# A Devaluation with Labor-Intensive Trading and Inelastic Labor Supply: The Polish Experience 1990-1991

by

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# A Devaluation with Labor-Intensive Trading and Inelastic Labor Supply:

## The Polish Experience 1990-1991*

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## Abstract

I seek to explain Poland's adjustment in 1990-1991. As documented below, the Polish case displays several interesting features, including a protracted post-devaluation adjustment of nominal and relative prices in the presence of a fixed exchange rate. I develop a simple, general equilibrium model with money which provides a new explanation for most of the features of the Polish adjustment. I depart from the standard assumption of the costless instantaneous arbitrage and its implication, PPP. The quadratic labor costs involved in carrying out foreign transactions imply that a devaluation results in a temporary increase in the PPP real exchange rate. In fact, given the absence of capital mobility, such export-stimulating real depreciation must occur if the lack of "money illusion" is to hold in the long run. The mere act of selling abroad drags labor away from production what, under the assumption of inelastic labor supply, leads to a fall in output. Thus, the devaluation is contractionary in the short run. Over time, as the continuing inflation in the domestic tradeable sector reestablishes PPP, all the real effects are gradually reversed. The analysis can be, potentially, useful in designing the future exchange-rate-based stabilizations in Eastern Europe and elsewhere.

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# 1. Introduction

I seek to explain Poland's adjustment in 1990-1991. Studying the Polish case is worthwhile as more formerly communist countries, e.g., Russia, may soon follow the country's stabilization/reform policies.

As documented below, the Polish case displays several interesting features, including a protracted post-devaluation adjustment of nominal and relative prices in the presence of a fixed exchange rate. I develop a simple, general equilibrium model with money which provides a new explanation for most of the features of the Polish adjustment. I depart from the standard assumption of the costless instantaneous arbitrage and its implication, PPP. The quadratic labor costs involved in carrying out foreign transactions imply that a devaluation results in a temporary increase in the PPP real exchange rate. In fact, given the absence of capital mobility, such export-stimulating real depreciation must occur if the lack of "money illusion" is to hold in the long run. The mere act of selling abroad drags labor away from production what, under the assumption of the perfectly inelastic labor supply, leads to a fall in output. Thus, the devaluation is contractionary in the short run. Over time, as the continuing inflation in the domestic tradeable sector reestablishes PPP, all the real effects are gradually reversed.

The rest paper is organized as follows. In section 2 I briefly document the key facts about the Polish adjustment. A simple monetary model is developed in section 3. Finally, section 4 concludes.

## 2. The Polish Adjustment: January 1990 - May 1991

On January 1, 1990 the Polish government implemented a broad policy package aimed at stopping an ongoing nearhyperinflation and accelerating

a transformation into a market economy. Most importantly, it established a new monetary regime by combining a 46% devaluation with the exchange rate unification and an introduction of the internal convertibility of the zloty at a fixed exchange rate of zl 9,500 for one U.S. dollar. In addition, restrictions were placed on the government's ability to borrow at the Central Bank as well as on the overall growth of the domestic credit. Lastly, while certain price and trade controls were lifted, a set of new wage controls was put in place.[1]

The initial level of the exchange rate was maintained until May 17, 1991 when the zloty was devalued by 16.8 % percent and pegged to a basket of currencies. This paper is concerned with the events between January 1, 1990 and May 17, 1991.

The January 1990 Big Bang was followed by a slump in output and employment. Interestingly, industrial employment fell by substantially less than industrial output. Between December 1989 and April 1991 the reductions were 16% and 40%, respectively. The relative inflexibility of employment, at least as compared to output, is easily seen in Figure 1 which shows the total as well as per employee measures of the real industrial sales (SI and SIP, respectively).[2] The simple correlation coefficient between the two series equals 0.88 thus confirming the visual impression of a close comovement. The small (strictly zero) adjustment in employment will be featured in the model

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[1]    The actual scope of price liberalization was small since by the end of 1989 86% of consumer prices were already free. Thus, strictly, the January program can claim only a partial credit for the elimination of of waiting lines.

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[2]    Note that the graph does confirm a fall in employment.

developed below.

As seen in Figures 1 and 2, the real wage seems procyclical. The correlation coefficient between the real wage and SI equals 0.69. It has to be said upfront that I will not be able to replicate this feature of the data.

The post-stabilization recession coincided with a boom in the hard currency exports. They increased by over 40% in 1990 alone. Figure 3 plots the quarterly exports and the trade balance in convertible currencies. Recalling Figure 1, the gross and net exports seem a bit countercyclical. The correlation coefficient between the monthly observations on the balance of trade and SI is only -.04 but this could well be due to the dating problems since the trade balance statistics reflect the financial settlements and not the shipments of goods. As well-known, in most cases, shipments predate settlements. The simple correlation coefficient between trade balance and lagged output is, actually, -0.22. Therefore, I will still take the countercyclicality of the net exports as another important feature of the Polish adjustment.

