Regional monetary heterogeneities within currency unions – challenges for the EMU and selected EU countries in the financial crisis

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- Preliminary version -

Abstract

Our research addresses the question whether existing currency unions can be regarded as optimum currency areas (Mundell, 1961). We investigate this question within the context of regional differentials in monetary processes inside monetary unions, and, following Beck et al. (2009), consider it as an equilibrating adjustment mechanism in response to asymmetric shocks. For example, in the literature, large and long-lasting differences in inflation rates were detected across euro area countries, furthermore, heterogeneity is considerably more pronounced across regions than across countries. During the financial crisis it was learned that countries outside the euro area are more vulnerable to the effects of the recession. Some of the difficulties arose because of the risk management techniques followed by the foreign parent banks of the local affiliates who tended to redirect financial resources from the peripheries to the centres on intra- and international scales. The aim of our research is twofold. First, we would like to review the literature in order to get a picture about the existing regional monetary heterogeneities. Second, we try to assess the consequences of the financial crisis concerning spatial differences, and the potential policy implications. Finally, with the help of a Hungarian case study, we demonstrate the size, persistence and nature of within-country inflation and price differentials from an empirical perspective.

Keywords: regional heterogeneity, inflation, price levels, global financial crisis

JEL: E31, E44, G01, O18

1 Introduction

In the middle of the financial crisis, the Optimum Currency Area theory, first analysed in the pioneering work of Mundell (1961), is again much debated. The original work studied that under what conditions a region constitutes an optimum currency area.[1] In that time, the "one country, one money" was the common practice everywhere in the world. By now, we can experience the creation of the European currency area and, in other parts of the world, the dollarisation process. Optimum currency areas are independent of country borders, they can

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[1] See e.g. Mongelli (2002) for a detailed examination of the main benefits and costs associated with a currency area.

appear in the international or in a sub-national level, as well. In the light of the OCA theory, concerning the single market in Europe, the principle became “one market, one money”, moreover, “one money, one market” if we consider the endogeneity paradigm of the OCA theory (see e.g. Mongelli 2002). In large, heterogeneous currency unions, asymmetric shocks may cause fewer problems for individual countries in the presence of high factor mobility and price flexibility, because they can serve as equilibrating mechanisms. Beck et al. (2009) uses the same argument: “In the absence of the country-specific nominal exchange rate channel and in the presence of low labour mobility, differences in inflation rates play an important role as a macroeconomic adjustment mechanism in response to asymmetric shocks” (pp. 143-144). They regard these kinds of inflation differentials not just unavoidable but desirable. Another source of the inflation dispersion may be the well-known Balassa-Samuelson effect which reflects a convergence process between relatively poor and rich countries. However, this effect was found quite weak in Europe in many times.

Our paper analyses the current economic crisis and tries to assess the effects of monetary and fiscal responses to these shocks on spatial inequalities. We try to understand how the above mentioned adjustment mechanisms work in response to the asymmetric shocks within a monetary union and in the EU.

Following Beck et al. (2009), inflation differentials can not only be malign, but also be the result of economic distortions which cause welfare losses. Harmful inflation differentials can also stem from nominal wage and price rigidities. Inflation differentials within a monetary union – as highlighted by Beck et al. (2009) – have another potential destabilizing effect through influencing real interest rates. As a consequence, regions with relatively high inflation rates will have relatively low real interest rates, which can increase investment and thus aggregate demand which might lead to even higher inflation rates.

Nominal and real heterogeneities may occur not only across countries but also across regions within a country. It was reported in the literature that, in many cases, cross-country convergence may occur together with regional divergence. In this paper, we try to assess what kind of asymmetries arose from the crisis, what were the reasons behind them, and how did exit strategies, monetary and fiscal policy interventions influence them. As a part of this, we will analyze the outcomes of cross-country (intra-European) financial flows. For example, Beirne et al. (2009) analyse the contagion process of stock market shocks between mature and emerging economies.

The remainder of this paper is structured as follows. Section 2 briefly reviews the literature to draw a picture of the existing regional monetary heterogeneities and their

underlying determinants. In the next part, we try to assess the consequences of the financial crisis concerning spatial differences, and the potential policy implications. In Section 4, with the help of a Hungarian case study, we demonstrate the size, persistence and nature of within-country inflation and price differentials from an empirical perspective. Finally, Section 5 concludes.

2 Regional inflation heterogeneities – a brief review of the literature

Regional differences in the monetary processes within Europe were brought into the focus of the researches from the beginning of the 1990s. In a single currency union, the common monetary policy is formed on the basis of an area-wide assessment of economic conditions. If the level of inflation is found to diverge from the target level in individual countries, it has to be treated by completely different instruments, for instance, fiscal or structural policy measures, at the national level. Furthermore, inflation differentials are closely related to the evolution of the real exchange rate, real interest rate, competitiveness and capital movements.

A large-scale empirical research project has been carried out by the Eurosystem central banks called the Inflation Persistence Network (IPN), and its speciality was that it aimed to analyse micro price data in the euro area. The findings of the IPN were summarized by Dhyne et al. (2005), and a survey of the IPN evidence concerning price setting in the euro area were conducted by Altissimo et al. (2006). European level monetary convergence was investigated – among others – by Alberola (2000), ECB (2003), Angeloni-Ehrman (2004), Altissimo et al. (2005), Hofmann-Remsperger (2005), Égert et al. (2004), Égert (2007), Andersson et al. (2009). Galesi-Lombardi (2009) investigated the regional inflationary effects of certain common external shocks.

Concerning spatial differences, the above mentioned studies focussed on cross-country comparisons, especially on comparative analyses of the euro zone countries or the US and the euro area. Our opinion is that investigating spatial differences in monetary (inflationary) processes is a relevant issue within a single country, as well. The issues of the OCA theory may occur not at the level of a multinational currency union, but also at the level of the individual countries, e.g. the USA (Schunk 2005). Such questions were discussed in the United Kingdom (Hayes 2005), in Italy (Fabiani et al 2004 and Veronese et al 2005) and in Spain (Alberola-Marqués 2001), so far. Broda and Weinstein (2008) compared cross-border

and within border price differences in the US and Canada, and found that the degree of market segmentation across the border is similar to that within borders.

Weber-Beck (2003) and Beck et al. (2009) took a novel approach to the analysis of inflation dynamics within and across euro area countries since their comparative researches were conducted at the regional level. They employed a model where regional inflation dynamics were explained by common euro area and country specific factors as well as an idiosyncratic regional component. They found that while the area wide factors are strongly significant and have a high explanatory power, their loadings are different across different regions, which suggests that differences in regional inflation developments are partly due to area wide phenomena.

Apart from the previously mentioned adjustment processes, in the long run, inflation differentials may be a reflection of cross-country differences in real variables. Productivity growth differentials and catching-up processes indicate a structural adjustment process in an integrated economic area, which in turn may not be of concern for economic policy. However, inflation differentials may reflect inappropriate domestic policies or other domestic developments, for example wage increases not kept in line with productivity and employment growth, excessive increases in house prices, unsustainable expansion of profit margins, financial asset price bubbles or an inappropriate fiscal policy setting, etc.

Moreover, both common and idiosyncratic shocks could interact with imperfections in product, labour and capital markets, generating persistent inflation differentials. Such differentials could, if not handled by domestic economic policy, lead to losses in competitiveness and, thus, in output and employment growth for those countries with relatively higher inflation rates (see ECB 2003).

ECB (2003) groups the potential underlying reasons for the observed inflation heterogeneity in the euro area into three classes:

1. Differences in consumption patterns and institutional reasons.

   First, different national weights of the inflation sub-indices per se cause inflation differentials. This effect can be examined by using common weights for the whole area. However, one may expect two opposite effects: inflation dispersion may decrease because common price effects will have similar implications in the national data. The other is that inflation dispersion may increase because of the consumer substitution due to the relative price changes.

Second, government policies can affect inflation through changes in administered prices and indirect taxes and thus such national measures may contribute to inflation dispersion within the euro area.

2. Structural differences.

   First, the divergence in inflation rates may be explained by external effects such as oil price shocks (different degrees of oil dependency and oil intensity) and exchange rate changes (different pass-through patterns).

   Second, price convergence of the tradable goods (given the purchasing power parity assumption) and the non-tradable goods (Balassa-Samuelson effect) may also cause differences in inflation rates.

   Third, reducing market rigidities through structural reforms improves conditions for productivity growth and employment, and facilitates the absorption of shocks, while reduces the persistence of their impact on inflation.

3. Cyclical differences.

   First, differences in the cyclical position may cause inflation divergence across countries since they are partly driven by the different sizes of the output gap and, on the demand side of the economy, by wage and unemployment developments, real credit growth and fiscal policy stance.

   Second, – depending on their underlying source – inflation differentials among countries within a monetary union may cause temporary expansion of aggregate demand through real interest rate differentials which will result in even more diverging inflation rates.

   Third, real exchange rate changes may have an equilibrating effect after a change in inflation differentials.

Similar factors are identified, however, with a changing emphasis in Honohan-Lane (2003), Égert et al. (2004), ECB (2005), Hofman-Remsperger (2005), Égert (2007) or Andersson et al. (2009). According to Beck et al. (2009), the listed factors of inflation differentials are only transitory or reflect the result of convergence dynamics, however, there are harmful inflation differentials, as well. They might be, on the one hand, the result of inappropriate national policies or other unwarranted national developments such as misaligned fiscal policies, immoderate wage evolution or other input factor price developments. On the other hand, harmful inflation differentials may stem from nominal wage and price rigidities which cause persistent differences in inflation rates and may lead to relative price distortions in response to economic shocks. Such nominal rigidities are often the result of imperfect competition in the labour or product markets.

Empirical evidences concerning the determinants of spatial inflation differences in EMU

On the basis of the above mentioned literature, empirical evidence for the EMU countries suggests that **output gaps** play an important, though (expectedly) decreasing role in inflation developments in the euro area. Furthermore, differences in employment and wage growth and real credit growth confirm that differences in inflation, in part, are caused by cyclical factors. The costs of non-wage input factors, e.g. renting, maintaining, distribution and production facilities, are found important in explaining spatial differences. Changes in indicators of national competitiveness, such as real exchange rate, caused by inflation differentials have been substantial across euro area countries over some periods, suggesting considerable scope for the equilibrating effects of the real exchange rate channel over the medium term.

The **exchange rate pass-through** is found to be significant in the literature, however, the empirical results are mixed. **Oil prices** proved to have a positive but weak impact on inflation rates (oil price pass-through), which exerts its effect through the countries/regions different oil dependency ratio and the different oil intensity of production (defined as the ratio of net oil imports to GDP, and industry oil consumption divided by industrial production, respectively). In is argued in the empirical literature that oil price shocks affect more the developed regions than the emerging regions.

Empirical researches indicated that **price level convergence** is also an important factor in explaining inflation differentials in Europe, especially for tradable goods. However, this process slowed down, and ECB (2003) emphasize that there is no automatic link between the dispersion of price levels and the dispersion of price changes across countries in the tradable goods sector. Price level convergence of the non-tradable goods, which is known as the **Balassa-Samuelson effect**, is heterogeneous, but mainly low in the European countries, that is, the impact of catching-up effects on inflation differentials is relatively limited.

Inflation differentials that originate from differing **weights in the CPI basket** are found not significant, which is explicit from the computations comparing the dispersion of the official inflation rates to the dispersion of the inflation rates with the same euro area average weights. The **economic structure** (sectoral specialization) of a region plays a significant role in explaining regional differences.

