set for a two-period time interval such that the present value of two-period wages equals a predetermined present value of real purchasing power ω_t. Since the latter is taken as exogeneous to the model, the analysis embodies a form of real wage rigidity. Specifically, the wage rule is:

$$(3) \qquad w_t + \beta_t w_t = \omega_t(p_{t-1} + \beta_t p_{t+1}), \quad \text{for} \quad t \quad \text{odd}.$$

Equations (2)-(3) describe the basic wage-price spiral model. It can be seen that past and future wages are taken into account by firms when setting prices, and similarly past and future prices are taken into account by workers when setting wages. Although the processes of wage-price determination are not derived here from first principles, they capture what is believed to be an observed nonsynchronization of these variables. (In Section 4 we discuss the consistency of the present formulation with general equilibrium considerations.) Our specification differs from Blanchard's in two main respects. First, it is in level form rather than log-linear, as it should be, so that it is exact rather than an approximation. Second, we have a wage determination rule designed to emphasize autonomous shifts in real wages and their effect on the inflationary process.[4]

3. Inflation Dynamics

Now assume that the real interest rate is positive and constant, and let ρ, $0 < \rho < 1$, be the real discount factor (equal to one over one plus the real interest rate). Then $\beta_t = \rho P_t / P_{t+1}$. Since $p_t = p_{t+1}$ for t even, we obtain:

$$\beta_t = \begin{cases} \rho & \text{for } t \text{ even,} \\ \rho p_{t-1}/p_{t+1} & \text{for } t \text{ odd.} \end{cases}$$

[4] It is possible to generalize the wage rule so as to incorporate also backward looking elements, such as in Taylor (1980). However, it is convenient to concentrate on the simplified version for current purposes.

Combining this with (2)-(3) yields:

$$(4) \qquad 1 = R\,\frac{1+\rho}{1+\alpha_t\rho}\left[\frac{\omega_{t-1}\phi(a_t)}{x_t+\rho} + \alpha_t\rho\,\frac{\omega_{t+1}\phi(a_{t+1})x_{t+2}}{x_{t+2}+\rho}\right],$$

where $\alpha_t = a_{t+1}/a_t$ is the growth rate of demand per-firm and $x_t = p_t/p_{t-2}$ is one plus the two-period inflation rate. This equation describes the determination of current (period t) inflation as an implicit function of the markup, the real interest rate, the evolution of real wages, the evolution of demand, and expected future inflation.

In order to study inflation dynamics, we specialize at this point the model by assuming that real wages ω_t and real demand per-firm a_t are constant over time (the case of rising real wages is discussed in the sequel). In this case (4) reduces to:

$$(5) \qquad 1 = R\omega\phi(a)\left[\frac{1}{x_t+\rho} + \frac{\rho x_{t+2}}{x_{t+2}+\rho}\right] \qquad \text{for } t \text{ even.}$$

It is useful to begin the discussion with the case of a constant rate of inflation; i.e., $x_t = x$ for all t even. This is applicable to steady states, but it may also apply to situations in which the economy is not in a steady state, as we explain in Section 4. In this case (5) implies:

$$(6) \qquad R\omega\phi(a) = \frac{x+\rho}{\rho x + 1}.$$

It is easy to see that in (6) x is an increasing function of $R\omega\phi$ if and only if $\rho < 1$. Hence, if the real interest rate is positive, higher values of the real wage rate, the markup, or the marginal labor requirement are associated with higher constant inflation rates. It is also straightforward to see from (6) that for a given value of $R\omega\phi$ the rate of inflation is a decreasing function of the real interest rate (an increasing function of ρ) if the real interest rate and the inflation rate are positive.[5]

Equation (6) is highly nonlinear. It implies that small changes in the real wage rate, the markup, or marginal labor reqirement may bring about large changes in the rate of inflation. To see this point, consider the case in which prices are adjusted every six months, so that the elementary time unit is one quarter. Let the quarterly real interest rate be 1.5%. Then, if $R\omega\phi=1$ there is price stability, and if, say, the real wage rate increases by one tenth of one percent the rate of inflation increases to 14.4% per half year. A further increase in the real wage rate or marginal labor requirement by one tenth of one percent increases the rate of inflation to 31% per half year. This shows clearly the high elasticity of the inflation rate with respect to costs.