The private consumption per capita seems a bit procyclical. This is revealed upon a joint inspection of Figures 1 and 4. The latter plots the average real per capita consumption expenditure in the non-farm and non-pensioner families, c. The correlation coefficient between c and SI is 0.17. The model in section 3 will replicate an initial drop and a subsequent recovery in consumption.

Poland's adjustment featured protracted changes in the relative prices. Figure 5 displays the time profile of the ratios of the nominal exchange rate, E, to CPI and the price index for alcoholic beverages, PIALC, respectively, as well as the ratio of PIALC to the price index

for haircuts, PIHAIR. E/CPI and E/PIALC measure the PPP real exchange rate, while PIALC/PIHAIR serves as a proxy for the relative price of traded goods in terms of nontraded goods.[3] It is seen that the January 1990 devaluation brought about an increase in the PPP real exchange rate. This initial real depreciation seems too small to justify a subsequent large real appreciation. However, one has to remember about a sizable real depreciation in the last months of 1989, when the government kept devaluing the official exchange rate by much more than the inflation rate. In fact, simple calculations reveal that in November and December the zloty depreciated in the real terms by 33.6% and 52.3%, respectively.

Figure 5 documents one of the most characteristic features of the Polish experience, i.e., the persistent movements in both nominal and relative prices despite the rigidity of the nominal exchange rate. The fact that inflation continued even in the tradeable sector was already noted by Rodrik (1992a). As the prices of the nontradeables were increasing even faster, there was a continuing fall in the relative price of traded goods in terms of nontraded goods.

As expected, all three measures of the relative prices are positively correlated with the net exports. The simple correlation coefficients between the net exports and E/CPI, E/PIALC, and PIALC/PIHAIR are equal to 0.76, 0.59, and 0.87, respectively. Finally, as one can see, following an initial outburst, the inflation in the tradeable sector was declining, especially in the first two quarters of

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[3] The alcoholic beverages are suitable examples of traded goods also because they were subject to only minimal taxes and tariffs. Clearly, a haircut is good example of a nontraded good.

1990. This is something that I will be able to replicate in the model.

Figures 6 and 7 show the monthly data on the real balances of zlotys, m, and the interest rates, respectively. The real balances and the nominal interest rate, i, display the expected post-devaluation pattern, i.e, they drop (resp. increases) on impact and gradually increase (decreases) thereafter. The behavior of the ex-post real interest rate, r1, computed by subtracting the contemporaneous inflation rate from the nominal interest rate is somewhat puzzling. In particular, r1 goes down at the time of the initial drop in both output and consumption (see Figures 1 and 4). I suspect that this may be due to the measurement/dating problems. For example, if the nominal interest rates reported for any given month actually corresponds to the loans repayable at the end of the next period (or, in other words, this is the rate as of the end of the month), then in computing the real rate one should use the one-period-ahead inflation rate. In this case, the emerging pattern is perfectly reasonable (see r2 in Figure 7).

Having reviewed the facts, I will now model the Polish experience.

## 3. The Model

With an exception of the diametrically different assumption on the elasticity of labor supply, I will use a small open economy model which I developed in (1992). This is a perfect foresight model set up in continuous time. The economy is populated by a large number of immortal and identical households. Each household has three members: a manager, a shopper, and a worker. The manager runs the family-owned firm. In the firm, hired labor operates a linear technology to produce a perishable tradeable good. The firm can sell its output either on the

domestic market (for the domestic money) at price p, or on the foreign

market (for the foreign money) at price $p^*$. $p^*$ is normalized to unity.

The nominal exchange rate is pegged by the central bank at a constant

level of E units of domestic money for one unit of foreign money. The

totality of the gross interest earnings on the stock of the central bank

foreign exchange (which backs the domestic money supply) is used to pay

for the wasteful government consumption. This eliminates the income

effects associated with the accumulation of foreign reserves.

Denote by h the productive employment (= output), and let a be the

fraction of h that the firm chooses to sell on the world market.

Selling abroad is subject to the quadratic labor costs. In particular,

exporting ah units of the good requires hiring $a^2h$ hours of domestic

labor at the competitive nominal wage w units of domestic money per hour

(i.e., aw is the average selling cost). The selling costs are incurred

in, e.g., a preparation of sales documents, labels, and catalogs in

foreign languages, and are convex because of some fixed factor, say, a

stock of human linguistic skills.

The shopper's job is to buy the consumption good, c. Buying

it abroad is costly (e.g., there is a time cost of translating the

foreign labels, etc.). Let e be the fraction of c that is purchased on

the foreign market. A purchase of ec units of the foreign-produced good

requires $ce^2$ hours of domestic labor. I assume that the foreign agents

are not allowed to hold the domestic money, and thus cannot sell nor buy

goods on the domestic market.

Finally, the last family member, the worker, sells n hours of his

labor to the domestic employers. His total endowment of time is

normalized to one.

Families hold exclusively the domestic-currency-denominated assets.

In addition to the home money, M, they hold the privately-issued

domestic-currency-denominated console-type nominal bonds, B. The nominal

interest rate on these bonds equals i. Just as in Poland, the domestic

money is internally convertible. The internal convertibility means that

the central bank sells the foreign currency (to the domestic residents)

only for the purpose of an importation of goods, and that all the export

earnings (of the domestic firms) must be converted into the domestic

money.