The changes in **regulated and administered prices** also matter for inflation differentials, since price adjustments occur in an unsystematic way within the currency union. However, the estimated magnitude of the impact is relatively small. Differences in **indirect**

tax rates, to some extent, determine the overall price level differences in Europe, however, there is a huge gap in price levels between the euro area and the Central and Eastern European countries, whereas indirect tax burdens are much higher in the latter countries. Price level convergence is expected between the different regions of Europe since there are ongoing efforts to harmonize the indirect tax rates.

3 Inflation dynamics during the financial crisis in Europe – spatial differences

After the start of the EMU, inflation continuously declined, and from 2002 it stabilized near its target level, the 2 percent annual rate. Significant changes occurred after October 2007, when inflation increased, and reached its peak at 4.4 percent (EU-27 average) in July 2008. After it, the rate of inflation decreased and the lowest value, 0.2 percent was measured in July 2009. Now it took a slightly rising trend, again. These movements can be detected in the different countries, however, there are notable differences. The euro area countries are quite near the average inflation rates (see Figure 12 in the Appendix), therefore most of the heterogeneity is attributable to the non-euro zone countries. The highest and most volatile inflation rates were measured in the Baltic countries and in Bulgaria and Romania. These are followed by the Czech Republic, Hungary and Slovenia. The other countries of the EU remained relatively near the average (see Figure 1 below). Before the financial crisis, negative inflation rates were measured only in Malta and in Finland.

We study the cross-country deviations by three dispersion measures[2], the spread between the lowest and the highest value in each period, the cross-sectional standard deviation and the variation coefficient (see Figure 2, and Figure 13 in the Appendix for the euro zone countries). The scale-adjusted spread (which means that we divided the spread values by 5, for the sake of comparability) is sensitive to outliers, however, this problem could be handled by computing the spread between the three countries with the highest and the lowest inflation rates. In our case, this method does not cause much difference between the results. The standard deviation is the most regularly used indicator and it shows very similar dynamics to the spread. Spatial inflation differentials increased in the period between September 2007 and May 2008, after it, differentials started to decrease and stabilized near its previous level (slightly below 2 percentage points) from June 2009.

[2] For a brief review of inflation dispersion measures, see ECB (2003) and Égert et al. (2004).

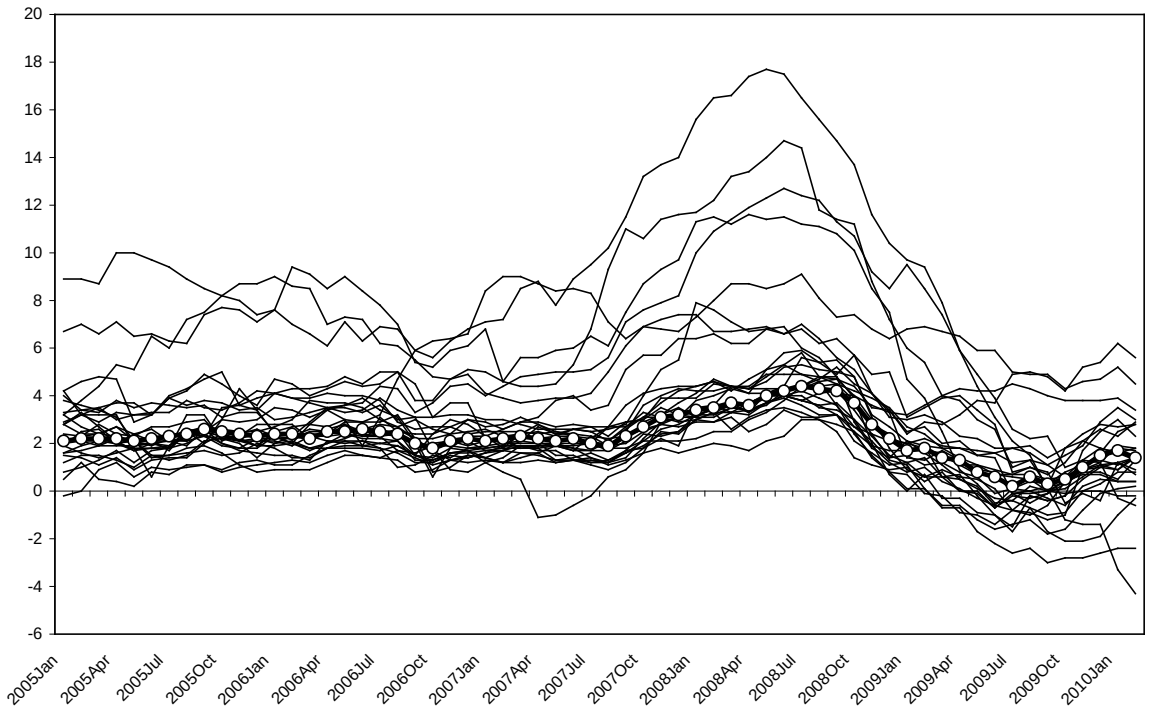

Figure 1 The dynamics of inflation in the EU-27 countries (percentages).

Note: inflation is measured as the annual rate of change of the HICP series. The highlighted series indicate the EU-27 average inflation rate.

Source: European Central Bank

The third dispersion measure, the variation coefficient is computed as the ratio of the standard deviation to the average value of inflation[3]. It helps to eliminate scale effects, but statistically, it cannot be used when the mean inflation is close to zero, since it can take extreme values. In our case, this problem arises after April 2009. The same problem occurs with the indicator of the percentage deviation from the mean inflation.

Spatial dispersion measures are much lower in the euro area than between the EU-27 countries which proves that the majority of the spatial inequalities occur in the non-euro zone countries.

[3] The coefficient of variation is statistically interpretable only when the mean values are positive. In our case, this requirement is fulfilled in each period.

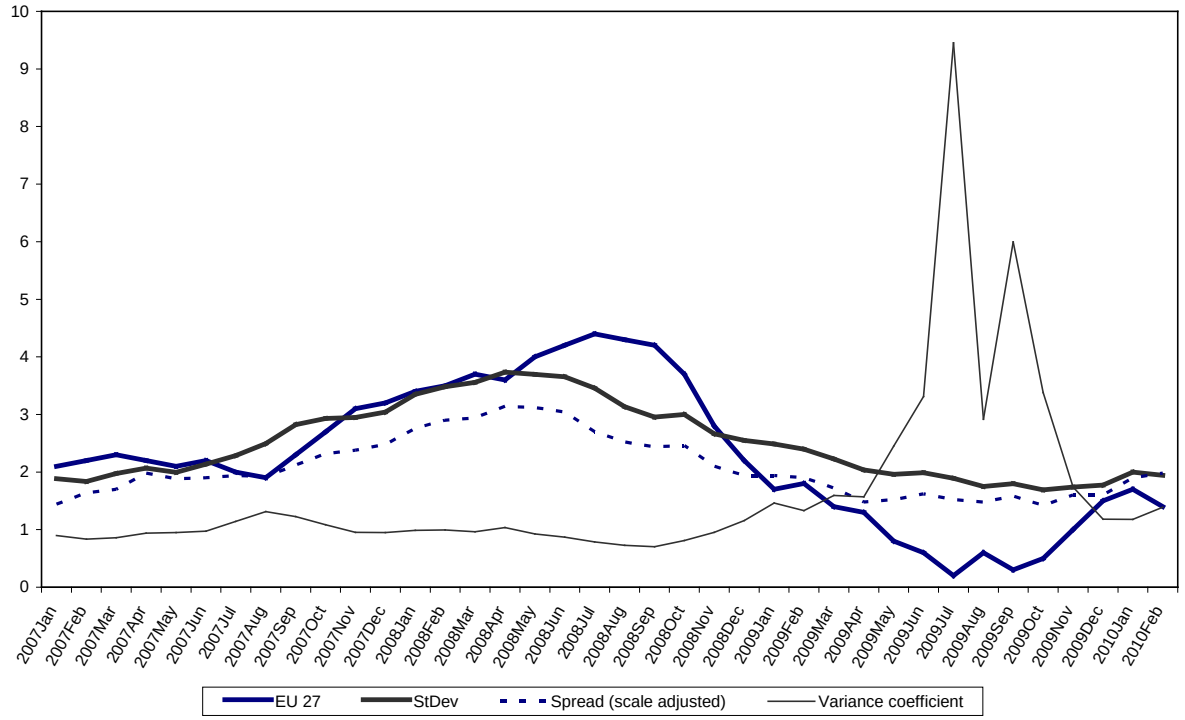

Figure 2 Inflation dispersion in the EU-27 countries.

Note: inflation is measured as the annual rate of change of the HICP series, the dispersion is measured by the cross-sectional standard deviation of the underlying country-level series.

Source: European Central Bank

ECB (2003) states that "in the particular case of inflation there is no obvious and clear-cut relationship between the degree of dispersion and the average level of inflation" (p. 46). However, some co-movement was observed in the literature (see Égert et al. 2004) and can be seen on Figure 2, also. An exception is the period between April 2009 and December 2009 when inflation rates were relatively low and spatial differences remained stable (and this caused the variation coefficient to jump). Truly, the co-movement is weaker in the case of the euro zone countries, which confirms that non-euro zone countries should be treated differently (see Figure 3 below).

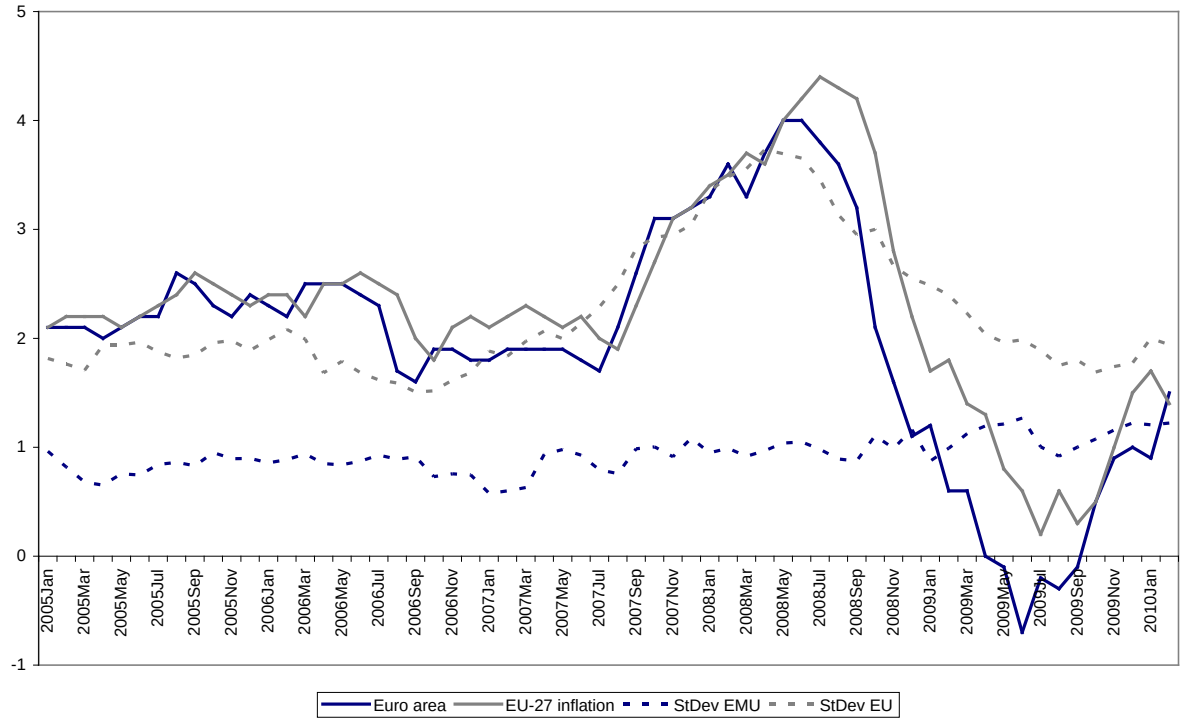

Figure 3 Inflation dispersion in the EU-27 countries and in the EMU countries.

