WP/96/57

INTERNATIONAL MONETARY FUND
European I Department

Moderate Inflation in Poland: A Real Story
Prepared by Thierry Pujol and Mark Griffiths *
Authorized for Distribution by Carlo Cottarelli

June 1996

Abstract

Why is moving from moderate to low inflation almost always slow or costly? This paper answers this question, based on the Polish experience. First, reflecting the transition to a market economy, Polish inflation has been marked by significant changes in relative prices. Second, as wage and price indexation takes root, the inflationary effect of shocks to relative prices is magnified. Third, lagging structural reform, including the failure to extend hard budget constraints to all sectors of the economy, makes monetary policy less effective. Reduced money supply growth with structural reform offers the best prospect for moving to low inflation.

JEL Classification Numbers: E31, P22, E64

* We would like to thank, without implication, Gérard Bélanger, Carlo Cottarelli, Michael Deppler, Juha Kähkönen, Vincent Köen, Markus Rodlauer, and Robert Sirhej, for their comments and encouragement, and Patricia Emerson, Indra Perera and David Maxwell for their assistance.
Table of Contents

Summary iii

1. Introduction 1
2. Sectoral Aspects of Polish Inflation 2
3. Price Adjustment in a Well-Indexed Economy 15
4. Monetary Policy, Delayed Restructuring and Inflation 20
5. Conclusion 34

References 37

Tables

1. Indices of Relative Prices in Visegrad Countries and Slovenia 11
2. The Relative Price of Polish Utilities 13
3. Electricity and Natural Gas Pricing in 1994 14
4. Wage and Price Equations 17
5. The Structure of Polish Imports in 1994 19
6. Consumer Price Inflation Basic Descriptive Statistics 22
7. Predictive Content of Broad Money and Interest Rates in Explaining Inflation 24

Charts

1. Indicators of Real Economic Activity, 1989-95 3
2. Indicators of Real Economic Activity, 1989-95 4
3a. Monthly Price Changes 7
3b. Histogram of Monthly Price Changes 8
4. Money Growth and Inflation 21
5. Equilibrium in Two Sector Model 31
Summary

In 1990, Poland became the first transition economy to undertake a comprehensive program of price liberalization, macroeconomic stabilization, and structural reform. Annual inflation rates were reduced from quadruple-to double-digit levels within a relatively short time. However, an inflation rate of about 30 percent became entrenched until recently; this was unacceptably high in its own right, and inconsistent with the authorities' ambitions to progress toward European norms.

This paper looks at how "real" factors (relative prices, indexation rules, and enterprise restructuring) have complicated inflation reduction--factors that, in the event, might usefully have been tackled more fully during the initial stabilization phase.

First, the paper finds that Polish inflation has been marked by significant relative price changes, reflecting the adoption of the price mechanism as the means of allocating resources.

Second, the paper shows how changes in relative prices can have an inflationary impact. If changing prices is costly, only firms facing large shocks will change their prices. If the large shocks are predominantly price increases--that is, the distribution of price increases is skewed rightward--there is upward pressure on the price level. The paper tests this argument against the alternative that inflation itself induces relative price variability. It also shows how the inflationary impact of relative price changes in Poland is worsened by pervasive wage and price indexation.

Third, the paper outlines problems encountered when relying solely on monetary policy as a means of reducing inflation. Failure to impose hard budget constraints evenly across all sectors means the burden of high interest rates or exchange rate appreciation falls disproportionately on the emerging private sector. Ideally, tight monetary policy should be complemented by a full-fledged restructuring effort that enhances wage and price flexibility while ensuring that the burden of hard budget constraints is borne evenly.
This page intentionally left blank
I. Introduction

Inflation in Poland has proven resilient. Since stabilizing the economy in 1991-92, policymakers have been unable to tame inflation and to bring it back to single-digit levels. Hyperinflation was overcome, but since then inflation has seemingly become stuck at moderate levels. Of particular interest is the fact that a marked slowdown of the currency depreciation, which began in 1994, appears to have contributed little, at least until recently.

Why is that? In a sense, this is the same question Dornbusch and Fischer (1993) asked for other countries: why is it that the switch from moderate to low inflation is almost always slow or costly?

A first answer is that Poland was not willing to bear the high cost of this adjustment. Just over three years ago, when still in academia, Finance Minister Kolodko expressed this view succinctly: "It seems that curbing the inflation rate to about 2 percent monthly (i.e., 27 percent yearly), while keeping up the trend to form market-clearing prices, is sufficient at this phase of inflation fighting. Because otherwise, e.g., if a goal of the order of 1 percent monthly is laid down, the policy must be much more restrictive, thus sustaining the recessionary trends in the real economy sphere and threatening it with further destruction" (Kolodko et al. (1992)).

This assessment raises the issue of why the cost of reducing inflation in terms of lost output (the "sacrifice ratio") is unusually high when inflation is moderate.

The general thrust of the analysis of this chapter is that persistent inflation is both caused by and reflects imbalances in the real economy. The main arguments are as follows:

First, a salient feature of Polish inflation is that it has been accompanied by marked changes in relative prices. In particular, utility and rental price inflation has vastly exceeded overall CPI inflation. The explanation for this is fairly intuitive: to improve profitability, these sectors, and loss-making firms in general, need to change their relative prices if they are to remain in business. In addition, prices in many sectors are still in the process of converging toward international levels.

Second, in a well-indexed economy, the effects of frequent sectoral price hikes will be magnified. A wage-price model of the Polish economy shows that after four years the initial inflationary impact of a CPI shock is quadrupled, even if the exchange rate remains constant. In a sense, this validates Kolodko's assertion: to combat inflation, sectoral inflationary pressure combined with high indexation would require very tight monetary policy.

Third, certain underlying structural problems, in particular in the labor market, undermine the efficiency of monetary and fiscal policies. Chief among them is the fact that some loss-making firms do not yet face a hard budget constraint. The threat of job losses gives large established firms political power against the imposition of such constraints. In
addition, the sizable debts such firms have already accumulated makes default a powerful threat against banks. In this context, a policy of high real interest rates and exchange rate appreciation would place the brunt of adjustment on Poland's emerging private sector. In short, tight monetary policy is not a substitute for structural reforms.

2. Sectoral aspects of Polish inflation

Price liberalization was a key element of reform programs in transitional economies. Hence, there was an outburst of inflation at the inception of the transition, also fueled by a monetary overhang. But, as the primary goal of this liberalization was to restore prices as a means for allocating resources in the economy, it is important to analyze how relative prices have evolved.

a. A brief history of inflation in Poland. (1989-94) 1/

Chart 1 illustrates the precipitous increase in inflation in Poland in 1989. By October 1989, CPI inflation had reached 55 percent per month and, in early 1990, Poland was on the verge of hyperinflation (for the year, inflation averaged 585.8 percent). The stabilization program brought inflation down, but was accompanied by an unexpectedly high drop in output (see Ebrill et al. (1994)). That period also witnessed marked changes in the terms of trade and in real wages.

During these chaotic developments on the macroeconomic front, movements in the overall CPI masked considerable divergences in relative prices. Past repressed inflation in the service sector suddenly materialized through a marked increase in relative prices. In particular, the drift in services prices persisted in 1992, even though overall price inflation was tamed (see Chart 2). By 1993, however, it seemed that the bulk of relative price adjustment between food, services and manufactured goods had already taken place.

Relative price adjustment was, however, not over. At a more disaggregated level, relative price changes remain substantial although less visible. For instance, between January 1992 and May 1995, the relative cost of water tripled. Rental prices have also largely exceeded average inflation. Substantial relative price adjustment can therefore take place not only in the atmosphere of hyperinflation and stabilization, but also during moderate inflation spells.

The causation between these relative price changes and inflation remains open to question. On the one hand, at low levels of inflation, even small changes in relative prices may have a large proportionate effect on

---

1/ A more detailed analysis can be found in National Bank of Poland (1995).
CHART 1
POLAND
INDICATORS OF REAL ECONOMIC ACTIVITY, 1989-95

Sources: Polish authorities and staff estimates.
CHART 2
POLAND
INDICATORS OF REAL ECONOMIC ACTIVITY, 1989-95

Price Indices
(Month-on-month percent change)

Levels
(January 1992 = 100)

Sources: Polish authorities and staff estimates.
inflation. On the other hand, annual inflation in the range of, say, 20 percent to 40 percent can also create large relative price shifts if certain prices are sticky.

