



DIRECTORATE-GENERAL FOR INTERNAL POLICIES

POLICY DEPARTMENT **A**
ECONOMIC AND SCIENTIFIC POLICY



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**The Consequences of Persistent Inflation
Differentials Across Countries for the
Conduct of a Common Monetary Policy**

**Monetary Dialogue
September 2014**

COMPILATION OF NOTES



DIRECTORATE GENERAL FOR INTERNAL POLICIES
POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

The consequences of persistent inflation differentials for the conduct of a common monetary policy

Monetary Dialogue 22 September 2014

COMPILATION OF NOTES

Abstract

In this compilation of notes, key monetary policy experts analyse the consequences of persistent inflation differentials for the conduct of common monetary policy for the euro area. The notes have been requested by the Committee on Economic and Monetary Affairs (ECON) of the European Parliament as an input for the September 2014 session of the Monetary Dialogue between the Members of the ECON Committee and the President of the ECB.

This document was requested by the European Parliament's Committee on Economic and Monetary Affairs.

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INTRODUCTION

After the adoption of the single currency, inflation differentials in the euro-area countries have persisted. Countries with inflation persistently higher (lower) than average have experienced lower (higher) real interest rates. This has led to divergent developments in competitiveness and, in some countries, to excessive private and public borrowing, real estate bubbles and to postpone budgetary consolidation efforts.

Inflation may temporarily diverge in a monetary union, due to differences in countries' business cycles. In such a context, a common monetary policy can help to ensure a smooth adjustment process and offer temporary relief. But monetary policy cannot provide a lasting solution to the underlying problems causing this persistent heterogeneity. Indeed, as the crisis has shown, ECB monetary policy faces severe limitations when macroeconomic and financial imbalances across-countries become (too) large.

Against this background, the notes in this compilation by key monetary policy experts analyse the consequences of persistent inflation differentials for the conduct of common monetary policy for the euro area. The main conclusions and policy options are summarised below.

The notes have been requested by the Committee on Economic and Monetary Affairs (ECON) of the European Parliament as an input for the September 2014 session of the Monetary Dialogue between the Members of the ECON Committee and the President of the ECB.

Karl Whelan (University College Dublin). The ECB has been given a mandate to maintain price stability for the euro area as a whole. As such, it does not need to concern itself directly with differences in inflation rates across its member states. But, there will be occasions when these differences reflect dangerous macroeconomic trends (e.g. the differences in inflation between the core and periphery of the euro area during its first eight years reflected the impact on aggregate demand in the periphery of a significant easing of credit conditions). Given the ECB's new role as the single supervisory of Europe's banking system and the European Commission's widened role in assessing macroeconomic imbalances, we can hope that the build-up of future imbalances will be better dealt with using appropriate regulatory and fiscal tools.

The cross-sectional standard deviation of inflation rates across euro area member states is currently close to historical lows as a strong disinflationary trend has spread throughout the member states. With inflation rates running at extremely low levels in almost all member states, it is not possible for those member states with high debt levels to recover competitiveness without experiencing outright deflation, which causes a number of economic and financial problems. Thus far, the ECB has not taken sufficient steps to effectively counter the disinflationary trends in the euro area and the latest indicators suggest economic conditions in the area are weakening. The ECB continues to have significant unused tools at its disposal that can raise aggregate demand and boost inflation. If the euro area remains in a disinflationary slump, it will be fair to blame the ECB for failing to use these tools.

A final word is perhaps appropriate on the topic of structural reforms. As the ECB takes a more active role in battling the ongoing slump, Mario Draghi has intensified his rhetoric about structural reforms. The transcript of his September press conferences shows fifteen uses of this phrase. Draghi now says he has "*concluded that there is no fiscal or monetary stimulus that will produce any effect without ambitious and important, strong, structural*

reforms." It is hard to find a logic (at least one based on macroeconomic theory as we know it) for this argument. It is certainly the case that the potential output growth in the euro area is currently low and can be improved by various policy reforms. However, it is also true that there is currently a very large shortfall between aggregate demand and the current supply potential of the euro area economy, a shortfall summarised in an unemployment rate of over 11 percent. So there is room for fiscal and monetary stimulus to boost the economy, even without structural reforms. In addition, to the extent that we are worried about deflation, the initial impact of structural reforms that boosted the supply capacity of the euro area would be to further depress inflation. My point here is not to argue against structural reforms. There are many such reforms that can have an important positive effect over the medium- and longer-run (though we know little about the magnitude of their potential impact). But it is important for the ECB to take responsibility for its crucial role in the shorter-term macroeconomic management of the euro area and ECB officials continually placing structural reforms at the heart of discussions of this issue is unhelpful.

Zsolt Darvas *et al.* (Bruegel). Inflation rates can differ across regions of monetary unions, reflecting *inter alia* normal adjustment processes (such as price convergence or the Balassa-Samuelson effect), different cyclical position of the region, different composition of consumption, economic distortions resulting from segmented markets and insufficient competition. In the euro area, before the global crisis, unsustainable demand and credit developments were fuelled by higher inflation, which reduced the real interest rates and thereby made borrowing cheaper.

In normal times, the European Central Bank (ECB) does not influence country-specific developments with its single interest rate instrument. In fact, pre-crisis literature showed that the monetary transmission to different euro-area countries was comparable. In crisis times, liquidity operations such as MRO (Main Refinancing Operations) or LTRO (Long Term Refinancing Operations) will be used differently by different banks depending on the strength of their balance sheets and the strength of the sovereign in which they have their main activity. Yet, such measures only mitigate failures in the financial system and help to improve the proper transmission of monetary policy. Asset purchases by the ECB could also have different effects in different euro-area countries, because assets are not uniformly distributed across countries. For example, French companies have issued about half of all outstanding corporate bonds in the euro area, and almost half of residential mortgage-based asset backed securities (ABS) have been issued in the Netherlands. In some other euro-area countries there was close to zero issuance of such securities. Unconventional policy measures can therefore have different effects on different countries depending on the chosen instrument. They are used to reduce fragmentation and improve proper transmission of monetary policy but they can also influence the area-wide inflation rate.

The new macroprudential policy tools are unlikely to be practical to address inflation divergences. Overall, the primary responsibility for addressing unsustainable regional differences in inflation resides with national policy makers and the EU institutions responsible for surveillance. The ECB should keep the average inflation rate close to two percent so that inflation differences are possible without deflation in some parts of the euro area. It can use unconventional policy measures to steer the area-wide inflation rate or address financial fragmentation that hinders proper monetary policy transmission, but it should refrain from using unconventional policy measures to influence country-specific inflation rates.

Anne Sibert (Birkbeck, University of London and Centre for Economic Policy Research). There are two reasons that (actual) inflation rates might differ across countries. The first is that consumers in different countries consume different consumption baskets. Inflation

differentials arising from different consumption baskets are desirable; they are a reflection of relative price changes that bring about an efficient allocation of resources. The second reason is that market segmentation coupled with distortions and imperfect competition cause consumers in different countries to pay different prices for different goods. Outcomes with inflation differentials arising from this reason are inefficient and undesirable. In this case the underlying problem is the distortions and the imperfect competition.

