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**Christian Dreger
Konstantin Kholodilin
Kirsten Lommatzsch
Jiri Slacalek
Przemyslaw Wozniak**



DIW Berlin

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for Economic Research

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DIW Berlin

German Institute for Economic Research

Mohrenstr. 58

10117 Berlin

Tel. +49 (30) 897 89-0

Fax +49 (30) 897 89-200

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Price convergence in the enlarged internal market¹

Christian Dreger, Konstantin Kholodilin, Kirsten Lommatzsch, Jiří Slačálek, Przemyslaw Wozniak²

Abstract

In this paper we investigate the effects of EU enlargement on price convergence. The internal market is expected to boost integration and increase efficiency and welfare through a convergence of prices in product markets. Two principal drivers are crucial to explain price developments. On the one hand, higher competition exerts a downward pressure on prices because of lower mark ups. On the other hand, the catching up process of low income countries leads to a rise in the price levels and higher inflation over a transition period. Using comparative price levels for 41 product categories price convergence can be established. However, the speed of convergence is rather slow, with half lives around 10 years. The enlargement has slightly stimulated convergence towards the mean price, and this impact is robust across different groups of countries. Moreover, the driving forces of convergence are explored. In line with theoretical predictions, the rise in competition exerts a downward pressure on prices, while catching up of low income countries leads to a rise in price levels and higher inflation. The findings have important implications, as price convergence facilitates the working of common economic policies.

Keywords: EU enlargement, price convergence, catching up and competition

JEL codes: E31, F15, C33

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² Dreger (corresponding author): DIW Berlin, cdreger@diw.de, Kholodilin: DIW Berlin, kkholodilin@diw.de, Lommatzsch: DIW Berlin, Kirsten.Lommatzsch@berlin.de, Slačálek: DIW Berlin, jiri.slacalek@gmail.com, Wozniak: CASE Warsaw, Przemek.Wozniak@case.com.pl.

I. Introduction

The implementation of the Internal Market Programme and the introduction of a common currency in a number of key EU Member States have led to an unprecedented degree of economic integration. The introduction of the euro has improved price transparency and has eliminated costs of currency conversion and exchange rate risk premia for a number of countries. Because of the increase in trade, the level of competition in the euro area and between euro area member states and third countries has risen. Advances in the integration of labour, product and financial markets have reduced the costs for private households and businesses to undertake price arbitrage. It may also give rise to industrial restructuring, mergers and acquisitions and a change in the market strategy of enterprises.

The EU enlargement with the accession of the Eastern European economies has marked another cornerstone in the completion of the internal market. These countries are in the process of catching up in per capita income. During the process of transition and accession, trade has expanded rapidly. In addition, the new member states have received large foreign direct investments in manufacturing industries, financial, distribution and communication sectors. Firms have been included in international production chains. Multi-national firms have utilized the comparative advantages of these countries through shifting labour intensive work into this low cost region. The internal market is expected to foster market integration and increase efficiency and welfare through a convergence of prices. Although a high degree of market integration is achieved, price dispersion in the EU has increased with the enlargement in 2004. Price levels in the new member states are substantially lower than for the old members, most likely due of their lower income level.

In fact, two principal forces are crucial to explain the process of price convergence. On the one hand, the rise in competition in the Internal Market exerts a downward pressure on prices because of lower mark ups of prices over marginal costs. Domestic factors become less important, in particular for tradable products. On the other hand, this effect is overlapped by the catching up process of low income countries. Catching up leads to a rise in the price levels and higher inflation over a transition period. The overall price level tends to increase and affects the consumption and production pattern of the econ-

omy. This development is based on market reforms, a different composition of value added, and a rise in the variety and quality of products. It is the main task of this study to disentangle the effects these two forces exert on price developments and to assess their relative importance.

The empirical findings are broadly in line with the theoretical predictions. Price convergence can be established, although the speed of convergence appears to be rather slow. This confirms the results of previous studies. In addition, the enlargement of the Internal Market has stimulated the convergence process, and the result is robust across different groups of countries. Furthermore, the rise in competition exerts a downward pressure on prices, while catching up of the low income countries leads to a rise in price levels and higher inflation.