Note: inflation is measured as the annual rate of change of the HICP series, the dispersion is measured by the cross-sectional standard deviation of the underlying country-level series.

Source: European Central Bank

The relationship between spatial inflation dispersion and some selected economic indicators

In order to get a broader picture, we analyze not only EMU countries but the whole European Union. First, we investigated to what extent inflation differentials can be explained by cyclical factors. As a proxy, we used the **employment rate** which is 100 minus the published unemployment rate. Figure 4 confirms the co-movement of the inflation rate and the employment rate at the EU-27 level even during the financial crisis. As a consequence, if cyclical shocks are asymmetric across the EU countries, the inflation rates will diverge from each other.

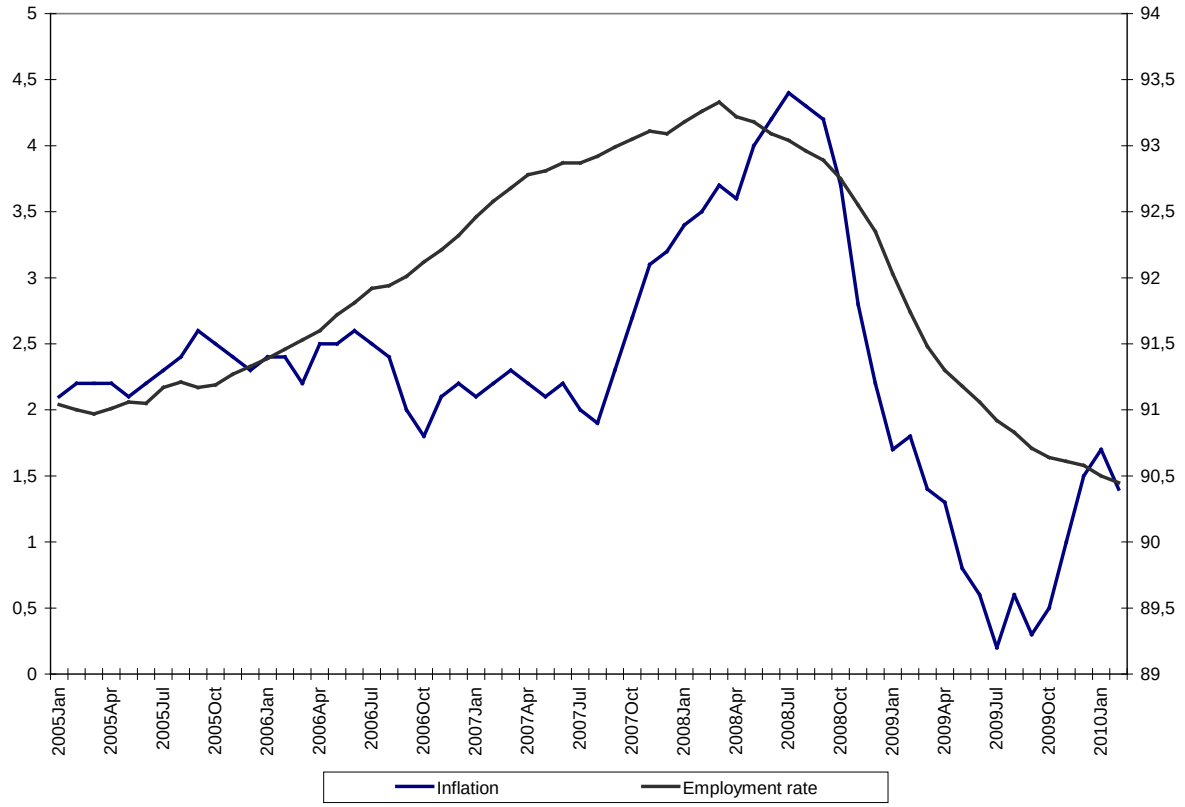

Figure 4 The co-movement between the EU-27 HICP inflation rate (left hand scale) and the employment rate (right hand scale).

Source: European Central Bank

We study spatial inequalities, again, with the cross-sectional standard deviations (Figure 5). While spatial differences during the financial crisis increased and then fell back in inflation rates, the opposite happened to the spatial differences in the (un)employment rates.

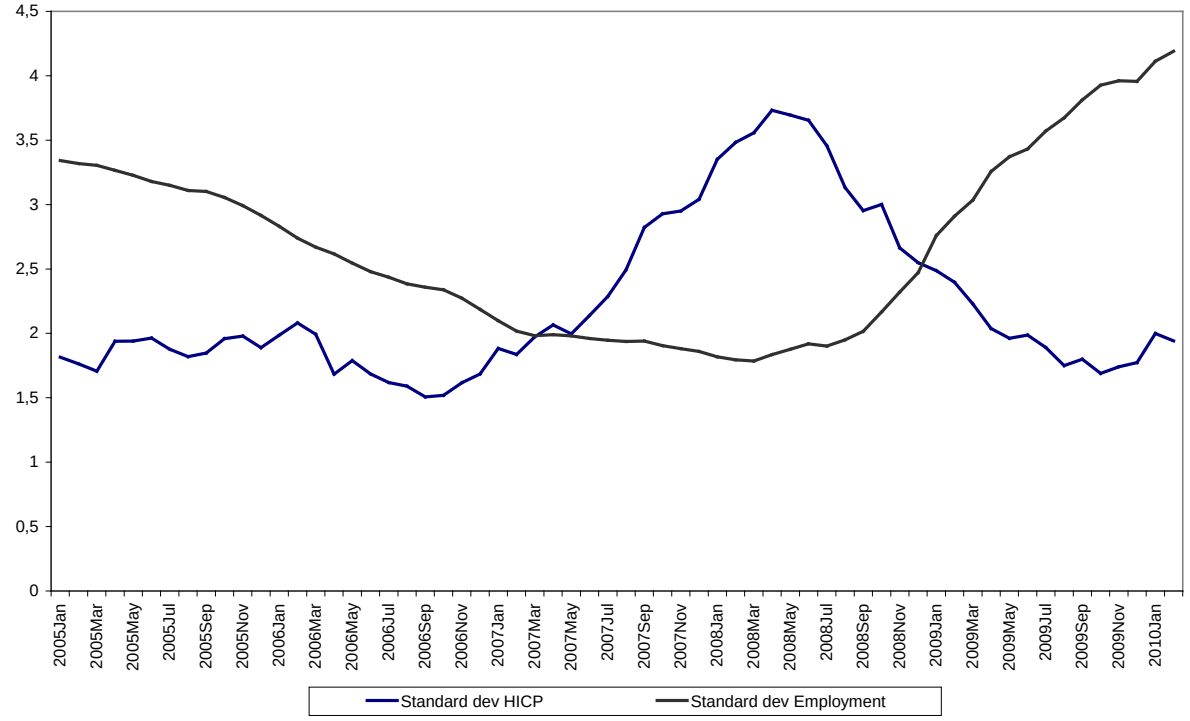

Figure 5 Cross-sectional standard deviation of the inflation rates and the employment rate of the EU-27 countries.

Source: European Central Bank

On the country level, we computed correlation coefficients between the inflation rates and the employment rates. The results are presented in Table 1. According to the correlation coefficients, cyclical factors matter most to the inflation dynamics in Ireland, Portugal, Spain, Estonia, the Czech Republic, Finland and Latvia. In these countries, the co-movement is stronger than the EU-27 average which is 0,71. The lowest correlation coefficients were measured in Germany, the UK (these are even negative), and in Romania, Slovakia and Hungary (slightly above 0,10).

Austria	**Belgium**	**Bulgaria**	**Cyprus**	**Czech Republic**	**Denmark**	**Estonia**
0,6369	0,3521	0,3569	0,6114	0,7659	0,6171	0,7960
Finland	**France**	**Germany**	**Greece**	**Hungary**	**Ireland**	**Italy**
0,735348	0,655506	-0,151453	0,449284	0,13463	0,916528	0,434612
Latvia	**Lithuania**	**Luxembourg**	**Malta**	**Nether-lands**	**Poland**	**Portugal**
0,733349	0,385842	0,465396	0,349368	0,390823	0,687314	0,851906
Romania	**Slovakia**	**Slovenia**	**Spain**	**Sweden**	**United Kingdom**	***EU-27***
0,099034	0,130377	0,590222	0,798667	0,307255	-0,015619	*0,708146*

Table 1. Correlation coefficients between the inflation rates and the unemployment rates in the EU-27 countries.

Source. Author's computations based on European Central Bank data.

Second, we investigated spatial dynamics before and during the financial crisis concerning the **unit labour costs**. Unfortunately, data are not available for France, Portugal, Hungary and Romania. As represented by Figure 6 below, the average unit labour cost index increased quite sharply at the beginning of the financial crisis and it stagnated and decreased a little bit in the year 2009. The size and the direction of the changes are quite similar between the EMU countries and the whole EU, however, the difference is increasing.

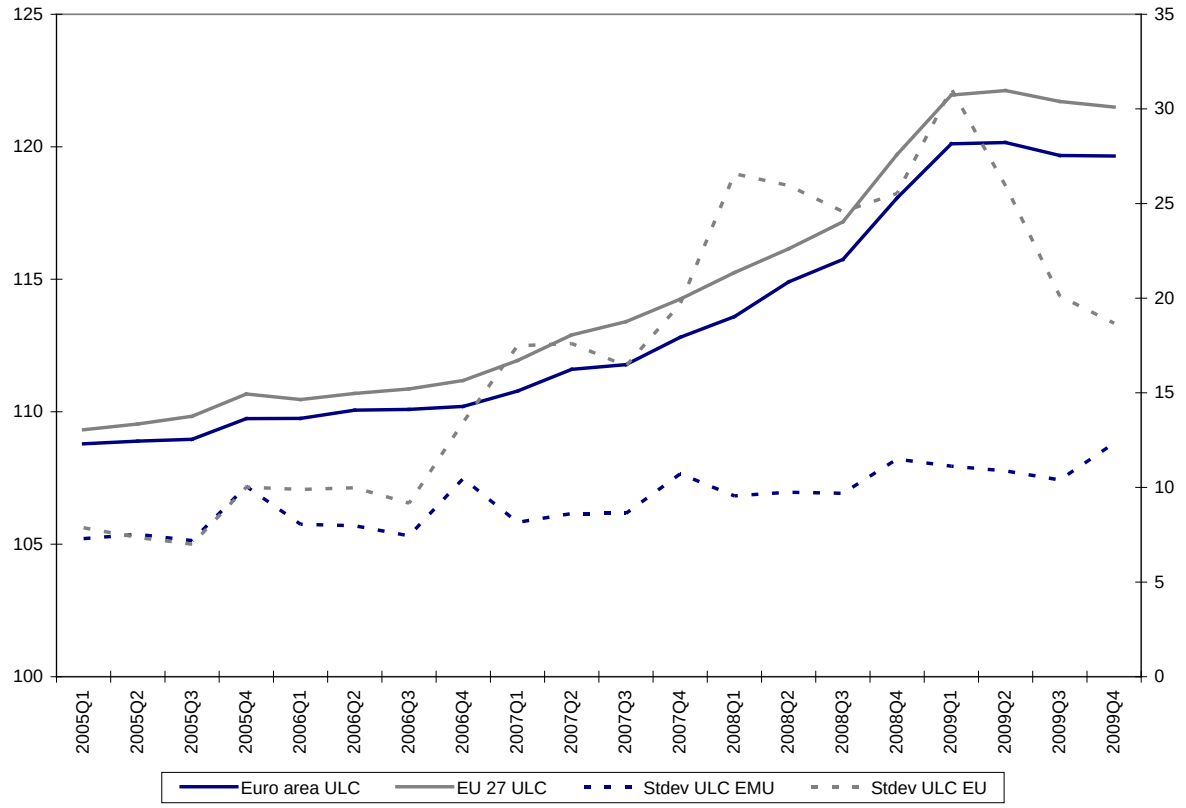

Figure 6 Cross-sectional standard deviation of the unit labour cost indices (right hand scale) and average unit labour cost index (left hand scale) of the EMU and the EU-27 countries.

