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# IMF Working Paper

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## Inflation in Poland: How Much Can Globalization Explain?

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**IMF Working Paper**

European Department

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**Abstract**

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This paper analyses how globalization has affected inflation in the New EU Members States (NMS), and Poland in particular, since 1995. It finds prices have become less sensitive to domestic economic conditions as trade integration rose, possibly because monetary policy incentives increasingly shifted toward meeting price stability objectives. Quantitatively, globalization appears to have lowered Polish prices by  $\frac{1}{2}$  to 1 percentage point annually since 1995, substantially more than in advanced economies. However, future inflation-dampening effects in the NMS are likely to be smaller as the pace of increases in trade openness moderates.

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## I. INTRODUCTION

Poland has experienced a dramatic decline in inflation from the early transition period. From annual average rates of 150 percent in the early 1990s, inflation dropped rapidly, to reach single digit levels by 2001. In recent years, Polish inflation has sometimes even been below Euro Area levels and is currently one of the lowest in the European Union.

Economists have been wondering about the role of globalization in keeping down inflation. Sustained low inflation has been a stylized fact of the late 1990s and early 2000s, both in advanced and increasingly in emerging markets. Some have argued that these developments could reflect stiffer global competition and the increased weight of developing countries in the global trading system (Rogoff, 2003). A study for the IMF's spring 2006 World Economic Outlook (WEO) finds that, in advanced economies, globalization has contributed to reducing the sensitivity of inflation to domestic capacity constraints and had a significant dampening effect on relative manufacturing prices, a result Chen and others (2004) confirm for the EU15 countries using sectoral data. The WEO study concludes that ongoing trade integration will continue to put downward pressure on prices in many industries, but that at the current juncture of diminishing economic slack, the primary risk relates to further commodity price increases, which are also partly driven by globalization. The impact of globalization on inflation is also being debated in Poland, where trade openness and capital flows have surged in the wake of transition, privatization, and deregulation.

There are obviously implications for the conduct of the monetary policy, if globalization indeed dampens price pressures. The National Bank of Poland (NBP) would be able to reach its 2½ percent inflation target with somewhat lower interest rates. However, if the magnitude or duration of the globalization effect is overestimated, monetary policy could turn out overly expansionary.

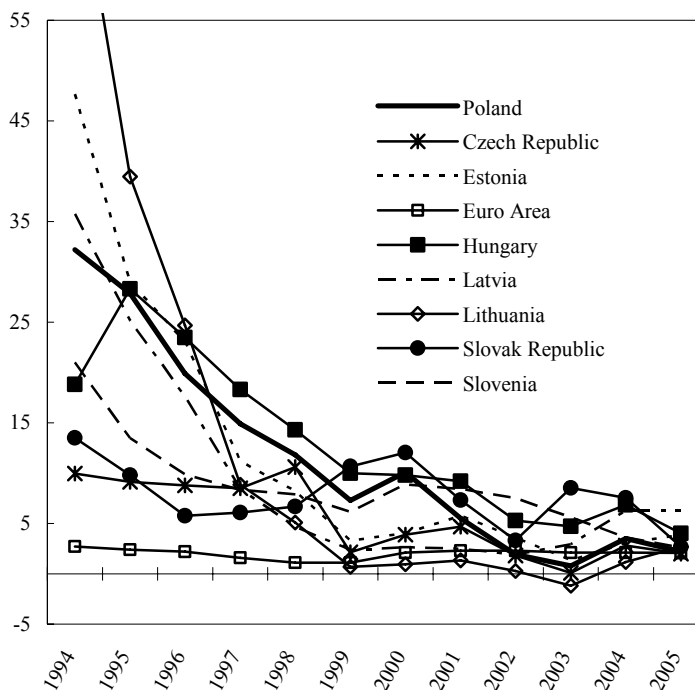
This paper explores the relationship between globalization and inflation in Poland, drawing on both aggregate and sectoral analyses. Section II provides an overview of recent inflation developments in Poland, as well as in other New Member States of the EU (NMS). Section III discusses the broad channels through which globalization can affect inflation. Section IV assesses the channels that operate at the macroeconomic level, along the line of the WEO study, whereas section V investigates the links at the sectoral level, along the line of Chen and others (2004). Section VI concludes.

## II. INFLATION DEVELOPMENTS AND THEIR DETERMINANTS

Polish inflation is currently the lowest in the European Union. Convergence to EU inflation rates started later than in other NMS in the late 1990s, but by the turn of the century inflation came down sharply (Figure 1). Since the inflationary fillip in the context of EU accession in May 2004, much of which was related to food price adjustment, price evolution has been surprisingly subdued: from November 2005, 12-month HICP inflation has undershot the NBP's target of  $2\frac{1}{2} \pm 1$  percent, and it dipped below 1 percent in the first quarter of 2006, before picking up moderately again, to reach 1.4 percent in July 2006.<sup>2</sup>

The decline over the last few months is largely attributable to idiosyncratic and temporary effects. Food and transport prices have been the main drivers of price deceleration since early 2005: Out of the 2.9 percentage point decline in 12-month HICP inflation between January 2005 and March 2006, food prices explain 1.5 percentage points and transport prices 0.6 percentage points (Figure 2 and Table 1). The food price hikes related to EU accession were still reflected in the inflation rates of early 2005, while the Russian and Ukrainian bans on Polish food exports have been dampening domestic prices since end-2005, as products were redirected to local markets. Finally, oil price fluctuations, compressed mark-ups in the refinery sector and the appreciation of the zloty during 2005 all influenced transport prices.

Figure 1. CPI Inflation in the New Member States, 1994-2005  
(In percent)



Source: IMF, World Economic Outlook.

<sup>2</sup> HICP inflation published by Eurostat has been higher than headline inflation compiled by the Polish Statistical office recently, reflecting different weights in the index, in particular for food products. To facilitate comparability across countries, HICP data is used throughout section II.

Figure 2. Poland: Contributions to 12-Month HICP Inflation  
(In percent)