Given that underlying distortions and imperfect competition exist, it is not clear that having a common currency is worse than the alternatives. Abandoning the common currency and adopting a floating exchange rate would permit each country to attempt to attain its most preferred inflation rate. Exchange rates would adjust to bring about changes in relative prices. This might appear alluring, as exchange rates are determined nearly instantly in financial markets whereas distortions ensure that changes in goods prices can be subject to long and variable lags. However, sticky goods prices and flexible exchange rates can cause exchange rate overshooting. This and imperfect rationality and non-fundamental equilibria can cause exchange rates to be a source of shocks that may make it difficult to conduct monetary policy. Even if all countries have the same desired inflation, country-specific monetary policies might lead to more inflation divergence in the euro area than has occurred with a common currency and a single monetary policy.

If a particular country suffers from significant and persistently divergent inflation or from more variable inflation than other countries that is the result of market segmentation and distortions then it is up to domestic policy makers in that country to address this issue. The existence of inflation differentials should be one more incentive for dilatory governments to summon the political will to enact fundamental economic reforms.

It has been suggested that a possible policy response to persistent inflation differentials resulting from rigidities is to give the countries with the greater rigidities more weight than would result from final consumption expenditure shares when the euro area HICP is constructed from individual countries' HICPs. While this is an interesting theoretical idea, political concerns likely render it infeasible. Countries that have undertaken costly economic reforms may not want to give greater weight to countries that have been unable to summon the political will to do the same. In addition such a rule would reduce the incentives of countries with distortions to carry out fundamental economic reforms.

There is little that a central bank can do about inflation differentials resulting from rigidities and other distortions. There is, however, some evidence that stabilizing inflation reduces inflation differentials across countries. This seems sensible in that aggregate monetary policy shocks can cause inflation differentials if the monetary transmission mechanism differs between countries because of country-specific nominal or real rigidities and distortions.



DIRECTORATE GENERAL FOR INTERNAL POLICIES
POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

Inflation differentials and euro area monetary policy

Karl WHELAN

IN-DEPTH ANALYSIS

Abstract

The ECB has been given a mandate to maintain price stability for the euro area as a whole. As such, it does not need to concern itself directly with differences in inflation rates across its member states. However, there are occasions when differences in inflation reflect dangerous macroeconomic trends. For example, the pre-crisis differences in inflation reflected the impact on the periphery of a significant easing of credit conditions. At present, however, inflation differentials in the euro area are limited as a strong disinflationary trend has spread throughout the member states. With inflation so low, it is difficult for those member states with high debt levels to recover competitiveness without experiencing deflation. The ECB has a number of options that it can pursue to raise inflation and bring the euro area out of its slump. These include a large sovereign QE programme, targeting the euro exchange rate and changing its definition of price stability.

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EXECUTIVE SUMMARY

- The ECB has been given a mandate to maintain price stability for the euro area as a whole. As such, it does not need to concern itself directly with differences in inflation rates across its member states.
- However, there will be occasions when these differences in inflation reflect dangerous macroeconomic trends. For example, the differences in inflation between the core and periphery of the euro area during its first eight years reflected the impact on aggregate demand in the periphery of a significant easing of credit conditions.
- At present, however, the concern about inflation differentials in the euro area should be that they are too low. The cross-sectional standard deviation of inflation rates across euro area member states is currently close to historical lows as a strong disinflationary trend has spread throughout the member states.
- With inflation rates running at extremely low levels in almost all member states, it is not possible for those member states with high debt levels to recover competitiveness without experiencing outright deflation, which causes a number of economic and financial problems.
- Fiscal policy should be used to deal with the ongoing slump in aggregate demand in the euro area, with member states that have “fiscal space” undertaking expansionary policies such as public infrastructure investment programmes.
- Ultimately, however, the current disinflationary trend is the responsibility of the ECB, which is failing to meet its goal of keeping inflation close to two percent.
- The ECB should implement a policy of purchasing asset-backed securities constructed by packaging together loans to small and medium-sized enterprises. Concerns over credit risk should not be allowed to prevent this programme from being effective.
- The ECB has a number of more radical options that it can pursue to raise inflation and bring the euro area out of its slump. These include a large sovereign QE programme, targeting the euro exchange rate and changing its definition of price stability.
- While various structural reforms are desirable, there is room for fiscal and monetary stimulus to boost the economy, even without structural reforms. It is important not to confuse those policies that are desirable in the medium- and long-term with those that are necessary in the short-term.

1. INTRODUCTION

Modern economic thinking has come down on the side of Milton Friedman's view that inflation is a monetary phenomenon and, as such, there has been a move over the past number of decades towards giving central banks explicit responsibility for meeting an inflation target. For many European countries, a strong motivation for joining the euro was dissatisfaction with the inflation performance that had been delivered by their national central banks during the 1970s and 1980s. With the ECB having an institutional structure that resembled that of the Bundesbank, many states joined EMU with an expectation that the ECB would deliver low and stable inflation rates to all participating member states.

Overall, the ECB has done well in delivering the promised low rates of inflation. However, it has still been the case that there are often significant deviations in the inflation rates prevailing across different euro-area countries. This is not the fault of the ECB as it has neither the mandate, nor the tools, to deliver the same inflation rate to each member state. In relation to its mandate, monetary policy can act to complement or counteract the other forces that influence aggregate demand in a region, such as fiscal policy and credit conditions. This should allow it to set monetary policy in a way that generally achieves its medium-term price stability goals in the euro area by correctly matching aggregate demand with the economy's aggregate supply capacity. However, if fiscal and financial conditions vary across member states, then it is likely that inflation rates will also vary, and this has indeed been the case since 1999, with the euro area experiencing periods of systematic variations in inflation across countries, most notably between core and periphery countries.

It should be stressed that variations in inflation across member states are not, in themselves, a bad thing. They may reflect underlying macroeconomic forces that could be either problematic or benign. The inflation divergences of the early years of the euro were driven by a negative pattern: They reflected differences in credit conditions (and to some extent fiscal policy) across member states and these differences sowed many of the seeds of the current crisis.

In contrast, the more recent trend of inflation in peripheral countries being lower than in core countries should not necessarily be a source of concern. This trend reflects a painful but necessary rebalancing in which these countries regain competitiveness, thus improving their trade balances which in turn would translate into a reduction in private and public debt burdens that are currently very high in many of these countries.

In fact, I believe it would be better if variations in inflation across the euro area were higher than they currently are, with more inflation in core countries than we are currently seeing. The low level of variation is largely due to the current very low inflation rates in the euro area. Given the empirical importance of downward nominal wage rigidity and the problems caused by debt deflation when prices fall, the process of adjustment in Europe's high-debt countries would be far healthier if the ECB was hitting its inflation target. This would allow these countries to register steady improvements in competitiveness while avoiding the difficulties associated with outright deflation.

