



# Long-term analysis of the evolution of price convergence in the EU (2000-13)

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*The disinflation prevailing in the EU in the aftermath of the crisis might suggest increasing price convergence between countries. Yet, quite the opposite is the case: the long-lasting reduction of price diversity has stalled. This article looks at diverging trends within some specific country groups (the euro area, new Member States, the EU-15) as well as the repercussions of the crisis. Beta and sigma convergence are used to evaluate the actual degree of price level catch-up, both between EU countries and between the different components of the consumer price index within countries.<sup>1</sup>*

## CURRENT LEVEL AND DEVELOPMENTS IN THE COMPARATIVE PRICE LEVEL

At first glance, a comparison of price levels between 2000 and 2013 appears to be quite revealing. Noteworthy, for instance, are the persistent large differences between relative price levels. One obvious observation is that prices in the most expensive country, Denmark, are up to three times higher than those in the least expensive, Bulgaria.<sup>2</sup>

Interestingly, when compared to 2000, the differences in overall price levels seem at first quite stable. However, the evolution in the new member states (NMS) was much more dynamic – both in the significant rise of comparative price levels and in changes in the ranking of individual countries. Nevertheless, price levels in the NMS other than Cyprus still remain below the average level in the original EU countries.

With prices at 70% of the EU level, Slovakia is no longer one of the cheapest countries. But despite

large increases in its relative price level over the past 13 years, Slovakia's price level remains relatively low compared to the EU average.

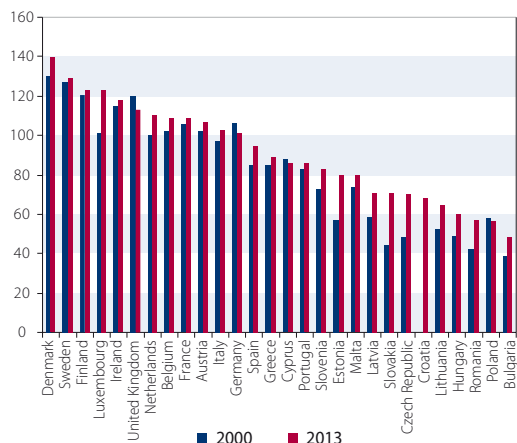
A closer look at the price level within different segments only further confirms the aforementioned trend of significantly higher price increases in the NMS – almost 20% higher compared to the EU and the euro area.<sup>3</sup> In fact, new member states saw their most pronounced price-level increases in education, health care, and housing and energy, and their lowest in telecommunications services, when compared to 2000 levels.

Apparently, it was in the period after accession to the EU (2004-08) that the greatest increases in prices were observed in the new member states. This was in particular the case in the education and housing and energy segments.<sup>4</sup> By contrast, prices in the NMS' health sectors grew rather continuously over the period as a whole, though at a more pronounced rate.

Remarkably, Slovakia was the country with the highest relative increase in price levels in as many as six segments: housing and energy, telecommunications, recreation and culture, food and household equipment. Essentially, after EU accession, price growth *de facto* doubled in most of the segments. This holds particularly true for food (an increase of 24%), household equipment (30%) and recreation and culture (36%). In contrast, telecommunications saw the most significant growth in prices before Slovakia's EU accession (+33%), and the housing and energy price levels grew in both periods at approximately the same rate (on average by 40%). In the post-crisis period there has been a clear declining trend in prices in most of these segments.<sup>5</sup>

- 1 While beta convergence accounts for the rate of catching-up to average EU prices depending on the initial price level, sigma convergence depicts the degree of reduction in price variability (measured by the coefficient of variation) between the countries in time. Comparative price levels for actual individual consumption published by Eurostat are used in this article.
- 2 Denmark reports a high level of prices in most of the main price index components. By contrast, Bulgaria has the lowest prices in several items. The differences between the various components across the EU are even more marked. The component with the largest difference between its highest and lowest values is "housing and energy", which is five times higher in Luxembourg than in Bulgaria.
- 3 The price rise in the EU and the euro area was comparable. More significant differences appeared only in clothing (+ 4.6% in the EU) and telecommunications (+ 3.7% in the euro area). In the EU and the euro area prices increased the most in health and education, the least in machinery and alcohol.
- 4 The price level in the education segment increased by 35% and in transport and energy segments by 37% in this period.
- 5 Pre-accession period: 2000-2004; after accession period: 2004-2008.