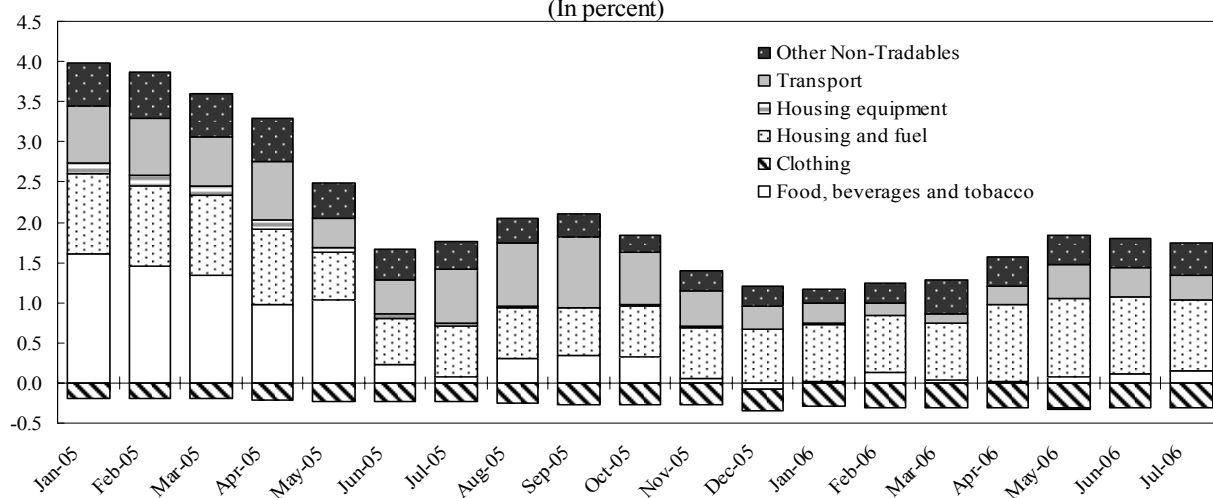


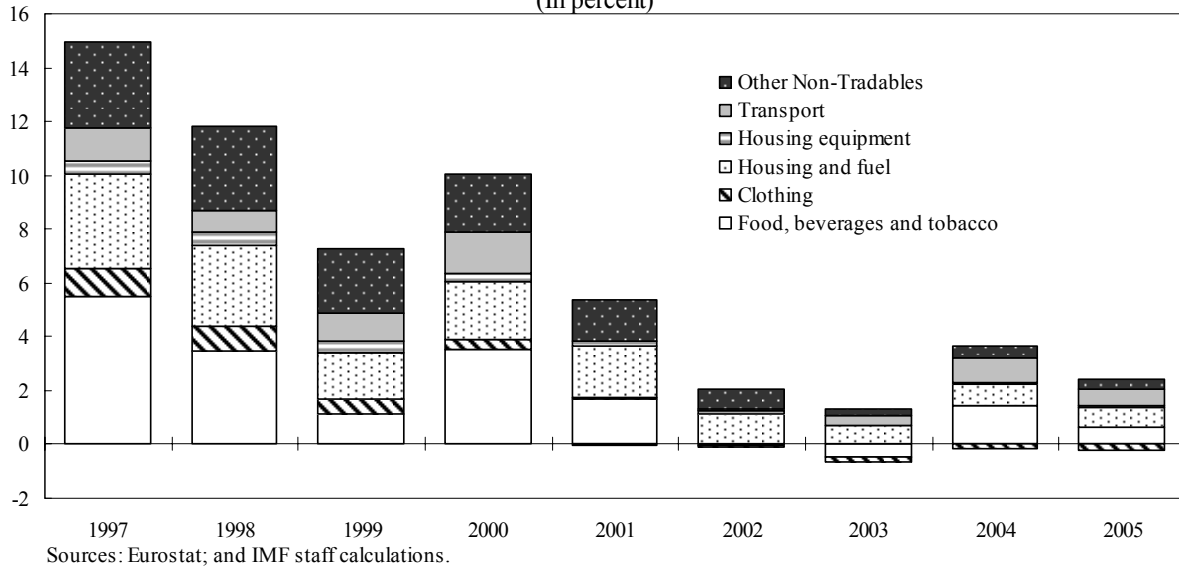
Table 1. Poland and Euro Area: Contribution to HICP Inflation, 1997-2006

	Annual average inflation			12-month inflation				
	1997	2004	2005	Jan 05	July 05	Dec 05	March 06	July 06
<b>Poland</b>								
HICP	15.0	3.6	2.2	3.8	1.5	0.8	0.9	1.4
<i>of which contributions from:</i>								
Food	4.3	1.3	0.4	1.4	-0.1	-0.3	-0.1	0.1
Clothing and footwear	1.1	-0.2	-0.2	-0.2	-0.2	-0.3	-0.3	-0.3
Housing, electricity and fuel	3.4	0.8	0.7	1.0	0.6	0.7	0.7	0.9
Transport	1.2	0.9	0.6	0.7	0.7	0.3	0.1	0.3
<b>Euro area</b>								
HICP	1.7	2.1	2.2	1.9	2.1	2.3	2.2	2.5
<i>of which contributions from:</i>								
Food	0.2	0.2	0.1	0.0	0.0	0.2	0.2	0.4
Clothing and footwear	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Housing, electricity and fuel	0.4	0.4	0.7	0.6	0.8	0.8	0.8	0.8
Transport	0.5	0.5	0.7	0.5	0.7	0.7	0.6	0.7

Sources: Eurostat; and IMF staff calculations.

However, structural factors appear instrumental for disinflation over the medium to long term. The same decomposition as in Figure 2 over 1997-2005 shows that prices decelerated across-the-board, reflecting enhanced monetary policy credibility and productivity gains in the real economy (Figure 3). In addition, price developments in the highly open textile sector have been contributing negatively to overall inflation consistently since 2002. This could potentially be related to increased trade openness, in particular since this sector has been subject to sharp competitive pressures from developing countries.

Figure 3. Poland: Contributions to Annual Average HICP Inflation  
(In percent)



Inflation developments are not entirely homogenous across the NMS, but common patterns exist, in particular regarding prices for textiles, housing equipment and non-tradables (Appendix I, Figures 1a and 1b). Poland exhibits an inflation pattern similar to that of the Czech Republic, and to some extent, Slovenia, Estonia and Lithuania, with a gradual across-the-board decrease followed by moderate inflation at present, while Hungary and Latvia are now showing signs of overheating.<sup>3</sup> Besides obvious gains in monetary policy credibility across the region that helped overall convergence towards Euro Area inflation rates, specific segments of the consumption basket seem to have dampened inflation in many of the NMS, in particular textiles, and to some extent, housing equipment, both of which are highly tradable. In addition, nontradables also contributed to the slowdown of prices throughout the region.

This simple decomposition points to various potential driving forces behind Poland's decreasing inflation, globalization being only one of them. One-off factors have without doubt reduced inflation in 2005.<sup>4</sup> The longer-run across-the-board deceleration could be rooted in monetary policy credibility gains, and better anchored inflation expectations; price stability imported, from trading partners where inflation is lower (Western Europe); increased competition in the wake of privatization; and large productivity gains. Regarding

<sup>3</sup> These broad commonalities justify that the econometric analyses described in the following sections were conducted on panels including some or all of the other new member states, adjacent to Poland.

<sup>4</sup> Additional IMF staff work, based on a general dynamic factor model approach, corroborates this finding (van Elkan and others, 2006). To analyze the co-movements of inflation within the European Union, their study decomposes inflation in each country into common trends, shared by the 25 members, and a residual, which reflects country-specific elements. This residual is found to have been negative by about one percentage point during the first half of 2005 in Poland, but is likely to gradually shrink going forward.



the latter, interestingly, there is no evidence that inflation of nontradables outstripped inflation of tradables, suggesting that Balassa-Samuelson effects did not play much of a role. Sector-specific developments of prices for textiles and housing equipment could reflect the dampening role of globalization, while declining inflation for nontradables points to domestic factors such as deregulation.