A representative household maximizes a life-time integral of the

discounted intraperiod utilities subject to a flow budget constraint and

the no Ponzi games condition. The momentary utility is a separable

function of consumption and real money balances (M/p) only. Notice that

labor is not unpleasant, which implies a perfectly inelastic labor

supply. It has to be said, however, that this technically convenient

assumption is not necessary for the main results, as they remain true

under the weaker assumption of simply inelastic labor supply. To

simplify the algebra and sharpen some of the results, I assume an

isoelastic utility of consumption. The utility of real balances has

standard properties (including the Inada conditions). This completes

the description of the model.[4]

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[4]     It easy to see that the model admits the following equivalent
representation. First, the selling costs, effectively, make the
foreign-market goods to be more labor-intensive than the domestic-market
goods. This, the convexity of the selling costs and the inelasticity of
the supply of labor imply that the production set is described by a
concave PPF with this additional feature that the marginal rate of
transformation is less than one. It turns out, therefore, that one of
the building blocks of the Keynesian theory of international economics,
i.e., an upward-sloping export supply function can be recovered without
an exogenously assumed stickiness of the domestic prices.

Formally, for a given initial stock of nominal assets, $A_0$, the household solves the following optimal control problem:

$$(1) \quad \max_{n,h,c,M,B,a,e} \int_0^\infty [u(c) + v(m)]\exp(-\delta t)dt$$

subject to:

$$(2) \quad \dot{A} = Ai - iM + wn + h[aE + (1-a)p - a^2 w] - wh - c[eE + (1-e)p + e^2 w]$$

$$(3) \quad A = M + B$$

$$(4) \quad \lim_{t\to\infty} A\exp(-\int_0^t i d\tau) = 0 \quad \text{(no Ponzi games)}$$

where: $u(c) = c^{1-\sigma}/(1-\sigma)$ for $0 < \sigma \neq 1$ and $\log(c)$ for $\sigma = 1$; In what follows, I will stick to the general notation: $u(c)$, $u'(c)$, etc.; $\delta > 0$ is the subjective rate of time preference; the time subscripts are suppressed to economize on notation.

It is easy to see that a (e) is positive if and only if $E/p > 1$ ($E/p < 1$). It follows that a and e are never jointly positive. An assumption will be made below to rule out a positive e. It will also become clear that a will be (temporarily) positive in the aftermath of a nominal devaluation. Denote by $\mu$ the multiplier on (2) (the marginal utility of the nominal wealth). The optimality conditions for the interior solutions of the problem (1)-(4) consist of (2)-(4), and:

(5)  $n = 1$

(6)  $aE + (1-a)p = w(1 + a^2)$

(7)  $u'(c) = \mu p$

(8)  $E - p = 2aw$

(9)  $v'(m) = \mu p i$

(10)  $\dot{\mu} = \mu(\delta - i)$

where a prime, "'", indicates the first derivative.

(5) and (6) define the total supply of labor and (implicitly) the demand for the productive labor, respectively. The demand for consumption is implicitly given by (7), while (8) says that sellers are, on the margin, indifferent between selling on the domestic or the foreign market. The latter is true when the marginal selling cost equals the price differential between the two markets. (9) determines, in a standard way, the real money demand. Finally, (10) describes the optimality in the accumulation of assets.

(5), (6), and (8) can be solved for the PPP real exchange rate, $E/p$, and the real wage, $w/p$:

(11)  $E/p = (1-a^2+2a)/(1-a^2) \geq 1$

(12)  $w/p = 1/(1-a^2) \geq 1$

where the inequalities in (11)-(12) are strict for any positive a; assumptions will be made below to ensure that a is between zero and one;

Thus, the real exchange rate and the real wage are both rising in a. The underlying intuition is straightforward. Suppose that the PPP real exchange rate, E/p, goes up. It will be shown in a moment that this is indeed the case following a devaluation. If the real wage remains constant, then each firm has an incentive to redirect its sales towards the foreign market, i.e., raise a. However, the foreign sales are labor-intensive, so there is an excess demand for labor. It necessitates both an increase in the real wage and, as shown below, a fall in the productive employment (=output).

In equilibrium the following must be true:

$$(13) \quad n = 1 = h(1+a^2)$$

or

$$(13') \quad h = 1/(1+a^2)$$

$$(14) \quad c = h(1-a) = (1-a)/(1+a^2)$$

$$(15) \quad B = 0$$

$$(16) \quad \dot{M} = haE = aE/(1+a^2)$$

that is, the domestic labor and goods markets clear[5], the net supply of private bonds is zero (since all the families are alike), and the change in the stock of nominal money equals the net exports. The latter is just a restatement of the familiar endogeneity of money in the sterilization-free fixed exchange rate regime.