The paper is organized in sections. After the introduction in section I, previous studies on price convergence are reviewed in section II. Catching up and competition effects are discussed separately. Section III describes the data set. Empirical results are presented in section IV. Finally, section V concludes the paper.

II. Empirical studies of price convergence

The most important factors influencing price convergence are the competition effect and catching up effect. The competition effect is based on the law of one price, which predicts that price arbitrage will inevitably lead to convergence of prices to the most efficient supplier. Due to several frictions (transaction costs, imperfect tradability in goods and services, etc), the law of one price should be interpreted as a long run anchor for the price development. The catching up effect rests on the different levels of per capita income in the member states of the Internal Market. According to the Balassa-Samuelson hypothesis, price levels are higher in wealthier countries. In particular, the non-tradable component of products provides a rationale for the presence of a trend in prices, which is not related to the functioning of the Internal Market. Specifically, prices of non-tradables should be substantially lower in the New Member States, as long as they are in a catching up period (Backé, Fidrmuc, Schardax and Reininger, 2002, Égert and Halpern, 2005). To the extent that inflation differentials are caused by catching up behavior, they will not affect competitiveness and disappear when real convergence is

achieved. Therefore, a part of the divergent inflation experience might be transitory, as the countries move towards a common price level. The joint impact of competition and the catching up on the path of price convergence is difficult to foresee beforehand, as the effects move prices in opposite directions.

II.1. Empirical evidence on the competition effect

Recent studies have emphasized the increasing role of global drivers to explain price and inflation dynamics, see Pain, Koske and Sollie (2006), Borio and Filardo (2006) and Mumtaz and Surico (2006). Chen, Imbs, and Scott (2006) reported evidence for manufacturing sectors in some EU countries, i.e. the size by which prices and mark ups fall and productivity is enhanced due to intensified competition. Competition measures include domestic and foreign openness to trade and the number of firms in domestic and foreign markets. The sign is in line with expectations only in the short run. In the long run, however, the analysis suggests that the competition effect diminishes and can even reverse. As domestic firms face tougher competition they might relocate production abroad into more the protected and less competitive regions.

According to the IMF (2006), producer prices have increased less than headline inflation in sectors exposed to intensified competition. Moreover, prices in hightech sectors declined less than in lowtech sectors. This might reflect a tendency to outsource larger parts of the production of lowtech products in low-wage countries. A one percent increase in the import share reduces relative producer price inflation by less than 0.2 percent on the average of the products considered. The impact of competitiveness on price dynamics seems to have accelerated as integration has intensified. However, the impact is not very strong, and other variables are relevant as well. For example, the effect of a rise in the import share on producer price inflation is slightly lower than the effect of a change in import prices in absolute value.

Regarding the transition to the euro, most research has focused on the impact of the common currency on the path of consumer price convergence and therefore relied on a cost of living concept, see for example Rogers (2001), Engel and Rogers (2004), and Allington, Kattuman and Waldmann (2004). These studies were unable to find an additional downward shift in price dispersion in response to the euro introduction. In con-

trast, Andrén and Oxelheim (2006) have investigated the development of producer prices in the transition from a national exchange rate regime to the currency union. Convergence of producer prices is equally significant before and after the introduction of the euro. To the extent that developments in producer prices are passed through to consumer prices, a further potential for convergence seems to exist in the euro area over the years to come. A further harmonization of VAT rates will also foster this process.

Furthermore, exchange rate stability seems to promote price convergence. For the founding members of the euro area, price dispersion is relatively low and close to US figures (Rogers, 2002). Nevertheless, these effects might occur as long-term benefits, and can hardly be detected in short-time periods.

II.2. Empirical evidence on the catching up effect

In the EU accession countries, competition is overlapped by the catching up process in per capita income. Starting from relative low income and price levels, these economies have experienced an upward trend in prices and a real appreciation of their currencies. This might be attributed to the Balassa-Samuelson effect: due to wage spillovers between the tradables and non-tradables sector higher inflation is expected for non-tradables. As far as convergence of income per capita is not achieved, prices in the transition economies are expected to be on an upward trend. In the long run, convergence in productivity levels in the traded goods sector would imply convergence in the overall price levels.