### III. THE ROLE OF GLOBALIZATION

Poland is increasingly integrated into the world economy (Table 2). In the last ten years, trade openness—defined as the ratio of imports to GDP—almost doubled, something that took the industrial countries the last thirty years of the 20<sup>th</sup> century to achieve. Financial flows and labor mobility also picked up, as cross-border transactions costs fell. How have such globalization-related changes affected inflation?

Table 2. Poland's Integration in the World Economy  
(In percent of GDP)

	1995	2004
Trade openness 1/	23.9	41.5
Gross FDI flows	2.6	5.1

Sources: Eurostat; and National Bank of Poland.

1/ Imports over GDP.

Three main channels can be identified, the first two playing at the macroeconomic level and another at a more microeconomic or sectoral level:

- With the responsiveness of prices to domestic output fluctuations potentially lowered by globalization, the policy trade-offs may have shifted in favor of lower inflation. Through its impact on market access, competition and pricing decisions, but also because it allows more consumption smoothing via international borrowing and lending, globalization may have weakened the link between inflation and output fluctuations. In that context, policy makers' ability to temporarily stimulate output at the expense of inflation may have been reduced (Romer, 1993 ; Rogoff, 2003; Razin, 2004). Also, imprudent macroeconomic policies face increasingly severe sanctioning through large adverse international capital flows (Tytell and Wei, 2004).
- Cheap imports could have reduced inflation directly. With increased availability of foreign goods, relatively cheap imports account for a growing share in consumption and a higher weight in price indices, thus reducing measured inflation directly.
- Globalization could also curb domestic production prices, as domestic enterprises face stronger competition, higher productivity growth becomes imperative, and wage pressures diminish. Given the growing availability of close substitutes produced abroad and easily importable, domestic companies could face increased competition. In order to remain competitive, they have the option to lower their markups—all the more if they are initially in an oligopolistic situation—or to become more efficient and innovative. Over time, only the strongest firms survive, implying increased aggregate productivity. Finally, as it becomes easier for firms to outsource production to abroad, domestic wage demands might become more modest.

An additional question is whether the effects of globalization on inflation are permanent or only transitory. Obviously, long run inflation is ultimately determined foremost by monetary policy. Hence, if globalization does indeed alter monetary policy incentives, it may have permanent effects. Alternatively, for a given inflation target, the benefit of globalization takes the form of making central banks' jobs easier, i.e., the target can be met at lower interest rates. As far as the effect from cheaper imports and more competition are concerned, they are likely to reduce inflation only as long as trade openness keeps rising. Once trade openness has settled at a higher level, competition is more intense, and price levels are lower, but price dynamics are not longer affected. In this vein, the WEO study concludes that industrial countries are unlikely to experience more than a temporary effect of globalization on inflation given their well-established monetary policy objectives and already low inflation targets, whereas, in emerging markets, greater openness is likely to remain an important factor behind the sustained improvement in inflation.

#### IV. MACROECONOMIC ANALYSIS

This section analyzes empirically the relationship between inflation and globalization at the aggregate, or macroeconomic, level. It focuses on the first two broad channels discussed above: did globalization reduce the sensitivity of prices to domestic conditions; and did the increasing availability of cheap imports curb headline inflation?

An “augmented Phillips curve” is estimated to assess how trade openness affects the relationship between output and inflation. Following the approach of the WEO study, the traditional Phillips curve framework, which relates the inflation rate to the slack in the economy, is extended: for the eight NMS in the panel dataset, consumer price inflation is related to its own lag (to take into account inflation persistence), the output-gap, and a combination of trade openness and output gap. This setting allows globalization to influence the tradeoff between inflation and domestic economic conditions either because prices of items consumed domestically are increasingly determined by global demand, or because stronger foreign competition reduces the pricing power of domestic firms, limiting their ability to raise prices during upswings.<sup>5</sup>

$$\Pi_{it} = \alpha \Pi_{it-1} + \beta(1 + \gamma \text{Trade Openness}_{it}) \text{outputgap}_{it} + \varepsilon_{it} \quad (1)$$

with  $\Pi$  consumer price inflation, trade openness defined as the ratio of imports of GDP, and output gaps derived by running Hodrick Prescott filters on GDP series.

Depending on specifications, import price inflation, oil price inflation and exchange rate fluctuations are added to the regressions. Finally, a pre-1998 dummy was introduced, to parsimoniously capture credibility gains achieved by these monetary authorities of the NMS during the sample period.

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<sup>5</sup> Here trade openness is not introduced as an explanatory variable by itself. At this level of aggregation, there is insufficient variability to see an independent effect on domestic prices. See also the discussion in section V.

Table 3. New Members States: Augmented Phillips Curve 1/

Dependent variable	Consumer Price Inflation			
Sector sample	Aggregate CPI for All Eight New Members, 1996-2004			
Estimation method	Arellano-Bond Dynamic Panel Estimation			
Explanatory variables	(1)	(2)	(3)	(4)
Lagged inflation	0.46*** (8.60)	0.36*** (4.39)	0.29*** (3.68)	0.29*** (3.71)
Output gap	1.40** (2.05)	1.41** (2.21)	1.22** (2.02)	1.17** (1.98)
Output gap * trade openness	-0.01 (-1.42)	-0.013* (-1.78)	-0.012* (-1.68)	-0.012* (-1.66)
Import price inflation			0.21*** (2.82)	0.19*** (3.34)
Oil price inflation			-0.046 (-0.34)	
Change in nominal exchange rate			0.014 (0.46)	
Dummy prior to 1998		1.66* (1.69)	1.63 (1.45)	1.90** (2.10)
Number of observations	56	56	56	56
Arellano-Bond test for residual autocorrelation (P(z) for H0: no correlation)	0.01	0.01	0.03	0.02
Sargan test (P-value)	0.24	0.27	0.42	0.38
<i>Memorandum:</i>				
Inflation-output elasticity for Poland				
1996	1.13	1.09	0.94	0.89
2004	0.93	0.85	0.73	0.69

Source: IMF staff calculations.

1/ T-statistics are reported in parentheses. Coefficients significant at the 1 (resp. 5 and 10) percent level are shown with \*\*\* (resp. \*\* and \*).

