

# Why has inflation in the European Union stopped converging?

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## Abstract

The dispersion of European Union inflation rates drifted upward in recent years, after the drive toward the euro pushed it downward sharply in the late 1990s and early 2000s. Inflation accelerated in economies that have either grown faster than their potential output or have failed to liberalize their factor and product markets, generating cost-push pressures and monetary transmission inefficiencies. To the extent inflation performance has been affected by factors outside of the control of the European Central Bank stabilization of inflation around a euro-area target will remain an elusive goal.

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## 1. Introduction

Against the background of a stable *average* inflation rate in the EU-15 countries,<sup>1</sup> inflation accelerated in economies that have either grown faster than their potential output or have failed to liberalize their factor and product markets. The dispersion of inflation rates across member countries has introduced noise into the European Central Bank (ECB) policymaking process to the extent that the EU-wide inflation rate reflects an average of national inflation rates and may not reflect cyclical conditions and markups in any given country. It seems clear that a low and

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<sup>1</sup> Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

stable level of average inflation in the eurozone will not necessarily translate into a low level of volatility across the member countries.

Employing a two-step generalized method of moments (GMM) panel regression of a reduced-form model, we find that the EU-15 inflation rates during 1996–2005 has been associated mostly with the variability of the output gap and structural reform variables, while the price-level convergence variable has not been statistically significant at the usual levels.

## 2. Factors of inflation

Several explanations for the inflation differentials that widened again after declining sharply during the introduction of the euro in the late 1990s and early 2000s have been put forward.<sup>2</sup> These included price-level convergence as a result of economic convergence, demand pressures (output gap), and markup patterns resulting from country-specific regulations and other structural characteristics (Angeloni & Ehrmann, 2004). On inspection, in a cross-section setting, all three explanations appear to be relevant empirically: 2001–2005 average inflation has been higher in catching-up countries, in countries with a positive output gap, and in countries with more regulated product markets (Fig. 1).

### 2.1. Inflation and the level of economic development

It has been observed that the average price level and the level of economic development are closely correlated—prices of both tradable and nontradable goods and services tend to be substantially lower in countries with lower per capita GDP and vice versa. Thus, as the relatively poorer countries' income converges toward that of relatively richer countries, faster inflation in the initially poorer countries can be expected to bring both price levels in line.<sup>3</sup> Historically, the relationship has been close to unity: an increase in GDP per capita in purchasing power parity units relative to the EU average by 1% corresponds to an increase in the price level relative to the EU by 3/4 to 1% (Čihák & Holub, 2005). In this paper we approximate the convergence process by comparing average annual inflation rates with the country's purchasing power parity (PPP) GDP per capita (in constant US\$ 2000) relative to that of Denmark, the richest EU-15 country.

The link between the level of economic development and inflation is akin to the Balassa–Samuelson effect, however, it encompasses more processes than just productivity differentials in the tradable and nontradable sectors.<sup>4</sup> Most empirical studies of EU-15 inflation could attribute only a small fraction of the inflation differential to the Balassa–Samuelson effect as nontradables' productivity growth has been surprisingly fast and, hence, tradable-to-nontradable

<sup>2</sup> It has been argued that a part of euro-related inflation convergence was a mirage resulting from various administrative gimmicks, see Bulíř and Hurník (2006) for a review of the literature.

<sup>3</sup> This adjustment can be effected either through higher domestic inflation (and a stable currency vis-à-vis the euro) or through nominal appreciation of the domestic currency (and a stable and low inflation differential vis-à-vis the eurozone). Of course, the nominal appreciation channel has been closed for the eurozone countries, whose currencies are pegged to the euro.

<sup>4</sup> The Balassa–Samuelson effect is expected to work as follows. Productivity growth in the tradable good sector is assumed to exceed that in the nontradable good sector. Assuming further that wages equalize across sectors, faster tradables' productivity growth pushes up wages in all sectors, thus leading to an increase in the relative prices of nontradables. With a fixed exchange rate, the relative-price increase in fast catching-up countries may result in an overall price level increase relative to slow-growing countries.