The remainder of this section fleshes out the argument linking relative prices to inflation. First, following Ball and Mankiw (1995), it is shown that there is a relation between inflation and the skewness of the distribution of sectoral price changes, and that the latter helps explain inflation. Second, we use a comparison of international price levels to show that, notwithstanding the dramatic relative price changes associated with the "big bang", considerable scope remains for further Polish relative price adjustment. To the extent that relative price changes are a cause of inflation, this could fuel more inflation. Finally, the Polish energy sector is considered in some detail, to illustrate the extent of relative price adjustment that may still be needed.

b. Relative price adjustment, asymmetric price adjustment, and inflation in Poland

In recent years, economists have paid renewed attention to relative price adjustments. This interest has been fueled by consistent statistical evidence that these adjustments are asymmetric (prices are more flexible upward than downward) and that relative price adjustments are correlated with the level of inflation. Fischer (1981) stressed, for instance, that U.S. inflation is highly correlated with a higher variance of sectoral price inflation. Similarly, Gerhaeusser (1988) found instantaneous Granger-causation between inflation and relative price volatility in Germany. 1/

The empirical relationship between relative price changes and inflation has until recently been regarded as an analytical puzzle. Indeed, at first glance, there need be no relationship between relative price changes and the overall price level (for example, if money determines the overall level of prices). On this view, price increases in certain sectors would be offset by price decreases in others, leaving the overall price level in the hands of monetary policy. Of course, if prices were sticky downward, relative price changes could only occur in an inflationary context. But downward price adjustment is difficult to justify on theoretical grounds (unless adjustment costs were, for some reason, asymmetric). A solution to this puzzle must therefore be based on different grounds.

1/ Lach and Tsiddon (1992) present similar results for the Israeli hyperinflation; however, Reinsdorf (1994) argues for a negative correlation between price dispersion and inflation.
Such a solution has recently been proposed by Ball and Mankiw (1995) who argue that price stickiness (both upward and downward) arising from "menu costs" can cause higher inflation if the distribution of relative price changes is skewed. Their argument runs as follows.

In the presence of menu costs, firms will only change their prices if the costs of inaction exceed the menu costs associated with changing prices. Accordingly, small shocks to the economy will have little effect on the price level, since individual firms will be reluctant to change prices. Large shocks will have a disproportionate effect on individual prices—but not necessarily on the aggregate price level: if the distribution of shocks is symmetric, price increases and decreases at the firm level cancel each other out. Thus, greater variance of shocks need not lead to overall price inflation.

Rather, Ball and Mankiw's approach can justify a relation between the skewness of price changes and overall inflation. In a skewed distribution, most outliers are on one side of the distribution. Suppose that the distribution of relative price shocks is skewed positive (that is, there is a small number of large positive price shocks, offset by a large number of small negative price shocks). In the presence of menu costs, the large number of firms with small negative price shocks leave their prices unchanged, while firms with large price shocks increase their prices, raising the average price level. Conversely, if the distribution of price shocks is skewed negative, the overall price level will fall.

Empirical analysis of price dispersion in Poland for the 1990-94 period yields the following results.

First, the distribution of price changes is heavily skewed, and not only during the first months of the transition (Charts 3a and 3b). On average, once every two months there is some change in price more than two standard deviations away from the mean price increase. This fat-tailed distribution of price changes primarily reflects sizable price increases, largely concentrated in particular sectors (e.g., utilities). Thus, there is considerable evidence of relative price adjustment within overall price level changes.

1/ "Menu-costs" here are shorthand for all of the costs associated with changing prices, from the physical costs of reprinting menus, to the costs of lost sales from reduced customer satisfaction (Rotemberg (1987)). An interesting issue is whether these menu costs are similar in high and low inflation economies.
CHART 3a. POLAND
MONTHLY PRICE CHANGES
(In percent)
CHART 3b.
POLAND
HISTOGRAM OF MONTHLY PRICE CHANGES
Sample period: December 1989 - June 1995
Number of observations: 66

This result suggests that relative price shocks are closely linked to aggregate inflation.

However, causation is uncertain. Just as menu costs can explain why relative price increases can cause inflation, they can also explain why trend inflation owing to other causes can lead, in any given period, to a positively skewed distribution of price changes (Ball and Mankiw (1994)). First, in the presence of menu costs and trend inflation, those sectors facing relative price declines can simply avoid paying the menu cost, keep nominal prices unchanged, and allow overall inflation to generate the desired erosion in relative prices. On the other hand, those sectors needing to establish relative price increases must increase prices, over and above the inflation rate. With no change in certain sectors and increases in others, the result is a positively skewed distribution of price changes. Second, menu costs may differ across sectors. For example, assume that average long-term inflation does not differ between sectors. Sectors with small menu costs will change prices continuously, but those with large menu costs will change prices infrequently—but by large amounts when they do. The result is apparent skewness in the distribution of price changes, without implication for the long term inflation rate.

The question is whether skewness causes inflation, or whether inflation causes skewness. On the first interpretation, skewness—and relative prices—are part of the inflation process; on the latter they are simply an epiphenomenon. If the relative price explanation is correct, one should

\[ \Delta CPI = 0.20 \Delta CPI(-1) + 0.67 SD + 1.29 SK + 77.5 \]  
\[ R^2 = 0.59 \quad D.W. = 1.67 \]

Second, monthly inflation (ΔCPI) is highly correlated with the standard deviation (SD) and skewness (SK) of the distribution of sectoral price changes that month. 1/

As in most econometric equations in this paper, t-statistics are reported in parentheses; D.W. refers to the Durbin-Watson statistic. In the calculations, monthly inflation series for 35 consumer price basket items were seasonally adjusted by regressing on monthly dummies, then weighted squared and cubed deviations from the mean inflation rate were used to calculate the standard deviation and skewness of the distribution of price changes. Results were somewhat sensitive to the sample period used; including a dummy for the January 1990 price liberalization or confining the sample to the period of more moderate inflation tended to increase the statistical significance of skewness, and lessen the statistical significance of the standard deviation term.

1/ As in most econometric equations in this paper, t-statistics are reported in parentheses; D.W. refers to the Durbin-Watson statistic. In the calculations, monthly inflation series for 35 consumer price basket items were seasonally adjusted by regressing on monthly dummies, then weighted squared and cubed deviations from the mean inflation rate were used to calculate the standard deviation and skewness of the distribution of price changes. Results were somewhat sensitive to the sample period used; including a dummy for the January 1990 price liberalization or confining the sample to the period of more moderate inflation tended to increase the statistical significance of skewness, and lessen the statistical significance of the standard deviation term.
observe in the same sectors skewed price increases and a lasting improvement in their relative prices. If the second explanation is correct, the skewed price increases should be essentially random, without any lasting effect. To distinguish between these explanations, the change in a sector's relative price (RCPI) between December 1989 and June 1995 was regressed against the number of times that sector registered a skewed price increase (NSKI):

$$\Delta \text{RCPI}_i = 0.211 \text{NSKI}_i + 0.94$$  \hspace{1cm} R^2 = 0.39 \hspace{1cm} (2)

(4.48) \hspace{1cm} (2.03)

This cross-section regression indicates a strong correlation between a sector's ability to generate a sustained increase in relative prices, and the number of times its price changes are "outliers". This is consistent with the claim that skewness captures lasting relative price changes, and that these relative price changes are causing Polish inflation.

c. Incomplete convergence toward world prices

While the previous section argued for a causal link from relative price changes to inflation, for this linkage to have continuing empirical significance it needs to be shown that considerable relative price adjustment has still to take place. This section makes two attempts at this. First, it is shown that, in general, prices of Polish goods are lower than their international counterparts. Second, this undervaluation varies enormously for different goods. The implication is that exchange rate adjustment alone would not solve the problem of relative price disparities.

Description of the method Since 1991, Business Eastern Europe (BEE) has collected prices for basic consumer goods and services in various Eastern European countries. In addition, the Polish statistical bulletin provides a breakdown of Polish households' average expenditures, together with information on the volume of consumption of selected foodstuffs.

By combining these sets of data, one can calculate a cost of living index, with weights corresponding to the consumption basket for Polish households. To facilitate comparison, for a selection of countries we calculated a relative price index (I), as the weighted average of each country's cost-of-living index relative to its Austrian equivalent, the latter assumed to be prototypical for a Western European country.

1/ The basket, which includes 61 items, is in itself a useful source of information. It should be noted, however, that little is known about the sampling procedures and that prices are collected only in capital cities.

2/ $P_{CEE,i}$ represents the price of good $i$ in the Central and Eastern European country, and $P_{Aus,i}$ the price of good $i$ in Austria, converted to a common currency; $\omega_i$ is the weight of good $i$ in Polish household expenditure.
Index I provides information on the relative cost of living in Eastern European countries or, under certain conditions, the possible undervaluation of the exchange rate. It is also of interest to measure the extent to which product prices depart from the average cost of living index. This can be done by calculating a (weighted) standard deviation of individual relative prices:

\[ S = \sqrt{\sum \omega_i \left( \frac{P_{CEE,i}}{P_{Aus,i}} - I \right)^2} \]  

and dividing by index I to derive the coefficient of variation.