The presence of the Balassa-Samuelson effect is generally confirmed by previous studies, but its magnitude appears to be rather small, see Égert (2003) for a review. For example, Arratibel, Rodriguez-Palenzuela, and Thimann (2002) have concluded that the effect is almost insignificant in explaining inflation in accession countries. According to Lojschová (2003), the Balassa-Samuelson effect can account for an average annual rate of real appreciation of around 2.5 percent. Then, a constant nominal exchange rate could justify an inflation rate 2.5 percentage points above the rate in the euro area. By employing a very detailed dataset, Égert (2003) has estimated the size of the effect between 2 and 3 percentage points for Estonia over the 1993-2002 period. At the end of the period, the contribution to inflation is found to be less than one percentage point. In fact,

Estonia has converged rather rapidly towards the EU level, both in terms of per capita income and productivity.

These findings partly reflect empirical shortcomings. In particular, the tradables and non-tradables distinction is not obvious, given that non-tradable inputs are also required for tradables (Lee and Tang, 2003, MacDonald and Ricci, 2001). However, the essential point to be taken from these studies is that catching up is relevant, but it is related to a broader concept than the pure Balassa-Samuelson model. Especially in the early years of transition, market reforms are more important in explaining relative price movements (Hlouskova and Wagner, 2004). The quality of products, the degree of price regulation, market reforms, and reputation problems need to be taken into account (MacDonald and Wojcik, 2004). For example, catching up countries may have lower reputation and have to underprice their products to stay in the market. This effect will gradually diminish over the catching up period, as reputation will improve.

III. Data description

A serious problem to assess price convergence refers to the appropriate choice of the price variable. Due to the lack of individual data, aggregate price measures like the GDP deflator, consumer or producer price indexes are often employed. However, they contain less information about advances in competition, as they reflect cumulated inflation rates rather than absolute price levels.

To enable the comparison of prices across countries, Eurostat has undertaken the European Comparison Programme: Purchasing power parities (PPPs) and comparative price levels (CPLs) are calculated for a number of product aggregates. CPLs are defined as PPPs divided by the nominal exchange rate. The CPL for a bundle of goods and services is its cost in one country in percent of the cost of the same bundle in another country, when prices in are expressed in the common currency. CPLs are taken from Eurostat and measured in terms of indices. The index in the reference country (EU12) is set equal to 100. Figures below 100 indicate that the prices in the country under examination are lower than its counterpart in the EU12. It should be noted that the weighting scheme in PPPs and CPLs might be different at home and abroad. Hence CPL conver-

gence or divergence might be a joint outcome of a change in prices and the weighting structure.

The competition variable refers to the integration of countries in international markets. Therefore, the competition effect is proxied by the openness to foreign trade, defined as the sum of exports and imports divided by GDP. These series are taken at constant prices (2000=100) and obtained from the AMECO database of the EU Commission. An increase in openness implies that domestic producers are confronted with stronger competition from abroad, thereby reducing their mark ups. Domestic costs become less important, in particular for tradable goods.

-Figure 1 about here-

Figure 1 reveals that openness has a dampening influence on relative price levels, i.e. higher foreign trade is associated with a lower CPL. Therefore, an increase in openness should exert a dampening effect on the price evolution, albeit the reaction does not seem to be very strong. Note that the accession countries are concentrated in the lower right part of the graph. Generally, these economies are more open, and have lower price levels than the EU12 average.

-Figure 2 about here-

The catching up variable is proxied by real GDP per capita at constant prices (2000=100), taken from AMECO and defined in relative terms, i.e. divided by the EU12 level. CPLs in the poorer countries are expected to follow an upward trend correlated with relative per capita income. Indeed, the relationship seems to be rather strong, albeit not perfect. For example, the Czech Republic and Portugal as well as Netherlands and Denmark realize similar levels of per capita income (67% and 117%). However, their CPL positions differ by 27 and 25 percentage points, respectively. As already stated, the relative GDP variable should be interpreted rather broadly, as it is a general variable for the catching up process (Cihak and Holub, 2005).

IV. Empirical analysis of price convergence

The empirical analysis determines whether price convergence has occurred and provides insights into the driving forces of this process. Higher market integration is expected to boost competition and puts a downward pressure on prices via the reduction of mark ups. However, this development is overlapped by the catching up in the accession countries. Catching up and competition factors are identified to reveal insights into the impact of these components on the path of price convergence. The time span of data available for the new member states is very short. Thus, univariate time series models are not appropriate. Instead, the analysis is conducted in a panel framework. Hence, the estimated effects display the average across countries and markets.