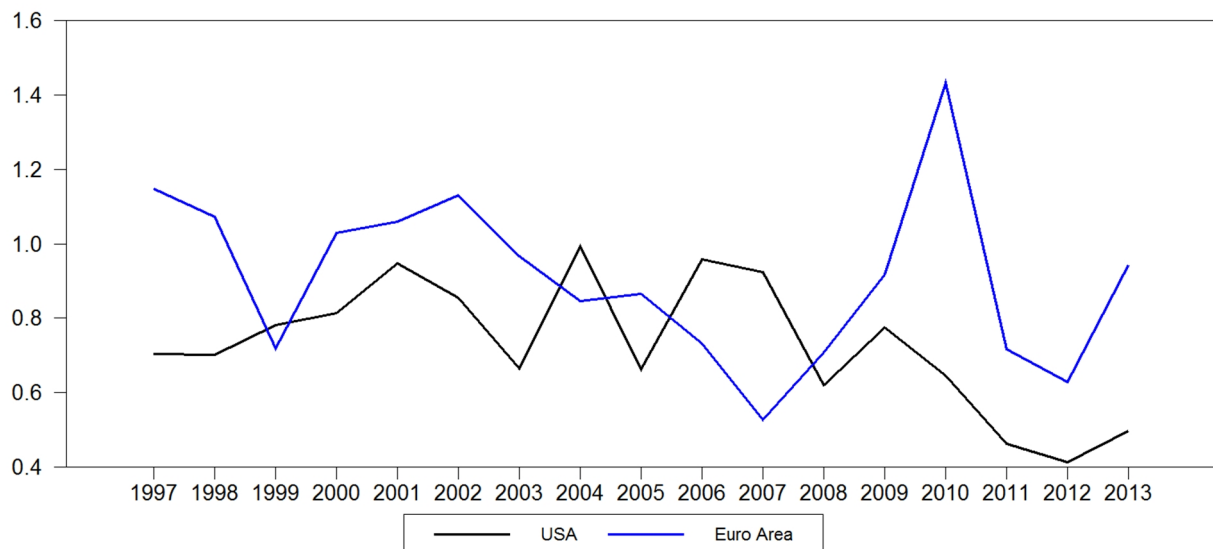
The rest of this paper discusses these points in more detail. Section 2 presents some facts on inflation differentials in the euro area. Section 3 discusses the factors underlying differences in inflation across member states prior to 2008 and Section 4 discusses the current situation and the role the ECB should be playing. Section 5 provides some concluding thought, including some points relating to the role of structural reforms in ending the euro area's slump.

2. SOME FACTS ON INFLATION DIFFERENTIALS

As discussed above, even within areas that share a common monetary policy, we should expect differences in local economic conditions to cause variations in inflation rates across regions. Figure 1 below plots annual data on the cross-sectional standard deviation of consumer price inflation rates for the first twelve euro area member states (the blue line) and compares these with the standard deviation of inflation rates across 27 US regions (the black line) using data obtained from the Bureau of Labor Statistics.

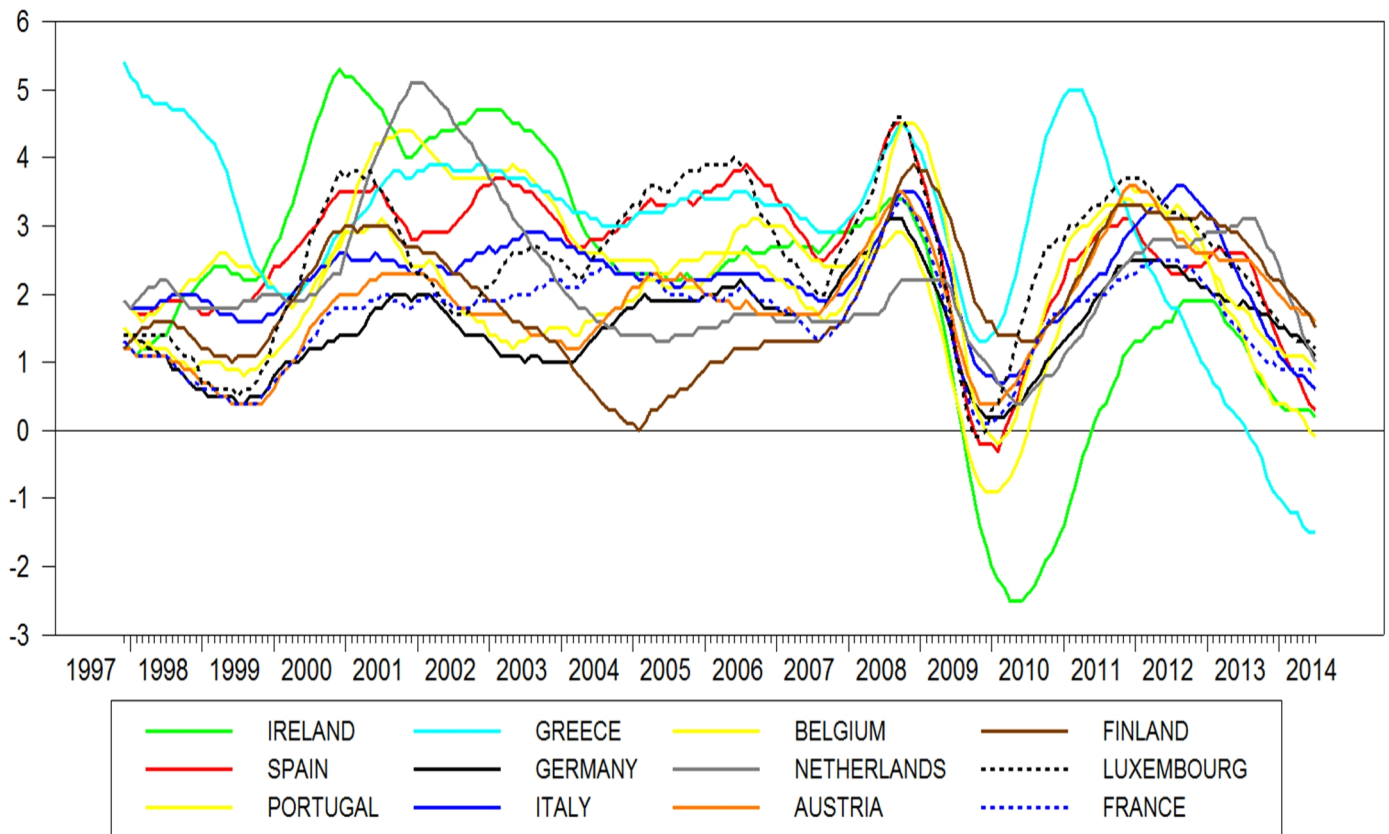
The figure shows that the standard deviation of inflation across euro area member states has generally been higher than for the United States. This would be expected given the greater differences in economic structures across the euro area as well as the significantly greater room to pursue different policies in relation to fiscal policies. However, the variation within the euro area is not that much higher than that observed in the United States. This suggests that there is nothing unnatural, *per se*, about the variation in inflation rates across euro area member states and so the ECB should not be any more concerned about these variations than the Federal Reserve

Figure 1: Standard Deviation of Inflation Rates Across Euro Area 12 and U.S.