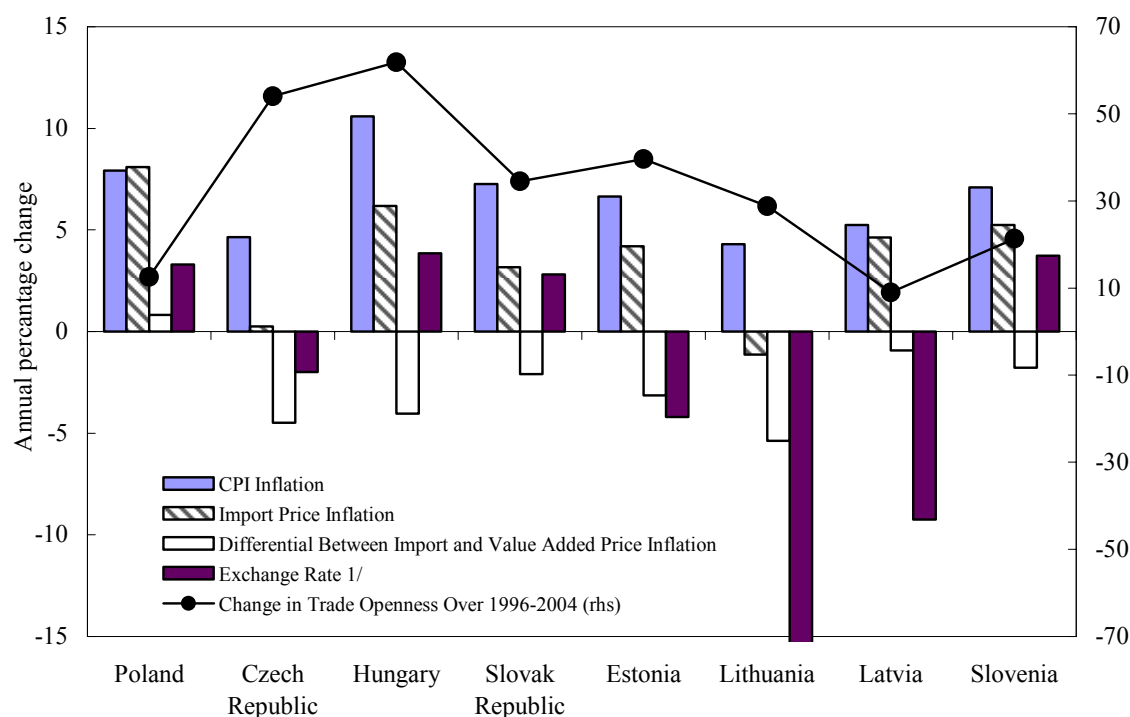
The econometric analysis suggests that the sensitivity of prices to domestic economic conditions in the eight NMS has been falling in the wake of higher trade integration (Table 3). The trade openness coefficient appears significant (although only at the 10 percent level) and negative, therefore lowering the sensitivity of inflation to the output gap. According to equation 4 of Table 3, the rise of trade openness from 1996 to 2004 reduced the inflation-output elasticity in Poland by more than 20 percent, from 0.89 to 0.69. In other words, if output rises above its long-term trend by 1 percentage point inflation would currently increase by 0.7 percentage points in the first year, compared to 0.9 percentage points ten years ago. This is consistent with the view that in the wake of globalization, price developments in Poland increasingly also reflect global developments at the expense of domestic ones. A flatter Phillips curve could also be the result of monetary policy becoming less activist and more focused on price stability as globalization altered policy incentives.

Import price developments apparently did not contribute much to the decline in inflation in Poland. This might be because much of the expanding trade was with high-price

Europe rather than low-price China or India. In 2004, the latter accounted for only 5 percent of Poland's imports compared to 60 percent in the case of western Europe. Moreover, exchange rate depreciation offset much of any fall in world market prices.

- Compared to the other NMS, Polish import prices expressed in domestic currency rose at a relatively high rate, and unlike in any of the neighboring countries, they actually increased at a higher rate than the overall CPI (Figure 4 and Appendix II). Exchange rate developments explain at least partially this result, as moderating effects from cheaper imports in foreign currencies were counteracted by the effective zloty's depreciation during the sample period (1996-2004). Import prices grew the least in countries with the largest appreciation, notably the Baltics, which were strongly affected by the ruble depreciation, in the aftermath of the 1998 Russia crisis. Looking forward, the zloty could well appreciate, but the effect of import prices on inflation is unlikely to be large.

Figure 4. Price and Trade Openness,  
Evolution Over 1996–2004



1/ An increase (decrease) in the exchange rate corresponds to a depreciation (appreciation).

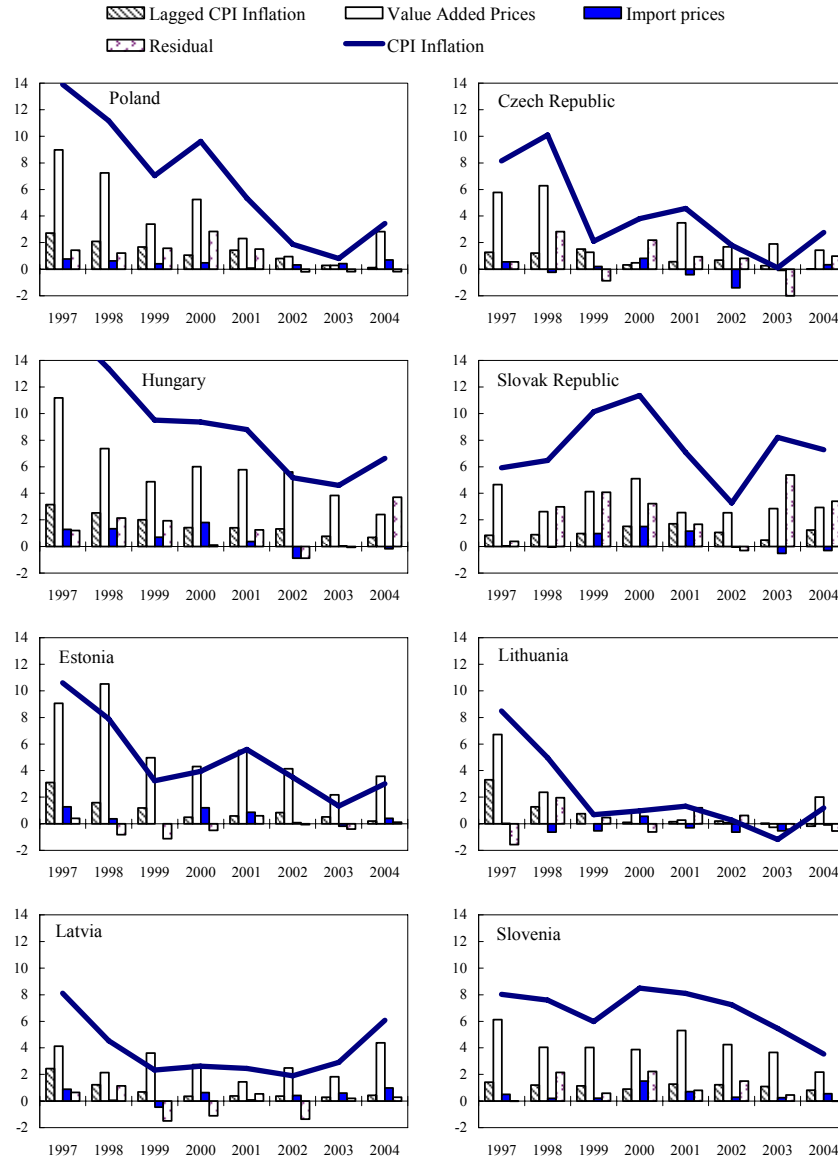
Sources: Eurostat; IMF, World Economic Outlook; and IMF staff calculations.