In what follows we consider the case in which

$$\rho < R\omega\phi < 1/\rho,$$

which ensures the existence of an equilibrium with a constant rate of

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[5]The partial derivative of x with respect to ρ that is implied by (6) is $(x^2 - 1)/(1 - \rho^2)$.

inflation. In this case equation (5) implies the functional relationship between x_t and x_{t+2} as described in Figure 1. The curve is rising, going to infinity as x approaches $\overline{x}$ from below, and going to minus infinity as x approaches $\overline{x}$ from above. It intersects the 45° line at the steady state point A, with a slope larger than one. It is clear from Figure 1 that perfect foresight and expected positive prices require expected and actual values of x to be in the interval $(\underline{x},\overline{x})$ in all time periods. This, however, is satisfied if and only if the expected rate of inflation is equal to the constant level represented by point A. Hence, in this case perfect foresight leads to a constant rate of inflation as long as the underlying parameters are constant; i.e., there is no inflationary inertia.

We have seen that this wage-price spiral model does not exhibit inflationary inertia; constant parameter values imply a necessarily constant rate of inflation. An unexpected permanent shock brings about a permanent change in the rate of inflation. However, anticipated changes in key parameters may generate a gradual rise in inflation which can mistakenly be interpreted as inflationary inertia. Take, for example, a gradual increase in the real wage rate ω_t, with a_t being constant. It is easy to see from (4) that this brings about a rightward shift of the curve that passes through A in Figure 1. If $\omega_1=\omega'$ and it rises over time until it reaches a constant level ω from time $t=T$ on, then on a perfect foresight path the rate of inflation at time T has to be the constant rate of inflation that corresponds to the wage rate ω (i.e., the solution to (6)). Solving (4) backwards produces the unique perfect foresight path. In terms of our diagram, Figure 2 describes the adjustment path for a two-period increase in real wages. If the real wage was constant at the level ω_1 the rate of inflation would have been constant at point A. However, since $\omega_3 > \omega_1$, the relevant curve is more to the right, such as curve 2. Hence, in period 2 the system has to be on curve 2. Similarly, in period 4 it has to be on curve 4 and in period 6 on curve 6. Moreover, in period 6 it has to be at point B. Therefore, moving backwards we identify the arrow path as the equilibrium trajectory. It is clear that on this trajectory the rate of inflation is rising, and so is positively autocorrelated-- a feature often interpreted as inflationary inertia. This interpretation is not valid in the current context.

4. General Equilibrium Considerations

So far we have discussed price-wage dynamics under the assumption that monetary policy accommodates the resulting price developments. We have also assumed a given time pattern of real spending per-firm, a_t. We now develop an explicit model of intertemporal choice that provides general equilibrium underpinnings for this analysis. It is assumed for this purpose that the number of firms is n in every time period. Hence, n is also the number of available varieties. In addition, there exist indexed bonds that are freely traded in the capital market. These bonds can be issued by the government or the private sector.

Consider a representative individual that maximizes the discounted flow of utility:

$$\sum_{t=0}^{\infty} \rho^t [u(c_t) + v(M_t/p_t)]$$

subject to the budget constraint:

$$(7) \qquad \sum_{t=0}^{\infty} \delta_t[c_t + (M_{t+1} - M_t)/p_t] \leq \sum_{t=0}^{\infty} \delta_t(y_t - \tau_t) + (1 + r_{-1})b_{-1}.$$

Here the utility level depends on real consumption and real balance holdings, where the dependence on real consumption is derived from a Spence-Dixit-Stiglitz utility function with a fixed number n of equally priced varieties.[6] The period t real discount factor is denoted by δ_t (discounted from time t to time 0). M_t stands for nominal money balances, y_t for real income, τ_t for lump-sum taxes, r_{-1} for the real interest rate in the period prior to zero, and b_{-1} for bonds acquired in the period prior to zero. If $b_{-1}>0$, these bonds have been issued by the government, and if $b_{-1}<0$, the bonds have been issued by the private sector. The evolution of private bond holdings is described by:

$$b_{t+1} = (1 + r_t)b_t + y_t - \tau_t - c_t - (M_{t+1} - M_t)/p_t.$$

Let θ be the multiplier of constraint (7). Then the first order conditions for the consumer's maximization problem are:

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[6]Let $u^o(U)$ be the original utility function from which $u(\cdot)$ has been derived, with $U=[\int_{i\epsilon I} c_i^{\gamma}]^{1/\gamma}$, where c_i is consumption of variety i and $0<\gamma<1$ (see Appendix). Then if p is the price of every variety, it is optimal to choose equal quantities c_i=a. Given real consumption spending c this yields a=c/n, where n is the number of available varieties. Hence, we can define $u(c)\equiv u^o(n^{1/\gamma-1}c)$, which is used in the text.

$$\rho^t u'(c_t) = \delta_t \theta, \qquad t = 0,1,2... \tag{8}$$

$$\rho^{t+1} v'(m_{t+1})/p_{t+1} = \theta(\delta_t/p_t - \delta_{t+1}/p_{t+1}), \qquad t = 0,1,2... \tag{9}$$

where m_t is real balance holdings.