Table 1. Indices of Relative Prices in Visegrad Countries and Slovenia

(In percent. March 1994)

<table>
<thead>
<tr>
<th></th>
<th>Poland</th>
<th>Hungary</th>
<th>Czech Rep.</th>
<th>Slovakia</th>
<th>Slovenia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index I</td>
<td>60.4</td>
<td>74.1</td>
<td>47.5</td>
<td>57.7</td>
<td>95.1</td>
</tr>
<tr>
<td>Food</td>
<td>67.3</td>
<td>79.2</td>
<td>54.3</td>
<td>68.0</td>
<td>105.2</td>
</tr>
<tr>
<td>Utilities</td>
<td>22.6</td>
<td>35.0</td>
<td>29.6</td>
<td>10.9</td>
<td>73.6</td>
</tr>
<tr>
<td>Coefficient of</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>57.4</td>
<td>61.7</td>
<td>57.7</td>
<td>74.2</td>
<td>49.9</td>
</tr>
<tr>
<td>1991</td>
<td>45.5</td>
<td>75.0</td>
<td>38.6</td>
<td></td>
<td>83.3</td>
</tr>
</tbody>
</table>

Sources: Business Eastern Europe (1994); and authors' calculations.

The cost of living index is much lower in Slovenia and the Visegrad group of countries than in Austria (Table 1). However, prices in Slovenia and, to a lesser extent, Hungary come closer to their Austrian counterparts. Not surprisingly, these two countries were also relatively open to international trade during the communist era. In comparison, a recent (and much more detailed) study of Russian prices, De Masi and Koen (1995), found that,
in 1994, Russian prices were only a fifth of the level of their French equivalents. Thus, while considerable distance remains, the group of countries surveyed here has made notable progress toward Western price levels, in particular after 1991.

In addition, relative prices (captured by index $S$) fluctuate significantly around the average price level, more so than would be predicted if Eastern European prices were a constant fraction of Austrian prices. In a sense, the variation in relative prices gives a better indication of the extent of price liberalization. For Poland, much of this variation reflects the significant undervaluation (in relative terms) of utility prices: subsidized household utility prices have remained an important component of the social safety net. Other prices, and in particular those of manufacturing goods, come closer to world (Austrian) prices. 1/

The low value of index $I$ suggests that considerable currency undervaluation remains. However, currency appreciation would not eliminate the price dispersion and the need for corrective relative price adjustments.

d. The need to adjust relative prices: the case of energy

As a legacy of the communist safety net, certain goods are still highly subsidized in Poland. The comparison with Austrian price levels has underlined that the two single most important areas of subsidies are probably the housing and the energy sectors. This section focuses on the latter. 2/

It would be incorrect to suggest that utility prices have not adjusted since the beginning of the transition. Indeed, as Table 2 reveals, utility price growth has significantly outpaced CPI growth since 1990. Compared to the average CPI, their relative price has multiplied two to fifteen times. It is noteworthy, however, that most of the relative price hike took place before 1992.

Before the transition, energy subsidies in Poland were pervasive and clearly favored over-consumption. As stressed by Meyers et al. (1994a and 1994b), energy-intensive industries in Poland in 1991 reached a share in GDP that, among industrialized countries, only Norway exceeded. These authors

1/ This concentration of differences in a few of the service sectors suggests that productivity differentials are not the main explanation of the different relative price structures.

2/ Subsidies in the housing sector also have far reaching implications. In particular, to retain their subsidized housing, households are often reluctant to move to other regions, if they then have to pay market rents. As a result, unemployment rates vary widely between regions and geographical mismatches are high. However, these important issues are beyond the scope of the present study.
Table 2. The Relative Price of Polish Utilities 1/

<table>
<thead>
<tr>
<th></th>
<th>Hot Water Central Heating</th>
<th>Electricity and Gas</th>
<th>Health</th>
<th>Public Transport</th>
<th>Rents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec. 1989</td>
<td>27.9</td>
<td>18.9</td>
<td>21.5</td>
<td>35.8</td>
<td>55.9</td>
</tr>
<tr>
<td>Jan. 1992</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>June 1995</td>
<td>103.0</td>
<td>331.5</td>
<td>124.1</td>
<td>114.3</td>
<td>118.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>137.1</td>
</tr>
</tbody>
</table>

Source: Polish Statistical Office, Biuletyn Statystyczny, various issues.

1/ Ratio of sectoral price index to CPI (in percent).
stands in stark contrast with well-established practices in Eastern European economies where (short-term) average cost pricing is favored. Because the debt levels of utility companies are unusually low by Western standards, low energy prices do not necessarily bring these companies into the red. However, leaving aside the insufficient return on capital, ignoring replacement costs will become a growing impediment as the need for modernizing existing equipment becomes more pressing.

Thus there is evidence that the relative price of utilities is still in need of significant overhaul. According to Freund and Wallich (1995), in 1993 the extent of desirable price adjustment ranged from 60 percent for district heat to 80 percent for gas and 90 percent for electricity.

Implementing such an energy price increase could create profound social tensions. However, since Poland's income elasticity of energy consumption exceeds one, the welfare gains from the current system of energy price subsidies are greater for the rich than for the poor and, overall, the current system is regressive (Freund and Wallich (1995)). To maintain the safety net, while encouraging more efficient energy usage, the one-time increase in energy prices could be accompanied by cash or voucher distribution to compensate households. It is clear that, for the reform to succeed and to be genuinely welfare-improving, considerable attention needs to be paid to its design. The point is more that the case of energy prices shows that further relative price adjustment still has to be made in Poland, and that this is likely to have significant implications for inflation.

Table 3. Electricity and Natural Gas Pricing in 1994
(Absolute terms, and in percent of estimated LRMC)

<table>
<thead>
<tr>
<th>Country</th>
<th>Electricity 1/</th>
<th>Natural Gas 2/</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Industrial</td>
<td>Residential</td>
<td>Industrial</td>
</tr>
<tr>
<td>Poland</td>
<td>3.7 (60-70)</td>
<td>5.1 (50-50)</td>
<td>12 (90-100)</td>
</tr>
<tr>
<td>Hungary</td>
<td>5.2 (130)</td>
<td>5.5 (70-80)</td>
<td>28 (112)</td>
</tr>
<tr>
<td>OECD</td>
<td>7.4</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>


1/ U.S. cents/kWh.
2/ U.S. cents/cubic meter.
3. **Price adjustment in a well-indexed economy**

The previous section documented the role that relative price adjustment has played in the Polish inflation story. This section estimates the extent to which Polish inflation has become increasingly inertial, reflecting the widespread move toward indexation. The two elements, relative price adjustment and inertial inflation, are then put together to consider the likely inflationary consequences of future relative price adjustment.

a. **The dynamics of wages, prices, and the exchange rate**

To gauge the extent of wage and price indexation, we estimated a standard mark-up model of the Polish economy. Given that the estimation period is restricted to 1991:3-1995:5, simple dynamic specifications were favored. This exercise sheds some light on the nature of the interplay between prices, wages and the exchange rate, as well as of the lags involved.

\[ PPI = (1+\mu) \left( \frac{P_{IC} IC + WL}{Y} \right)^\alpha \]  

Thus, producer prices are a mark-up on unit variable costs, defined as the sum of wage costs (WL) and the costs of intermediate inputs (P_{IC} IC), divided by output (Y).

Output affects prices through at least two distinct channels. First, through the effect on marginal cost. Unless the production function has constant returns to scale, average and marginal productivity differ. For example, with increasing returns to scale and holding factor prices constant, marginal cost will decline as output increases. Second, through the effect on the mark-up. Some authors have argued that, in industrialized economies, price-competition fades somewhat during growth spurts. Therefore, the mark-up $\mu$ of prices on costs is a function of capacity utilization, simply proxied here by changes in output.

The impact of the exchange rate (exr) upon producer prices is also twofold. First, it directly affects the cost of imported intermediate

---

1/ It is usually accepted that, before the transition, inflation was artificially repressed in Poland, as evidenced by rationing and the significant role of the parallel (black) market. Thus, it would not make sense to use data prior to 1990. In addition, significant behavioral changes accompanying the Polish hyperinflation rule out using 1990 data.
inputs. Second, foreign competition may also influence the mark-up of domestic firms: when the currency appreciates, margins shrink in those sectors most exposed to foreign competition.