Sources: Eurostat and Bureau of Labor Statistics

The more important question about variations in inflation is whether they represent economic factors that are desirable or undesirable. Here, it is necessary to examine each situation and relate it back to the forces generating the variations in inflation. Figure 2 illustrates the behaviour of inflation in the first twelve euro area member states since 1997.

Figure 2: Year-Over-Year Inflation Rates for Euro Area Members

Source: Eurostat

Though the large number of lines in the chart makes it difficult to use this graph to discuss developments in individual countries, it does illustrate a number of trends.

- While there are clear variations in inflation rates across member states at all times, there are also some noticeable common trends. In particular, inflation was stable in most of the member states from 2002 to 2007. Most states then experienced a jump in inflation in 2008 due to oil prices and then a sharp decline in 2009 due to the global recession. After this period, there was a common pattern of rising inflation rates through 2011 and early 2012 but this has been followed a strong pattern of falling inflation across all member states since mid-2012.
- The period prior to the global recession saw euro area states such as Ireland, Spain, Portugal, Greece and Italy—all of whom have subsequently gone through debt crises—record inflation rates that were consistently higher than recorded in Germany.
- There has been a reversal of this pattern in recent years, with Ireland and Greece most notably recording lower inflation rates than Germany. However, this is mainly a recent phenomenon and the “debt crisis” countries have still had much larger increases in their consumer price levels since the beginning of EMU than core countries such as Germany.

3. SOURCES OF PRE-CRISIS INFLATION DIFFERENTIALS

The differences in inflation rates that were observed across the euro area in its first eight years were part of a wider pattern that saw important imbalances build up.

In the years prior to EMU, there were wide variations across countries in the interest rates at which governments, households and firms could borrow at. With monetary policy run by national central banks and limited fiscal discipline, some countries had reputations for regular devaluations and the risk of these devaluations was priced into the cost of borrowing. As the prospect of devaluations receded in the run-up to EMU and then (apparently) disappeared altogether with the euro's introduction, yields on sovereign debt across all member states—which had previously differed substantially—converged within a narrow band and remained this way until 2009. See Figure 3 for the long-term sovereign bond rates of a selected group of euro area member states over this period.

Of course, with hindsight we can see that financial markets should have been pricing in some possibility of sovereign default in various euro area member states, particularly given the failure of the Stability and Growth Pact to deliver the fiscal discipline that many had envisaged prior to the introduction of the euro. Financial markets, however, had not seen a sovereign debt default in Europe in the post-war period. Instead, they were well attuned to the risks associated with currency devaluations. Despite substantial variations across euro area member states in their underlying fiscal positions, financial markets barely priced default risk into sovereign debt yields instead focused on celebrating the end of devaluations.

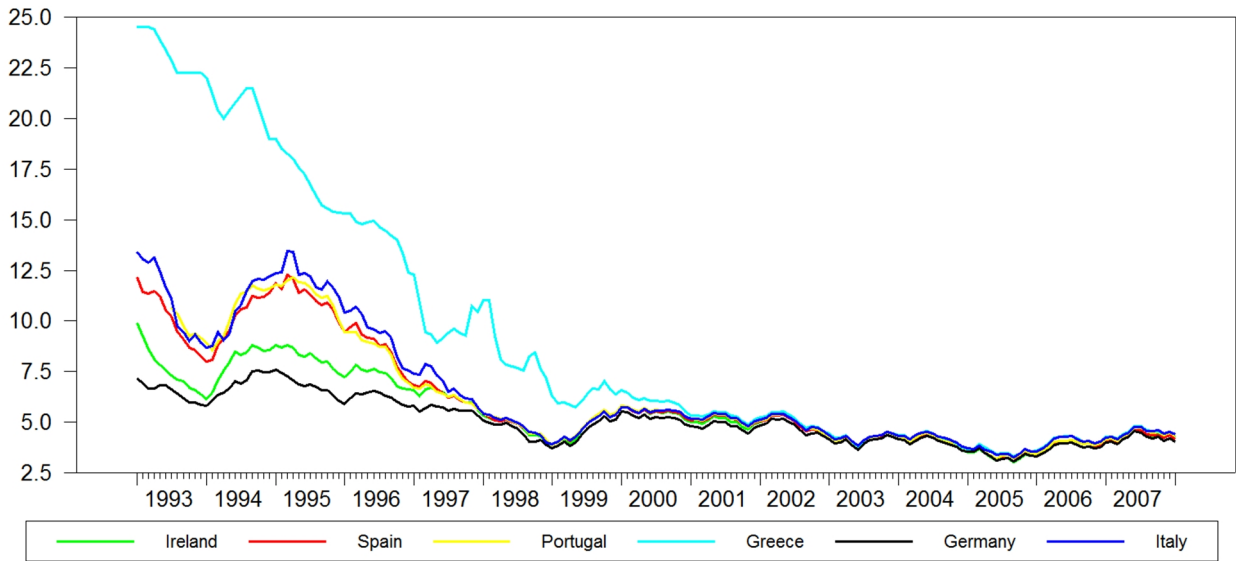
Private borrowing rates in euro area member states generally tracked sovereign yields after the introduction of the new currency leading to a substantial harmonisation of private borrowing rates across the area. While most of the pre-EMU academic debate had focused on differences in trade structures as a source of asymmetric shocks, this near-harmonisation of private borrowing rates proved to be a far greater asymmetric shock than had been envisaged by most of the commentators in this debate.¹ Figure 3 illustrates how asymmetric this shock was. Interest rates in Germany and other "core" euro members remained at pre-EMU levels after 1999 but private borrowing rates for firms and households in many other euro area states declined dramatically.

The elimination of devaluation risk also greatly encouraged intra-EMU financial flows. With borrowing costs well down and many willing providers of this cheap credit, it is perhaps unsurprising that private debt levels in the euro area's "peripheral" member states soared. Figure 4 illustrates how current account balances deteriorated in these countries as spending increasingly outstripped income while Figure 5 shows how this increased borrowing translated into ever-worsening net debt positions relative to the rest of the world.

It was these imbalances – aggregate demand fuelled by cheap credit – that were responsible for the higher rates of inflation in countries such as Ireland and Spain. The loss of competitiveness associated with these higher rates of inflation proved to be particularly damaging once the global financial crisis led to a re-pricing of risk and an end to cheap credit. Re-establishing cost competitiveness has been a painful but necessary process for the peripheral countries so that they can move towards running current account surpluses and thus stabilise and then improve their net debt positions.