In what follows we deal with the case in which real income y_t is constant; i.e., $y_t=y$. It will be shown that this is indeed an equilibrium (albait not the only one). Assume also that government spending is the same in all time periods at the level g, and that its allocation across varieties is the same as in the private sector. In this case

$$c_t = c = y - g,$$

which implies with the aid of (8) that $\delta_t=\rho^t u'(c)/\theta$. However, since by definition $\delta_0=1$, this yields $\theta=u'(y-g)$ and $\delta_t = \rho^t$ for all t. Applying these results to (9) yields

$$\frac{v'(m_{t+1})}{u'(y-g)} = \frac{p_{t+1}}{\rho p_t} - 1 \qquad \text{for all } t. \tag{10}$$

This equation provides a link between inflation and real money holdings, given real income y, real government spending g, and the real interest factor ρ. In order for this equation to be satisfied at each point in time while price movements are determined by the process described in the previous section, the government has to accommodate the demand for money. It is, therefore, necessary to see whether and how this can be done.[7]

Taking b_{-1}^G to be the government's outstanding debt, and using $\delta_t=\rho^t$, the government's consolidated intertemporal budget constraint is:

$$(11) \qquad \sum_{t=0}^{\infty} \rho^t[\tau_t + (M_{t+1} - M_t)/p_t - g] = (1 + r_{-1})b_{-1}^G.$$

The left hand side represents the present value of its income over spending, where income is derived from lump-sum taxes and monetary injections. The right hand side represents its liabilities at time zero. This implies the evolution of government debt according to

$$b_{t+1}^G = \rho^{-1}b_t^G + g - \tau_t - (M_{t+1} - M_t)/p_t.$$

Naturally, in equilibrium $b_t = b_t^G$.

The government is solvent as long as (11) is satisfied. This intertemporal budget constraint can also be written as:

$$(11') \qquad \sum_{t=0}^{\infty} \rho^t\tau_t = (1 + r_{-1})b_{-1}^G + \sum_{t=0}^{\infty} \rho^t(g + m_t - m_{t+1}p_{t+1}/p_t),$$

which implies that given a) the inflation path that is determined by means of the mechanism described in the previous section; b) the implied real balance

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[7]Observe that the analysis in the previous section implied that $p_{t+1}=p_t$ for t even. Therefore, in this case (10) implies that real balance holdings are the same in all even periods. Hence, if there is inflation, real balance holdings are higher in even periods than in odd periods. The amplitude of these fluctuations in real balance holdings is smaller the lower is the rate of inflation.

holdings that are described in (10); c) the real spending level g; and d) accommodation of the demand for money; the right hand side of (11') is given. Therefore, this determines the present value of lump-sum taxes. Naturally, there is more than one time pattern of taxes that ensures solvency, and with each feasible pattern there is an associated pattern of government debt. However, the substitution of debt for taxes has no real effects (there is Ricardian neutrality). Hence, as long as taxes can be chosen so as to ensure intertemporal balancing of the government budget, the government can indeed pursue an accommodating monetary policy. Given some natural restrictions on the level of taxes at each point in time (such as the requirement that taxes cannot exceed income), this leaves a wide range of cases in which this policy is feasible.

It remains to discuss the consistency of a constant real income level y with the predetermined price-wage dynamics. Recall that we assumed that government spending g is allocated across varieties in the same way as in the private sector. Hence, aggregate spending per-firm is

$$a = (c + g)/n = y/n.$$

On the other hand, employment is given by

$$\ell = n\phi^{-1}(a) = n\phi^{-1}(y/n),$$

where $\phi^{-1}(\cdot)$ may include fixed costs. Hence, as long as y is low enough so that ℓ is below the full employment level (assuming an inelastic labor supply), we have an equilibrium configuration. Namely, if individuals expect such y to be their real income in every period (from wages and profits), and firms expect y to be the level of aggregate spending in every time period, then indeed these will be equilibrium values. The pattern of inflation, on the other hand, is determined according to the mechanism described in the pevious section. Since every level of real income y that leads to less than full employment of labor is an equilibrium value, there is a continuum of equilibria with constant income and consumption. In fact, there also exist many others in which private consumption, and therefore also aggregate spending, change over time (while government spending is constant). In the latter case the real interest rate is not the same in all time periods.