As seen from (13)-(14), output and consumption on one hand, and a (and hence the real exchange rate) and net exports on the other, are inversely related. It has been already explained why higher $E/p$ encourages exports. Now, notice that, given the inflexibility of labor supply, selling abroad necessarily crowds out productive employment and hence reduces output.

As will be discussed in a moment, a as well as ha will jump up following a nominal devaluation. Therefore, the type of crowding out in the labor market which I have just described, is really an argument about the contractionary devaluation.

Notice that this argument is completely different from the ones already available in the literature. Recall that one of the oldest among these existing arguments, due to Diaz-Alejandro (1965), is that a devaluation redistributes income towards the groups with a low marginal propensity to consume, implying a fall in the aggregate demand and output. The other familiar theory also stresses the contraction in the aggregate demand, but sees its cause in the post-devaluation negative real balance effect. Finally, van Wijnbergen (1986) argued that the devaluation might reduce the aggregate output by reducing the supply of

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[5]   Remember that the foreign agents cannot sell nor buy on the domestic market.

nontraded goods. This would happen if the domestic price of the nontradeables is rigid and, therefore, the post-devaluation increase in the price of imported intermediate inputs lowers the profitability in this sector.

The previously suggested explanations for the Polish post-stabilization recession have stressed a Keynesian-type fall in the domestic effective demand (see Blanchard et al (1990) and Rodrik (1992a)), the collapse of the Soviet export market (Rodrik (1992b)), and a "credit crunch" caused by a simultaneous upward adjustment in prices and tight control of nominal credit expansion (see Calvo and Coricelli (1991)).

Clearly, a negative post-devaluation relationship between h and ha would never be true in the fixed-labor-supply versions of the Mundell-Flemming and the monetary models (see, e.g., Frenkel and Mussa (1985), Dornbusch (1973), and Calvo (1981). By definition, in these models a devaluation would not affect output. At the same time, it would increase exports because of either the expenditure-switching effect of a real depreciation (when the Marshall-Lerner holds), or a need to rebuild real money balances (when there is no long-run "money illusion"). However, a countercyclical trade balance does obtain in the standard Keynesian model in which imports depend on income, and the latter falls in the result of the devaluation-caused decline in demand.

As discussed in section 2, the Polish data on the real exchange rate, net exports, employment and output seem to support the explanation advanced in this paper. A prevalent street trade in Poland in 1990-1991 provides an additional anecdotal support for my basic point that trade

may sometimes crowd out production.

The dynamic path of the economy can be derived as follows. First, use (7), (11) and (14) to express the marginal utility of nominal wealth in terms of a:

$$(17) \quad \mu = u'(c)/p = u'[(1-a)/(1+a^2)]/[E(1-a^2+2a)/(1-a^2)] \equiv F(a)$$
$$+$$

Second, the law of motion for a can be derived by substituting (9), (11) and (17) into (10):

$$(18) \quad \dot{a} = [F(a)/F'(a)](\delta - i) =$$

$$= [F(a)/F'(a)][\delta - v'(m)/u'(c)]$$

where m and c are computed using (11) and (14).

The dynamic behavior of the economy is, therefore, described by the differential equations (16) and (18), the initial nominal stock of money, $M_0$, and (4). M is a stock variable and is differentiable everywhere. a (and, subsequently, all the nominal and real variables) is differentiable everywhere except, possibly, at time zero where it is, at least, right-differentiable. The steady-state of the system is determined by:

$$(19) \quad \dot{a}^* = 0$$

$$(20) \quad M^* = E\{(v')^{-1}[\delta]\} \equiv Em^*$$

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(11), (13), (14), (16), (18), and (19) jointly imply that, in the steady-state, the trade balance and trade are zero and, labor is employed solely in production, PPP holds (i.e., E/p = 1), and output and consumption are at the maximal levels. Also, the nominal interest rate is equal to the subjective rate of time preference. (20) says that in the long run the real balances of money are constant and independent of the price level (i.e., there is no long run "money illusion").

I assume that the initial stock of nominal money is lower than the steady-state stock, i.e.,

$$(21) \quad M_0 < M^* = E\{(v')^{-1} [\delta]\}$$

A (permanent) devaluation is an obvious case in which (21) would be true.[6] Note that what (21) really means is that an establishment of the long run equilibrium requires an increase in the nominal stock of money. But, given the lack of both capital mobility and accommodation by the Central Bank, such increase can only occur through a monetization of a temporary trade surplus.

It is easy to establish that, under (21), the linearized counterpart of (16) and (18) is saddle-point stable. If a (and hence the trade balance) is initially zero then, as shown in Figure 8, a dynamic adjustment involves an instantaneous upward jump in a onto a negatively-sloped saddle path, SS. Along SS, a falls and M rises. I

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[6] Strictly, (21) will not necessarily be true for every devaluation, since it must be the case that that the new nominal exchange rate is higher than the ratio of the current nominal money stock to the long-run real money demand. Yet, (21) would certainly hold for a sufficiently large devaluation.

make implicit assumptions which guarantee that a is always below unity.[7]

Given the path for a, the time profiles of the real exchange rate, the real wage, output, net exports and consumption are all clear from (11), (12), (13), (14) and (16). Note that, just as in Poland, the PPP real exchange rate and the net exports first rise and then gradually fall. The model's predictions about output and consumption are also in accord with the Polish experience. However, as said earlier, the model delivers a counterfactual pattern of real wages.