- A simple panel estimation confirms the limited influence of import prices. Inflation of import prices (pimp) weighted by trade openness ( $\theta$ ) contributes only 16 percent to overall inflation when controlling for the inflation of value added prices (pva) and lagged inflation in a sample covering the NMS in the years 1996-2004:

$$\Delta l(cpi) = \underset{(2.52)}{0.16} \Delta l(cpi_{-1}) + \underset{(6.48)}{0.64} \Delta l(pva) + \underset{(3.01)}{0.16} \theta \Delta l(pimp) \quad (2)$$

Figure 5 shows the implied decomposition of consumer price inflation. In the case of Poland, the bulk of the inflation slowdown over the period comes from changes in value added prices—although they are not immune to the effects of globalization as explained below. The contribution of import price inflation is minor and constant over time.

Figure 5. New Member States: Contributions to CPI Inflation 1/



Source: Eurostat; and IMF staff calculations.

1/ Reading note: Using estimated relation (2), the evolution of CPI is broken down in the contributions of past CPI inflation, value added inflation, import price inflation, and of the residual, all shown here in columns.

## V. SECTORAL ANALYSIS

This section analyzes the role of globalization on domestic price patterns, drawing on sectoral price data for the manufacturing industry. As explained in section III, increased access of foreign producers to the Polish market might have intensified competition, forcing producers to lower mark-ups, and hastening the exit of inefficient firms (Chen and others, 2004). A sectoral approach is required to study the relationship between production prices and globalization as there is insufficient data variability in trade openness at the country level (Figure 6). Data availability considerations restricted the sample to 14 sub-sectors of the manufacturing industry—where the globalization process has been the strongest—for Poland, Hungary, the Czech Republic and the Slovak Republic during 1995-2003 (see Appendix 3 for a detailed description of the dataset).

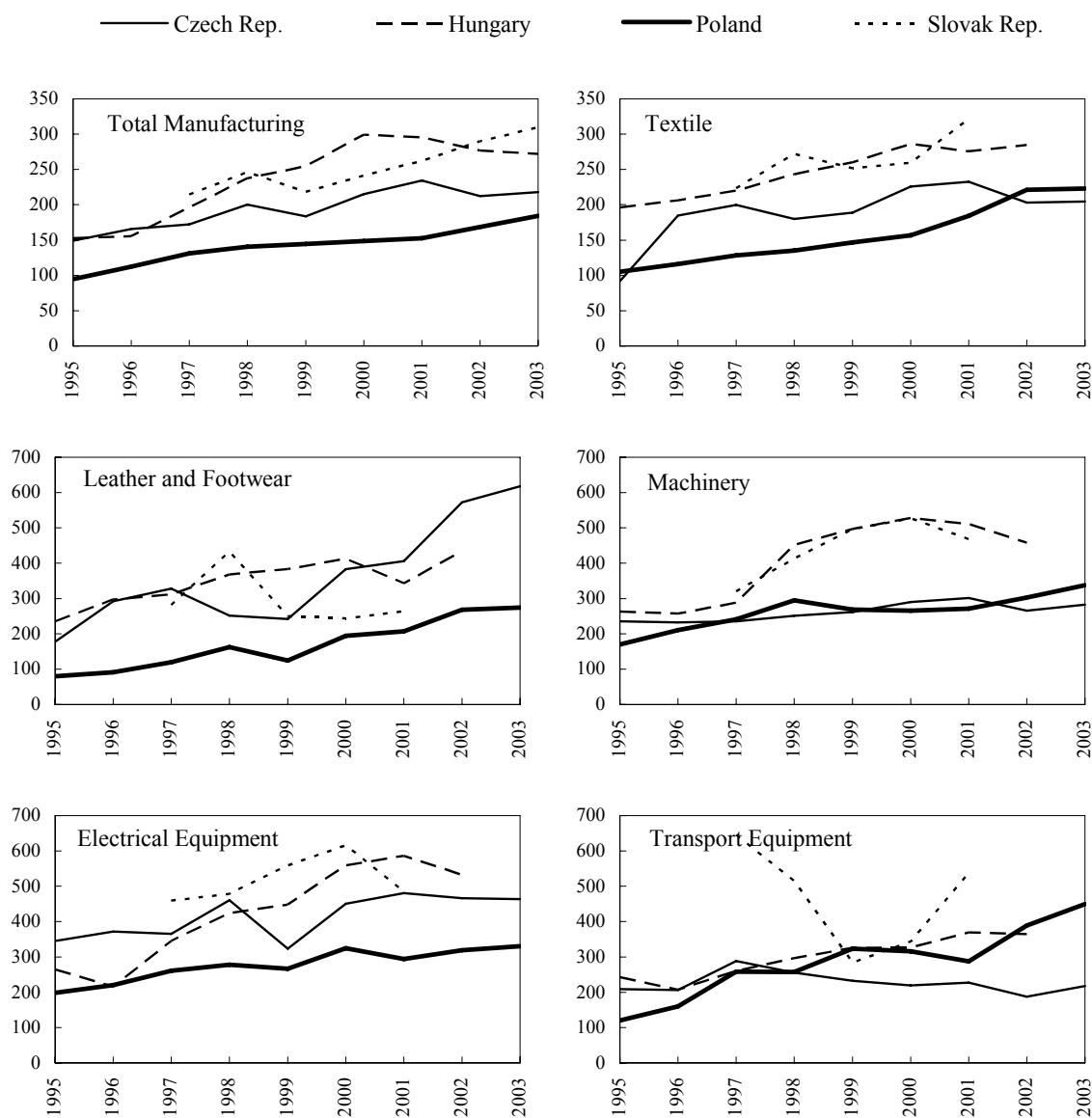
The analysis seeks to relate price, productivity and wage developments to changes in the sectors' trade openness. Following Chen and others (2004) and the WEO study, changes in value added prices are regressed on changes in sectors' import-to-value-added ratio.<sup>6</sup> The expectation is for a negative sign, as faster increases in trade openness would be associated with smaller value-added price increases. The role of trade openness evolution on productivity gains and wage developments are also assessed, the intuition being that larger exposure to foreign competition spurs innovation and restructuration, and dampens wage pressures. As they were studying Western European countries, Chen and others (2004) had enough data to allow for full-fledged adjustment dynamics in an Error Correction model. Such hindsight is missing for CEEs countries, as detailed sectoral data exist only from 1995 onwards, and a specification in first differences was chosen. Further research will be needed, once longer series become available. Obviously, as the region underwent tremendous structural changes over the period at hand, the estimation results need to be interpreted with caution.