Figure 1 Long-term evolution of the relative price level (% EU)



Source: Eurostat.

## SPEED OF CONVERGENCE OF PRICE LEVELS DEPENDING ON ITS INITIAL VALUE (BETA CONVERGENCE)

As the above analysis indicated, rapidly growing prices could have been observed especially in



Table 1 Cumulative growth of price level by main components (% , 2000-13)

	EU	EA	NMS	Min EU	Max EU	SK
Food and Beverages	8.1	7.9	25.5	-14.9	55.5	55.5
Alcohol and Tabac	4.2	6.1	32.8	-19.6	68.5	55.6
Clothing and Footwear	8.5	3.9	32.3	-15.2	108.1	51.4
Housing and Energy	7.1	5.7	38.8	-17.6	98.1	98.1
Household Equipment	7.2	8.9	19.4	-15.7	36.4	36.4
Healthcare	16.0	18.2	48.8	-15.1	103.2	58.4
Transport	6.8	8.0	22.4	-18.3	45.1	30.3
Telecommunications	5.5	9.2	3.9	-45.2	82.1	82.1
Recreation and Culture	7.0	7.9	23.5	-11.1	61.0	61.0
Education	15.7	13.7	55.5	-37.7	105.3	88.4
Restaurants and Hotels	10.5	9.8	25.6	-18.0	66.4	56.0
Machinery	6.3	5.4	13.2	-16.4	27.3	15.0
Construction	6.4	5.7	24.7	-26.0	101.9	59.8

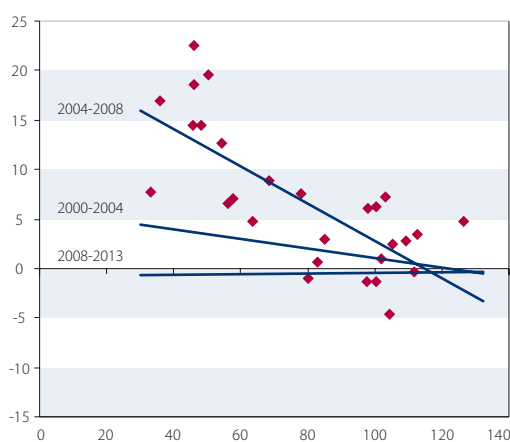
Source: Eurostat, own calculations.

Note: green = component with the lowest increase, red = component with the highest increase within the country group, yellow = components for which the highest increase within the EU was recorded in Slovakia, EU = European Union, EA = euro area, NMS = new EU member states, SK = Slovakia.

6 The coefficient of determination of the absolute beta convergence was relatively high (56%).

the poorer EU countries with initially lower price levels, "catching up" with more economically advanced countries. Yet, the speed of convergence of poorer countries (beta convergence) was far from even over the past 13 years. While there appears to be a certain trend of mutual correlation from 2000 to 2004, this relation was statistically less significant. However, the situation changed after the EU accession of the new countries (2004-08), when the price level of countries with lower initial levels grew remarkably faster.<sup>6</sup> Nevertheless, a faster catch-up effect has not been observed in the post-crisis period, due to negative economic developments, and the convergence process has virtually stalled.

Figure 2 Relation between growth and the initial value of the price level



Source: Eurostat, own calculations.