What about the behavior of the real balances and interest rates? First, let $\lambda$ be the negative (stable) root of the linearized system. Noting that the stationary value of a is zero, it follows from the well-known argument that on the saddle path:

$$(22) \quad \dot{a} = \lambda a$$

(22) together with the fact that a falls on the transition can now be used to (approximately) characterize the dynamic path for the nominal and real interest rates, and the real money balances. Denoting by $\rho$ the instantaneous real interest rate, the Fisher equation, (7), (10), (14), (17), and (22) imply the following chain of equalities:

$$(23) \quad \rho = i - (\dot{p}/p) = \delta - (\dot{\mu}/\mu) - (\dot{p}/p) = \delta - (u''/u')c =$$

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[7] Obviously, it is sufficient to ensure that a jumps up to less than one.

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$$= \delta - (u''c/u')(\dot{c}/c) = \delta + \sigma[(-1+a^2-2a)/(1+a^2)(1-a)]\dot{a} =$$

$$= \delta + \sigma\lambda[(-1+a^2-2a)/(1+a^2)(1-a)]a \equiv \rho(a)$$

Now, differentiation yields:

(24)  $\rho'(a) > 0$

(24) and the fifth equality in (23) say that, on impact, $\rho$ jumps above $\delta$ and then falls back on the transition.  If the measurement/dating problems described in section 2 indeed apply to the Polish data, then (23) and (24) are consistent with the realities.

Using (11) and (22) the inflation rate, $\pi$, can be expressed as a function of a:

(25)  $\pi = \dot{p}/p = -2\{(1+a^2)/[(1-a^2+2a)(1-a^2)]\}\dot{a} =$

$$= -2\lambda\{(1+a^2)/[(1-a^2+2a)(1-a^2)]\}a \equiv \pi(a)$$

and

(26)  $\pi'(a) > 0$

that is, the higher a, the higher the inflation rate.  Thus, following a devaluation the inflation rate jumps up and then gradually dies down. As discussed earlier, this is what one finds in the Polish data for the first two quarters of 1990.

The Fisher equation together with (24) and (25) lead to the following expression for the nominal interest rate:

(27)    $i = \rho + \pi = \rho(a) + \pi(a) \equiv i(a)$
                                            +

Thus, i mimics the behavior of $\rho$ and $\pi$, as it jumps on impact and then gradually returns to the unchanged long-run level $\delta$. This pattern is indeed present in the Polish data.

Since i (c) is rising (falling) in a, the separability of the utility function and the strict concavity of u(c) as well as (7) and (9) straightforwardly imply that:

(28)    $m = m(\underline{a})$

that is, a falling a corresponds to an increasing m. Again, this is in accord with the Polish transitional experience. It can also be shown, the price level (real balances) must increase (fall) at the instant of a devaluation.

## 4. Conclusions

In this paper, I have first documented several key features of the macroeconomic adjustment in Poland which followed the Big Bang stabilization in January 1990. I have then developed a simple general equilibrium monetary model which stresses the roles played by the labor-intensive arbitrage, a devaluation, an absence of capital mobility as well as an inelastic labor supply.

In the model, a lack of both long-run "money illusion" and capital

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mobility implies that a devaluation must lead a transitory trade surplus. As selling abroad is costly, no profit-maximizing firm would ever export unless there is a real depreciation. Given that selling abroad is labor-intensive and the labor supply perfectly inelastic, higher foreign sales, effectively, crowd out employment in production, thus leading to a fall in output. Therefore, I suggest that the Polish post-stabilization recession was due to a contractionary devaluation. With an exception of the real wage, the model, essentially, accounts for all the characteristic features of the Polish adjustment.

The realities in some formerly communist countries, e.g., Russia, closely resemble those in the pre-stabilization Poland. Therefore, the model might be useful in designing the future exchange-rate-based stabilizations in Eastern Europe and elsewhere. If the Polish-type saw-tooth adjustment is viewed as undesirable, it could, clearly, be avoided provided the future devaluations are smaller and/or accompanied by a one-shot monetary injection by the central bank.

## References

Blanchard, O., Dornbusch, R., Krugman, P., Layard, R., and L. Summers, 1990, Reform in Eastern Europe and the Soviet Union, UN Wider.

Calvo, G.A., 1981, Devaluation: Levels versus Rates, Journal of International Economics 11, 165-172.

Calvo, G., and F. Coricelli, 1991, Stagflationary Effect of Stabilization Programs in Reforming Socialist Countries: Enterprise-Side versus Household-Side Effects, World Bank Economic Review 6, 71-90.

Diaz-Alejandro, C., 1965, "Exchange Rate Devaluation in a Semi-Industrialized Economy: The Experience of Argentina 1955-1961", MIT Press.