The econometric analysis supports the intuition that globalization dampens domestic prices. The price equation is estimated in a panel model, controlling for labor productivity growth and overall consumer price inflation—as a proxy for the monetary policy stance—and for country and sector-specific factors (Table 4). The possibility of reverse causality from prices to the measure of globalization is addressed through instrumentalization, as disturbances that lift value added prices could also lower competitiveness and therefore raise the import ratio. In all specifications, the coefficient of trade openness is significant and negative. It is somewhat larger when estimated for Poland alone, although caution is warranted in interpreting this finding, considering the small size of the sample.

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<sup>6</sup> Chen and others, as well as the authors of the WEO study, use production prices, but due to data availability constraints, value added prices were used here. This obviates the need to control for exchange rate movements related to imported intermediary consumptions. Chen's paper considers EU 15 countries, while the WEO study extends the analysis to a larger OECD sample. This paper applies the methodology to four NMS.

Figure 6. Central Europe: Trade Openness for Various Manufacturing Sub-Sectors, 1995-2003 1/



Sources: OECD STAN database; and IMF staff calculations.

1/ Trade openness is defined as the ratio of imports over value-added, in value.

Table 4. Impact of Trade Openness on Value-Added Price Inflation 1/

Dependent variable		Change in value-added price							
Sector sample		Subsectors of the manufacturing sector (14 sub-sectors), Poland, Hungary, Czech Republic, and Slovak Republic							
Estimation method		FE (1)		2SLS 2/ (2)		2SLS 2/ (3)		2SLS 2/ (4)	
Explanatory variables		full sample 1996-2003	Poland only 3/	full sample 1996-2003	1999 and beyond	Poland only 3/	full sample 1996-2003	1999 and beyond	full sample 1996-2003
Change in trade openness (import share)		-0.39*** (-10.10)	-0.71*** (12.18)	-0.54*** (-4.24)	-0.42*** (-2.67)	-0.60*** (-3.54)	-0.68*** (-4.89)	-0.45*** (-2.84)	-0.35*** (-2.93)
Change in labor productivity		-0.58*** (-17.04)	-0.90*** (-20.12)	-0.67*** (-8.46)	-0.58*** (-6.31)	-0.84*** (-9.95)	-0.74*** (-8.64)	-0.60*** (-6.51)	-1.03*** (-5.41)
Change in national CPI		1.28*** (8.36)	1.41*** (3.52)	1.62*** (7.35)	1.38*** (3.43)	1.52*** (5.35)	1.39*** (5.66)	1.39*** (3.46)	0.88* (1.75)
Number of observations		350	210	294	210	84	252	210	182
Instruments					lagged level and change in nominal effective exch. rate and lagged change in trade openness			lagged changes in nominal effective exch. rate and lagged change in trade openness	
IV tests				0.00	0.00	0.02	0.00	0.00	0.00
Anderson statistic (P-val)				0.16	0.24	0.04	0.78	0.40	0.71
Sargan statistic (P-value)									0.00
									0.22

Source: IMF staff calculations.

1/ T-statistics are reported in parentheses. Coefficients significant at the 1 (resp. 5) percent level are shown with \*\*\* (resp. \*\*).

2/ With heteroskedasticity-consistent standard errors

3/ Over the full sample (1996-2002)



Globalization could have lowered domestic prices by between  $\frac{1}{2}$  and 1 percentage point per year since the middle of the 1990s, mainly through lower mark-ups. According to the central estimates (equation 3 of Table 4), globalization reduced manufacturing price inflation by 5.6 percentage points per year in Poland, implying an impact on consumer price inflation of between 0.5 and 0.9 percentage points per year during 1996-2003 (Table 5).<sup>7</sup> The higher estimate applies if one assumes that the effect of globalization on manufacturing prices extends to the tradable goods sector as a whole. However, as the pace of trade integration was particularly high at the beginning of the transition process, and has since slowed down, the effect of globalization on inflation runs now more likely between -0.2 and -0.4 percentage points per year. Productivity gains account for an even larger share of price moderation, lowering inflation by about 1 to  $1\frac{1}{2}$  percentage points per year on average over the whole sample period, and by  $\frac{3}{4}$  to  $1\frac{1}{4}$  percentage points since 1999. As the impact of globalization on innovation is likely to be captured by the coefficient on labor productivity, the trade-openness effect discussed here reflects primarily mark-up compression in the wake of intensified competition.

Table 5. Impact of Trade Openness on Inflation in Poland  
(In percentage points, as estimated in Equation 3 of Table 4)

Estimation sample	1996-2003	1999-2003
Change in import share	8.3	5.3
Change in manufacturing value-added prices	-5.8	-4.8
Impact of trade openness on manufacturing VA prices	-5.6	-2.4
Impact on CPI 1/ lower bound 2/ upper bound 3/	-0.5 -0.9	-0.2 -0.4

Source: IMF staff calculations.

1/ Using the equation (2) estimated in section D, linking value added prices, import prices and CPI.

2/ Using the weight of the manufacturing sector in overall value added, at 15 percent.

3/ Assuming the globalization impact applies to the whole tradable sector, whose weight in overall value added reaches 25 percent.

## VI. CONCLUDING REMARKS

This paper provides evidence that globalization significantly dampened down inflation in central Europe over the last ten years, and somewhat more so in Poland than elsewhere in the region. Globalization appears to have strengthened incentives for a less activist monetary policy focused on price stability. Moreover, increasing exposure to global markets seems to have forced firms in the manufacturing sector to reduce markups. This effect was particularly pronounced in the central European countries where import penetration converged toward levels of advanced economies in a relatively short period of time. Hence, rising trade openness subtracted as much as  $\frac{1}{2}$  to 1 percentage points from