### EVOLUTION OF THE VARIABILITY IN PRICE LEVELS BETWEEN COUNTRIES (SIGMA CONVERGENCE)

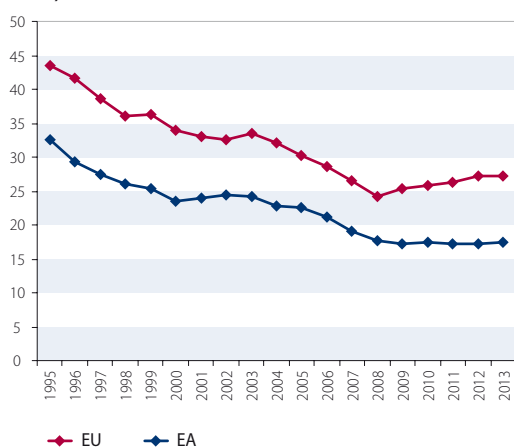
The sigma convergence analysis of the variability of price levels allows for a better evaluation of the evolution of differences in relative price levels between countries and between the segments of price index within the countries.

Over the whole period since 2000, and even prior, the current EU countries evinced greater relative differences in price levels than did the countries making up the euro area. Looking more closely at different periods, it appears that between 2000 and 2004 the variability declined only slightly, while in the 2004-08 period the variability fell sharply both within the EU as well as within the euro area (in the EU at a slightly faster pace). In terms of the impact of the European integration process, it is worth noting that a significant decrease of the coefficient of variation – actually comparable to the decrease observed in 2004-08 – had already taken place in the 1995-2000 period. A crucial turning point in this price convergence process came in 2008, when historically the lowest variability of price level was recorded (24% in the EU and 17.7% in the euro area).

However, the onset of the financial and economic crisis brought about both a radical reversal of the previous tendency – as the coefficient of variation began to rise (i.e. price diversity increased) – and the divergence of what had up then been parallel trends in the EU and the euro area. Whereas within the EU the variability of the price level increased, in the euro area the progress of price convergence stabilised. In other words, it may be assumed that low inflation following the

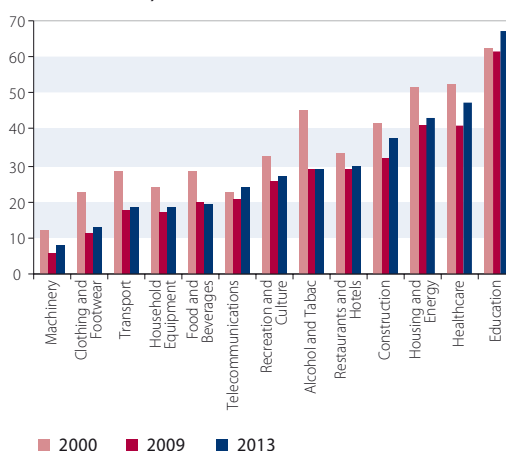


**Figure 3** The variability of relative price levels between countries (the coefficient of variation in %)



Source: Eurostat, own calculations.  
 Note: EU = European Union, EA = euro area.

**Figure 4** Variability in the price levels between countries by main components (the coefficient of variation in %)



Source: Eurostat, own calculations.

crisis hampered further price convergence; this is even more true within the EU, where, in contrast to the euro area, price diversity is markedly reinforced by exchange rate differences.

Variability in price levels between countries reflects differences between the individual components of the price index. Compared to the situation in 2000, all segments apart from education and telecommunications saw at least a minor decline in the variability of price level. The coefficient of variation fell most in the clothing and footwear component (almost by half), but significant decreases were also observed in machinery, transport and alcohol.

Arguably, this downward trend can be attributed to a more significant impact of the single market on these segments, for which the coefficient of variation remains generally quite low. Conversely, high price diversity between the EU countries persists in education and health-care, as well as in housing and energy – i.e. in areas specific to each country where the impact of homogenisation, and hence the tendency towards price convergence fuelled by the single market forces, is less significant.

As indicated by Figure 3 and Figure 4, the evolution of price levels for the individual components mirrored the general trend of price variability – an initial considerable decrease from 2000 levels to the 2009 low was followed by a recurring increase for most of the components. Remarkably, the increase in the variability of the education and telecommunications price levels even exceeded the 2000 values.