Dornbusch, R., 1973, "Devaluation, Money, and Nontraded Goods", The American Economic Review 63, 871-880.

Frenkel, J.A., and M.L. Mussa, 1985, Asset Markets, Exchange Rates and the Balance of Payments, Chapter 14 in: Handbook of International Economics edited by R.W. Jones and P.B. Kenen, North-Holland, Amsterdam.

Rodrik, D., 1992a, "Foreign Trade in Eastern Europe's Transition: Early Results", mimeo, Hoover Institution.

Rodrik, D., 1992b, "Making Sense of the Soviet Trade Shock in Eastern Europe: The Framework and Some Estimates", mimeo, Hoover Institution.

Stanczak, K., 1992, Devaluations and Revaluations without Capital Mobility and PPP, mimeo, UCLA, February.

van Wijnbergen, S., 1986, "Exchange Rate Management and Stabilization Policies in Developing Countries", in S. Edwards and L. Ahamed (eds.), Economic Adjustment and Exchange Rates in Developing Countries, University of Chicago Press, Chicago, Illinois.
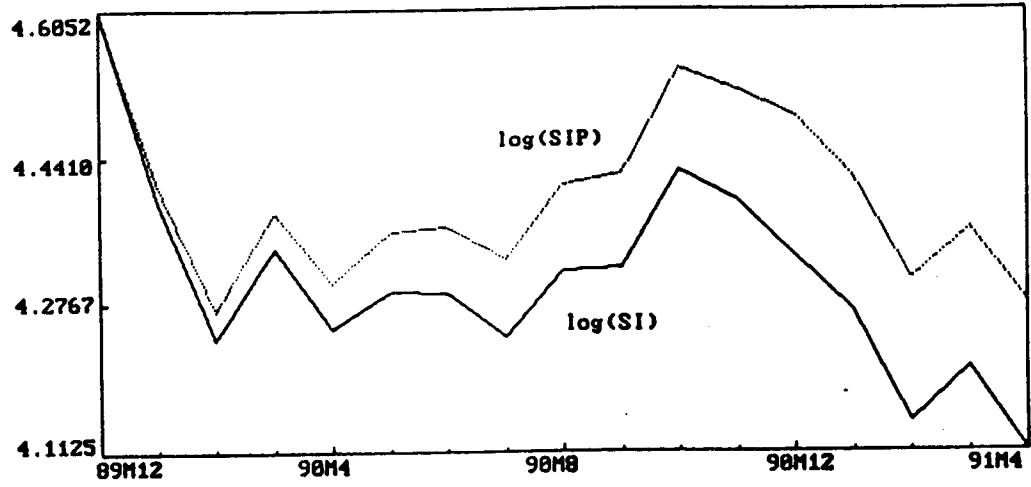
Poland: Output (SI) and Output per Employee (SIP)
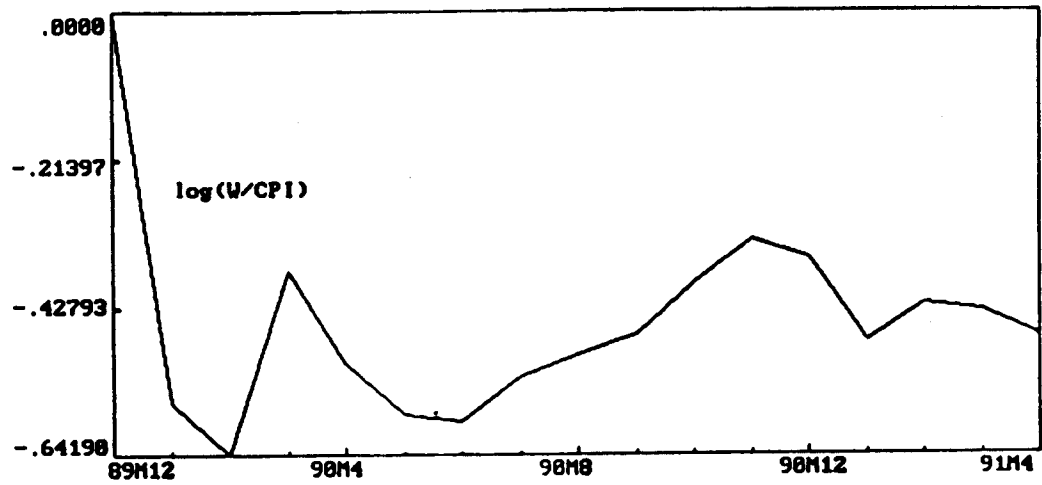