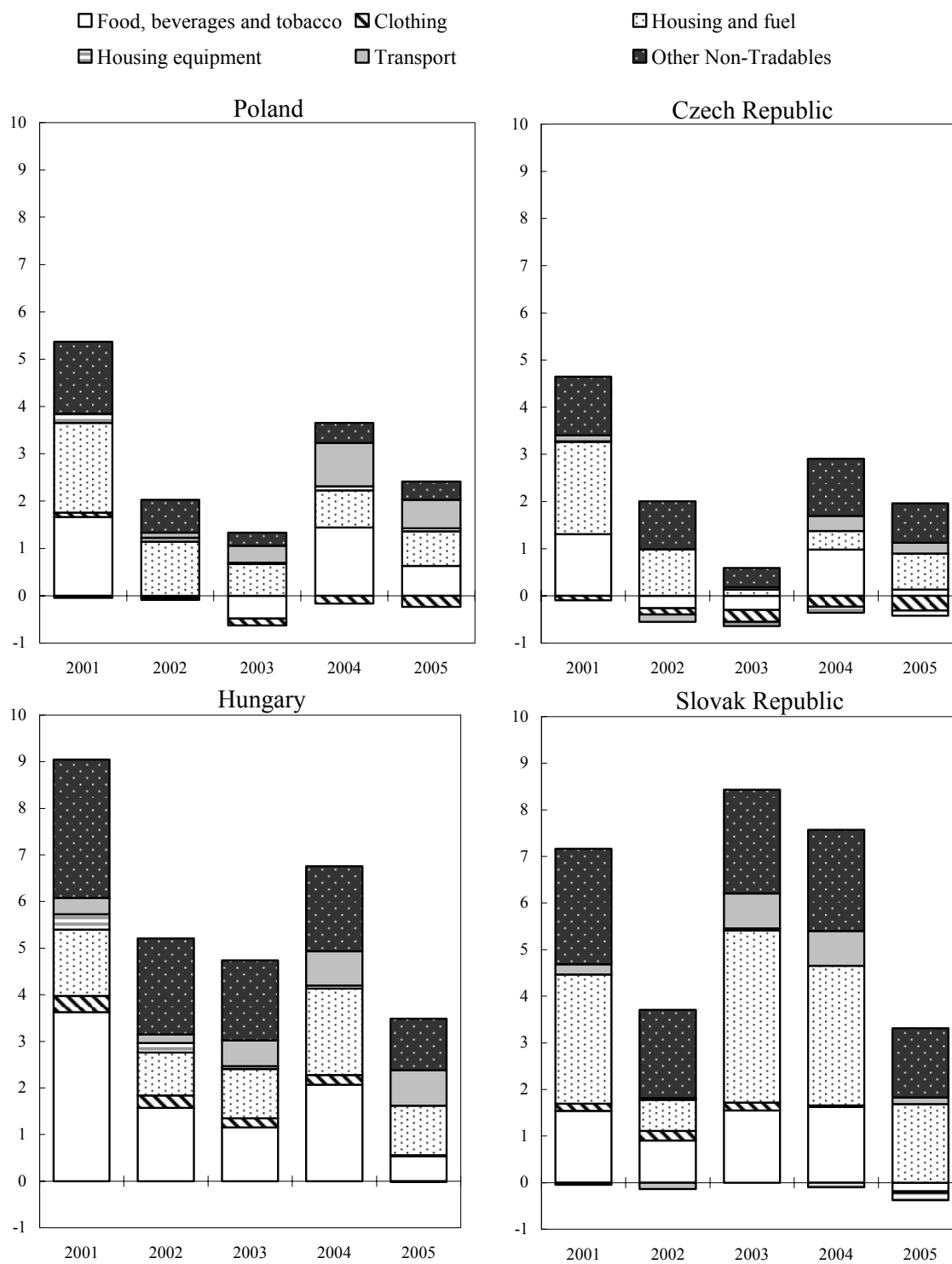
<sup>7</sup> The WEO study finds that the increased trade openness could have reduced relative producer prices in manufacturing by about 0.3 percentage points a year in industrial countries over the past 15 years.

inflation in Poland per year during 1996-2003, substantially more than in the advanced economies.

The effect of globalization on inflation through mark-up compression seems set to diminish in the future. Following the rapid growth of trade integration during transition and the run-up to EU membership, import shares are now likely to grow more moderately in central European economies. Consequently, pressure on mark-ups would intensify more slowly going forward and the relief for inflation would diminish. However, imported price stability from the increasing availability of cheap imports that was offset in Poland by zloty depreciation in the past could play a more dominant role in the future if the exchange rate remains stable or appreciates.

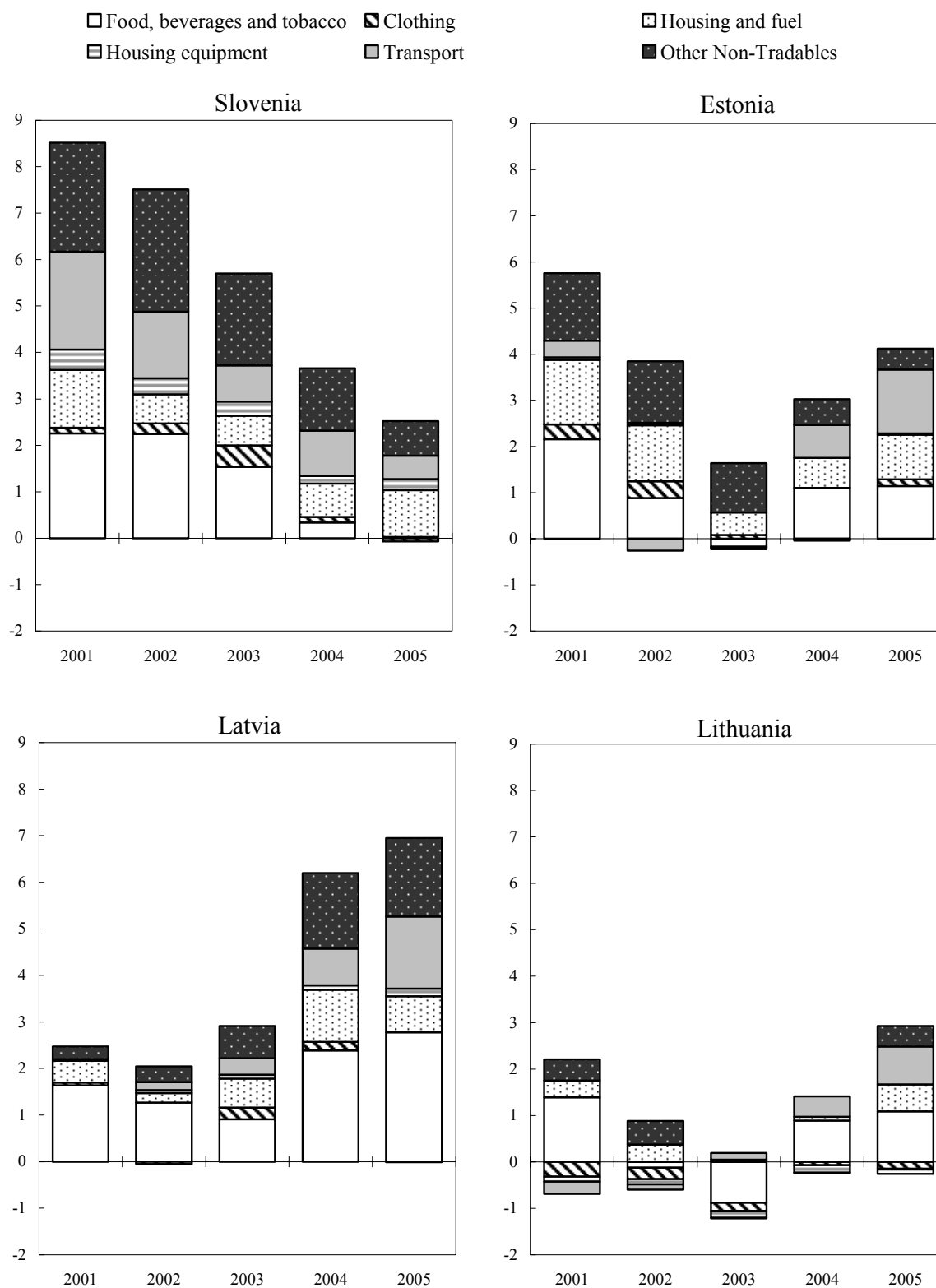
Other moderating effects of globalization on inflation are likely to endure. Unless globalization is reversed, the strong incentives for a monetary policy that is focused on price stability should remain in place. Moreover, even if trade integration advance more slowly from here on out, it will remain true that price developments in Poland are more closely tied to global conditions than in the past.