### THE EVOLUTION OF VARIABILITY BETWEEN THE COMPONENTS OF THE PRICE INDEX

A further view of the evolution of price level differences is provided by analysing trends in variability between the price index components.

Over the whole period studied, from 2000 to 2013, the lowest reported average price vari-

ability was between the components of the consumer basket in France (7%), Italy (7.1%) and Belgium (9.0%). Conversely, it was highest in Bulgaria (40.5%), Luxembourg (36.7%) and Romania (36.5%). Similarly in Slovakia, the variability of prices between individual components was also relatively high, averaging 34.8%.

In terms of changes over time, the biggest percentage drop in the coefficient of variation for the given period, and thus the most significant progress in price convergence, occurred in Germany and Slovenia, where the differences decreased by almost half. In Austria, by contrast, the differences in component price levels almost doubled.

Evidently, the differences in the evolution of sigma convergence of the components are obviously lower when the basic groups (see Figure 5) of the EU countries are compared. Price differences between the various price index components in the NMS, but also in non-euro area countries, were higher compared with the EU, and especially with the euro area, over the whole observed period.

Moreover, the evolution of price variability in the new member states was much more dynamic, marked by a significant drop in the coefficient of variation. In contrast, the EU and the euro area's relatively stable price-level variability over time might be due to the relatively low initial variability (14.3%).

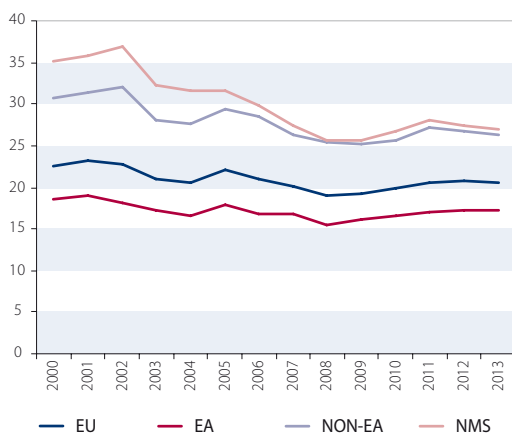
On closer inspection, up until 2008 there was a clear downward trend of price variability among individual components within the EU countries.<sup>7</sup> Specifically, in the period 2004-08 a comparable decrease of the coefficient of variation was recorded in the EU, the euro area and non-euro area countries, while price variability in the NMS was falling almost twice as fast.<sup>8</sup> In recent years (2009-13), the downward trend reversed and turned into a slight increase in price variability between the price index components. Moreover, it appears that euro area membership did not have a significant

7 The coefficient of variation decreased in 19 of 28 countries.

8 This evolution was due to the increase in prices of cheaper items, and not a fall in the price level of more expensive ones.

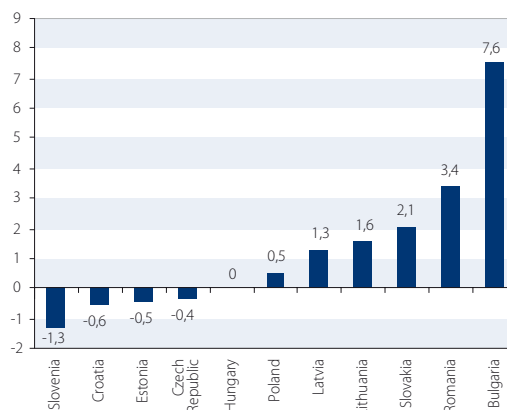


**Figure 5 Evolution of the variability in price levels between components (the coefficient of variation in %)**



Source: Eurostat, own calculations.  
 Note: EU = European Union, EA = euro area, NON-EA = non-euro area countries, NMS = new EU member states.

**Figure 7 Change in the average price variability by component in the New EU Member States, 2009-13 (in pp)**



Source: Eurostat, own calculations.