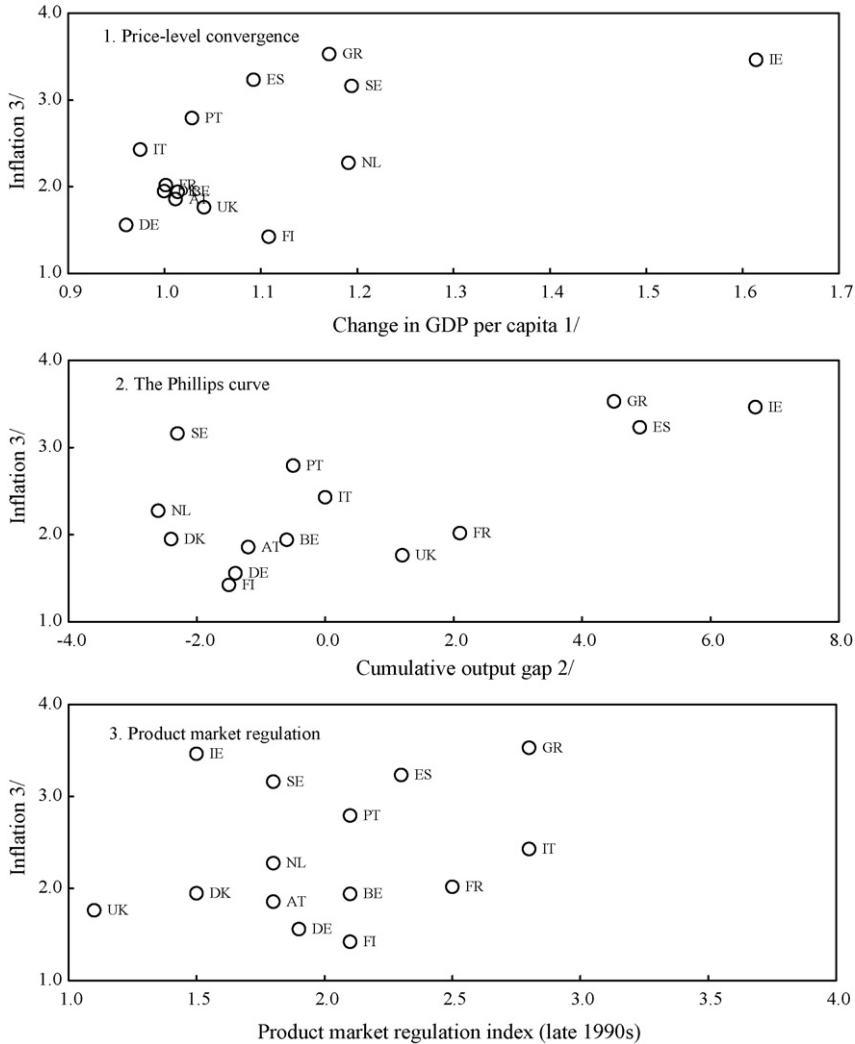


Fig. 1. EU-15: Three factors of inflation, 2001–2005. Source: AMECO, World Development Indicators, World Economic Outlook, Conway, Janod and Nicoletti (2005) and authors' calculations. (1) Change in GDP per capita in PPP terms, between 2005 and 1996, relative to Denmark. (2) Output gap = actual GDP – potential GDP. Potential GDP is calculated from a Cobb–Douglas production function that includes labor, capital, and trend total factor productivity. Cumulated from 2001 to 2005. (3) Average annual inflation, in percent.

productivity differentials have been smaller than those implied by the Balassa–Samuelson effect (see Mihaljek & Klau, 2006 for a review and Sánchez, 2007).

## 2.2. Inflation and aggregate demand

Aggregate demand fluctuations are known to explain a substantial part of inflation fluctuations. Low inflation comes at a cost—disinflation tends to be associated with output below its potential as the economy moves along a short-run Phillips curve (the middle panel of Fig. 1). We use

the output gap measure, as a percentage of potential gross domestic product at market prices, estimated by the European Commission from a Cobb–Douglas production function estimate with trend total factor productivity (the AMECO database).

### 2.3. Inflation and market regulation

The EU-15 countries have differed substantially in their approach to market-oriented reforms and these differences affect both the generation of cost pressures and their transmission to consumer prices, creating potentially the most problematic of the three inflation factors. In the bottom panel of Fig. 1 one can observe that countries with more protected product markets have had higher average inflation rates than those with less protected markets and using labor market regulation results in a similar picture. We measure market regulation by indexes of product and labor market regulation compiled by Conway, Janod and Nicoletti (2005) and OECD (2004), respectively.

Regarding product markets, protected economies tend to have both higher markups and a slower pass-through of external price shocks to consumer price inflation (Angeloni & Ehrmann, 2004; Honohan & Lane, 2003). The countries that lagged behind the most in 1998 (France, Greece, and Italy) still did not bring their level of product market protection in 2003 to the median level (Conway, Janod & Nicoletti, 2005). Regarding labor markets, trade unions in protected economies have exercised strong wage pressures, manifested in fast growth in unit labor cost (for example, Italy). The progress toward less labor market protection was even less pronounced than that in product markets, and labor markets have become actually less flexible in several EU-15 countries (OECD, 2004).