Source: European Central Bank

Similarly to the inflation differentials, much of the spatial inequality is attributable to the non-euro zone countries, especially to three of them, Latvia, Estonia and Bulgaria. The relatively low level of spatial differences increased significantly after the second half of 2006 and dropped in the third quarter of 2009. Within the EMU, spatial differences increased moderately, and the structure of the inequalities remained quite stable.

We computed correlation coefficients between the evolution of the unit labour cost indices and the inflation rates, and the results are mixed. In most of the countries, the relationship is

negative, even for the EU-27 and the euro area average. The highest negative correlation was measured in Germany and in Greece, and the highest positive correlation was in Lithuania and Latvia.

Next, we analyzed the relationship between the spatial differences of **banks' lending** activities and the inflation dynamics.[4] Again, we compared the cross-sectional standard deviation within the EU-27 countries. The volume of bank lending is measured as the sum of the lending for house purchases and the consumption credits. As indicated by Figure 7 below, there is little co-movement between the spatial differences concerning inflation rates and bank's lending.

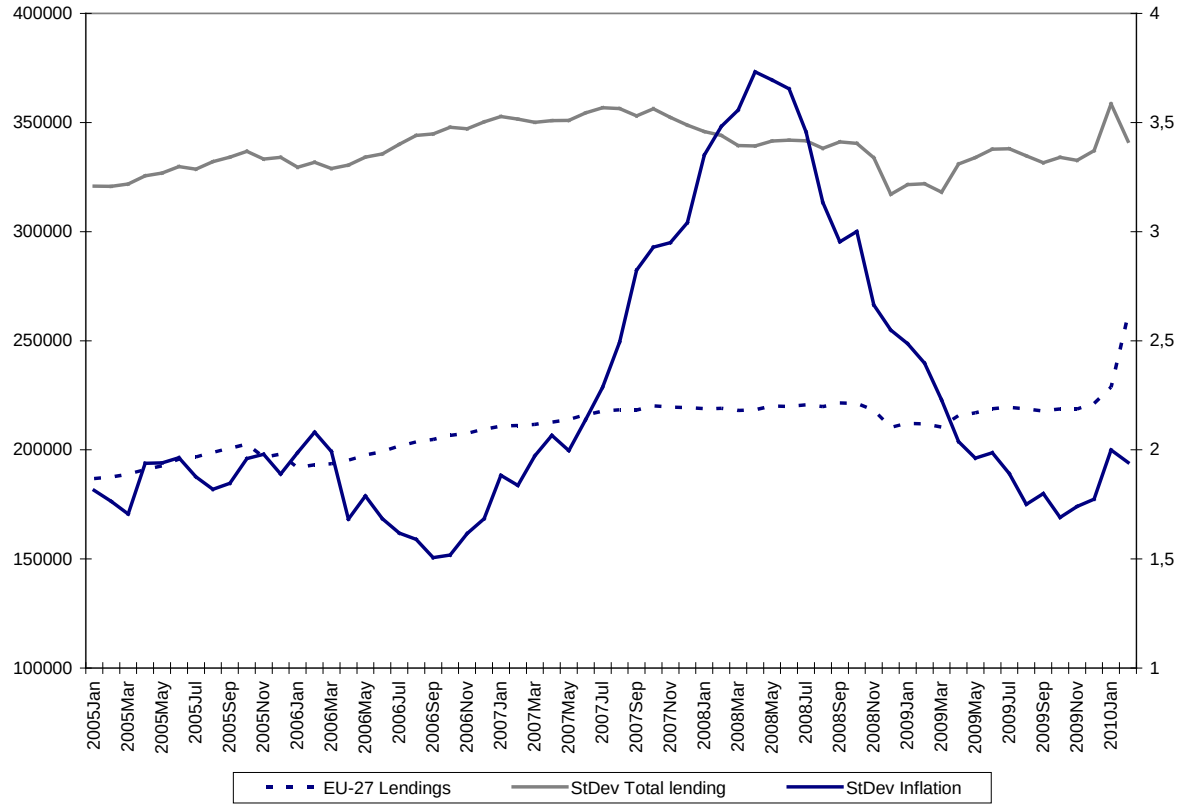

Figure 7 Cross-sectional standard deviation of the inflation rates (percentage points, right hand scale) and the bank credits (million euros, left hand scale) in the EU-27 countries, and the average volume of bank credits (million euros, left hand scale).

Source: Author's calculation based on European Central Bank data.

The mentioned finding is confirmed at the individual countries' level, as well. The correlation coefficient between these indicators (banks' lending and inflation rates) is around zero concerning the EU-27 average data. In a few countries, there is a strong positive

[4] For a detailed examination of bank credit's impact on economic indicators in the euro area, see Cappiello et al. (2010).

correlation: Poland, Sweden, Belgium, Finland and Lithuania (between 0,79 and 0,53). Nevertheless, the correlation coefficient is negative in many countries: the lowest values were measured in Slovakia, Portugal, Luxembourg, Spain and Romania (between -0,6 and -0,36).

Before the start of the financial crisis, the volume of the banks' lending continuously increased in most of the countries, excepting Germany where it stagnated. In the United Kingdom, it started to sink almost one year before the other countries in the Autumn of 2007. After the outbreak of the financial crisis, the liquidity issued by banks dramatically dropped in some countries, but not in Germany, France, Spain, Italy, Denmark, Finland, Luxembourg, Cyprus, Slovakia, Bulgaria, Slovenia and Malta (see Figures 14-16 in the Appendix). The observed huge asymmetries may, in part, point on the direction of the financial flows within the EU, however, the general structure of the cross-country imbalances remained relatively stable (except for Belgium which experienced a huge drop in the credit volume).

As an additional financial indicator, we analyzed **balance of payment** statistics.

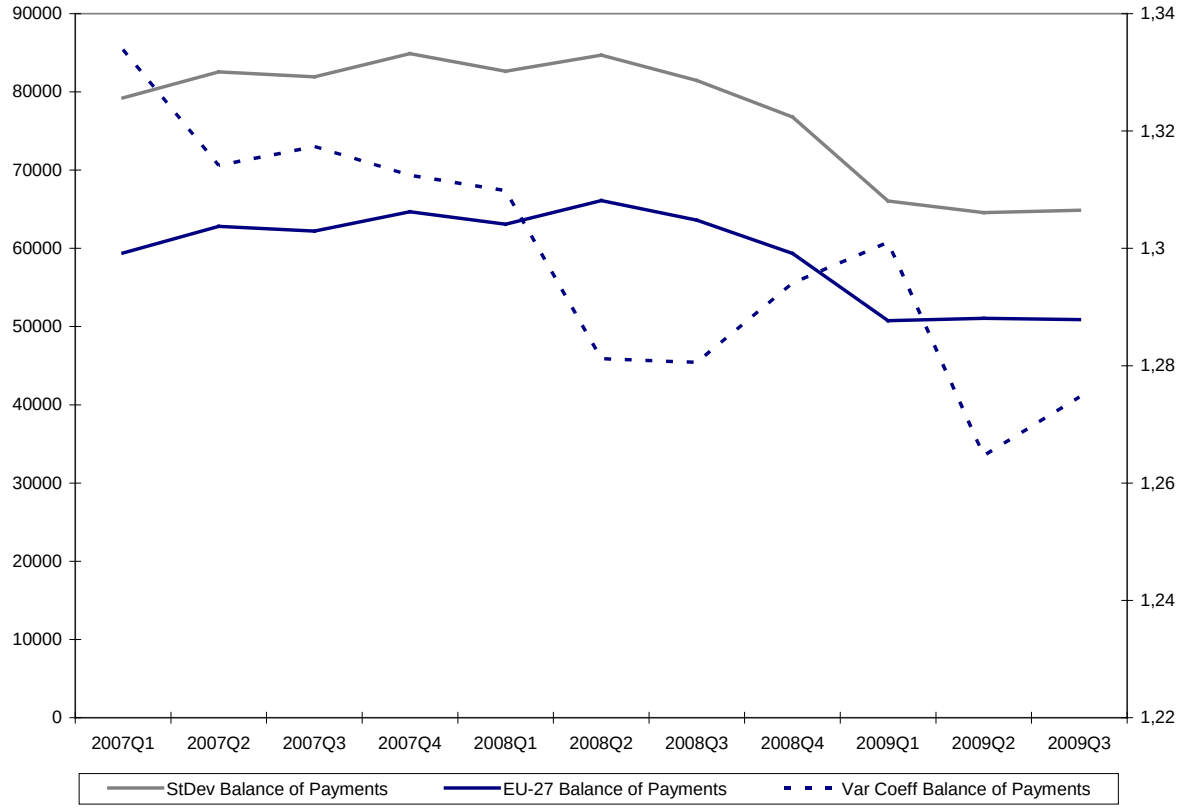

Figure 8 Cross-sectional standard deviation of the balance of payments (million euros) in the EU-27 countries, variance coefficients, and the average volume of balance of payments (million euros).

Source: Author's calculation based on Eurostat data.

By examining Figure 8, one can discover a clear co-movement between the average balance of payments and the spatial inequalities. For this reason, we also examined the

variation coefficient statistics which is an additional indicator of spatial dispersion. These measures show that during the financial crisis, balances of payments, after a smooth increase until the third quarter of 2008, decreased significantly and stabilized at a low level from the beginning of 2009. Intuitively, it may indicate the protectionist reactions of the individual EU member states or in other words financial de-globalization. The structure of the inequalities remained quite stable during the period.

An important part of the adjustment mechanism following the financial crisis is the development of the government finances. In this field, we have quarterly data from the IMF for the period between 2007 Q4 and 2009 Q3 for the **gross external debt** of the EU countries, excepting Cyprus (Figure 9).