Overall, a reduced form equivalent of equation (5) can be expressed as

\[ \log(PPI) = a_1 \log(W) + a_2 \log(\text{exr}) + a_3 \log(Y) + a_4 \]  

(6)

The CPI equation is largely an accounting identity. Most models simply assume that the CPI is a weighted average of producer price indices and import prices. This CPI equation also incorporates wages. This could be justified on the following grounds. First, consumer goods are often more labor intensive than typical industrial goods. Hence, simply using an aggregate PPI would underestimate the influence of wages. Second, wages also represent an important variable cost for retailers. Thus, for consumer prices, the following equation is assumed:

\[ \log(CPI) = b_1 \log(PPI) + b_2 \log(\text{exr}) + b_3 \log(W) + b_4 \]  

(7)

For the labor market, a standard relation between unemployment and real wages is assumed:

\[ \log(Wn) = \log(CPI) - c_1 \log(UR) + c_2 \]  

(8)

where UR represents the unemployment rate, and wages are considered net of tax.  1/

To capture the dynamics associated with high frequency data, these equations were all estimated in an error-correction form. This involves estimating, first, a long-term ("cointegrating") relation between the various variables and, second, a short-term dynamic equation which determines the speed of adjustment towards the long-term target. Econometric results are reported in Table 4.  2/

(ii) A highly indexed economy

Poland is a well-indexed economy, therefore prone to relatively high inflation. Such findings are not unexpected after a hyperinflation spell (see Commander and Coricelli (1991)). However, certain aspects of the econometric results deserve specific comment.

---

1/ In the simulations that follow, the tax wedge is held constant.

2/ The short sample prohibits any serious attempt to test for cointegration; it also makes our estimates fragile, and subject to small sample bias. By the same token, the short period did not allow the inclusion of long-term error correcting mechanisms in certain equations (e.g., productivity in the wage equation).
Table 4. Poland: Wage and Price Equations

<table>
<thead>
<tr>
<th>Equation</th>
<th>Coefficients</th>
<th>R²</th>
<th>D.W.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{lwnr} = 1.00 - 0.076 \text{lur} + ecmw )</td>
<td>(26.3)</td>
<td>0.83</td>
<td>0.44</td>
</tr>
<tr>
<td>( \text{lppi} = -1.37 + 0.81 \text{lip} + 0.54 \text{lcu} + 0.24 \text{lexr} + ecmp )</td>
<td>(5.4) (11.0) (9.7) (3.3)</td>
<td>0.99</td>
<td>0.87</td>
</tr>
<tr>
<td>( \text{lcpi} = -0.74 + 0.43 \text{lwg} + 0.56 \text{lppi} + 0.07 \text{lexr} + ecmc )</td>
<td>(12.2) (11.3) (9.8) (1.9)</td>
<td>0.99</td>
<td>0.96</td>
</tr>
<tr>
<td>( \Delta \text{lwn} = -0.14 + 0.42 \Delta \text{lcp} - 0.21 ecmw_{-1} )</td>
<td>(14.5) (2.5) (2.3)</td>
<td>0.95</td>
<td>2.02</td>
</tr>
<tr>
<td>( \Delta \text{lppi} = 0.01 + 0.06 \Delta \text{lcu} + 0.06 \Delta \text{lexr} - 0.13 ecmp_{-1} )</td>
<td>(2.4) (2.3) (1.3) (2.7)</td>
<td>0.50</td>
<td>2.03</td>
</tr>
<tr>
<td>( \Delta \text{lcpi} = 0.002 + 0.20 \Delta \text{lwg} + 0.58 \Delta \text{lppi} - 0.30 ecmc_{-1} )</td>
<td>(0.42) (4.2) (3.7) (2.6)</td>
<td>0.71</td>
<td>1.35</td>
</tr>
</tbody>
</table>

Notation (all variables in logarithms): \( \Delta \) denotes first difference. Error-correction terms \( ecmw_{-1} \), \( ecmp_{-1} \), and \( ecmc_{-1} \), are, respectively, the lagged residuals from the long run wage, producer price, and consumer price equations of the previous table. Series names: \( \text{lwnr} \), real wage (deflated by consumer price index); \( \text{lur} \), unemployment rate; \( \text{lip} \), producer price index; \( \text{lip} \), industrial production; \( \text{lcu} \), unit labor costs; \( \text{lexr} \), exchange rate; \( \text{lcpi} \), consumer price index; \( \text{lwg} \), gross wages.
First, wages are much more indexed than prices. After a consumer price shock, the mean lag of wage adjustment amounts to about two months. Hence, an inflationary shock to the CPI or wages is likely to reduce enterprises' mark-ups rather than real wages. This result may seem counter-factual since, at the beginning of the transition, average real wages declined strongly. However, there are various ways to reconcile these two facts. For one, Polish households may have learned from the hyperinflation period how to protect themselves against price changes. Also, in addition to the precipitous decline in productivity, the initial real wage decline was facilitated by centralized negotiations, quite independently from any inflationary surprise. 1/

Second, the producers' mark-up reacts rapidly to changes in output, and is negatively affected by sudden changes in costs. The first feature may partly explain the PPI's growth in early 1995 given the brisk pace of output growth. The magnitude of the effect of output on price is, however, surprising. It may have resulted from a shortage of capital in industry during the recent recovery and, subsequently, higher margins accompanying the boost in demand. As expected, exchange rate appreciation compresses producers' margins. However, such an impact on inflation materializes only with a mean lag of 7-8 months. The pass-through from unit labor cost is somewhat more rapid.

Third, CPI inflation is driven mainly by wages and the domestic PPI. Possible explanations for the strong direct impact of wages on the CPI have already been mentioned. The main surprise is the relatively weak role of the exchange rate: the direct impact appears relatively small, and the mean lag is three to four months. A more disaggregated analysis shows the exchange rate's impact is statistically significant only for manufactured consumption goods, but not for foodstuffs or services.

A casual inspection of the structure of Polish imports provides an explanation for such findings (Table 5). Before the transition, imports of consumer goods were constrained to fairly low levels in Poland, as in other Eastern European countries. Since then, a strong appetite for Western products combined with a more liberal trade policy have boosted consumer goods imports. Their share in total imports has more than doubled since 1988 to reach approximately 20 percent. 2/ As such, since imports and consumption represent respectively, 25 percent and 70 percent of GDP in 1994, an appreciation of the currency by 10 percent mechanically reduces CPI only by 0.7 percent. 3/ This

1/ Growing unemployment is the usual explanation offered for the real wage decline in Poland, but the correlation between the tax ratio on wages and unemployment, perhaps suggests an alternative interpretation. As unemployment crept up, the financing of existing government spending (including social outlays) required higher taxes and social security contributions. Either willingly, or because of myopic wage negotiation, wage earners have borne part of the resulting burden. Hence, the negative correlation between unemployment and net wages.

2/ See Gacs (1994) for a description. Note also that this increasing trend makes our econometric estimates potentially unstable. A time-varying coefficient, however, is a luxury our small sample does not allow.

3/ Assuming that importers do not alter their margins.
is in line with our econometric estimates. Overall, the stronger impact of the exchange rate on PPI than on CPI mainly reflects the large share of intermediate inputs in total imports (Table 5).

Table 5. The Structure of Polish Imports in 1994

<table>
<thead>
<tr>
<th>Goods</th>
<th>In Percent of Total Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment goods</td>
<td>13.6</td>
</tr>
<tr>
<td>Raw materials</td>
<td>66.3</td>
</tr>
<tr>
<td>Consumer goods</td>
<td>19.3</td>
</tr>
</tbody>
</table>

Source: Polish Statistical Office.

It would be utterly misleading, however, to infer from this that the exchange rate is useless in controlling inflation. Indeed, the weak initial impact from the exchange rate on both CPI and PPI is magnified by the high indexation in the economy. To illustrate this point, this model was simulated in two different ways. The first simulation simply consists of a ten percent devaluation. Consumer prices increase by 2.5 percent after one year and by about 6 percent after three years. In the second simulation it is assumed that, after the initial shock, the exchange rate is depreciated in line with inflation to offset the loss of competitiveness. This would amount to adding to the previous three equations the following one:

$$\Delta \log(\text{exr}) = d_1 \Delta \log(\text{CPI})$$

which represents an accommodating policy reaction function. With this addition to the model and, by setting $d_1$ equal to 0.5, assuming only a partly accommodating exchange rate policy, the inflationary effect of the devaluation is severely compounded and exceeds 10 percent. Thus, despite its slow impact, the exchange rate is therefore key as an anchor.

Finally, the wage-price model was used to gauge the inflationary impact of the energy price adjustment discussed earlier in this chapter. At first glance, if utility prices increase by 60 percent, the immediate impact on CPI would amount to approximately 6 percent, given the share of energy in the consumption basket. This effect would be stronger if one takes into consideration the effects of utility price increases on the prices of other public services (e.g., transportation) and on household rents.

In the well-indexed Polish economy captured in our wage-price model, any such energy price shock would also induce a considerable multiplier effect. With fixed exchange rates, such a shock would increase the overall level of prices by approximately 20 percent after a four year period. Additional
exchange rate depreciation would compound the inflationary impact. With a partly accommodating exchange rate rule (\(d^*=0.5\)), consumer prices would increase by 40 percent after four years, and 70 percent after 10 years. I/

This exercise in itself need not imply that inflation should be high if energy prices are liberalized. Indeed, one could argue that a tighter monetary policy would keep overall inflation subdued. What is important, however, is that such an outcome would hinge on a severe price adjustment in other sectors. In the face of nominal price rigidity, changes in relative prices can only be achieved through higher inflation.