Figure 1

Poland: The Real Wage



Figure 2

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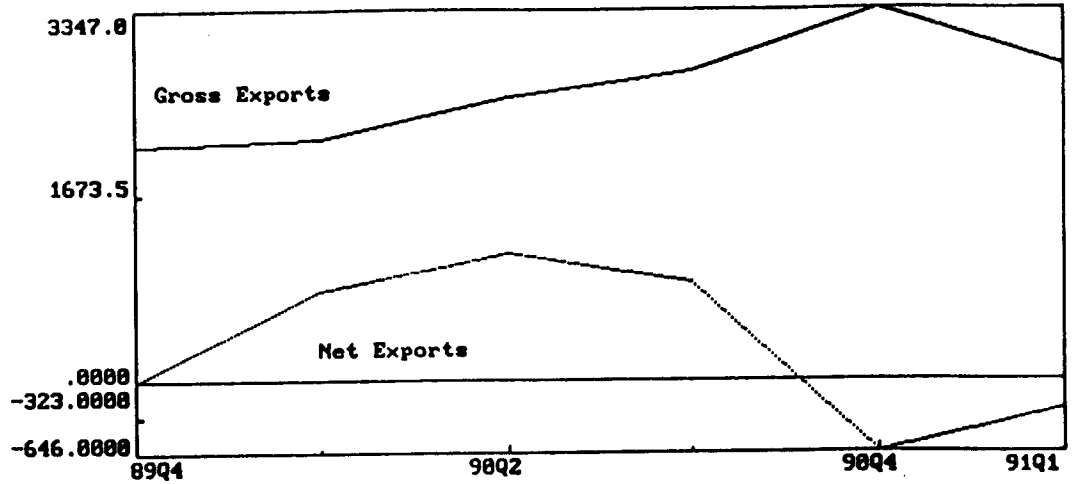Poland: Gross and Net Dollar-Denominated Exports (in $ millions)



Figure 3
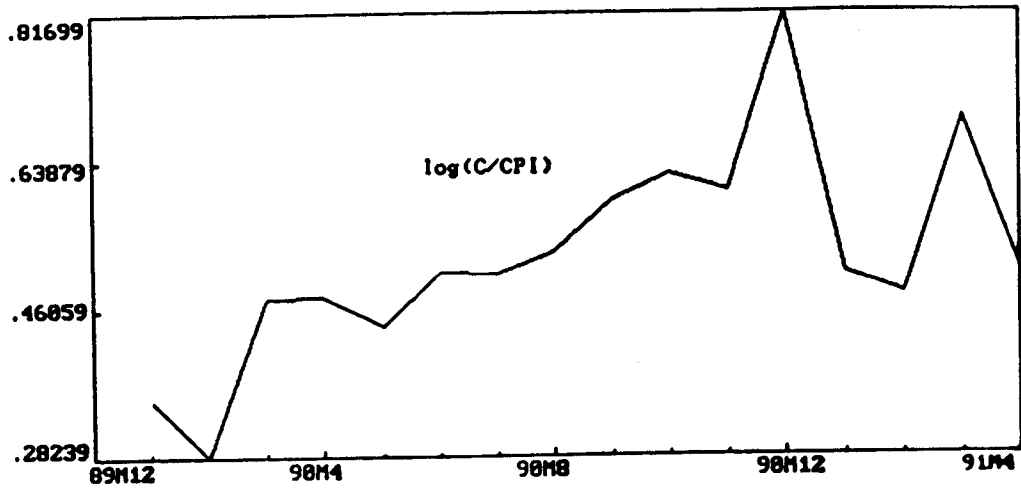
Poland: Private Consumption per Capita



Figure 4

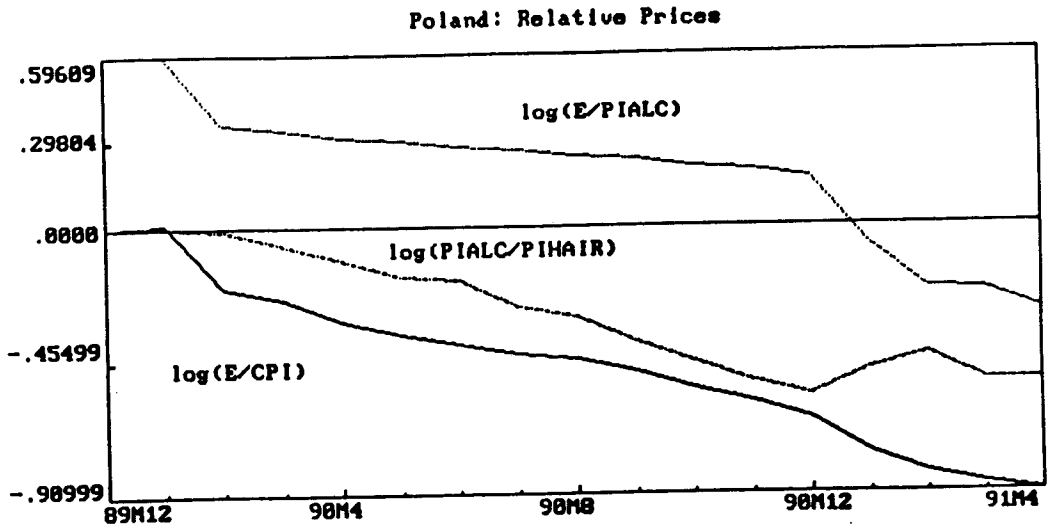22

Poland: Relative Prices

log(E/PIALC)

log(PIALC/PIHAIR)

log(E/CPI)