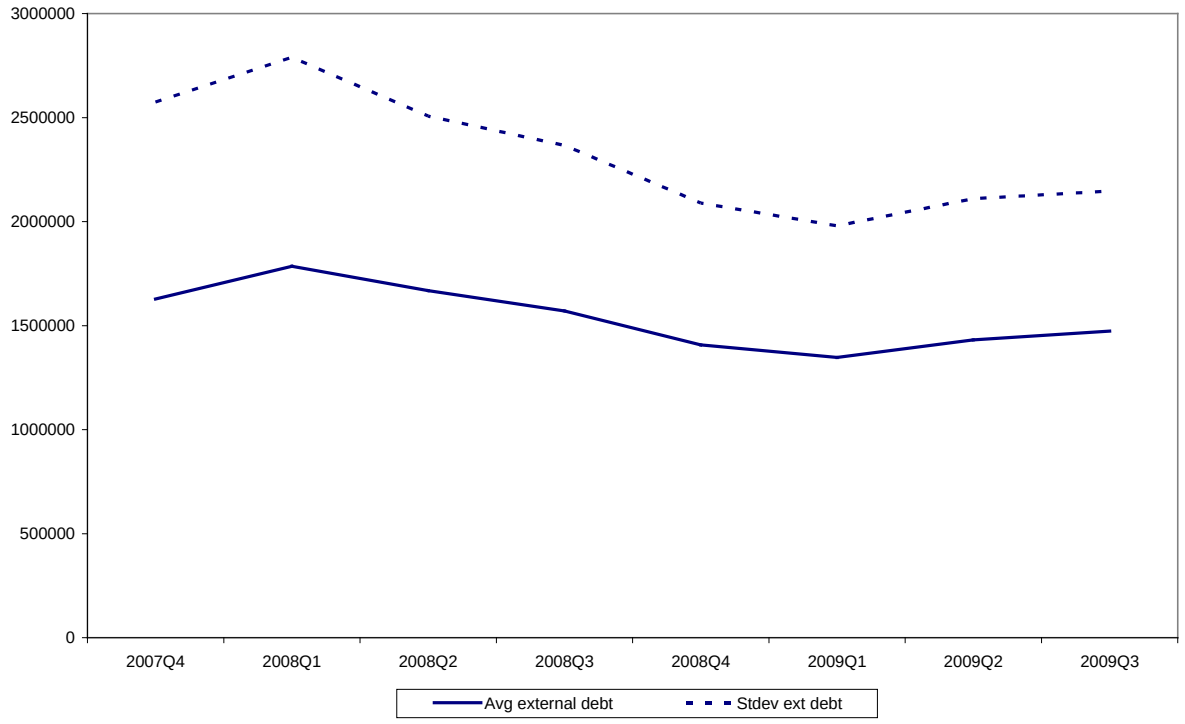

Figure 9 Cross-sectional standard deviation of the gross external debt position (million dollars) of the EU-27 countries, and the average volume of gross external debt position (million dollars).

Source: Author's calculation based on International Monetary Fund data.

In order to eliminate scale effects, we analysed the quarterly growth rate of the external debt positions (Figure 17 in the Appendix). The dynamics of the gross external debts are followed by the spatial inequalities. After a common increasing trend, gross external debts started to decrease in the first quarter of 2008 in the UK, the Netherlands and Germany. In other countries, the decline started only in the next quarter (except for Hungary). The sharpest decline was measured in Belgium, the UK, the Czech Republic, Poland and Italy at the end of

2008, while Sweden experienced a huge increase. External debts increased again in the second half of 2009 in every country, and the highest increases were measured in Slovakia, Greece, Romania and Poland. In the next period, the dynamics slowed down in each member states of the EU, excepting Poland, Slovenia, Latvia, the Netherlands and Belgium. These facts demonstrate substantial spatial asymmetries caused by the crisis (and the differences in the exit strategies).

Barrios et al. (2009) and Schuknecht et al. (2010) examined the effects of different budgetary environments on government bond spreads in the euro area during the financial crisis. They found that due to the increased general risk aversion, the market penalizes more the governments' budget deficit and debt than before the crisis which results in increasing government bond spreads within the euro area. That is, spatial differences in fiscal imbalances cause further spatial heterogeneity in government bonds rates, especially during the financial crisis.

Policy implications

As emphasized by Beck et al. (2009), policy makers have to be aware not only of the nature of monetary heterogeneities but also of their sources, since different kinds of spatial heterogeneities need to be treated differently.

Many of the nowadays literature deal with the policy lessons of the financial crisis (e.g. Bénassy-Quéré et al. 2009, Bernanke 2009, IMF 2009, Reinhart-Rogoff 2009), but only some of them address the spatial issue. One example is Darvas (2009) which analyses the effects of the crisis in the Central and Eastern European countries. It highlighted that for most CEE countries, "the impact of the crisis can be summarised as (1) a significant revenue shortfall, (2) changes in the global economic environment that have led to external financial constraints and less growth in main export destination markets, and (3) a significant change in the medium/long term outlook[5]." (Darvas 2009 pp. 17) These facts can be detected in the presented monetary heterogeneities. An important message of Darvas (2009) is that the financial crisis provides a good opportunity to prompt budgetary adjustment and structural reforms, including fiscal reforms.

Similarly, Schuknecht et al. (2010) examined the evolution of government bond risk premia during the financial crisis and found that markets penalize more the government

[5] of growth, wealth and income and consumption prospects

budgetary imbalances and debts after autumn 2008 than before due to the increased risk aversion. Therefore, market valuation of sovereign risk disciplines fiscal policy, underlining the need for compliance with the Stability and Growth Pact. This means that different fiscal policy stance in the individual countries may have an impact on important monetary variables and therefore cause further spatial monetary heterogeneities.[6]

4 Regional inflation differences at the sub-national level – A case study from Hungary

This section of the paper demonstrates the size and persistence of the within-country inflation differentials.[7] Unfortunately, our data set does not cover the period of the financial crisis. We use a data set collected by the Central Statistical Office of Hungary (KSH), containing micro Consumer Price Index (CPI) data from December 2001 to June 2007 (altogether 67 consecutive months) where the observations were made at store-level.[8] Monthly inflation rates were computed as the weighted averages of the item-specific monthly changes in the average price, based on the log differences of average prices. Yearly inflation rates were computed as the cumulative inflation of the previous 12 months.

Figure 10 depicts the time series of yearly inflation rates and the cross-sectional standard deviation thereof in the observation period in Hungary. The county (NUTS-3) level inflation series are presented in Figure 18 in the Appendix.

As suggested by the chart below, there is no clear-cut relationship between the level of the inflation rates and their dispersion (cross-sectional standard deviation) in our case. Though there is a relatively strong co-movement between the individual county-level series, the spatial inequalities are high, as indicated by the spread between the highest and the lowest inflation rates in each period. This measure of dispersion reached even 6 percentage points in certain periods. After controlling for the sensitivity to outliers (which means that we computed the spread between the three counties with the highest and the lowest inflation rates), the dispersion dropped and became much smoother. Even this indicator measures spreads above 3 percentage points in some periods.

[6] For additional reference, see Barrios et al. (2009).
[7] For a detailed analysis, see Reiff-Zsibók (2007).
[8] The author thanks the Central Statistical Office and the National Bank of Hungary (MNB) for making it possible to use the data, and for Beáta Kollár and Borbála Mináry for discussions.

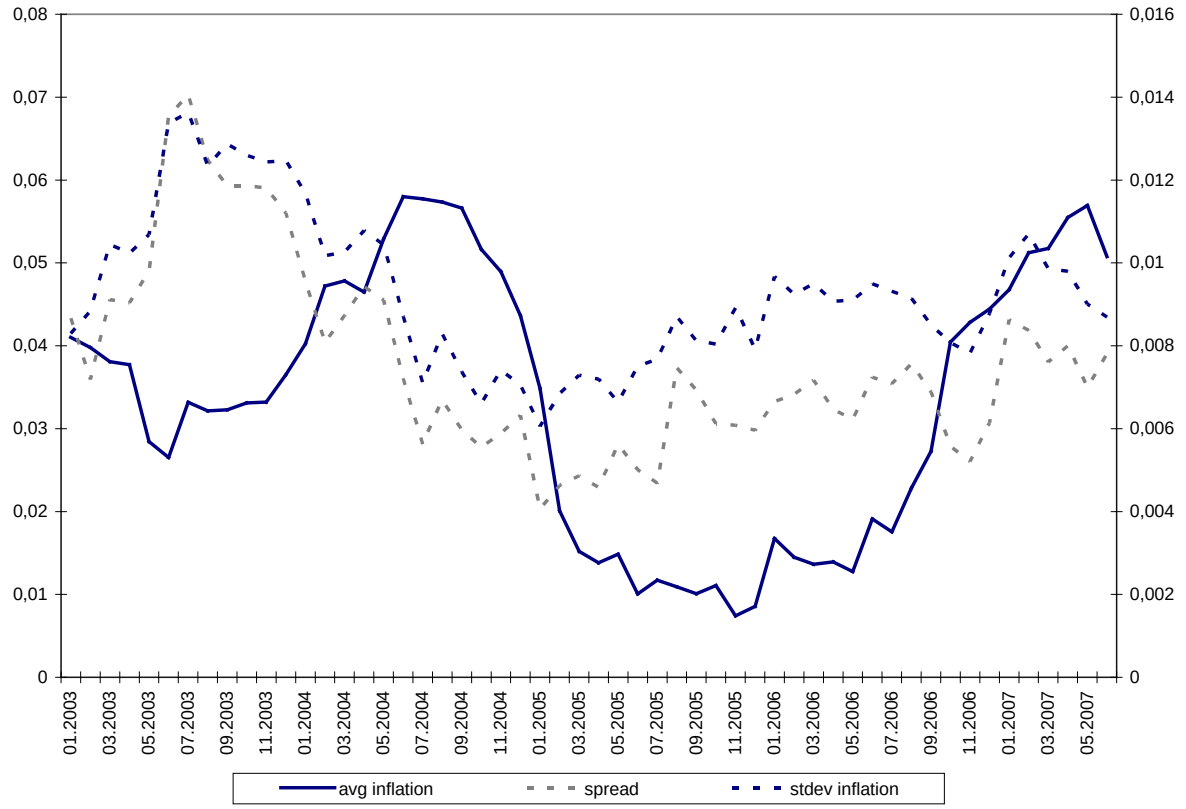

Figure 10 The cross-sectional standard deviation of the yearly inflation rates in Hungary (right hand scale), the spread of the inflation rates (left hand scale), and the average yearly inflation rates (left hand scale).
Source: Author's calculation based on KSH data.

Not only the extent of the spatial inequalities varies over the sample period, but also the structure of the inequalities is instable. This means that the inflation rates relative to the country-level average vary a lot in the individual counties within the sample period. There are no regions with persistently high inflation or low inflation, since it is changing in time.

We also investigate whether there is any price level convergence (which may indicate a catching-up process) behind the observed differences between the county-level inflation rates. The same question was investigated at the euro area level by Hofmann-Remsperger (2005), who found that a marked feature of the euro area inflation differentials is their persistence after the start of the EMU. The proxies of price level convergence were not significant, but this does not mean the rejection of the Balassa-Samuelson effect, since this is probably due to temporary supply and demand shocks whose effects offset the Balassa-Samuelson effect. Previously, Rogers (2001) found that the contribution of price level convergence to explaining inflation differentials is economically important in the euro area. In the Hungarian case, we cannot find evidence of price level convergence.

As the product categories and their price levels in our sample are very heterogeneous, we used relative price levels (i.e. log deviations of absolute prices from their average in the whole country) at the representative item level to analyze the price level convergence between the Hungarian counties. In this setting zero is the average price in the whole country, and the county-level figures represent the price levels in the counties relative to the country average. These county-level series are presented on Figure 19 in the Appendix. In order to investigate spatial inequalities, we plot the cross-sectional standard deviation of the relative price levels on Figure 11 below.