Observe that given constant values of (a,ω), and the constant real interest rate, the rate of inflation is constant. In this case government debt may be growing over time if higher taxes are expected in the future. Hence, there may be constant inflation despite the fact that the economy is not in a steady state. In addition, rising marginal costs imply higher inflation for a higher real spending level per-firm, while higher real spending implies higher employment. Therefore, in this type of an economy one may observe a long-run Phillips curve, although it may be argued that this model is not suitable for long-run analysis because in the long run the rules for determining prices and wages may change.

Can the government affect employment? The answer is yes if private sector expectations are such that an increase in public spending makes people believe that income will be higher. If expectations satisfy this condition, then an increase in public spending brings about expectations of higher income, which induces in turn higher aggregate spending and higher employment. Given rising marginal costs the result will be higher inflation. Consequently, the correspondingly lower demand for real balances has to be accommodated, implying the need to adjust the present value of tax revenue in order to satisfy (11').

5. Implications for Tests of Inflationary Inertia

A common procedure in some recent research has been to use autoregressive representations of inflation in order to empirically assess inertia. A typical example is the analysis by Bruno and Fischer (1986). They show that in quarterly inflation autoregressions for Israel, the size and sum of coefficients on the first and second lags have increased over time along with the inflation rate. For 1965:I-1971:I this sum is 0.56, for 1975:III-1978:IV it is 0.87, and for 1979:I-1982:IV it is 1.04. Their conclusion is that the evidence supports the notion that there is considerable inertia in the inflationary process in Israel and that this inertia has been growing over time.

An important limitation of using inflation autoregressions to assess inertia is that in high inflation countries like Israel the inflation rate is nonstationary. Consequently, some of the inflation autocorrelations are likely to be spurious and not to neccessarily represent inflationary inertia. In order to illustrate this issue, we have estimated inflation autoregressions without and with the inclusion of a deterministic time trend variable[8], and instead of using these to investigate inertia, we have calculated the implied moving average representations which are more useful for assessing persistence. These representations are depicted in Chart 2 in the form of impulse response functions. We have used monthly data for Israel covering the period 70:12-83:9.

The evidence in the chart is quite clear. When a time trend is not included, there seems to be some own persistence of shocks to the rate of inflation. Some may interpret this persistence as representing inertia due to a price-wage spiral. However, when a time trend is included, the impulse response function shows that a one-time inflation shock has only short-lived effects on subsequent inflation, thereby raising doubts about the existence of inertia.[9,10]

Having established that findings from inflation autoregressions are not robust with respect to the inclusion of a time trend variable, the next question is why, if at all, such a variable should be included in the equation? And more generally, what seems to be a proper test of inertia? To answer these questions, let us go back to our price-wage spiral model. Equation (4) provides the model's implications for the inflation rate as an

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[8]Obviously, other detrending methods could be used; see Nelson and Plosser (1981) and Watson (1986). As it will become clear later on, our view is that if applied, detrending should be done on the basis of what is implied by the model being investigated. The AR equations that we estimated regress the inflation rate on a constant and six lagged values of inflation, and estimations were performed with and without the addition of a time trend term.

[9]When a time trend is not included in the inflation autoregression, the coefficients on the six lagged inflation terms are: .41 (.08), -.10 (.09), .26 (.09), -.08 (.09), .22 (.09), and .17 (.08), where standard errors appear in parentheses. Upon including a time trend the AR coefficients are: .31 (.08), -.17 (.09), .18 (.09), -.16 (.09), .14 (.09), and .08 (.09). The coefficient on the time trend is .03 and its standard error is .008. Notice that the sum of AR coefficients when a time trend is included is about half

implicit function of the markup, the evolution of the target real wage, the real interest rate, the evolution of aggregate demand, and expected future inflation. Therefore, from this model's standpoint inflation autoregressions that do not allow for changes in fundamentals are misspecified. Admittedly, the inclusion of a time trend is a too simplistic method for taking into account the evolution of these factors. However, our results highlight the fact that conclusions about inertia are sensitive to the specification of the role of forcing variables. Indicative evidence on the importance of one such variable in the inflationary process in Israel, i.e., changes in real wages, is provided in Chart 1, and was discussed in the Introduction. As shown in the previous section, our model implies that increases over time in real wages bring about increases over time in the rate of inflation, as depicted in Chart 1. These increases in inflation may show persistence over time, despite the fact that the model does not exhibit inflationary inertia. The upshot from this discussion is that there appears to be no meaningful model-free test of inflationary inertia. In order to test this hypothesis, it is appropriate to formulate a model that embodies it and to face it with data.