- 9 Slovakia, which also experienced a decline in price variability, remains one of the NMS with the largest average differences between the various price-level components. A somewhat more significant reduction in price variability occurred only after 2004. In recent years, the coefficient of variation for Slovakia had a rising tendency.
- 10 In fact, the average increase in price-level variability in the NMS excluding Hungary accounted for only 0,6 percentage points, i.e. less than the average for the euro area and the EU.

impact on the progress of the price convergence of individual components, given that differences in the rate of decline in the variability between the euro area and the EU countries outside the euro area were essentially negligible. Rather the key factor in the reduction of the variability of the price level in the EU (since 2000) seems to be the entry of the new members to the EU, or the concomitant influence of the single market.<sup>9</sup>

Looking at the post-crisis period, when in general price variability increased slightly, Figure 6 shows partially higher growth in the coefficient of variation in the NMS. As further demonstrated in Figure 7, the average increase in price-level variability in the NMS was a result of negative developments in Hungary, where price variability

increased by more than seven percentage points in the period 2009-13.<sup>10</sup>

Given the above-mentioned results, it appears that price convergence is typically lower in the EU than in the euro area. However, it seems that differences effectively exist between the degree of convergence observed on the cross-country and within-country basis – or rather between countries and between items of the price index.

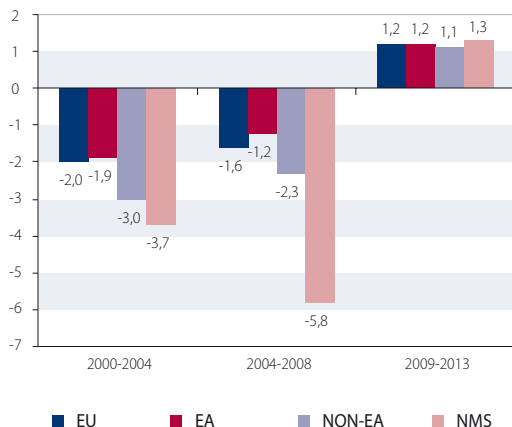
### COMPARING DEVELOPMENTS IN VARIABILITY WITHIN AND ACROSS COUNTRIES

Within the euro area, the coefficient of variation for countries and components appears to be essentially identical, as well as the lowest – suggesting relatively higher homogeneity of price levels. In contrast, the EU's price variability seems generally a somewhat higher – which can be reasonably attributed to the greater heterogeneity of this group – especially in terms of variability between countries.

Remarkably, the group of non-euro area countries provides a noticeably different result. In fact, in the case of price variability within countries, we compare on the one hand countries with a very high price level (Denmark, Sweden and the United Kingdom) and, on the other hand, countries with very low price levels (Romania, Bulgaria). It is also interesting to note that among the NMS, the variability between the components in individual countries is almost twice as high as that between countries. In other words, it seems that there is greater price homogeneity between the new member states, than within one country.

Although the pace of price catch-up in most price index components was quite significant, the new member states continue to see large differences in price levels of tradable and non-tradable goods and services.

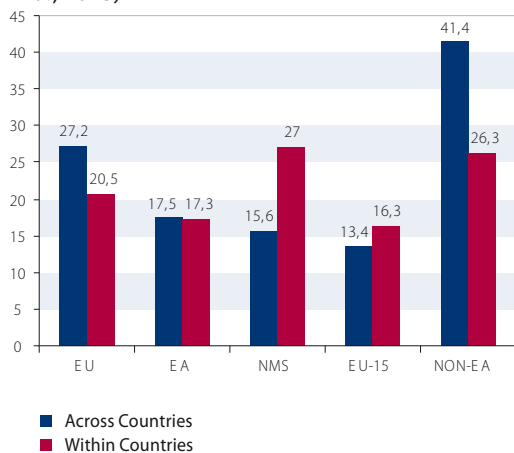
**Figure 6 Change in the average price variability by component within countries (in pp)**



Source: Eurostat, own calculations.  
 Note: EU = European Union, EA = euro area, NON-EA = non-euro area countries, NMS = new EU member states.