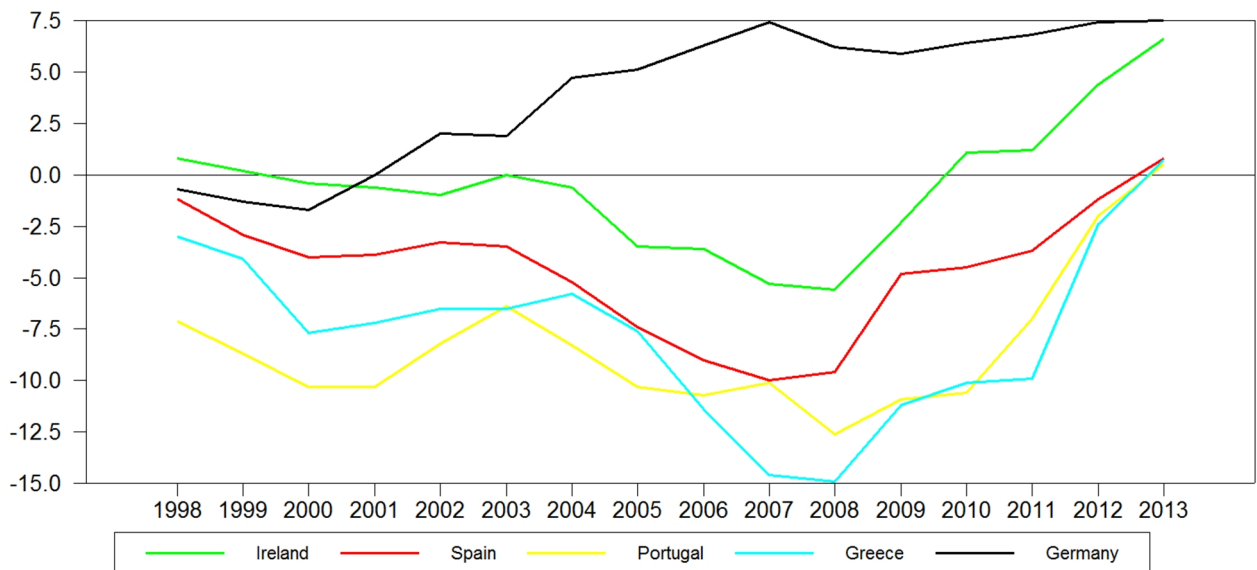
¹ Whelan (2013) discusses the pre-EMU debate about the euro and contrasts this with the events since 1999.

Figure 3: Long-Term Sovereign Bond Yields for Selected Countries



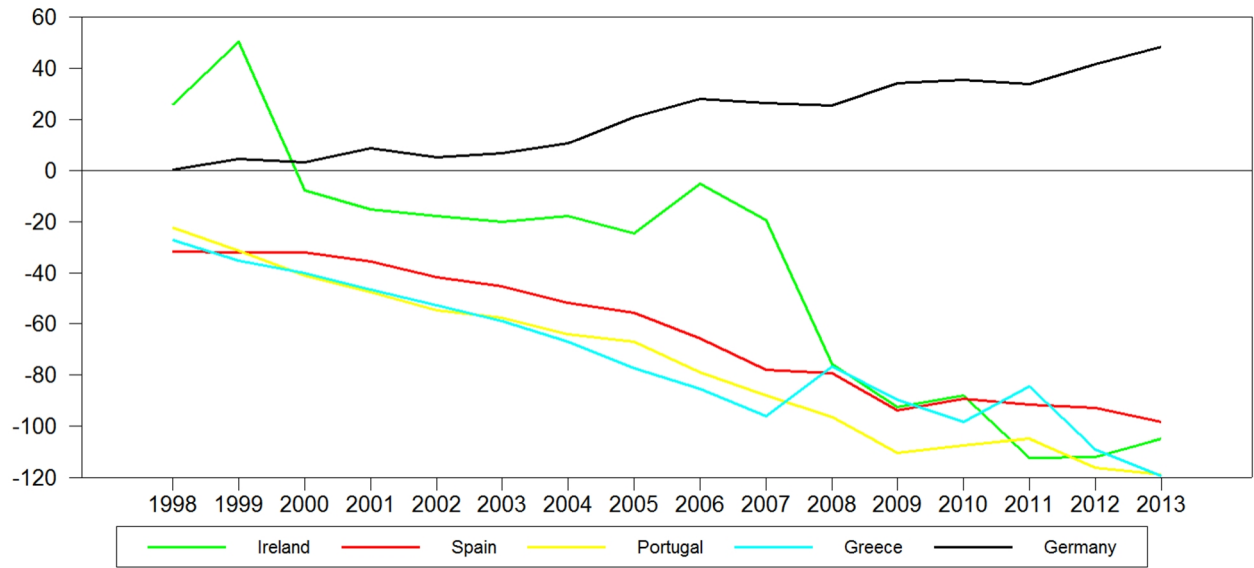
Source: ECB

Figure 4: Current Accounts Balance as a Percent of GDP for Selected Countries



Source: Eurostat

Figure 5: Net International Investment Position as a Percent of GDP for Selected Countries.



Source: Eurostat

4. THE CURRENT SITUATION

This section discusses the current situation relating to inflation and macroeconomic adjustment in the euro area. It then focuses on the role that macroeconomic policy can played in improving this situation.

4.1. Widespread Disinflation

The previous discussion illustrated how the introduction of the euro contributed to the imbalances that fuelled a specific pattern of inflation differentials across member states in the period up to 2008. However, there is nothing innately bad about differences in inflation rates across countries and the necessary process of unwinding the pre-crisis imbalances should also be associated with inflation differentials, this time of the reverse nature.

Specifically, those countries in the euro area with large debt burdens need to move towards running current account surpluses, which will then see a decline in their net international debtor positions. This process requires a rebalancing of these economies towards higher exports and relatively lower inflation rates are part of the improved competitiveness that is required to generate this outcome.

The turnaround in peripheral current account balances has been underway for a number of years. As Figure 4 shows, the years after 2008 have seen a gradual reduction in the size of current account deficits in the highly indebted countries. However, only Ireland is currently running a large surplus, while total debt levels are stabilising at dangerously high levels.

Against this background, the current configuration of macroeconomic policies in the euro area is doing relatively little to help these member states to recover their competitiveness and tackle their debt problems.