Structural reforms – such as those that increase competition in domestic factor and product markets – tend to result in lower long-term inflation. This mechanism can operate either directly through smaller markups<sup>5</sup> and more intensive price competition that keep prices pressures in check, or indirectly through expectations, as agents in flexible economies tend to have more forward-looking expectations than agents in economies without such flexibility (Laxton & N'Diaye, 2002).

## 3. Quantitative results

EU-15 inflation during 1996–2005 has been associated mostly with the variability of the output gap and structural reform variables, while the PPP GDP per capita variable has not been statistically significant at the usual levels. Rather than building a fully-fledged inflation model based on microeconomic foundations, we focus on reduced-form regressions, estimating a panel regression of average annual inflation on relative PPP GDP per capita; a measure of the GDP gap; and various measures of structural reforms undertaken during this period in the area of product and labor market regulation. To avoid potential simultaneity – for example, from inflation to the level of development and back to inflation – the panel is estimated as a two-step generalized method of moments (GMM) regression, with appropriate instruments, see Table 1.

About 2/3 of inflation variability in EU-15 countries can be explained by the three variables and the share of explained variance increases to over 4/5 if a dummy variable is used to capture inflation outliers in Greece (not shown, but available on request). These results are driven by

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<sup>5</sup> Markup models have been used extensively for modeling long-term determinants of inflation, see, for example, de Brouwer and Ericsson (1998).

Table 1  
Determinants of European inflation, 1996–2005

	A	B	C
GDP per capita	–2.305 (1.47)	–1.881 (1.11)	–2.588 (1.55)
Output gap	0.487** (5.99)	0.398** (5.07)	0.438** (5.52)
Product market regulation	2.054** (4.03)		
Labor market regulation		0.712** (2.19)	
Index of regulation			1.469** (3.27)
Country fixed effects	Yes	Yes	Yes
Years fixed effects	Yes	Yes	Yes
R <sup>2</sup>	0.70	0.67	0.68
Adjusted R <sup>2</sup>	0.63	0.60	0.62
Durbin–Watson statistics	1.274	1.163	1.217
J-statistics	0.000	0.000	0.000
Observations	140	140	140

This table reports the results of panel regressions for EU-15 countries excluding Luxembourg. The dependent variable is the average annual rate of inflation. GDP per capita is measured in PPP terms and is expressed as a ratio to Denmark's GDP (World Development Indicators database). The output gap is measured in percent of potential output (the production-function-based estimate in the *AMECO* database). The product and labor market regulation variables are based on data in Conway, Janod and Nicoletti (2005) and OECD (2004), respectively; missing annual observations are linearly interpolated. The index of regulation gives a weight of one-half to each variable. The estimation technique uses a two-step GMM, with one lag for instruments. Other instruments are the trend-based output gap and U.S. dollar GDP per capita relative to Denmark. *Note:* *t* statistics in parentheses. \*Significant at 5%; \*\*significant at 1%.

differences in individual countries' cyclical stance and the level of regulation in product and labor markets. Quantitatively, the negative annual output gap of 1% has been associated with a reduction in average annual inflation between 2/5% and 1/2%. More regulation in product or labor markets by one sample standard deviation has been associated with a rise in inflation, between 2/3% and 1%, depending on the explanatory variable. Although we could drop GDP per capita from the equation on statistical grounds – the coefficient is statistically significant at only about 10–20% – its exclusion generates omitted-variable bias. We note also that our results are unaffected by the exclusion of countries that did not adopt the euro (Denmark, Sweden, and the UK).

Long-term inflation cost of regulation are sizable—deregulation in some of the more regulated EU-15 countries would have resulted in markedly lower inflation. In-sample simulations suggest that 1996–2006 inflation in Italy, Greece, and France would have been some 1.5 percentage points lower than actual inflation had these countries brought their product market regulation to the level of the less regulated countries.<sup>6</sup> The EU-15 gains for 1996–2005 in terms of lower average inflation and lower standard deviation thereof would be equal to about 0.4 percentage points and 15%.

#### 4. Policy implications

Our findings have implications for both the EU-15 countries and new member states. A euro-area inflation target will remain elusive to the extent inflation performance in the EU-15 countries is influenced by forces independent of the monetary stance of the European Central Bank. Despite progress in the common legislation of all the EU member countries (*acquis communautaire*),

<sup>6</sup> We calculate an adjusted average index of product market regulation by excluding the five countries with the highest value of the index (Italy, Greece, France, Spain, and Portugal). The gain in terms of lower inflation is the product of the improvement in the national product market regulation index and the estimated coefficient in Table 1, that is, 2.054.