4. Monetary policy, delayed restructuring and inflation

Inflation is a monetary phenomenon and there is little doubt that tighter monetary policy would ultimately bring down inflation. The interesting question is at what cost would such a policy succeed in reducing Polish inflation.

First, we attempt to gauge whether lax monetary policy has contributed to inflation, or whether monetary policy has accommodated inflationary shocks. We find statistical evidence linking financial variables, including money supply, to inflation. However, the results are quite sensitive to the sample period, and there is also evidence of reverse causation from inflation to monetary growth, suggesting that monetary policy has often accommodated inflationary shocks.

Second, the effectiveness of monetary policy is discussed, in the Polish context. We try to model the effects of monetary policy in a dual economy consisting of a market-oriented sector and an inefficient nontraded sector. It is argued that, in such a model, to succeed in reducing inflation tighter monetary policy must act with disproportionate effect on the restructured traded goods sector—leaving the unreformed sector largely intact. After presenting arguments for and against monetary tightening to reduce inflation in such a second-best world, it is concluded that—at least for the inefficient nontraded sector—structural reform should be part of any stabilization program aimed at sustained inflation reduction.

a. Statistical evidence on money and inflation

In recent years, inflation and broad money growth have been closely related (Chart 4). The relationship is clearest for annual growth rates, where both broad money growth and inflation have declined. The relationship is much less discernible for monthly growth rates. However, even for annual growth rates, it is difficult to ascertain whether monetary growth leads or lags the inflation rate. Finally, over this period broad money growth has, on average, exceeded measured CPI inflation. The result is a sizable trend increase in real money balances. This remonetization is not surprising given the decline in Poland's inflation rate.

I/ By ignoring the indirect effects of energy price increases on production costs, these estimates probably err on the low side. However, to some extent, this effect should be mitigated by more efficient use of energy.
CHART 4
POLAND
MONEY GROWTH AND INFLATION
June 1991 - December 1995

(Twelve month percentage increase)

Money growth
Inflation

Source: Polish authorities.
Inspecting the data suggests some relationship between money growth and inflation, but cannot pronounce on its statistical significance. Also, it is difficult to judge the direction of causality: is money leading inflation or lagging inflation? To answer these questions, econometric "Granger-causality" tests of the relationship between inflation and money were conducted. Strictly speaking, these are simply tests for predictive content, which may only hint at "true" causality, and may instead be more useful for finding leading indicators.

Ideally, such tests would be employed on long data series, to increase degrees of freedom. But for Poland as a transition economy, there are barely five years of observations. To increase our degrees of freedom, we used monthly data. However, monthly inflation is extremely volatile, reflecting the effects of one-off shocks (such as changes in administered prices) or seasonal factors, and thus difficult to predict. Adding monthly dummy variables should help capture seasonal patterns in so far as they are regular, but will not incorporate the effects of irregular shocks.

Table 6. Consumer Price Inflation
Basic Descriptive Statistics (1990:1 to 1995:9)

<table>
<thead>
<tr>
<th>Mean Growth Rate</th>
<th>Standard Deviation</th>
<th>Coefficient of Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 months ahead</td>
<td>38.4</td>
<td>16.6</td>
</tr>
<tr>
<td>6 months ahead</td>
<td>19.8</td>
<td>12.6</td>
</tr>
<tr>
<td>3 months ahead</td>
<td>10.5</td>
<td>10.5</td>
</tr>
<tr>
<td>1 month ahead</td>
<td>4.1</td>
<td>7.2</td>
</tr>
</tbody>
</table>

One way round this data problem is to test whether money growth helps predict inflation not 1 month, but on average over a 6 or 12-month period. Annual and six-month inflation rates are far less volatile than monthly rates. Their coefficient of variation is far lower than that for monthly inflation (Table 6). For Western economies, a time lag of 18 months to 2 years between money growth and inflation would be thought common place. Indeed, predicting inflation only 6 or 12 months ahead might also be too short, save that inflation in transition economies is much higher and, presumably, the frequency of price changes that much greater, so the transmission to inflation is that much more rapid.

Table 7 presents the results of causality tests linking financial variables to inflation. The table is divided into four sections, concerned with predicting inflation 12, 6, 3 and 1 month ahead, respectively. In each section, four rows summarize the results of regressing future inflation on past inflation (DLCPI), past inflation and broad money growth (DLFMB), past inflation and changes in the deposit interest rate (DRD), and past inflation, broad money...
growth and changes in the deposit rate together. 1/ Save for interest rates, all variables are in logarithms, so that the first differences measure growth rates.

The results suggest that broad money has considerable predictive power for future inflation. First, consider a simple autoregression of inflation on lagged monthly inflation rates (Row 1). Lagged monthly inflation explains only around a third of the variance of inflation over the next twelve months; the standard deviation of the forecast error is approximately 7 percentage points. Adding lagged broad money growth improves predictive power (Row 2). F-tests show statistical significance at even the 0.1 percent level, and the doubling of the R-squared and the near-halving of the standard error show that money has considerable explanatory power in economic terms. Results predicting inflation one, three and six months ahead were broadly similar.

However, proponents of alternative theories of inflation might accept that monetary growth leads to inflation, but would want to go one step further, and enquire what caused the monetary growth. Specifically, they would argue that monetary growth often accommodated inflationary impulses, such as the attempts of certain sectors to increase their relative prices, or of workers to raise their relative wages, to prevent a possible recession.

To test for this possibility, additional causality tests were conducted, this time from lagged inflation to future money growth. 2/ Except when forecasting money growth one month ahead, lagged inflation proved statistically significant in explaining future broad money growth.

Thus, in general, the results are open to interpretation. There is evidence that financial factors, including monetary growth, are linked to future inflation, consistent with conventional monetary explanations. At the same time, there is evidence linking inflation to future monetary growth, consistent with less orthodox and more structural explanations of inflation, or with a monetary policy reaction function that seeks to offset the output costs of adverse supply shocks. Thus, tighter monetary policy should succeed in lowering inflation, but perhaps at significant cost in terms of lost output.

b. Inflation and monetary policy in a restructuring economy

So far, three potential sources of entrenched inflation in Poland have been isolated: a drift of certain relative prices, de facto indexation of wages, and some evidence of an accommodating monetary policy. In this section, it is argued that the nature of Polish firms' restructuring process may be an ultimate underlying cause. Indeed, certain firms have restructured largely through attrition, accompanied by gradual output contraction and accumulated losses. It is argued that, due to this slow restructuring, firms are likely to increase their relative prices or to run deficits. As a result, they are less responsive to traditional macro-policy

1/ The deposit rate is chosen as the interest rate measure because more observations are available.
2/ To save space, the results are unreported, but are available on request.
Table 7. Predictive Content of Broad Money and Interest Rates in Explaining Inflation (Including Six Lags of the Explanatory Variables)