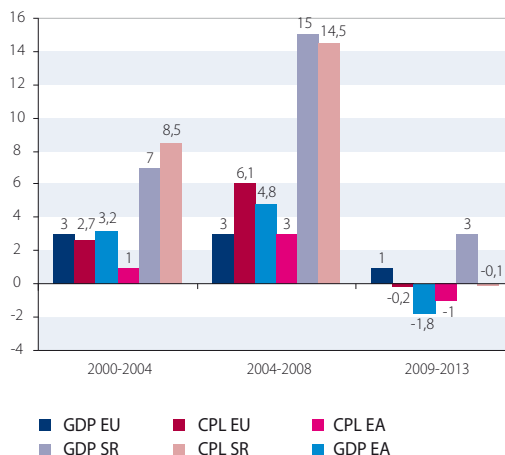
**Figure 8 Comparison of price variability across and within countries (the coefficient of variation in %, 2013)**



Source: Eurostat, own calculations.

Note: EU = European Union, EA = euro area, NMS = new EU member states, EU-15 = original EU member states, NON-EA = non-euro area countries.

**Figure 9 Comparison of changes in GDP per capita (in PPP) and price level changes (in pp)**



Source: Eurostat, own calculations.

Note: CPL = Comparative price level.

### CONSISTENCY OF PRICE-LEVEL EVOLUTION WITH ECONOMIC PERFORMANCE

When analysing price convergence, one particularly interesting question arises – whether price evolution corresponded to developments in the economy, or more precisely, to what extent did the growth rate of prices match the growth rate of the economy. In this respect, the analysis shows that the relationship between GDP and the price level is very much dependent on the observed period and on the group of countries.

During the 2000-04 period, price-level growth in the EU was more or less in line with GDP growth, while within the euro area GDP actually grew faster than the price level.

Throughout the 2004-08 period, comparative price levels in the EU grew faster than did the performance of the economy (measured by GDP in PPP) – almost twice as fast. In contrast, the trend within the euro area was again quite opposite, in that the price level rose more slowly on average. The post-crisis period was marked by the price level falling more than GDP.

As for Slovakia, the price level tended to grow slightly faster than the country's economic performance up until 2004. It was only after joining the EU that this trend finally attenuated. Recently, after the crisis, the price growth stopped, and although GDP grew only slightly, its growth was still faster than that of prices.

### CONCLUSION

Relatively large price differences persist throughout the European Union. In fact, in 2013 the comparative price level in the most expensive country, Denmark, was almost three times higher than in the least expensive, Bulgaria. The long-term view of price level evolution in the EU since 2000 suggests that there has been a noticeable reduction in

differences in overall price levels between EU countries. Until the outbreak of the economic crisis, price diversity had been steadily decreasing, while a slight increase ensued in the 2009-13 period.

The evolution of price levels over the past 13 years has been on average in line with the assumptions of absolute beta convergence, which predicts faster growth of poorer countries. In fact, the beta convergence of price levels occurred mainly in the pre-crisis period, and by 2009 the catching-up process had essentially stopped.

As in 2000, the largest price differences remain in non-tradable services, especially in education and health. Moreover, significantly higher differences persist in the new EU member states (despite the considerable fall they recorded). Interestingly, it is this group of countries that shows a much greater degree of price diversity in the components within one country than across countries. Conversely, the opposite holds true for the EU as a whole, where differences between countries are greater than the differences in component prices within these countries.

Regarding the consistency of price-level evolution of price levels with economic performance, it can be concluded that in the pre-crisis period, the growth rate of comparative price levels in the euro area lagged behind the growth of economic performance as measured by GDP per capita at PPP. By contrast, due to the impact of the developments in the NMS (including Slovakia) the EU as a whole recorded higher growth in the price level than in GDP. In 2009, the situation changed. Since then, on average, the EU has seen moderate economic growth at a more or less constant price level, while the euro area shows signs of decline in both indicators, with the decline in economic performance being more pronounced than that in price levels.