6. Concluding Comments

We have shown that the positive association between real wages and inflation can be explained by means of a model with staggered price and wage setting. The model does not exhibit inflationary inertia. Nevertheless, it produces autocorrelated inflation rates. The implication is that empirical tests of inflationary inertia have to builed on structural models rather than on pure statistical evidence.

Appendix

Let the utility function of the representative individual be of the Spence-Dixit-Stiglitz type with a constant elasticity of substitution and a continuum of varieties. Then it can be represented as:

$$(A.1) \qquad U = \left[\int_{i\epsilon I} c_i^{\gamma} di\right]^{1/\gamma},$$

where i is and index of varieties, I is the set of available varieties, c_i is consumption of variety i, and $0<\gamma<1$ is a parameter. The elasticity of substitution is given by $\sigma=1/(1-\gamma)$. This utility function implies the demand function for variety i:

$$(A.2) \qquad c_i = \left[\frac{p_i}{P}\right]^{-\sigma} a ,$$

where P is a price index and $a=A/(Pn)$ is real spending per-variety (or per-firm). Here, A stands for nominal spending and n for the number of firms. The number of firms is defined as:

$$n = \int_{i\epsilon I} di$$

and the price index P is defined as:

$$P = \left[\frac{1}{n}\int_{i\epsilon I} p^{1-\sigma}\right]^{1/(1-\sigma)}.$$

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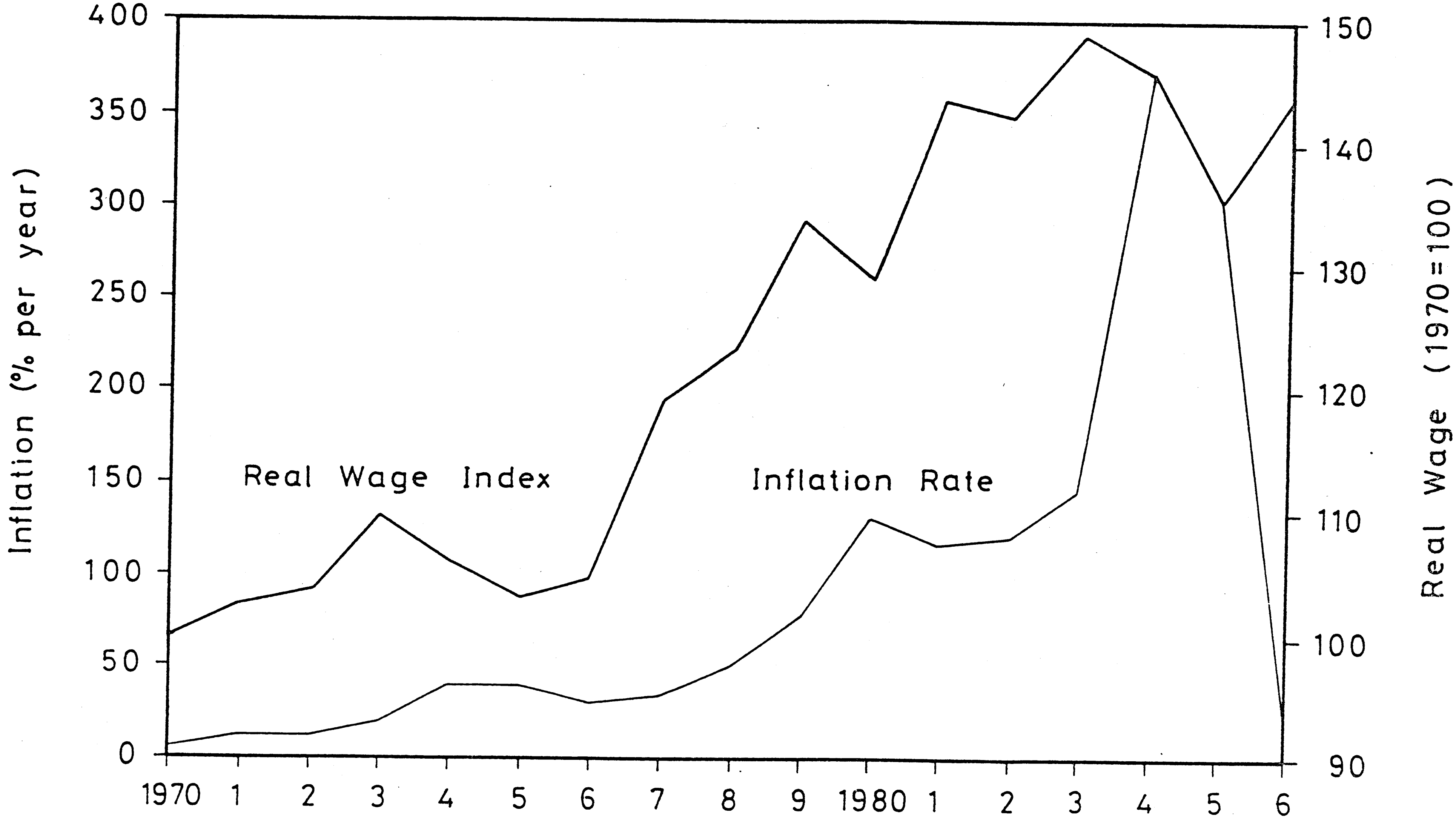