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Sample Period</th>
<th>Standard Error</th>
<th>Adjusted R-Squared</th>
<th>F-Tests (F-Values) on Legs of: DLCPI DLFMB DRD</th>
<th>Sum of Coefficients on: DLCPI DLFMB DRD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicting inflation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 months ahead</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DLCPI</td>
<td>1990:07 1994:10</td>
<td>0.070</td>
<td>0.358</td>
<td>5.735</td>
<td>2.927</td>
</tr>
<tr>
<td>DLCPI DLFMB</td>
<td>1990:07 1994:10</td>
<td>0.039</td>
<td>0.795</td>
<td>1.296 16.962</td>
<td>0.942 5.049</td>
</tr>
<tr>
<td>DLCPI DRD</td>
<td>1990:07 1994:10</td>
<td>0.053</td>
<td>0.628</td>
<td>9.124 6.446</td>
<td>5.121 -0.016</td>
</tr>
<tr>
<td>DLCPI DLFMB DRD</td>
<td>1990:07 1994:10</td>
<td>0.038</td>
<td>0.806</td>
<td>1.023 6.970 1.381</td>
<td>2.046 3.811 -0.005</td>
</tr>
<tr>
<td>6 months ahead</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DLCPI</td>
<td>1990:07 1995:04</td>
<td>0.071</td>
<td>0.035</td>
<td>1.344</td>
<td>1.137</td>
</tr>
<tr>
<td>DLCPI DLFMB</td>
<td>1990:07 1995:04</td>
<td>0.038</td>
<td>0.732</td>
<td>2.697 23.133</td>
<td>-1.170 5.608</td>
</tr>
<tr>
<td>DLCPI DRD</td>
<td>1990:07 1995:04</td>
<td>0.059</td>
<td>0.334</td>
<td>2.016 4.820</td>
<td>2.865 -0.014</td>
</tr>
<tr>
<td>DLCPI DLFMB DRD</td>
<td>1990:07 1995:04</td>
<td>0.037</td>
<td>0.734</td>
<td>1.416 12.273 1.050</td>
<td>-1.382 5.182 0.001</td>
</tr>
<tr>
<td>3 months ahead</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DLCPI</td>
<td>1990:07 1995:07</td>
<td>0.042</td>
<td>0.115</td>
<td>2.300</td>
<td>1.073</td>
</tr>
<tr>
<td>DLCPI DLFMB</td>
<td>1990:07 1995:07</td>
<td>0.028</td>
<td>0.603</td>
<td>5.399 12.061</td>
<td>-0.312 2.963</td>
</tr>
<tr>
<td>DLCPI DRD</td>
<td>1990:07 1995:07</td>
<td>0.038</td>
<td>0.249</td>
<td>3.017 2.606</td>
<td>2.068 -0.007</td>
</tr>
<tr>
<td>DLCPI DLFMB DRD</td>
<td>1990:07 1995:07</td>
<td>0.028</td>
<td>0.593</td>
<td>3.906 7.754 0.800</td>
<td>-0.527 3.015 0.001</td>
</tr>
<tr>
<td>1 month ahead</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DLCPI</td>
<td>1990:07 1995:09</td>
<td>0.018</td>
<td>0.171</td>
<td>3.125</td>
<td>0.586</td>
</tr>
<tr>
<td>DLCPI DLFMB</td>
<td>1990:07 1995:09</td>
<td>0.015</td>
<td>0.384</td>
<td>5.245 4.243</td>
<td>0.145 0.748</td>
</tr>
<tr>
<td>DLCPI DRD</td>
<td>1990:07 1995:09</td>
<td>0.017</td>
<td>0.203</td>
<td>3.430 1.376</td>
<td>0.828 -0.002</td>
</tr>
<tr>
<td>DLCPI DLFMB DRD</td>
<td>1990:07 1995:09</td>
<td>0.015</td>
<td>0.430</td>
<td>3.951 4.323 1.665</td>
<td>0.202 0.637 -0.000</td>
</tr>
</tbody>
</table>
instruments. Therefore, to the extent that such firms represent a sizable proportion of output, we show that a "hard-currency" strategy to reduce inflation may be unexpectedly costly. 1/

The move to a market economy was accompanied by a relative price shock of unprecedented magnitude. This shock created a fault line between two groups of firms: those which benefitted from it and those for which it proved detrimental. 2/ In the face of this shock, restructuring in the sectors adversely affected can be expected to follow one of three paths:

(i) cutting wages to restore profitability;
(ii) boosting productivity by shedding labor or, in certain (rare) instances, by investing in new equipment;
(iii) a "wait-and-see" approach where firms merely shrink by attrition. In this situation they run losses, and possibly increase their prices.

In a sense (iii) is a slower version of (ii), leading through accumulated losses to a depletion of the firms' assets.

The "wait-and-see" approach seems to capture certain traits of the restructuring process in some sectors of the Polish economy. Indeed, as argued in Pujol (1995), Poland has adjusted employment rather than the structure of its relative (sectoral) wages. Relative wages have remained fairly stable, while employment has plunged most in loss-making sectors. So far, however, labor shedding has fallen short of restoring profits. In other words, for these sectors, the "hard" budget constraint has not been binding enough to force firms into sufficient adjustment.

However, it is important to bear in mind two things. First, this characterization only applies to sectors in need of restructuring and which have delayed it. Privatized or newly created firms have been less prone to procrastination and, in certain cases, have made giant strides toward Western productivity standards. In essence, the transition creates a dual economy. 3/ Second, a pure "wait-and-see" approach is unlikely since no firm is totally immune from restructuring pressure. As we discuss below, firms are better sheltered if they can get additional financing (e.g., from rolling over loans, tax arrears or interenterprise credits). What the above

1/ The simple model presented in this section supports these conclusions but, of course, there are many alternative models. The most difficult question is to what extent the model in the text provides a relevant description of the Polish economy. The lack of microeconomic data concerning how firms restructure makes this question particularly difficult to answer.

2/ The price shock may happen under different guises, e.g., a slash in governmental subsidies.

3/ Because of this dual nature of transitional economies, average data (e.g., on wage costs or productivity) can be misleading.
description emphasizes, however, is that the process is relatively slow because managers try to shelter workers from painful wage adjustment or labor shedding. A similar point is made by Berg and Blanchard (1993).

The coal mining sector provides an interesting illustration of this behavior. First, the coal industry has restructured as evidenced by sizable productivity gains (Table 8). These gains have certainly exceeded what a pure "wait-and-see" approach would have delivered and have contributed to the improvement in the sectors' profitability. However, despite substantial losses, coal miners have improved their relative wages which still stand strikingly above the average for industry as a whole. In other words, a large fraction of productivity gains have been erased by additional wage costs. These developments have three main implications. First, the price of Polish coal has increased despite a 15 percent decline in international prices between 1991 and 1994. Second, the sectors' assets have been severely eroded, threatening its long-term viability. Third, the completion of restructuring has been delayed. A recent report issued by the Polish Ministry of Mining now considers that restructuring might take another five years and involve the loss of another 90,000 jobs. 1/

Table 8. Restructuring in the Coal Industry, 1991-94 2/

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in employment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(in percent)</td>
<td>9.5</td>
<td>-4.9</td>
<td>-14.3</td>
<td>-7.6</td>
</tr>
<tr>
<td>Output index</td>
<td>108.5</td>
<td>100.0</td>
<td>97.6</td>
<td>100.4</td>
</tr>
<tr>
<td>Relative wage index</td>
<td>164.5</td>
<td>158.3</td>
<td>170.1</td>
<td>190.6</td>
</tr>
<tr>
<td>Change in relative price index</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(in percent)</td>
<td>40.9</td>
<td>2.2</td>
<td>16.9</td>
<td>14.5</td>
</tr>
<tr>
<td>Profitability (in percent)</td>
<td>-4.9</td>
<td>-23</td>
<td>-10.4</td>
<td>-0.8</td>
</tr>
<tr>
<td>Assets/liabilities</td>
<td>1.4</td>
<td>1.0</td>
<td>0.6</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Source: Polish Statistical Office, Biuletyn Statystyczny, various issues.

How relevant is this example? One may argue that the mining industry is an extreme case, reflecting largely the historical and political clout of miners in the Polish society. In a sense, this is precisely the lesson

1/ Reuter, December 4, 1995 citing a report in Gazeta Wyborcza.
2/ Definitions: "Employment" is the change in average employment over the year. The coverage of the series changes in 1992. "Relative wage" is the ratio of gross wages in the coal sector to average gross wages in industry. "Relative price index" represents the change in the relative price of sold production. "Profitability" is the ratio of net losses to total income. "Asset/liabilities" is the ratio of short-term assets to short-term liabilities.
drawn from this example: for whatever reasons, certain sectors have successfully circumvented the "hard-budget" constraint. And, because these sectors represented a substantial fraction of industrial employment before the transition (approximately 12 percent for the coal mining sector), they represent more than a statistical curiosity. Indeed, various studies have documented insiders' resistance to painful restructuring. Aghion et al. (1994) have modeled how certain groups can impose the status quo to avoid mass layoffs. Pujol (1995) also documents various rigidities in the labor market, and the lack of reaction of relative wages to the financial situation of firms.

At a macroeconomic level, the slow adjustment to the new post-transition conditions is also well illustrated by the financial results of Polish enterprises. Polish firms have restructured between 1992 and 1994, as evidenced by the recovery in profitability (Table 9). However, during this period the proportion of loss making firms, as well as their losses as a percentage of total income, has remained sizable. \( ^1/ \) This is consistent with the view that some firms adjusted by slowly reducing activity rather than by raising profitability. For the economy as a whole, losses have dwindled partly because some firms are profitable again but also because loss-making firms have shrunk.

**Table 9. Financial Results of Polish Enterprises, 1989-94**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross profits 2/</td>
<td>34.6</td>
<td>23.1</td>
<td>4.6</td>
<td>2.1</td>
<td>2.8</td>
<td>4.5</td>
</tr>
<tr>
<td>Net profits 2/</td>
<td>22.3</td>
<td>10.6</td>
<td>-1.3</td>
<td>-1.5</td>
<td>-0.5</td>
<td>1.7</td>
</tr>
<tr>
<td>Loss-making firms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of firms</td>
<td>n.a.</td>
<td>n.a.</td>
<td>46.3</td>
<td>49.2</td>
<td>45.3</td>
<td>39.6</td>
</tr>
<tr>
<td>Share of income</td>
<td>n.a.</td>
<td>n.a.</td>
<td>28.6</td>
<td>29.5</td>
<td>29.4</td>
<td>19.6</td>
</tr>
</tbody>
</table>

Source: Polish Statistical Office, Biuletyn Statystyczny, various issues.