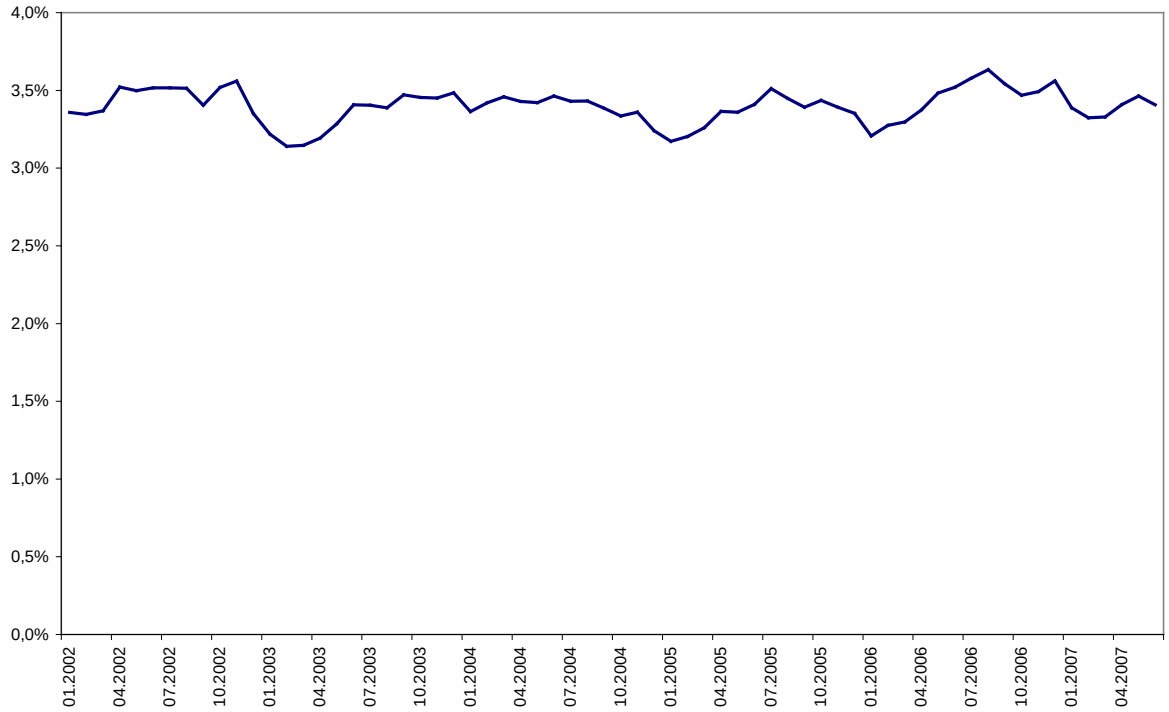

Figure 11 The cross-sectional standard deviation of the relative price levels in Hungary (percentage points).
Source: Author's calculation based on KSH data.

According to the concept of sigma-convergence, a declining trend of the cross-sectional standard deviation would reflect a price-level convergence between the counties. In our sample data, the spatial distribution of the relative price levels and the level of spatial price differentials seem quite persistent. The standard deviation of relative prices is between 3.1 and 3.6 percent during the whole sample period, with no clear decreasing trend. This means, that there is no catching-up process concerning the prices of the different Hungarian regions. However, similar phenomena – and even divergence – can be observed in other fields of the

economy such as economic development or wage levels. The different levels of economic development are largely reflected by the relative price levels of the individual counties.

This brief case study aimed to prove that similar (or even higher) extent of spatial differences may be present within a single country than across countries in the EMU or the EU. The policy problems are similar to the problems addressed by the OCA theory, since the common monetary policy cannot differentiate with regard to the sub-national spatial differences. In other words, a single country can be regarded, in parallel with the euro area, a single currency area and the monetary issues are quite similar to that of the EMU.

5 Conclusion

In this paper, we investigated what kind of monetary heterogeneities prevailed before the crisis and what changes occurred during the crisis within the euro area and the whole EU. The theoretical background behind our analyses is the OCA hypothesis which investigates the adjustment mechanisms within a single currency area after certain asymmetric shocks. In a monetary union, in the absence of national monetary policy, a large part of the adjustment may take place in prices and inflation rates or employment. Another source of heterogeneity can be the different fiscal policies pursued by the national governments. However, fiscal policy measures may not only result in convergence, but may further deepen the asymmetries. Examples can be observed for both cases within the European Union during the crisis. Some of these measures were predetermined by the existing asymmetries prior to the start of the crisis (in government finances, for example), mainly in those countries that were in an adverse financial and/or economic position. Additional asymmetries could have been caused by the exit strategies followed by the individual countries. It became manifest in the financial flows between the EU countries, that is, from the peripheries to the centres and also within countries in the same centre-periphery setting.

In order to have a picture about the spatial monetary heterogeneities before and after the financial crisis, we investigated several economic indicators. We found that spatial inflation differentials increased continuously, but moderately within the euro area. Nevertheless, within the whole EU, spatial heterogeneity dramatically increased during the outbreak of the crisis and then it dropped to its previous level. This means that most of the heterogeneity is attributable to the non-euro zone countries, though the underlying average inflation rates were quite similar. We found a relatively strong co-movement between the inflation rates and certain cyclical factors (employment rate), and during the financial crisis, spatial differences

significantly increased and the effects of cyclical factors are mixed. We found relatively large spatial inequalities concerning bank's lending activities and external debt positions. Spatial inequalities remained relatively stable in the balances of payments between the EU countries during the crisis.

References

Alberola, E. (2000). Interpreting inflation differentials in the euro area. Banco de Espana Economic Bulletin April 2000, pp. 59-68.

Alberola, E. and Marqués, J.M. (2001). On the evolution of relative prices and its nature at the regional level: The case of Spain, Journal of Regional Science, 41, 3, pp. 451-474.

Alesina, Alberto and Robert J. Barro (2002). Currency Unions. The Quarterly Journal of Economics, MIT Press, vol. 117(2), pp. 409-436

Altissimo, F., Benigno, P., Palenzuela, D.R. (2005). Long-run determinants of inflation differentials in a monetary union, NBER Working Paper No. 11473, National Bureau of Economic Research

Altissimo, Filippo, Ehrmann, Michael and Smets, Frank (2006). Inflation Persistence and Price Setting Behaviour in the Euro Area – a Summary of the IPN Evidence, European Central Bank Occasional Paper Series No. 46 (June, 2006), ECB, Frankfurt am Main.

Andersson, M. – Masuch, K. – Schiffbauer, M. (2009). Determinants of inflation and price level differential across the euro area countries, European Central Bank Working Paper Series No. 1129 (December 2009), ECB, Frankfurt am Main

Angeloni, I. – Ehrman, M. (2004). Euro Area Inflation Differentials, European Central Bank Working Paper Series No. 388.

Barrios, S.P. – Lewandowska, M. – Setzer, R. (2009), "Determinants of intra-euro area government bond spreads during the financial crisis", European Economy - Economic Papers, No. 388.

Beck, G.W. – Hübrich, K. – Marcellino, M. (2009). Regional inflation. Economic Policy, January, pp. 142-184.

Beirne, J. - Caporale, G.M. - Schulze-Ghattas, M. – Spagnolo, N. (2009). Volatility spillovers and contagion from mature to emerging stock markets. European Central Bank Working Paper Series No. 1113 (November 2009), ECB, Frankfurt am Main

Bénassy-Quéré, A. – Coeuré, B. – Jacquet, P. – Pisani-Ferry, J. (2009). The crisis: Policy lessons and policy challenges. Bruegel Working Paper 2009/06.

Bernanke, B. (2009). The Crisis and the Policy Responses. At the Stamp Lecture,London School of Economics, London, England, 13 January.

Broda, Christian and Weinstein, David E. (2008). Understanding International Price Differences Using Barcode Data, NBER Working Paper No. 14017, May 2008.

Cappiello, L. – Kadareja, A. – Sørensen, C.K. – Protopapa, M. (2010). Do bank loans and credit standards have an effect on output? A panel approach for the euro area. European Central Bank Working Paper Series No. 1150 (January, 2010).

Darvas, Zs. (2009). The impact of the crisis on budget policy in Central and Eastern Europe. Bruegel Working Paper 2009/05.

Dhyne, Emmanuel et al. (2005). Price Setting in the Euro Area: Some Stylised Facts from Individual Consumer Price Data, European Central Bank Working Paper Series No. 524 (September 2005).

Égert, Balázs – D. Ritzberger-Grünwald – M.A. Silgoner (2004). Inflation Differentials in Europe: Past Experience and Future Prospects, Österreichische Nazionalbank, Monetary Policy and the Economy, Q1/04.

Égert, Balázs (2007). Real convergence, price level convergence and inflation differentials in Europe, Österreichische Nazionalbank Working Paper, No. 138

European Central Bank (2003). Inflation differentials in the euro area: Potential causes and policy implications. http://www.ecb.int/pub/pdf/other/inflationdifferentialreporten.pdf

European Central Bank (2005). Monetary policy and inflation differentials in a heterogeneous currency area, ECB Monthly ulletin, May, pp. 61-78

Fabiani, Silvia, Gattulli, Angela and Sabbatini, Roberto (2004). The pricing behaviour of Italian firms: New survey evidence on price stickiness, European Central Bank Working Paper Series No. 333 (April 2004), ECB, Frankfurt am Main.

Galesi, A. – Lombardi, M.J. (2009). External shocks and international inflation linkages. A global VAR analysis. European Central Bank Working Paper Series No. 1062 (June, 2009).

Hayes, P. (2005). Estimating UK Regional Price Indices, 1974-96, Regional Studies, Vol. 39.3, pp. 333-344.

Hofmann, B. – Remsperger, H. (2005). Inflation differentials among the Euro area countries: Potential causes and consequences, Journal of Asian Economics, 16, pp. 403-419

Honohan, P. – Lane, P.R. (2003). Divergent inflation rates in EMU, Economic Policy, Vol. 18 (37), October 2003, pp. 357-394

International Monetary Fund (2009). Fiscal Implications of the Global Economic and Financial Crisis. Staff Position Paper, Fiscal Affairs Department, SPN/09/13, June 9.

Mongelli, F.P. (2002). „New" views ont he Optimum Currency Area Theory: What is EMU Telling Us? European Central Bank Working Paper Series No. 138 (April 2002), ECB, Frankfurt am Main.

Mundell, R.A. (1961). A Theory of Optimum Currency Areas, American Economic Review 51, pp. 657-665.

Reiff Á. – Zsibók Zs. (2007): Regional characteristics of price-setting and inflation in Hungary: A micro-level analysis, manuscript

Reinhart, C.M. – Rogoff, K.S. (2009), The aftermaths of financial crises. American Economic Review, May.

Rogers, John H. (2001). Price Level Convergence, Relative Prices and Inflation in Europe. Board of Governors of the Federal Reserve System (U.S.), International Finance Discussion Papers 699 (March 2001)

Schuknecht, L. – von Hagen, J. – Wolswijk, G. (2010). Government bond risk premiums in the EU revisited. The impact of the financial crisis. European Central Bank Working Paper Series No. 1152 (February, 2010).

Schunk, D. L. (2005). The differential impacts of monetary policy: Are the differences diminishing? Papers in Regional Science, Vol. 84 (1), 127–136.

Veronese Giovanni, Fabiani, Silvia, Gattulli, A. and Sabbatini, R. (2005). Consumer Price Behaviour In Italy: Evidence From Micro CPI Data, European Central Bank Working Paper Series No, 449, ECB, Frankfurt am Main.

Weber, A., – Beck, G. (2003). Price stability, inflation convergence and diversity in EMU: Does one size fit all? Discussion paper, University of Cologne.