The presence of price convergence is analysed in the first step. Two general concepts to measure convergence of certain variables are distinguished in the literature: β - and σ -convergence. They have been used extensively in the literature of economic growth to assess regional or cross country per capita income and productivity convergence (Barro and Sala-i-Martin, 1995). β -convergence in its absolute form postulates that poor countries will experience faster income or productivity growth thereafter. This implication is usually tested by regressing the growth rate, taken as average over some period of time on initial levels for a cross section of countries. Price dispersion is explored within an analysis of σ -convergence. This concept implies a decrease in the dispersion of per capita income levels across countries.

In the CPL analysis, absolute β -convergence is built upon a negative relationship between the initial price level and subsequent price increases. Countries with low prices at the beginning of the period have had higher inflation on average, implying convergence to the mean of the distribution. In terms of CPLs, an initial CPL level is used to explain subsequent changes in the CPL measure, i.e.

$$(1) \quad \Delta CPL_{i,t} = \alpha_i - \beta CPL_{i,t-j} + u_{i,t}$$

where i is a country index, α_i a country specific fixed effect, u_i the error term and t denotes time. The initial CPL is the CPL level lagged j periods. The one period lag ($j=1$) is

often employed in empirical studies, see Dobado and Marrero (2005) and Wolszczak-Derlacz (2006). Then, the equation

$$(2) \quad CPL_{i,t} = \alpha_i + (1 - \beta)CPL_{i,t-1} + u_{i,t}$$

relating subsequent CPLs is equivalent. The estimated coefficient of the lagged CPL is an indicator of β -convergence. In particular, two parameters of interest can be immediately revealed from the regression results. The speed of convergence and the half-life of shocks are calculated as

$$(3) \quad \lambda = -\ln(1 - \beta) \quad , \quad t^* = -\ln 0.5/\lambda$$

where λ is convergence per period. The half-life t^* measured in years indicates how long it takes for the impact of a unit shock to diminish by 50 percent. In case of higher autoregressive orders in the convergence model, the absolute value of the first-order coefficient provides a suitable approximation to access the speed of convergence and half-lives. Due to the dynamic structure of the panel regression (2), the Arellano and Bond (1991) GLS method is appropriate. It should be noted that some well known statistics like the R -squared are not informative in this case. According to Bloom, Bond, and van Reen (2007) the square of the correlation between the actual and fitted values of dependent variable is used as a measure for the goodness of fit. β -convergence is a necessary, but not a sufficient condition for price convergence. Here, σ -convergence must also hold, which is related to a decrease of the coefficient of variation over time. In the analysis, the presence of σ -convergence is investigated by the sign and significance of the slope coefficient in a regression of the CPL dispersion on a linear time trend.

In particular, a panel regression is performed for 41 CPLs for broad categories, which are observed for 24 countries. Luxembourg is excluded from the EU25 because of outlier problems. The cross-section dimension is 984 (41×24), whereas the time dimension includes 7 years (1999 to 2005). The cross-section dimension is rather large, but the time-series dimension is very short. As the results refer to time-series phenomena, they should be taken with some caution. Nevertheless, they are useful to provide a first indication of the path of convergence. Estimations are conducted using the Stata package

xtabond2, which is especially designed to estimate dynamic panel data models. For more details see Roodman (2006).

The results for three groups of the EU countries (EU24, old member states (EU15), and new member states (EU10)) are reported in Table 1. The speed of convergence and half-lives are calculated according to the formula (3). Also, the convergence regressions include a multiplicative dummy to control for a possible impact of the EU enlargement on the speed of convergence.