Europe's factor and product markets remain differentiated, mostly thanks to regulations and interventions by national authorities. Looking at the historic importance of the structural factors, the EU-15 countries would be well served by renewed deregulation efforts (Norén, 2003).

There is also a lesson for the new member countries of not delaying structural reforms. The four new member countries covered in the OECD surveys of regulation (the Czech Republic, Hungary, Poland, and Slovakia) scored substantially worse than most EU-15 countries in product market and administrative regulation, however, their labor markets are comparatively unregulated. While inflation can be brought down using short-term demand instruments, the long-term costs of neglecting the structural changes can be quite high (Breuss, Finka & Haiss, 2004; Bulíř & Hurník, 2006).

## 5. Conclusions

The observed lack of rate-of-inflation convergence in the EU-15 countries during the post-euro-adoption period can be attributed to underlying macroeconomic and microeconomic conditions. First, the cyclical stance of individual countries differed substantially. Second, inflation was higher in countries with more protected product and labor markets. Finally, we find some weak evidence that the price level in fast-converging EU-15 countries, such as Greece or Ireland, grew faster than warranted by the other two factors on the account of price-level convergence.

The past EU-15 experience is instructive for future inflation developments in the eurozone and suggests a lesson for the new member countries as well. Apart from the relatively high sacrifice ratio, the impact of structural reforms (or a lack thereof) will have bearing on future inflation. The lack of reforms may push inflation up in the future through two channels: first, through cost-push channels, as a result of either markup or wage-cost pressures; and, second, through its impact on the monetary transmission mechanism, by making inflation embedded in private agent expectations. The lesson for the new member countries is to make their economies structurally sound first as opposed to rushing to meet the Maastricht inflation criterion using short-term demand instruments.

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## References

- Angeloni, I., & Ehrmann, M. (2004). Euro area inflation differentials, *ECB Working Paper* 388. Frankfurt: European Central Bank. Available at: <http://www.ecb.int/pub/pdf/scpwps/ecbwp388.pdf>.
- Breuss, F., Finka, G., & Haiss, P. (2004). How well prepared are the new member states for the European Monetary Union? *Journal of Policy Modeling*, 26, 769–791.
- Bulíř, A., & Hurník, J. (2006). The maastricht inflation criterion: How unpleasant is purgatory? *Economic Systems*, 30, 385–404.
- Conway, P., Véronique, J., & Giuseppe, N. (2005). Product market regulation in OECD countries: 1998 to 2003, *OECD Economics Department Working Paper WKP* (2005)6. Paris: Organisation for Economic Co-operation and Development. Available at: [http://www.oilis.oecd.org/oilis/2005doc.nsf/43bb6130e5e86e5fc12569fa005d004c/72b2dfd81a241c5c1256fab008278e5/\\$FILE/JT00181518.DOC](http://www.oilis.oecd.org/oilis/2005doc.nsf/43bb6130e5e86e5fc12569fa005d004c/72b2dfd81a241c5c1256fab008278e5/$FILE/JT00181518.DOC).
- Čihák, M., & Holub, T. (2005). Price convergence in EU-accession countries: Evidence from the international comparison. *Économie Internationale*, 2e trimestre, 61–84. No. 102

- de Brouwer, G., & Ericsson, N. R. (1998). Modeling inflation in Australia. *Journal of Business & Economic Statistics*, 16, 433–449.
- Honohan, P., & Lane, P. (2003). Divergent inflation rates in EMU. *Economic Policy*, 18, 358–394.
- Laxton, D., & N'Diaye, Papa M'B. P. (2002). Monetary policy credibility and the unemployment-inflation tradeoff: Some evidence from 17 industrial countries, *IMF Working Paper 02/220*. Washington: International Monetary Fund. Available at: <http://www.imf.org/external/pubs/ft/wp/2002/wp02220.pdf>.
- Mihaljek, D., & Klau, M. (2006). The Balassa–Samuelson effect and the Maastricht criteria. In Nicoletta Batini (Ed.), *Monetary policy in emerging markets and other developing countries*. New York: Nova Science Publisher.
- Norén, R. (2003). Europe's lack of structural transformation and necessary policy changes of EMU. *Journal of Policy Modeling*, 25, 543–554.
- Organisation for Economic Co-operation and Development (2004). *OECD employment outlook 2004—reassessing the OECD jobs strategy*: Paris. Available via the internet: [www.oecd.org/document/62/0,2340,en\\_2649\\_201185\\_31935102\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/62/0,2340,en_2649_201185_31935102_1_1_1_1,00.html).
- Sánchez, M. (2007). Monetary stabilisation in a currency union: The role of catching up member states. *Journal of Policy Modeling*, 29, 29–40.