What are the macroeconomic implications of sizable loss-making sectors undergoing only (relatively) slow transformation? To answer that fundamental question, a model is presented where relative price adjustment plays a key role. Such a model is somewhat unrealistic but is nonetheless useful:

\( ^1/ \) As shown by Schaffer (1993), data on profitability between 1989 and 1991 are considerably affected by the changes in inflation. Indeed, Polish accounting methods based upon historical costs generate lower profits when inflation recedes. The 1991-1994 period is less exposed to this bias.

\( ^2/ \) In percent of total income.
it provides a way to synthesize certain stylized facts concerning the transition. 1/ Its main conclusion is that the sector undergoing restructuring will gradually increase its relative prices, as it reduces output and labor hoarding, adding to medium-term inflationary pressures. True, if the slowly restructuring sector faces a high price elasticity of demand, achieving such a relative price increase is unlikely, and the inflationary pressure correspondingly lower. However, in these circumstances, the slowly restructuring sector will make higher losses, for longer. For given money supply growth, the credits that it will require to stay afloat will unduly crowd out lending to the expanding sector, prolonging the restructuring process. If these credits remain in place, the burden of tighter monetary policy to reduce inflation would then fall disproportionately on the expanding sector.

Starting with the model, it is assumed that the Polish economy comprises two distinct groups of firms, say distressed (sector 1) and profitable (sector 2). 2/ In sector 1, activity dwindles at a pace determined by the rate of attrition of the labor force. This rate of attrition includes an exogenous factor (say, retirement) and an endogenous one, linked to employment growth in sector 2. The intuition between such a linkage is as follows. Growing employment in the emerging sector is the main source of job creation. Therefore, separations from distressed firms are facilitated by an important pool of job creation. Conversely, quits tend to fall during a period of intense job destruction. As a result, during the transition in Poland, job-to-job movements have become increasingly important as a way to avoid unemployment spells (see Coricelli et al. (1994)). Also, for certain occupational groups, intense job creation has led to shortages and, in turn, to higher wages to lure workers away from sector 1. This equation may therefore capture this wage competition between the two sectors.

Consider supply. In sector 1, at any instant, employment is assumed to determine output:

$$Y_{1,t} = F_1(L_{1,t}) \quad \text{with} \quad \Delta L_{1,t} = -\delta L_{1,t} - \beta \Delta L_{2,t}$$

(10)

This implies that output in sector 1 is exogenous, and does not respond to wage or price changes. However, employment declines by proportion $\delta$ through natural attrition, and by proportion $\beta$ as labor demand increases in the second sector. For simplicity, it is assumed that this latter effect is minor ($\beta\approx0$). As employment in sector 1 declines, so does output.

1/ By the same token, by delineating which factors impinge upon inflation, it could suggest certain avenues for empirical research, to test its empirical relevance.

2/ As discussed later, this is a drastic simplification. By assumption, we assert that the pace of restructuring in sector 1 is exogenous, impervious to the impact of financial or exchange rate policy. We also neglect the possibility that there is really a continuum of sectors, with all firms having the possibility of graduating from unreformed to fully restructured, perhaps encouraged in this process by tighter financial policy. These important topics await further research.
In the profitable second sector, output is given by equating the real wage, \( w/P_2 \), to the marginal product of labor:

\[
F_2'(L_{2,t}) = \frac{w}{P_2}
\]  

(11)

It is further assumed that nominal wages are given, so that increased prices of good 2 lower the real product wage, and increase employment and output in sector 2. \(^1\) In contrast, employment in sector 1 is assumed to be excessive, so that the real wage always exceeds the marginal product of labor. In addition, it is assumed that labor shedding has only a limited impact on output. One measure of progress toward restructuring is the extent to which the marginal product of labor and the real wage in sector 1 can be brought closer together. \(^2\) With fixed nominal wages, progress can only be achieved by reducing employment or by increasing output prices.

The demand side of the model is standard and simply assumes a certain substitution of domestic demand for the two goods depending upon their prices (see Blanchard and Kiyotaki (1987)). It is assumed that the output of sector 1 is consumed entirely at home, whereas the output of good 2 is both exported and consumed domestically. The share of domestic consumption of goods 1 and 2 as a proportion of domestic income depends on the relative price of the two goods:

\[
P_1C_1 = g(q) \text{Income} \\
P_2C_2 = h(q) \text{Income}
\]

\[\text{where:}\]
\[q = \frac{P_2}{P_1}\]
\[\text{Income} = \sum P_iY_i\]

\(g(.)\) and \(h(.)\) are, respectively, increasing and decreasing functions of \(q\): if the relative price of good 2 increases, consumption of good 1 increases and consumption of good 2 declines. The sum of \(g(.)\) and \(h(.)\) is constant, and less than unity. Equivalently, households save a constant share of their nominal income. \(^3\)

\(^1\) Given the econometric findings on wage indexation, this assumption may seem counter-intuitive. In fact, this assumption simply captures the fact that when the exchange rate depreciates, wages and CPI are less affected than producer prices. Hence, there is a reduction in wage cost.

\(^2\) Although this takes the level of capital stock as given when, in reality, we would expect significant reallocation of capital as part of the transition. We would also need to ensure that the marginal product of capital equalled the real rate of interest. However, the real wage condition is at least a first attempt to measure the degree of successful restructuring in the short run.

\(^3\) One could derive such demand functions from a nested Cobb-Douglas cum CES utility function.
It is assumed that foreign demand for exports of the profitable firms of sector 2 declines as the ratio of the domestic producer price to the exchange rate increases, 1/

\[ X = X \left( \frac{P_2}{e} \right) \]  

(13)

To determine equilibrium, we equate supply with demand in the two goods markets: 2/

\[ \bar{Y}_1 = C_1 \left( \frac{P_2}{P_1}, \frac{P_2}{e} \right) \quad (\text{Sector 1}) \]  

(14)

and,

\[ Y_2(P_2) = C_2 \left( \frac{P_2}{P_1}, \frac{P_2}{e} \right) + X_2 \left( \frac{P_2}{e} \right) \quad (\text{Sector 2}) \]  

(15)

The underlying mechanisms for the impact of prices on output can be summarized briefly. Demand for good 1 increases with a higher relative price of good 2, through a substitution effect; it is reduced by higher prices in sector 2 relative to the exchange rate because exports, and hence household income, diminish (income effect). Conversely, in sector 2, higher prices of good 2 relative to good 1 reduce domestic consumption, higher prices relative to foreign prices reduce export demand; in addition, the marginal product of labor condition determines total supply. Chart 5 depicts these two equilibrium loci.

As time goes by, exogenous labor shedding lowers the supply of good 1. Barring any change in households' demand, producers in this sector will gradually increase their relative price, restoring profitability but at the expense of a lower domestic market share. Conversely, sector 2 is faced with growing demand. Its firms react by increasing their prices slowly, leading to an increase in supply as well as a reduction in exports. 3/

---

1/ The exchange rate (e) is defined as the domestic price of foreign currency; an increase in e represents a depreciation. Implicitly, we are holding the foreign price of good 2 constant, or using it as numeraire.

2/ The labor market does not clear because of excess labor supply combined with wage rigidity.

3/ The supply-side effect is possibly magnified by exogenous productivity gains in sector 2. If these gains materialize--and, it seems they do currently in Poland--one may observe in fact a growth in exports. Productivity gains in sector 2 must be sizable enough to generate growth in sector 2 and offset the contractionary impact of labor shedding in sector 1.
CHART 5
POLAND
EQUILIBRIUM IN 2 SECTOR MODEL

P₂/P₁

P₂/e

(S₁)

(S₂(e))

(S₂(μ≤e))
Overall, this set-up provides a potential explanation for the gradual increase in the relative price of sector 1 during the transition. As sector 1 contracts, supply falls and the relative price of good 1 increases. As sector 2 grows, income increases, raising the demand for and relative price of good 1. This relative price shift is facilitated if the elasticity of substitution between goods 1 and 2 is low.

One may draw the following parallel. Some authors have argued that inflation is required in transitional economies to eliminate the initial monetary overhang. In our set-up, labor hoarding in sector 1 plays a similar role. As labor is dishoarded, output in sector 1 declines, and its relative price increases. However, the size of the relative price increase will depend on the size of the price elasticity of demand. Whether or not it leads to inflation will depend on the extent of monetary accommodation.

In this setting, a "hard currency" option will only deliver lower domestic prices at a substantial real cost. Real appreciation combined with imperfectly indexed wages entails lower output growth in sector 2 and, subsequently, in the economy as a whole. Moreover, owing to subdued demand, sector 1’s firms have to postpone their relative price increase and their profitability deteriorates. As a corollary, the end of the restructuring—when the marginal product and real wage equate in sector 1—is postponed. Obviously, this conclusion is reinforced the greater the spillover from growth in sector 2 to declining employment in sector 1. Note, however, that if sector 2 is already at capacity, enjoying the benefits of an undervalued exchange rate and buoyant foreign demand, more pressure may be needed to promote genuine restructuring. In these circumstances, real appreciation would still be appropriate.