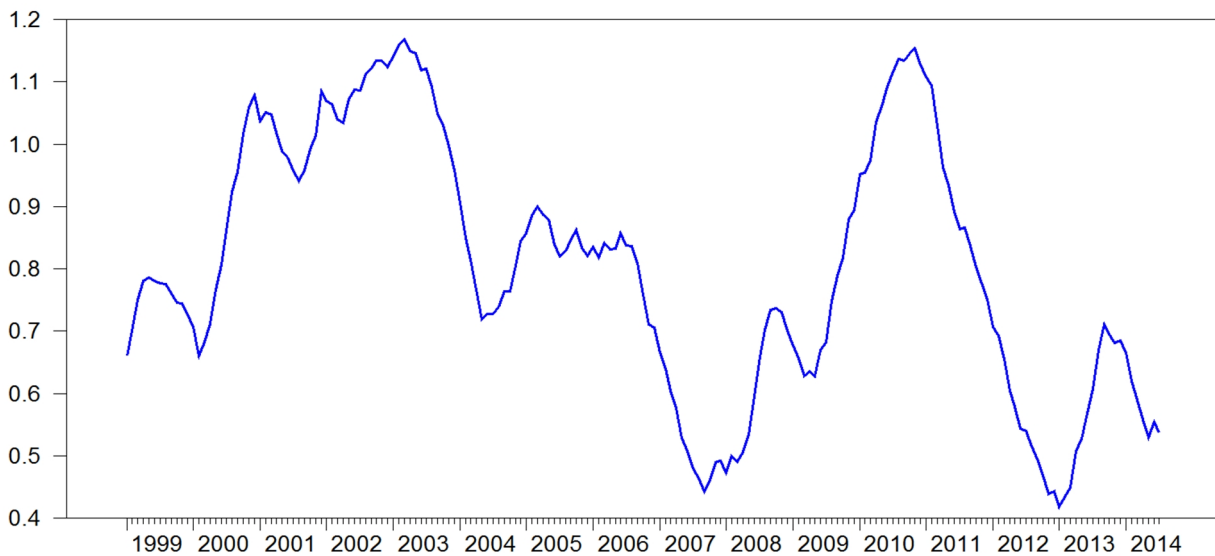
Figure 1 had shown the standard deviation of inflation rates across the euro area's first twelve members using annual data ending in 2013. What this chart fails to capture, however, is the widespread common decline in inflation over the past twelve months, something which can be seen in Figure 2. As illustrated below in Figure 6, this means that the cross-sectional variation in inflation in the euro area is now close its historic low point. Inflation is close to zero in a number of euro area member states but since the overall inflation rate for the euro area was only 0.3 percent in July, this means these countries are only making small gains in competitiveness. Inflation in Germany is a little bit higher, standing at 1.1 percent in July, but has been falling steadily over the past two years.

An important negative aspect of the current low inflation is the fact that the highly-indebted member states need to record negative inflation rates to make significant gains in competitiveness. This is problematic for two reasons.

First, there is an inherent resistance on the part of workers and trade unions to outright wage cuts. There is significant evidence on this phenomenon of downward nominal wage rigidity, with much of this research sponsored by the ECB.² For this reason, it is harder to improve cost competitiveness via outright wage cuts and deflation is more likely to be associated with labour market disruptions. Second, deflation generally reduces nominal income levels for workers and this raises the burden of existing private debts, thus putting more pressure on aggregate demand and on the financial system.

So, for many reasons, the euro area's process of rebalancing would be better achieved with a higher average inflation rate and, in particular, higher rates of inflation in core member states.

² See Babecký et al (2009).

Figure 6: Standard Deviation of Inflation for Across Euro Area 12: Monthly Data

Source: Eurostat

4.2. The Role of Macroeconomic Policy

What lies behind the current widespread slump in inflation? Falling energy prices provide a small part of the answer, but euro area inflation excluding the energy component was still only 0.5 percent in July. Thus, the principal explanation for the ongoing decline in inflation is a widespread shortfall in aggregate demand relative to aggregate supply that is having an impact across all of the euro's member states.

Against this background, the ideal policy mix would see national governments loosening their fiscal stance, meaning slower adjustment for these countries with large stocks of public debt and a temporary fiscal expansion from those countries that have fiscal space. It would also see the ECB using all of its tools to ease credit conditions, boost aggregate demand and raise inflationary expectations.

Credit Conditions

An important common factor underlying the current slump is the restrictiveness of credit conditions. Throughout Europe, banks are still restructuring their balance sheets to recover from the global financial crisis. Banks are taking a much stricter approach to risk-taking and are focused on boosting their capital ratios by deleveraging. While the upcoming announcement of the results of the ECB's comprehensive assessment may help in reducing uncertainty about bank fragility and in improving sentiment, European banks will be going through a process of adjustment to the Basle 3 regulations (and market-lead demands for higher capital ratios) for a few more years. As such, unless there are significant policy interventions, credit is likely to remain very tight in the euro area over the next few years.

Given these problems, there is a very strong argument for the ECB to intervene to improve the availability of credit, particularly to small and medium-sized enterprises which are highly reliant on the banking sector for access to credit. There has been some progress in recent months in this area but perhaps less than many people think.

Having written about this topic on a number of occasions, I am happy to welcome the ECB's new willingness to purchase asset-backed securities (ABS). However, it is disappointing that progress has not yet been made on the question of which institution should bear the

necessary credit risk. Despite apparently signalling a willingness to purchase ABS, the ECB's announcement had an important qualification that could severely limit the effectiveness of an asset purchase programme, namely that it would only purchase risky "tranches" of these securities if they were guaranteed by another body such as the European Investment Bank (EIB) or national governments. As of yet, however, there is no sign that national governments are willing to provide such guarantees and the EIB has already explicitly rejected the idea of playing this role.³

The absence of such guarantees could severely restrict the impact of an ECB purchase programme in generating new issuance. It is not possible to make large amounts of loans to SMEs without there being a risky element. If neither private nor public sector actors are willing to purchase sufficient quantities of the risky tranches of the ABS, then there simply may not be many new ABS issued for the ECB to purchase.

The unwillingness of various European bodies to take on this credit risk is unfortunate and short-sighted. Two points are relevant here.

First, ultimately, the creation of money by the ECB to purchase securities is a profitable activity for the euro area public sector as a whole. The credit risk associated with these securities could mean that the profits from these purchases are less than they would be if there were no defaults, but the purchases will still generate profits that will ultimately be passed back to national governments.

Second, given the revenue-sharing rule adopted by the Eurosystem, the credit risk associated with these purchases ultimately does affect national governments via variations in the rate of remittances from the Eurosystem. In this sense, the designation of which European body officially bears the brunt of this risk is arbitrary. Still, despite the lack of economic substance to this issue, it continues to be an important constraint on allowing the ECB to improve credit conditions in the euro area.

Fiscal Policy

Fiscal policy has also contributed to the widespread slump in aggregate demand. Despite relative calm in financial markets, which are pricing most euro area sovereign debt at extremely low yields, almost all of the member states are engaging in contractionary fiscal adjustments. Unfortunately, despite the evidence of a substantial deficiency in aggregate demand (and the distinct possibility that the euro area is slipping back into recession) the debate about policy options is still extremely tentative.

In relation to this debate, ECB president Draghi's recent comments (at Jackson Hole and at the September ECB press conference) are welcome.⁴ While Draghi's comments about using "the existing flexibility within the rules" and the usefulness of having "a discussion on the overall fiscal stance of the euro area" are sensitively phrased to avoid mentioning individual countries, it is clear that they are calling on those countries that have room for manoeuvre to help to stimulate aggregate demand. For example, with its current extremely low costs of borrowing, a German plan to borrow money to spend on public infrastructure would constitute expansionary short-term policy as well as sensible longer-term supply-side policy.

³ See the comments in April of the EIB's president: <https://mninews.marketnews.com/content/eib-hoyer-not-ready-large-scale-guarantees-abs-press>

⁴ Draghi's Jackson Hole speech "Unemployment in the Euro Area" can be found at: <http://www.ecb.europa.eu/press/key/date/2014/html/sp140822.en.html>

Of course, Mister Draghi has little influence on the fiscal policy stance of individual member states and the tentative nature of his proposals ("it may be useful to have a discussion ...") suggests little confidence that there will be much change in the overall fiscal stance of the euro area in the coming months. Draghi's backing for the Commission President Juncker's call for a large public European public infrastructure programme is also welcome but time will tell whether anything significant will come from this proposal.