Appendix

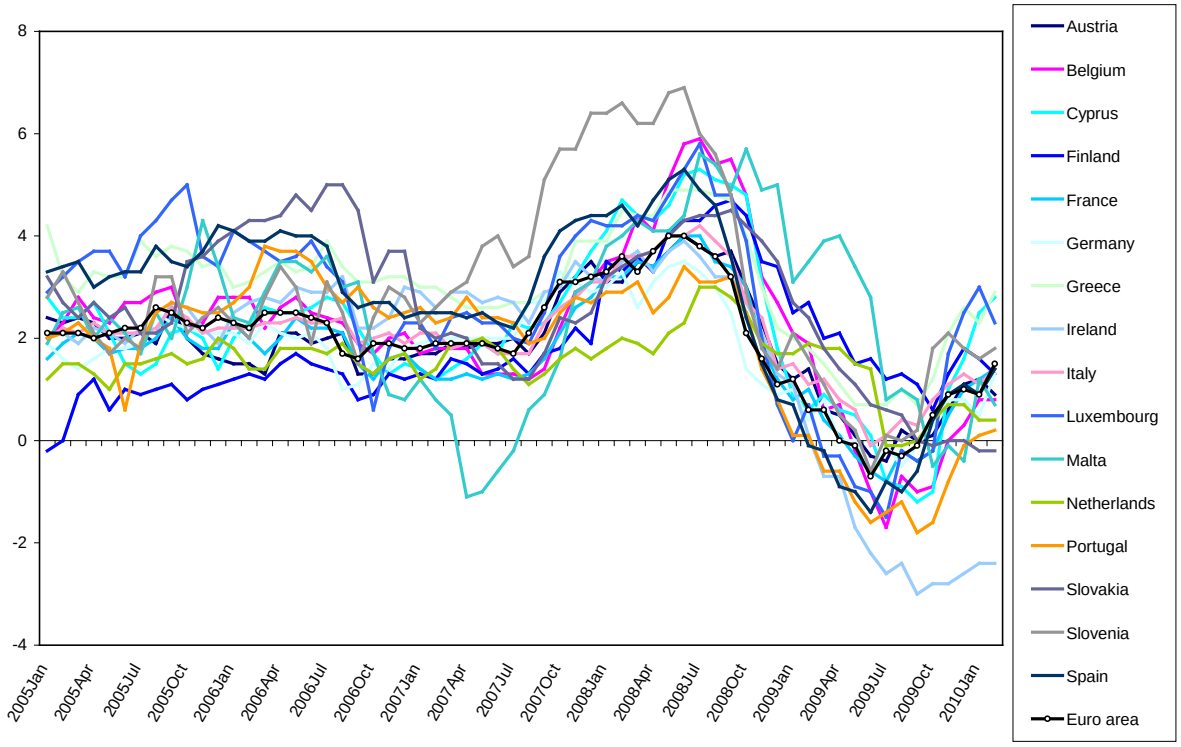

Figure 12 Inflation rates in the euro zone countries.

Source: European Central Bank

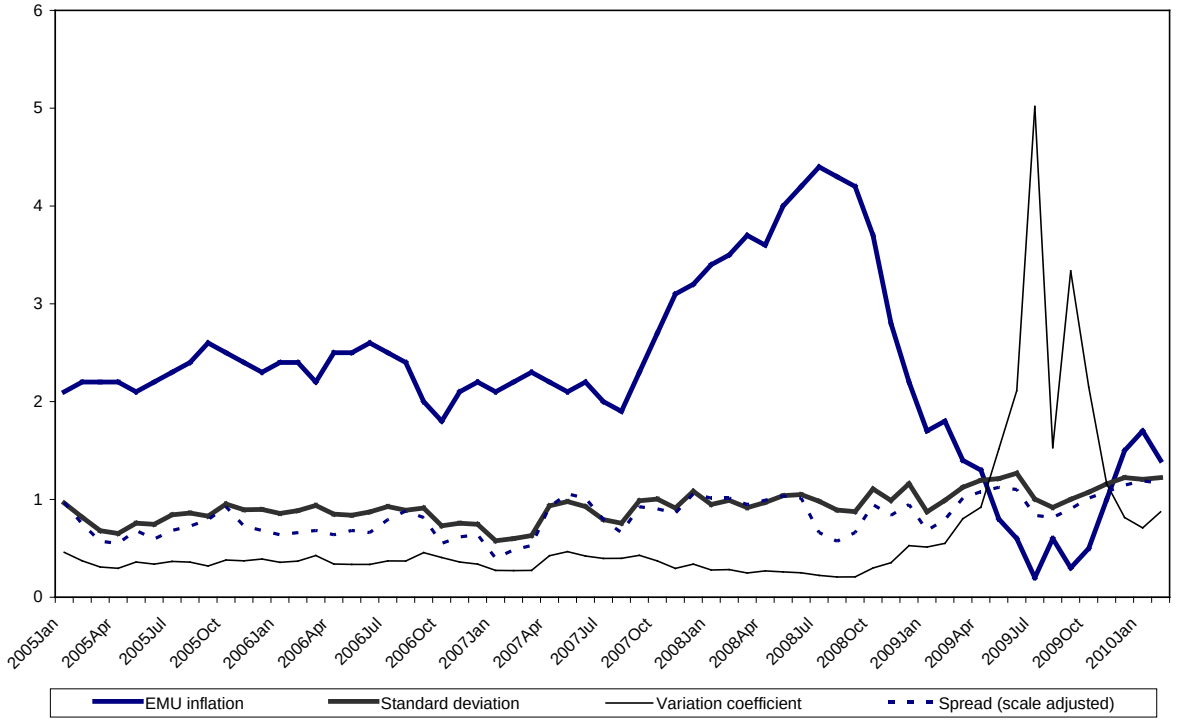

Figure 13 Dispersion measures for inflation rates between the euro zone countries.

Source: Author's computation based on European Central Bank data

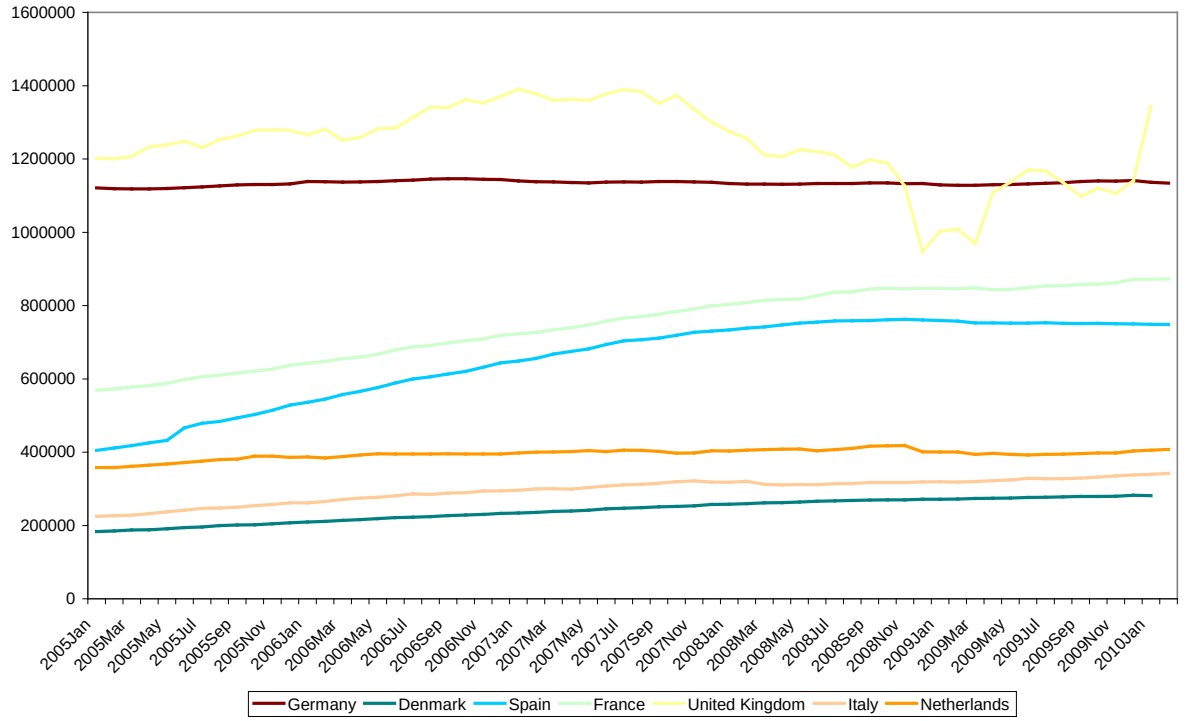

Figure 14 The volume of the bank credits (million euros) in the EU-27 countries – the highest volumes.

Source: Author's calculation based on European Central Bank data.

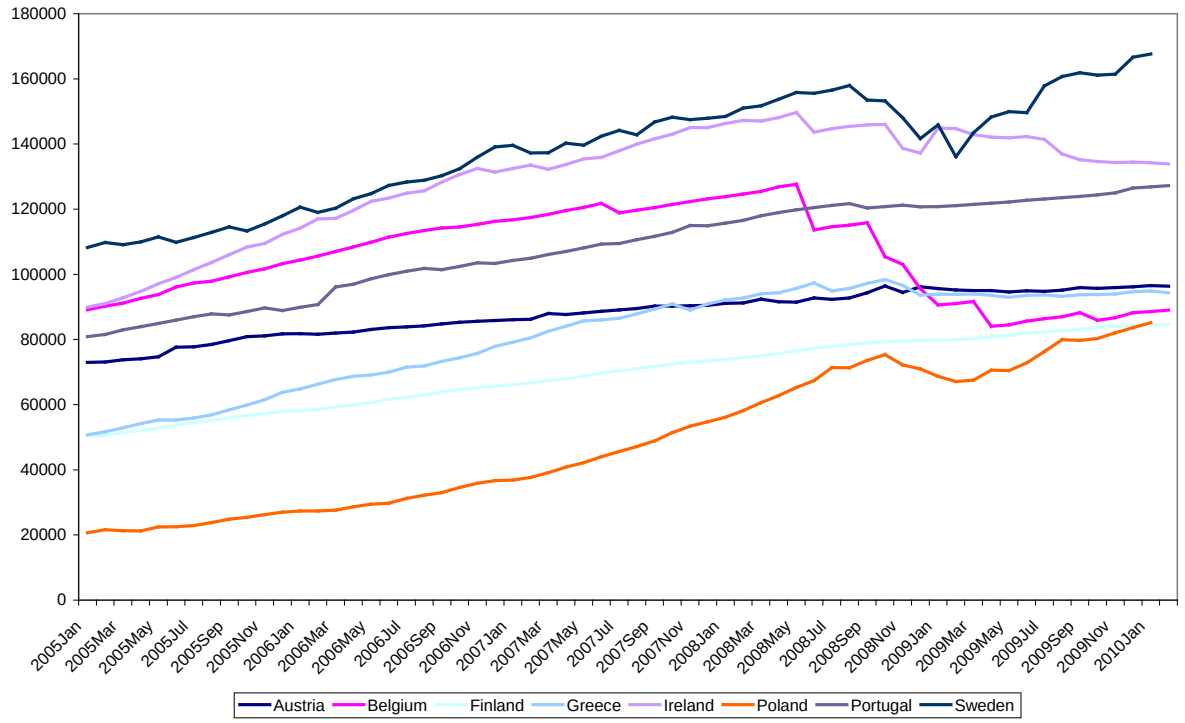

Figure 15 The volume of the bank credits (million euros) in the EU-27 countries – the middle-level volumes.

Source: Author's calculation based on European Central Bank data.