Serious caveats apply. As presented, the model is well-equipped only to describe the impact of slow restructuring when competition, possibly through foreign imports, is weak. This could well be the case in the energy sector, in nontradables, or where protection is strong. But there are other possibilities. First, in sectors where the price-elasticity of demand is high or in sectors exposed to foreign competition, a marked relative price increase is not a viable option. Various segments of Polish industry seem to be in this alternative situation (e.g., shipyards, tractors, etc.). Second, certain sectors may be producing goods that no one wants. In such a case, there will be no trend increase in relative prices, and there will be no demand spillover from growth in sector 2. Ultimately, there is no alternative to closure. In both of these two possibilities, firms have to seek outside financing to cover their losses. In the next section, it is argued that financing losses in these sectors may render the conduct of monetary policy more difficult, hence indirectly hampering the fight against inflation.

Loss-making firms have mainly relied upon three different sources of external financing: short-term loans, the accumulation of tax arrears and interenterprise credits. A World Bank survey (Belka et al. (1994)) indicated that, in state-owned firms, the payment of taxes and social security obligations had a much higher priority than obligations to banks or other firms. However, these authors also found that severely distressed
firms tend to share the burden more equally between creditors; ultimately, they end up accumulating substantial debt against the government. As a result, in addition to additional stress on the fiscal front, the Polish banking industry has many problem loans and a potential crowding out of "good" borrowers has developed.

Poorly performing loans represent a substantial fraction of Polish banks' assets. Moreover, these loans are highly concentrated in approximately ten percent of Polish firms (Gomulka (1994)). Baer and Gray (1995) offer an interesting account of how Polish banks have handled these nonperforming borrowers. Overall, banks seem to have only limited leverage to push these firms into restructuring. For instance, these authors mention that only 50 percent of nonperforming borrowers in December 1991 had signed conciliation agreements with banks by April 1994, to avoid lengthy legal procedures. An even smaller fraction, 19 percent, had resumed debt service. In fact, banks are unlikely to force companies into bankruptcy, because they come far down in priority as creditors (after employees and social security related liabilities). Therefore, to keep themselves and the distressed sector afloat, banks will tend to roll over past loans. 1/

Therefore, an immediate undesirable outcome of slow restructuring is that it increases the exposure of the banking system to nonperforming loans. 2/ Against this background, how do banks rebalance their portfolios or alter their lending rates? They could obviously charge higher premia to distressed firms. Such a move, however, will be largely cosmetic if the book value of these loans is already low. In fact, banks may pursue a quite different strategy to reduce the risk of their portfolio while increasing their margins. It involves:

- increasing their holdings of government paper to reduce their overall credit-risk exposure; and, 3/
- reducing loans or increasing the premia charged to sector 2 firms.

An additional perverse feature of this behavior is readily apparent. "Good" enterprises, in particular start-up firms, may be those most penalized. This crowding-out effect, and the ensuing higher interest rates, hamper capital accumulation in the emerging sector.

Other factors may well undermine the effectiveness of monetary policy. One may think that this undue premium cannot be imposed indefinitely upon good borrowers. Indeed, since the premium charged to these firms is not justified by the borrowers' credit risk but instead by the situation of

1/ A similar point is made for Hungary by Bonin and Schaffer (1994).
2/ An alternative solution for these distressed firms is to obtain additional nonbank financing, most frequently through tax or social security contributions arrears or interenterprise credits. To the extent these means are available, "hard" budget constraints are more difficult to enforce.
3/ The percentage of government and NBP securities amounted to 13 percent of the commercial banks' balance sheet in December 1991 and more than 20 percent in May 1995.
lenders, other sources of financing may become available. The crowding out could be circumvented, in particular, through the formation of new financial intermediaries, by borrowing abroad or through long-term capital inflows. If this occurs, the problem in the banking sector will rematerialize as a capital inflow problem. Of course, this could be offset by a steep appreciation of the currency to make zloty-denominated investments riskier, but such a move would again exacerbate the pressure imposed on restructuring firms.

Against this background, a tight monetary policy or a "hard currency" option may prove "costlier" than in more standard conditions. The underlying cause is that they are both rather indiscriminate instruments. As a result, whatever the transmission channel (competitiveness-effect or financial crowding out), most of the burden of appreciation is shouldered by the "wrong" sector. Indeed, instead of fostering a more intense restructuring in sector 1 along with a desirable reallocation of resources into sector 2, it simply slows down the emergence of the latter.

How to avoid these costs of tighter monetary policy? Under present circumstances, tighter monetary policy, be it in the form of exchange rate appreciation or reduced money supply growth, cannot be a substitute for restructuring. Indeed, if it unduly forces the burden of adjustment onto the emerging private sector, tighter monetary policy, unaccompanied by structural reform, might actually delay the restructuring on which the future growth of the Polish economy will depend. The first-best solution is to extend the discipline of "hard" budget constraints to all sectors of the economy, to promote restructuring and to ensure that the burdens of tighter monetary policy are borne proportionately.

5. Conclusion

This paper offers an alternative explanation of Poland's persistent inflation, possibly relevant to other economies in transition: the need for relative price adjustment. Specifically, for the price mechanism to replace central planning as the means of resource allocation, significant relative price adjustment is required. In centrally planned economies, divergences between supply and demand were not eliminated by relative price adjustment. As a result, the structure of prices (and wages) in these economies was vastly different from their Western counterparts. Therefore, relative price changes are pivotal during the move towards a market economy. These changes will affect the allocation of resources and the sectors' relative size. Profits rise in those sectors whose relative prices increase, and output increases as a result. Where relative prices decrease, output will tend to contract. This is how restructuring takes place.

1/ Again, this conclusion needs to be qualified if the export sector is already growing too rapidly and reaching capacity constraints, when tighter policy would be helpful. Also, it reflects our assertion that the sheltered sector 1 can wholly resist the effects of tighter economic policy, which may not be true in practice.
The paper argues that this process of relative price adjustment has contributed to high inflation. This argument is not novel, and has been applied to many types of economies. It goes back at least to the 1920s, in the arguments of Graham and Mills, and has been investigated comprehensively by Fischer (1981) after the oil-price shock. Most recently, the relationship has been revisited by Ball and Mankiw (1995), this time as evidence supporting the implications of theories of price adjustment based on menu costs. We think that this argument may be of particular relevance to transition economies.

This paper's contribution has been to document the role that relative price adjustment has played in Poland, both during hyperinflation, and in the more moderate inflation that followed. Much relative price adjustment has already taken place, and this has been part and parcel of Poland's inflation process. However, it is also shown that much relative price adjustment still needs to be made, and this will inevitably contribute to inflationary pressure in the future. This initial pressure is also magnified by high indexation in Poland. Combined with nominal rigidities, relative price adjustment in a relatively small number of sectors can help generate moderate inflation.

Since inflation is a monetary phenomenon, relative price adjustment cannot be the sole explanation of Poland's persistent inflation. At best it explains why monetary growth has been allowed to increase. This paper is also an attempt to explain the hurdles facing monetary policy, suggesting that tight monetary policy (either through exchange rate appreciation or lower money supply growth) cannot be a substitute for restructuring. Indeed, without active restructuring, the burden of tight monetary policy may be placed on Poland's emerging private sector. Likewise, appreciating the exchange rate places the burden of adjustment on Poland's traded goods sector. Tighter monetary policy is most effective when all firms face hard budget constraints.

What are the policy implications? In this paper's view, the first best strategy for reducing inflation would be to speed up the restructuring process through some combination of tighter monetary policy and active restructuring. Restructuring does not imply the need for centralized industrial policies and strategies: rather, it can be achieved at the micro-level through the imposition of "hard" budget constraints. Inevitably, this restructuring will entail lower relative wages and employment in loss-making sectors.

But reality is unlikely to be as simple as the economic model of this paper would suggest. In practice, there may be political or resource constraints to adjustment. Almost by necessity, restructuring takes time. In such a second-best world, tighter monetary policy by itself may well prove a useful tool for reducing inflation. In particular, the threat of tighter monetary policy by an independent central bank may allow a better control of public finances and, ultimately, enforce a tighter budget constraint on loss-making firms.
However, when relying on tight financial policies to lower inflation, the challenge is to ensure that those sectors most in need of restructuring bear the brunt of the adjustment. Orthodox monetary policy succeeded in defeating the hydra of hyperinflation. However, at moderate inflation levels, the rise in unemployment makes stabilization less attractive than it once was. Our paper sheds some light on why further progress on the inflation front has been slow, and possibly suggests some avenues for reducing the cost of disinflation in the future.
References