Inflation Expectations

Finally, it should be remembered that the ECB still has other tools available to it beyond those announced in September.

For example, the ECB could announce a large-scale QE-style programme of sovereign bond purchases. Based on evidence from the UK and US, a programme of this sort, focused on long-term bonds, could be expected to reduce long-term interest rates in all euro area countries.⁵ While the macroeconomic impact of a QE programme may be relatively limited, it could play an important role in signalling that the ECB is serious about steering inflation back towards its target and thus help to raise inflation expectations and thus act to bring about the desired outcome.

A bolder policy could see the ECB announcing targets for the euro exchange rate that would see it fall in value relative to the euro area's major trading partners. Such a programme could be implemented either in a "soft" way by simply announcing a preferred trading range for the euro or in a "hard" way by actively intervening in the foreign exchange market. This latter approach has been labelled the "foolproof way to escape from a liquidity trap" by leading monetary policy expert Lars Svensson (2003). This plan is implemented by the central bank announcing that it is willing to buy and sell unlimited amounts of foreign exchange at an announced exchange rate. This currency depreciation will make imports more expensive, which will raise inflation. It would also help the euro area's high-debt countries to improve their current account balances with respect to countries outside the euro area.

A final radical policy would see the ECB revising its definition of price stability towards a target for the price level that would see it return to the levels consistent with two percent inflation from a particular point in the recent past onwards. In other words, the ECB could commit to reversing the shortfall in the price level due its ongoing failure to meet its inflation target. While this policy may seem radical, it would not require any constitutional change to the ECB's mandate as the ECB has always been free to interpret its price stability mandate in whatever way it wishes.

I doubt if we will see any of these policies implemented over the next few months but it should be stressed that they are all technically and economically feasible. If it does not implement them and continues to fail to meet its inflation target, the fault should lie solely with the ECB Governing Council.

⁵ See, for example, D'Amico et al (2012) and Joyce et al (2010)

5. CONCLUSIONS

The ECB has been given a mandate to maintain price stability for the euro area as a whole. As such, it does not need to concern itself directly with differences in inflation rates across its member states.

Having said that, there will be occasions when these differences reflect dangerous macroeconomic trends. For example, the differences in inflation between the core and periphery of the euro area during its first eight years reflected the impact on aggregate demand in the periphery of a significant easing of credit conditions. Given the ECB's new role as the single supervisory of Europe's banking system and the European Commission's widened role in assessing macroeconomic imbalances, we can hope that the build-up of future imbalances will be better dealt with using appropriate regulatory and fiscal tools.

At present, however, the more appropriate concern about inflation differentials in the euro area should be that they are too low. The cross-sectional standard deviation of inflation rates across euro area member states is currently close to historical lows as a strong disinflationary trend has spread throughout the member states. With inflation rates running at extremely low levels in almost all member states, it is not possible for those member states with high debt levels to recover competitiveness without experiencing outright deflation, which causes a number of economic and financial problems.

Ultimately, these problems are the responsibility of the ECB, which is failing to meet its goal of keeping inflation close to two percent. Thus far, the ECB has not taken sufficient steps to effectively counter the disinflationary trends in the euro area and the latest indicators suggest economic conditions in the area are weakening. The ECB continues to have significant unused tools at its disposal that can raise aggregate demand and boost inflation. If the euro area remains in a disinflationary slump, it will be fair to blame the ECB for failing to use these tools.

A final word is perhaps appropriate on the topic of structural reforms. As the ECB takes a more active role in battling the ongoing slump, Mario Draghi has intensified his rhetoric about structural reforms. The transcript of his September press conferences shows fifteen uses of this phrase.⁶ Draghi now says he has "concluded that there is no fiscal or monetary stimulus that will produce any effect without ambitious and important, strong, structural reforms."

It is hard to find a logic (at least one based on macroeconomic theory as we know it) for this argument. It is certainly the case the potential output growth in the euro area is currently low and can be improved by various policy reforms. However, it is also true that there is currently a very large shortfall between aggregate demand and the *current* supply potential of the euro area economy, a shortfall summarised in an unemployment rate of over 11 percent. So there *is room* for fiscal and monetary stimulus to boost the economy, even without structural reforms. In addition, to the extent that we are worried about deflation, the initial impact of structural reforms that boosted the supply capacity of the euro area would be to further depress inflation.

My point here is not to argue against structural reforms. There are many such reforms that can have an important positive effect over the medium- and longer-run (though we know little about the magnitude of their potential impact). But it is important for the ECB to take responsibility for its crucial role in the shorter-term macroeconomic management of the euro area and ECB officials continually placing structural reforms at the heart of discussions of this issue is unhelpful.

⁶ See <http://www.ecb.europa.eu/press/pressconf/2014/html/is140904.en.html>

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NOTES



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So far apart and yet so close: should the ECB care about inflation differentials?

**Zsolt DARVAS, Guntram WOLFF,
Olga TSCHEKASSIN**

IN-DEPTH ANALYSIS

Abstract

Inflation rates can differ across regions of monetary unions. We show that in the euro area, the US, Canada, Japan and Australia inflation rates have been substantially and persistently different in different regions, which was particularly substantial in the euro area. Inflation differences can reflect normal adjustment processes such as price convergence or the Balassa-Samuelson effect or can reflect the different cyclical position of regions. But they can also be the result of economic distortions resulting from segmented markets or unsustainable demand and credit developments fuelled by low real interest rates. In normal times, the ECB cannot influence such developments with its single interest rate instrument. However, unconventional policy measures can have different effects on different countries depending on the chosen instrument and should be used to reduce fragmentation and ensure proper transmission of monetary policy. The new macroprudential policy tools are unlikely to be practical in addressing inflation divergences. Overall it is crucial to keep the average inflation rate close to two percent so that inflation differences are possible without deflation in some parts of the euro area.

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EXECUTIVE SUMMARY

Inflation rates can differ across regions of monetary unions. We show that in the euro area, the US, Canada, Japan and Australia, inflation rates have been substantially different in different regions. For example, the price level in San Diego increased by 9.1% between 1998-2013 relative to the average while in Atlanta it decreased by 6.1%. In the euro area, the German price level fell by 5.5% relative to the average while the Greek price level increased by 16.6% between 1998 and 2011. The differences have therefore been persistent, and particularly substantial in the euro area.

Inflation differences can reflect normal adjustment processes such as price convergence or the Balassa-Samuelson effect. They can also reflect the different cyclical position of the region, because e.g. in regions undergoing economic slump and high unemployment, prices tend to increase less. Different composition of consumption can also explain different overall inflation rates in regions. But inflation differences can also be the result of economic distortions resulting from segmented markets and insufficient competition. In the euro area, before the global crisis, unsustainable demand and credit developments were fuelled by higher inflation, which reduced the real interest rates and thereby made borrowing cheaper.