-Table 1 about here-

Overall, the evidence strongly points to the presence of β -convergence: countries with low relative prices in the initial period have experienced higher changes in the price level thereafter. According to the speed of convergence, 7 percent of the price differential are removed each period. The speed of convergence has slightly increased due to the EU enlargement. In general, convergence is expected to take a long period of time, with half-lives of shocks of about 10 years. Similar speeds have been reported by Wolszczak-Derlacz (2006). Also, the ECB (2003) has concluded that β -convergence is important in explaining different rates of inflation across the EU12 countries. The general finding can be confirmed if more homogeneous groups of countries are considered, such as the EU15 and the EU10. The speed of convergence is very similar, and the EU enlargement has increased the speed of convergence in both subsamples. Because of the negative trend parameters, σ -convergence is detected, where the reduction in the price dispersion is more pronounced for EU10.

Price convergence can be detected both in terms of β - and σ -convergence for the period before as well as for the period after the EU enlargement. However, while the speed of β -convergence seems to have increased, that of σ -convergence appears to have decreased. This inconclusive evidence could be caused by the short-time period, as the long-run convergence trends might be interfered with short-run fluctuations. For example, price dispersion might increase in the early years of an economic recovery. Moreover, the business cycles in the EU member countries are not fully synchronized yet (see Artis, Krolzig and Toro, 2004).

Next, insights into the determinants of the convergence process are provided. In particular, CPLs for broad categories are regressed on catching up and competition variables. As in the analysis of β - and σ -convergence, the number of cross sections is equal to the product of number of countries times the number of prices. In addition, the regressions include a multiplicative step dummy equal to 0 before 2004 and 1 afterwards to control for a possible different speed of convergence because of the EU enlargement. The panel regressions are estimated using the Arellano and Bond (1991) technique, see Table 2 for the results.

-Table 2 about here-

Catching up and competition are estimated with expected signs in almost all samples. Catching up is most striking for the EU10, and its impact has increased because of the accession. Competition is also important to explain relative price developments. However, as the variable appears to be insignificant for the EU10 before their accession, the impact is bounded to the participation in the Internal Market.

V. Conclusions

In this paper, we investigate the effects of EU enlargement on price convergence. The internal market is expected to boost integration and increase efficiency and welfare through a convergence of prices in product markets. Two principal drivers are crucial to explain price developments. On the one hand, higher competition exerts a downward pressure on prices because of lower mark ups. On the other hand, the catching up process of low income countries leads to a rise in the price levels and higher inflation over a transition period. Using comparative price levels for 41 product categories price convergence can be established. However, the speed of convergence is rather slow, with half-lives around 10 years. The enlargement has slightly stimulated convergence towards the mean price, and this impact is robust across different groups of countries. Moreover, the driving forces of convergence are explored. In line with theoretical predictions, the rise in competition exerts a downward pressure on prices, while catching

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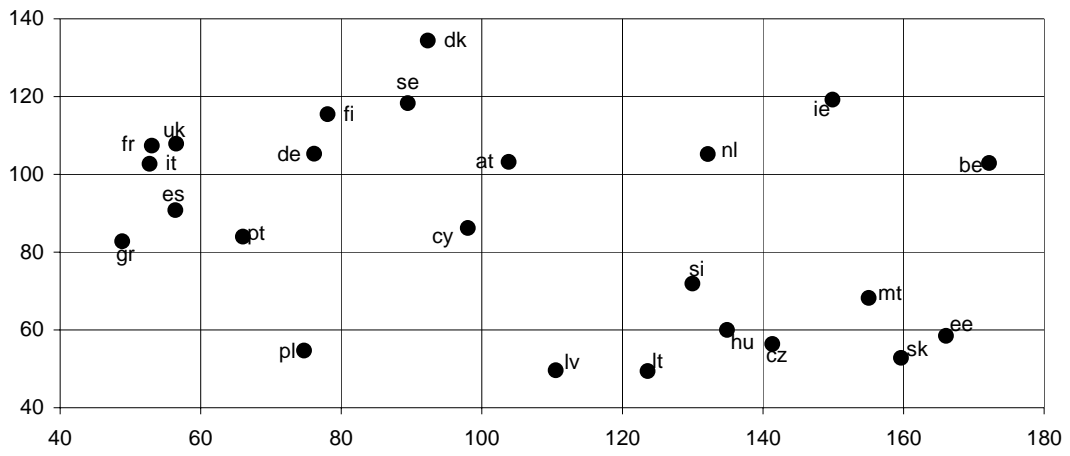
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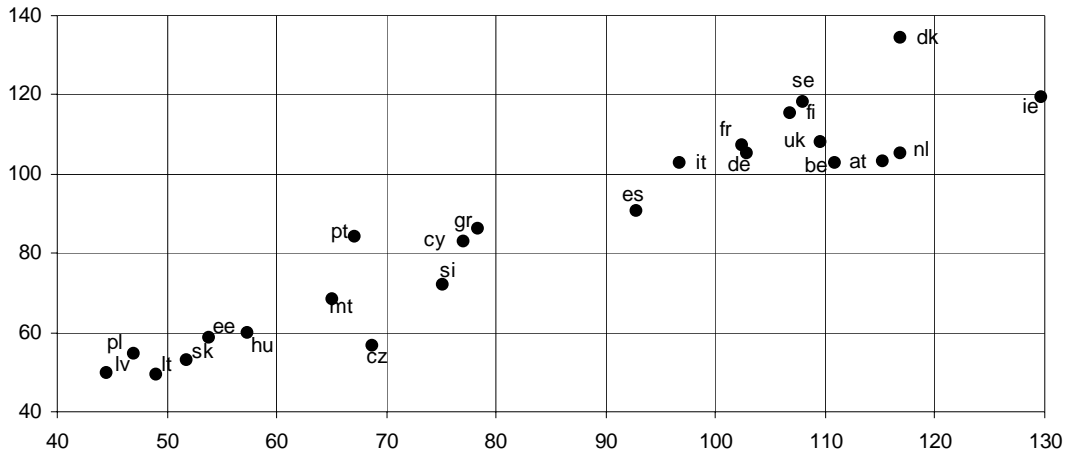
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Figure 1: Trade openness (horizontal) and CPL of GDP, 2005