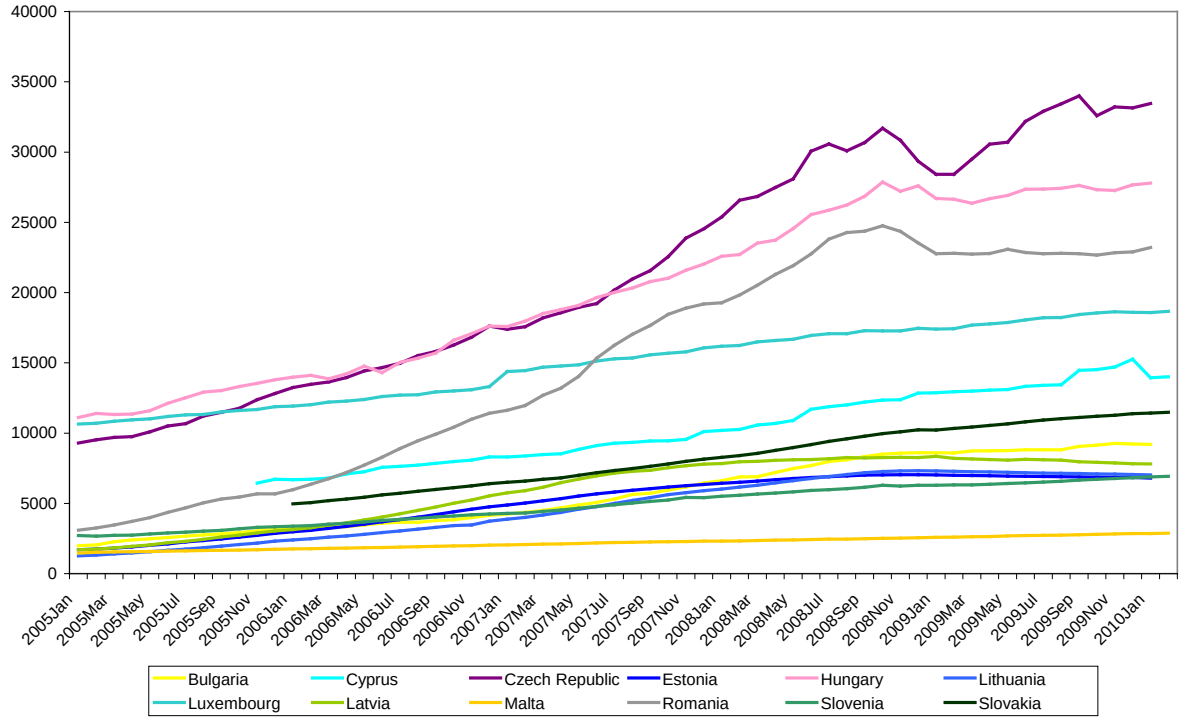

Figure 16 The volume of the bank credits (million euros) in the EU-27 countries – the lowest volumes.

Source: Author's calculation based on European Central Bank data.

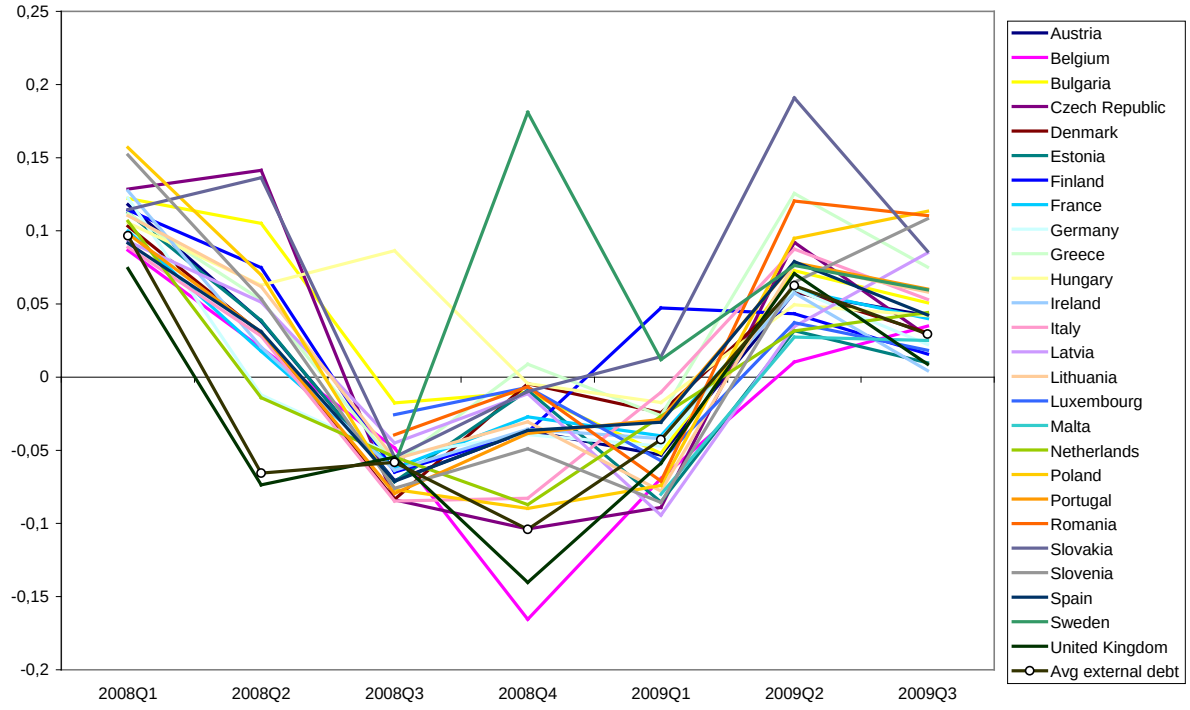

Figure 17 Quarterly growth rate of the gross external debt position of the EU-27 countries (excepting Cyprus).

Source: Author's calculation based on International Monetary Fund data.

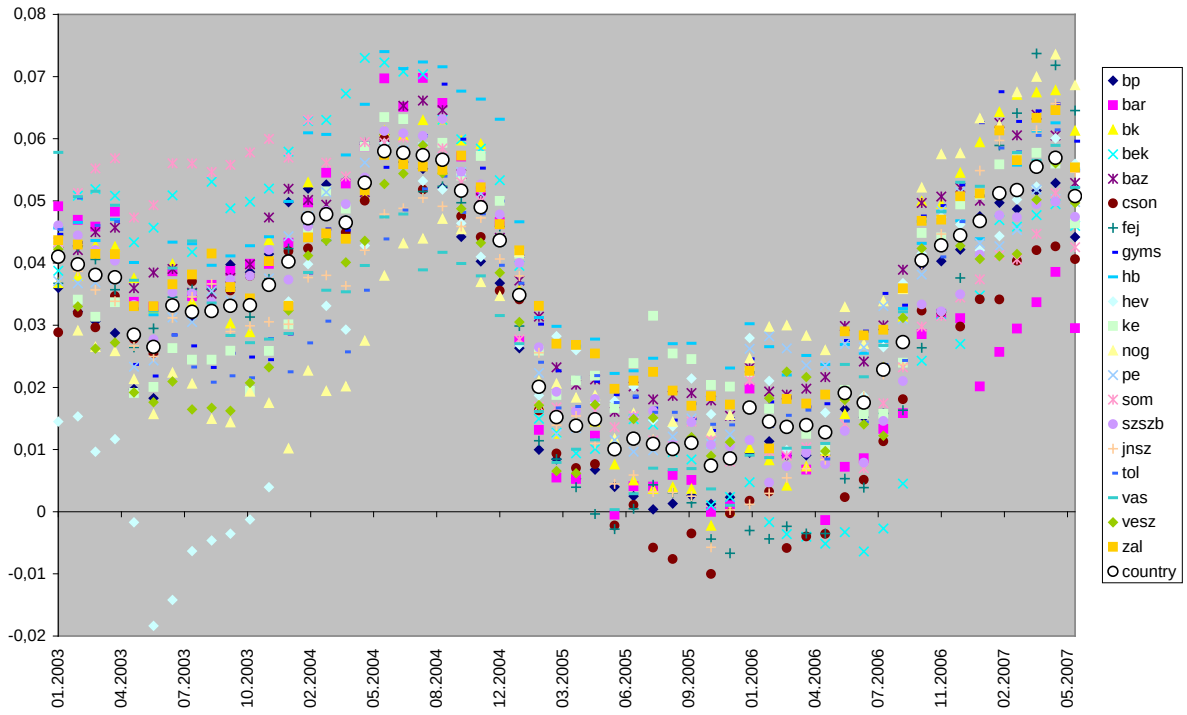

Figure 18 Yearly inflation rates at the NUTS-3 level in Hungary.

Source: Author's calculation based on KSH data.

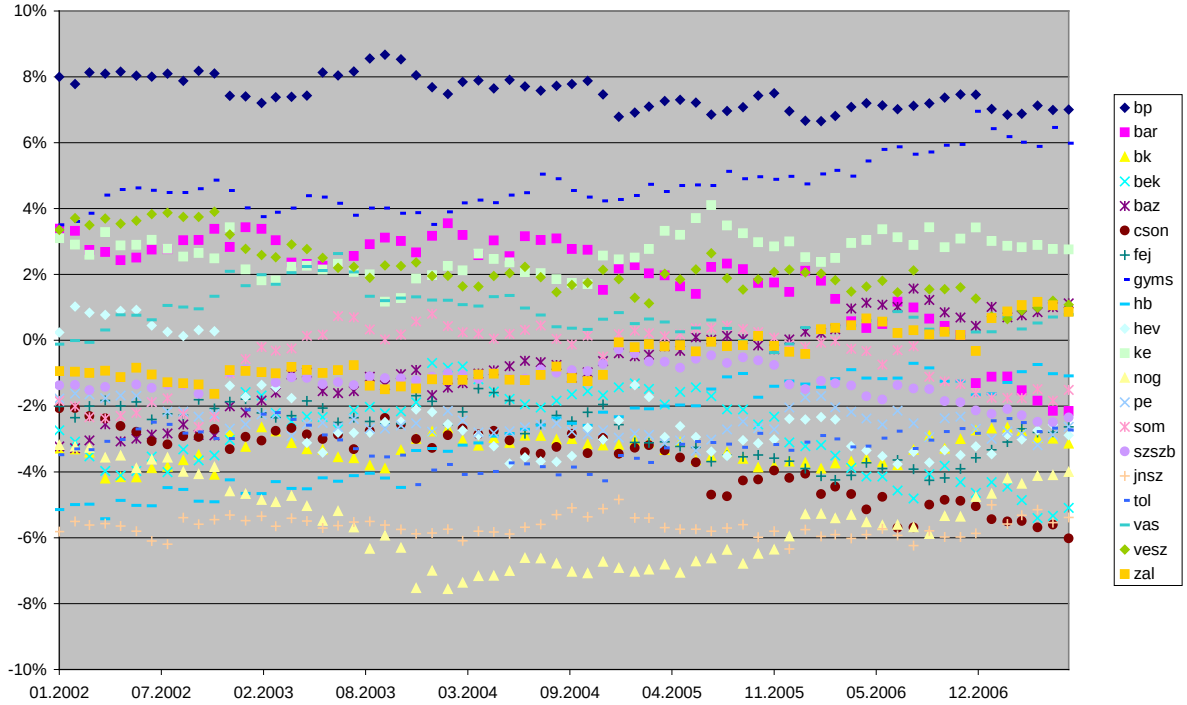

Figure 19 Relative price levels at the NUTS-3 level in Hungary.

Source: Author's calculation based on KSH data.