Chart 1: Inflation and Real Wages in Israel (1970-1986).

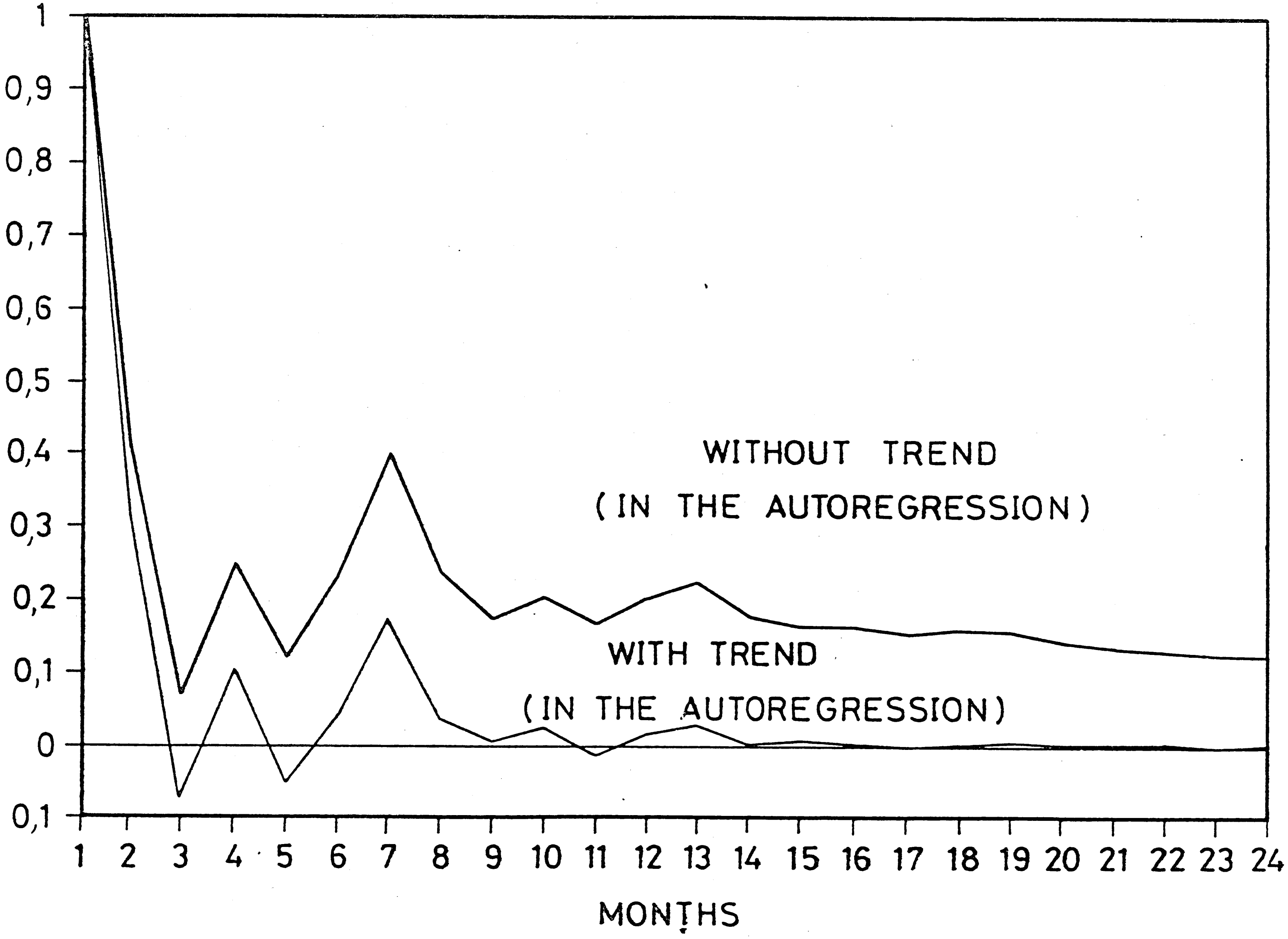
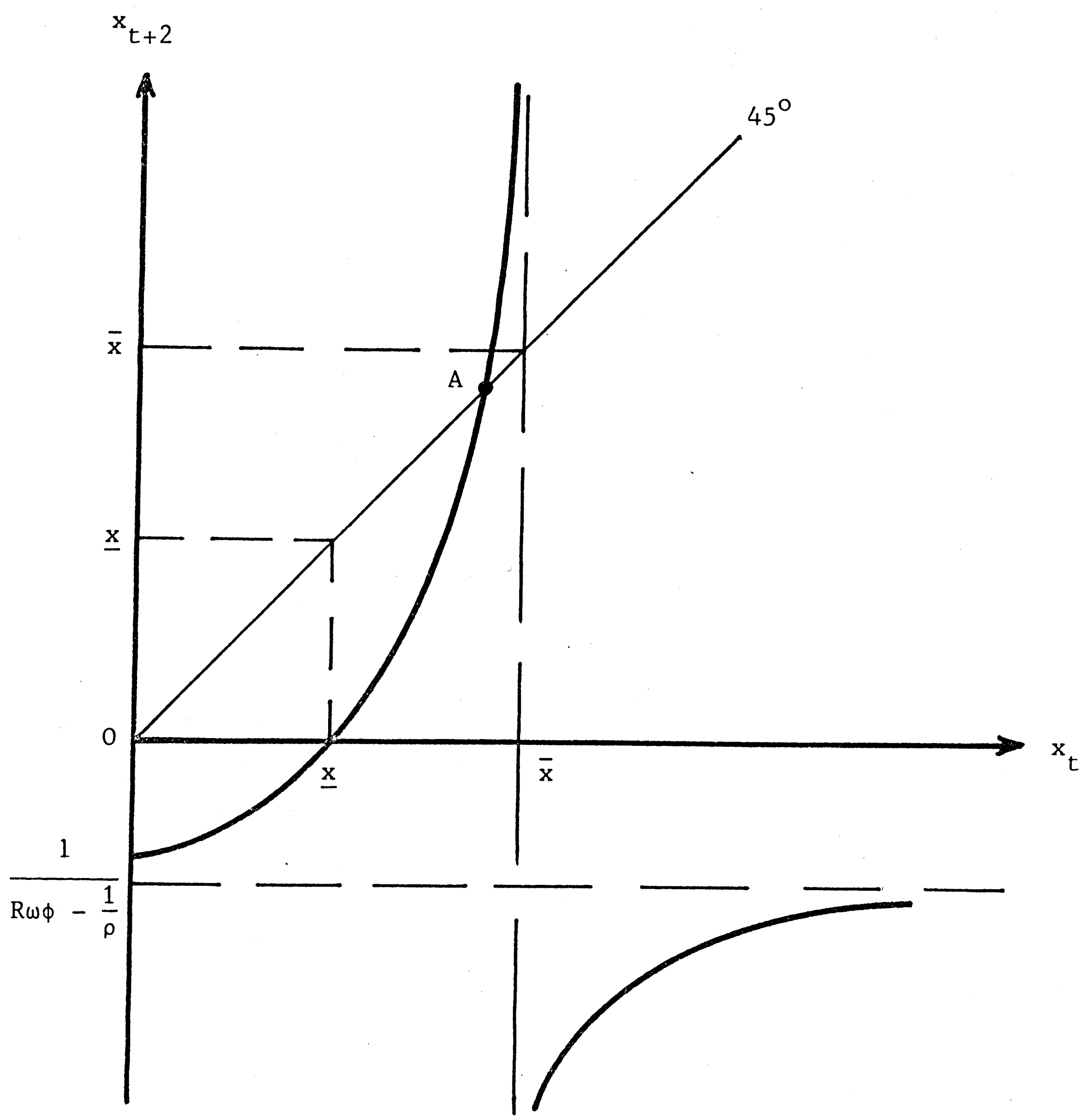