Appendix I. Figure 1a. New Member States: Contributions to HICP Growth Rate  
(In percent)



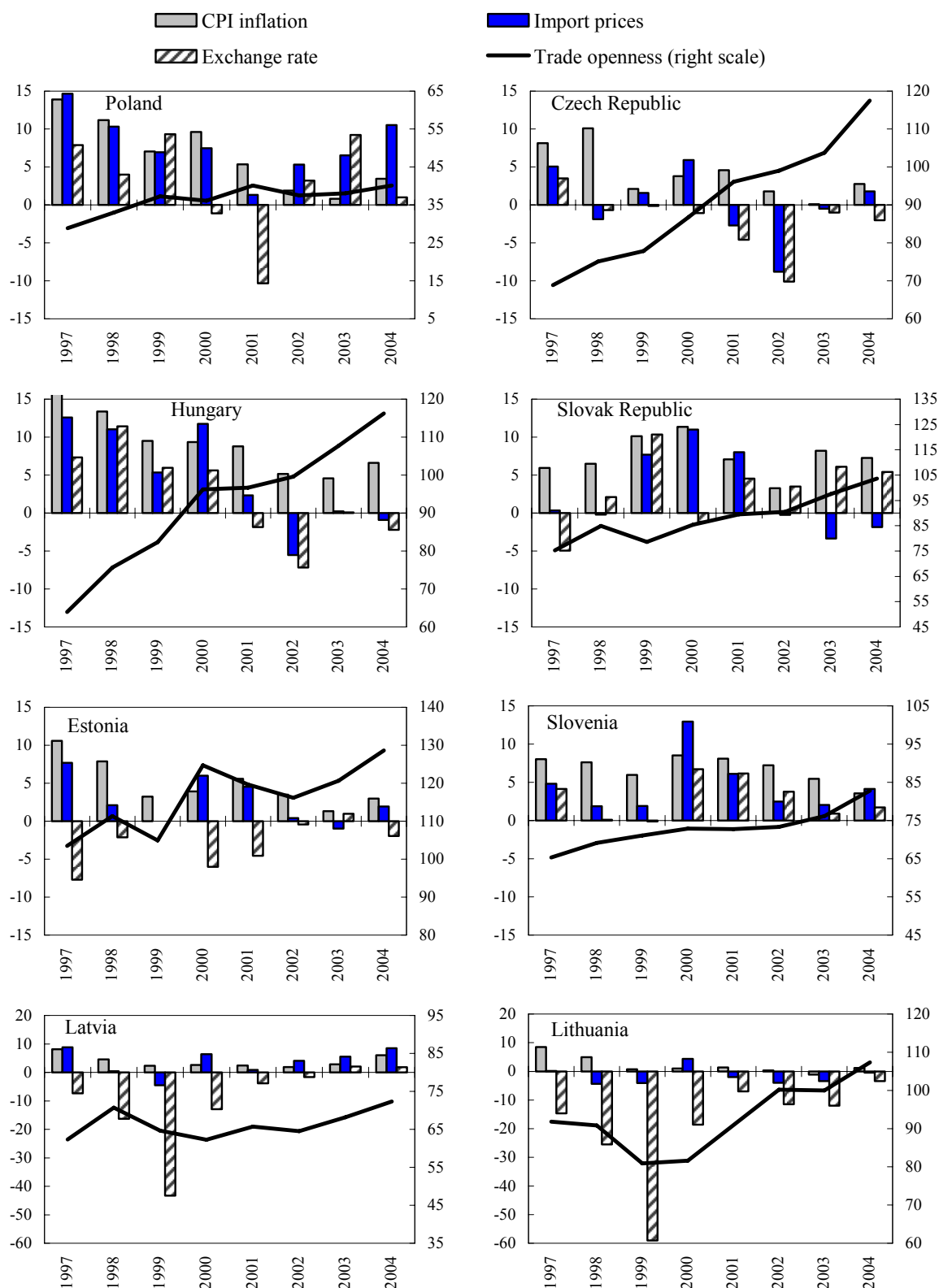
Sources: Eurostat; and IMF staff calculations.

Appendix I. Figure 1b. New Member States: Contributions to HICP Growth Rate  
(In percent)



Sources: Eurostat; and IMF staff calculations.

# Appendix II. New Member States: Consumer Price Inflation, Import Price Inflation, Exchange Rate Evolution, and Trade Openness 1/



Sources: Eurostat; and IMF staff calculations.

1/ A decrease (increase) in the exchange rate means an appreciation (depreciation).

### Appendix III. Dataset Used in the Sectoral Approach

The sectoral analysis uses a disaggregation of the sectors at the two- or three-digit level of the ISIC Rev 3 classification depending on data availability. Precisely, 14 sub-sectors were considered:

- Food products, beverages and tobacco
- Textiles and textile products
- Leather, leather products, and footwear
- Wood and products of wood and cork
- Pulp, paper, paper products, printing and publishing
- Coke, refined petroleum products and nuclear fuel
- Chemicals and chemical products
- Rubber and plastic products
- Other non-metallic mineral products
- Basic metals and fabricated metal products
- Machinery and equipment, n.e.c.
- Electrical and optical equipment
- Transport equipment
- Manufacturing n.e.c.

Data were constructed for Poland, Hungary, and the Czech and Slovak Republics, with all data available between 1995-2003. Most of the data are from the OECD's Structural Analysis (STAN) database. The following are the main variables (from STAN unless otherwise noted)

- *Value-added prices*: defined as the ratio of the value of value added at basic prices and the volume of value-added in each sector. For Poland, since data for the volume of value-added was not available at that level of disaggregation in the STAN dataset, the Groningen Growth and Development Center database was used (<http://www.ggdc.net/>). Compiled by the faculty of economics at the University of Groningen (Netherlands), it uses for this variable, data published in the Statistical Yearbook of Industry by the polish Statistical Office (GUS).
- *Trade openness*: defined as the ratio of the import value to the value-added in each sector. The imports referred to are those produced by foreign producers in the same sector.
- *Labor productivity*: defined as the ratio of the volume of value-added in each sector to the number of employees.
- *Wages*: defined as the ratio of the total labor costs of employees to the number of employees in each sector. For Poland, data are collected directly from the Polish Statistical Office (GUS), which at the time of the study, were only available until 2002.
- *Aggregate CPI index and unemployment rate*: are extracted from the IMF World Economic Outlook (WEO) database for each country.
- *Nominal Effective Exchange Rate*: is extracted from the IMF INS database, for each country.

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