**Figure 5**


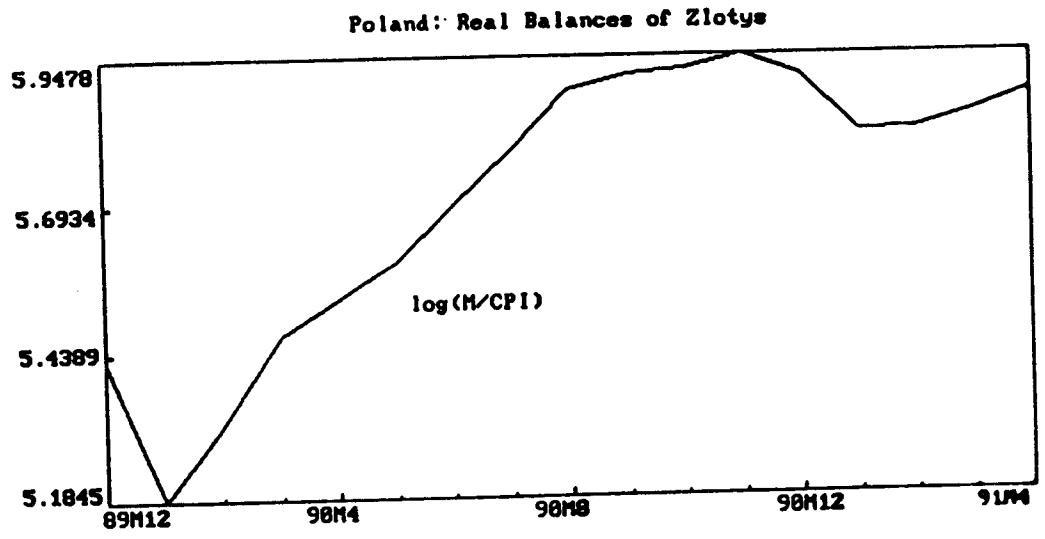
Poland: Real Balances of Zlotys

log(M/CPI)

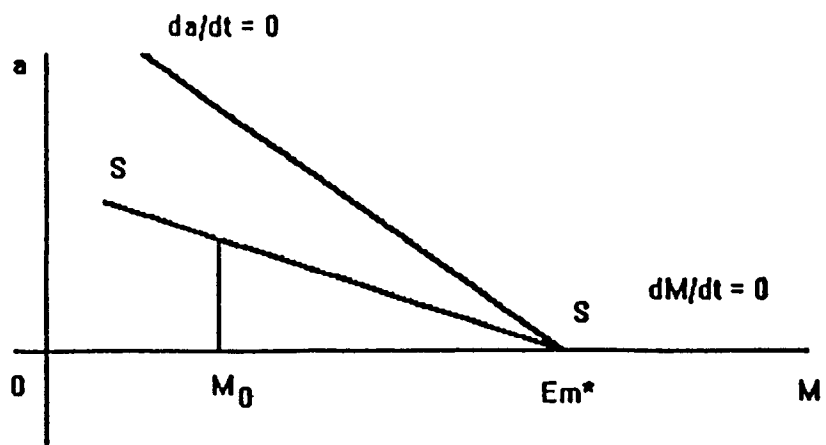**Figure 6**

Poland: Interest Rates (in %/100 per month)
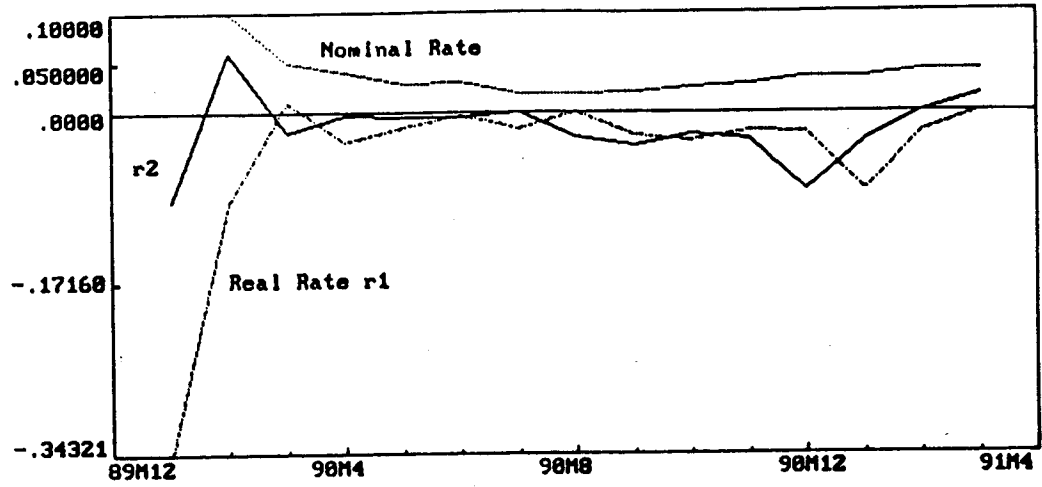
Figure 7

**Figure 8**
**Dynamics of a and M**