Note: Raw data from Eurostat, in percent of EU12 average (=100). Luxembourg not included due to an outlier (trade is 294% of euro area average, CPL 109%).

Figure 2: Relative GDP per capita (horizontal) and CPL of GDP, 2005



Note: Raw data from Eurostat, in percent of EU12 average (=100). Luxembourg is not included due to an outlier (GDP 233% of euro area average, CPL 109%).

Table 1: Price convergence in terms of broad categories

| | EU25 | EU15 | EU10 |
|----------------------------|---------------------|---------------------|---------------------|
| β -convergence | | | |
| CPL_{t-1} | 0.941 (0.003) | 0.931 (0.011) | 0.935 (0.005) |
| Dummy \times CPL_{t-1} | -0.024 (0.009) | -0.054 (0.022) | -0.048 (0.018) |
| Speed | 0.061 | 0.071 | 0.067 |
| Half-life | 11.4 | 9.8 | 10.3 |
| σ -convergence | | | |
| Time trend | -0.0394 (0.0013) | -0.0344 (0.0006) | -0.0811 (0.0011) |
| Dummy \times Time trend | 0.0090 (0.0003) | 0.0168 (0.0002) | 0.0317 (0.0002) |

Note: Sample period 1999-2005, Luxembourg excluded. Dummy is equal to 1 from 2004 onwards, 0 elsewhere. Arellano-Bond estimation for β -convergence, OLS regression for σ -convergence. Numbers in parantheses denote standard deviations. 5096 observations (24 countries \times 41 indices \times 6 years).

Table 2: Determinants of relative prices (CPLs)

| | EU25 | EU15 | EU10 |
|---------------------------------|-------------------|-------------------|-------------------|
| Catching up | 0.432 (0.031) | 0.080 (0.019) | 0.145 (0.016) |
| Competition | -0.029 (0.004) | -0.006 (0.001) | 0.002 (0.003) |
| Catching up×Dummy | -0.008 (0.003) | -0.010 (0.002) | 0.051 (0.012) |
| Competition×Dummy | 0.000 (0.001) | 0.000 (0.000) | -0.012 (0.003) |
| $\text{corr}(y_t, \hat{y}_t)^2$ | 0.621 | 0.510 | 0.218 |

Note: Sample period 1999-2005. 24 countries, Luxembourg excluded. Arellano-Bond estimation. Numbers in parentheses denote standard deviations. 6888 observations (24 countries×41 indices×7 years). The goodness-of-fit measure is the squared correlation coefficient between actual and predicted levels of the dependent variable.