Chart 2 : Inflation Responses to a Unit Standard Deviation Inflationary Shock — Israel .



$$\bar{x} = \frac{1}{\frac{1}{R\omega\phi} - \rho} - \rho \quad , \qquad \rho < R\omega\phi < \frac{1}{\rho}$$

FIGURE 1

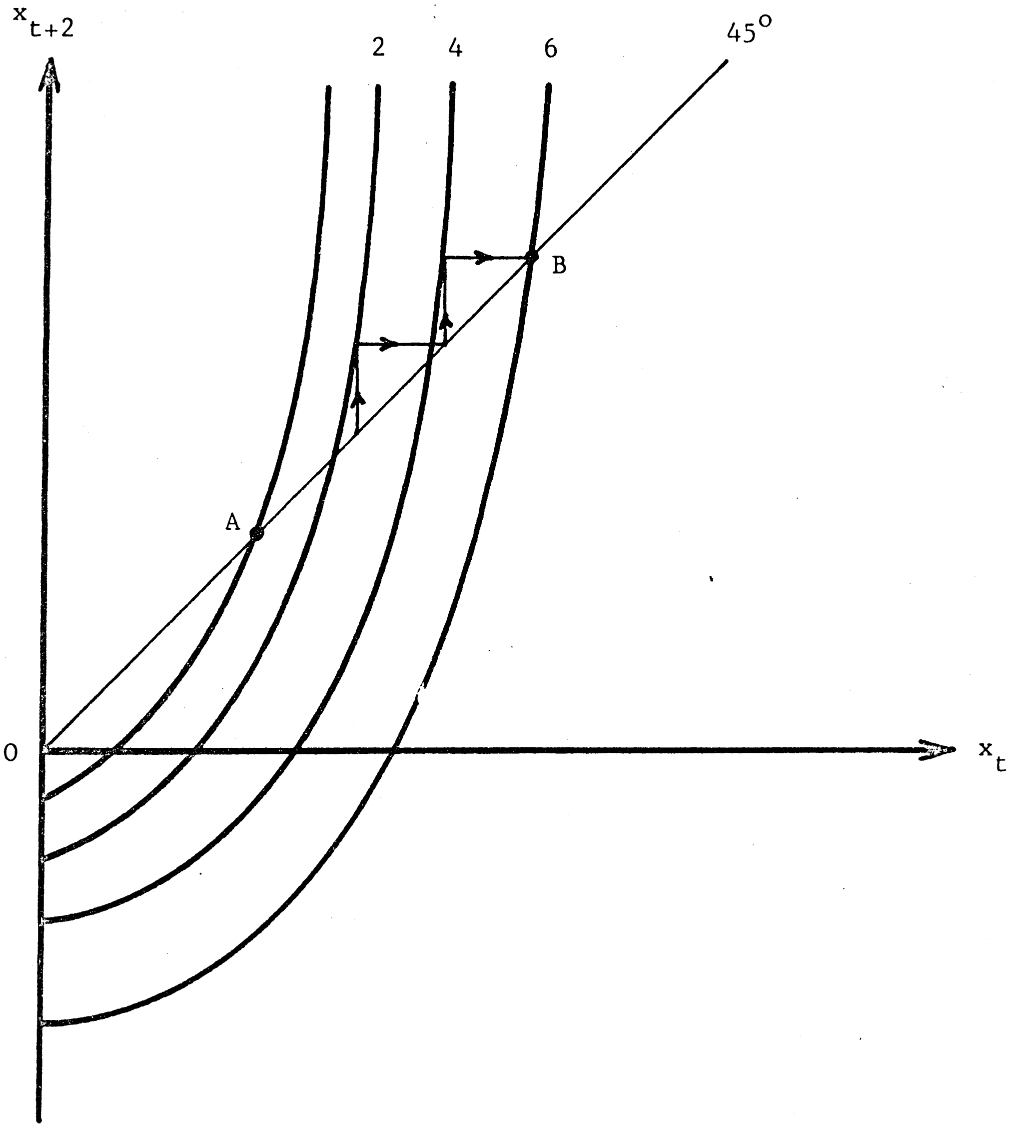


FIGURE 2