In normal times, the European Central Bank (ECB) does not influence country-specific developments with its single interest rate instrument. In fact, pre-crisis literature showed that the monetary transmission to different euro-area countries was comparable. In crisis times, liquidity operations such as MRO (Main Refinancing Operations) or LTRO (Long Term Refinancing Operations) will be used differently by different banks depending on the strength of their balance sheets and the strength of the sovereign in which they have their main activity. Yet, such measures only mitigate failures in the financial system and help to improve the proper transmission of monetary policy. Asset purchases by the ECB could also have different effects in different euro-area countries, because assets are not uniformly distributed across countries. For example, French companies have issued about half of all outstanding corporate bonds in the euro area, and almost half of residential mortgage-based asset backed securities (ABS) have been issued in the Netherlands. In some other euro-area countries there was close to zero issuance of such securities. Unconventional policy measures can therefore have different effects on different countries depending on the chosen instrument. They are used to reduce fragmentation and improve proper transmission of monetary policy but they can also influence the area-wide inflation rate.

The new macroprudential policy tools are unlikely to be practical to address inflation divergences.

Overall, the primary responsibility for addressing unsustainable regional differences in inflation resides with national policy makers and the EU institutions responsible for surveillance. The ECB should keep the average inflation rate close to two percent so that inflation differences are possible without deflation in some parts of the euro area. It can use unconventional policy measures to steer the area-wide inflation rate or address financial fragmentation that hinders proper monetary policy transmission, but it should refrain from using unconventional policy measures to influence country-specific inflation rates.

1. INTRODUCTION

Regional inflation differences are a common phenomenon in larger currency areas. Sometimes, these inflation differentials are persistent. The mandate of central banks, however, refers to the area-wide inflation rate, which is simply the weighted average of the regional inflation rates. The euro area is also structured that way: the Governing Council of the European Central Bank (ECB) has clarified that it aims to maintain inflation below, but close to, 2 percent over the medium term for the area as a whole.¹

The definition of one central policy goal is not surprising: Nobel Prize laureate Jan Tinbergen formulated the famous Tinbergen rule according to which one needs at least one policy instrument for each policy objective. Accordingly, a central bank in a currency area could use its interest rate policy to influence the area-wide inflation rate, but it would need additional policy instruments if it should take into account inflation differences in the currency area. The question of the implications of inflation differentials for monetary policy is therefore also a question of what policy instruments should be available to the ECB. In current circumstances, the ECB like many other central banks, uses more policy instruments to fulfil its mandate. In addition, the ECB has been given macroprudential policy powers, which could in principle be used to address inflation differentials if they are judged to be harmful.

Inflation differentials were noted and discussed in the ECB and by academics prior to the crisis (de Haan, 2010, provides a survey). Angeloni and Ehrmann (2007) note that inflation differentials are substantial with a standard deviation of around 1%. Fendel and Frenkel (2009) examine whether inflation differentials have influenced the behaviour of the ECB since the launch of the euro. They hypothesise that the ECB has been less restrictive than euro area-wide developments would dictate, thereby preventing deflation in the low-inflation countries such as Germany pre-crisis. Beck, Hubrich and Marcellino (2009) show that factor market distortions and other structural characteristics were key reasons for inflationary differences. ECB (2012) takes a similar view and suggests that the mispricing of risk, overly optimistic expectations and inappropriate national policies play a role. However, ECB (2012) also acknowledges that non-standard monetary policy measures, not just national structural policy measures, are needed to prevent disorderly adjustments and to ensure proper monetary policy transmission. An important theme discussed in the literature is the need to have a certain level of minimum inflation for the area as a whole to allow for differences in inflation rates without having some countries in deflation. Sibert (2003), for example, argues that unexpected shocks that tip a country into deflation might be more costly than redistribution resulting from an unexpected inflationary shock. Therefore, a certain minimum level of inflation for the area-wide aggregate is warranted.

And indeed, while the clarification of the area-wide inflation target does not refer to inflation differences within the euro area, inflation differences are one of the three reasons given by the ECB Governing Council to explain the aim of close to 2 percent area-wide inflation. This rate would allow the ECB to *“provide a sufficient margin to address the implications of inflation differentials in the euro area. It avoids that individual countries in the euro area have to structurally live with too low inflation rates or even deflation.”*²

¹ Article 127(1) of the Treaty on the Functioning of the European Union (TFEU) defines the primary objective of the European System of Central Banks to maintain price stability, but does not present an operational definition. Such a definition was set by the ECB’s Governing Council: *“Price stability is defined as a year-on-year increase in the Harmonised Index of Consumer Prices (HICP) for the euro area of below 2%.”* The aim of close to, but below 2 percent inflation in the medium term is a clarification issued by the Governing Council. See: <https://www.ecb.europa.eu/mopo/strategy/pricestab/html/index.en.html>

² See the webpage cited in the previous footnote.

Inflation rates can differ for a variety of reasons within a monetary union. Inflation can, for example, be lower when the region in question is regaining price competitiveness if the price level relative to productivity is higher than in other regions. Higher productivity growth can also lead to higher inflation rates via the Balassa-Samuelson effect. A weak business cycle in a particular region could also reduce inflation relative to the area-wide average. Such developments are a normal part of adjustment in a monetary union.

However, there are cases of persistent inflation differentials, which can be a cause of concern. In particular, the first nine years of the euro was characterised by rapid increases in prices and unit labour costs in a number of euro-area countries, which can be assessed as excessive. The persistently high inflation and wage increases reduced the real interest rate relative to other regions of the monetary union, fuelling bubbles in some of the countries. Such long-lasting divergence in unit labour costs is often associated with significant changes in production structures and current account divergences. The corresponding build-up of debt caused significant problems later.

Persistently falling inflation or even deflation in some parts of a currency area can also lead to adverse developments, in particular when private and/or public sector indebtedness is high, because it will become more difficult to service high debt. When downward nominal rigidities are prevalent in a region, low inflation or deflation seriously hinders the allocation of production factors, and unemployment can increase substantially.

Low inflation in a region increases the real interest rate that borrowers in the region have to pay because nominal rates in a monetary union are in principle identical for assets with similar risk. The problem is compounded when financial fragmentation prevents the equalisation of nominal interest rates for similar businesses in different regions and thereby even the nominal interest rate can be higher in a region facing low inflation. The combination of low inflation and somewhat higher nominal interest rates leads to substantially higher real interest rates. The economic literature documents how such high real interest rates undermine production and investment and are a severe obstacle to growth and recovery³.

Differences in inflation rates across regions of a currency area can make the monetary policy sub-optimal for many or perhaps even all regions ("one-size does not fit all"), even if monetary policy is optimal for the aggregate of the currency area. Moreover, when there are sizeable differences in inflation across the monetary union, it is especially crucial to reach the area-wide objective of 2 percent to prevent some countries or regions facing too-low inflation or deflation and the associated problems.

For all these reasons, the magnitude, causes and consequences of inflation differentials in a currency area have to be carefully analysed when assessing monetary policy. In this briefing paper we first compare the persistence of inflation differentials between euro-area countries in comparison with inflation differentials within the United States, Canada, Japan and Australia. The final section assesses the consequences of such differentials and their implications for monetary policy.

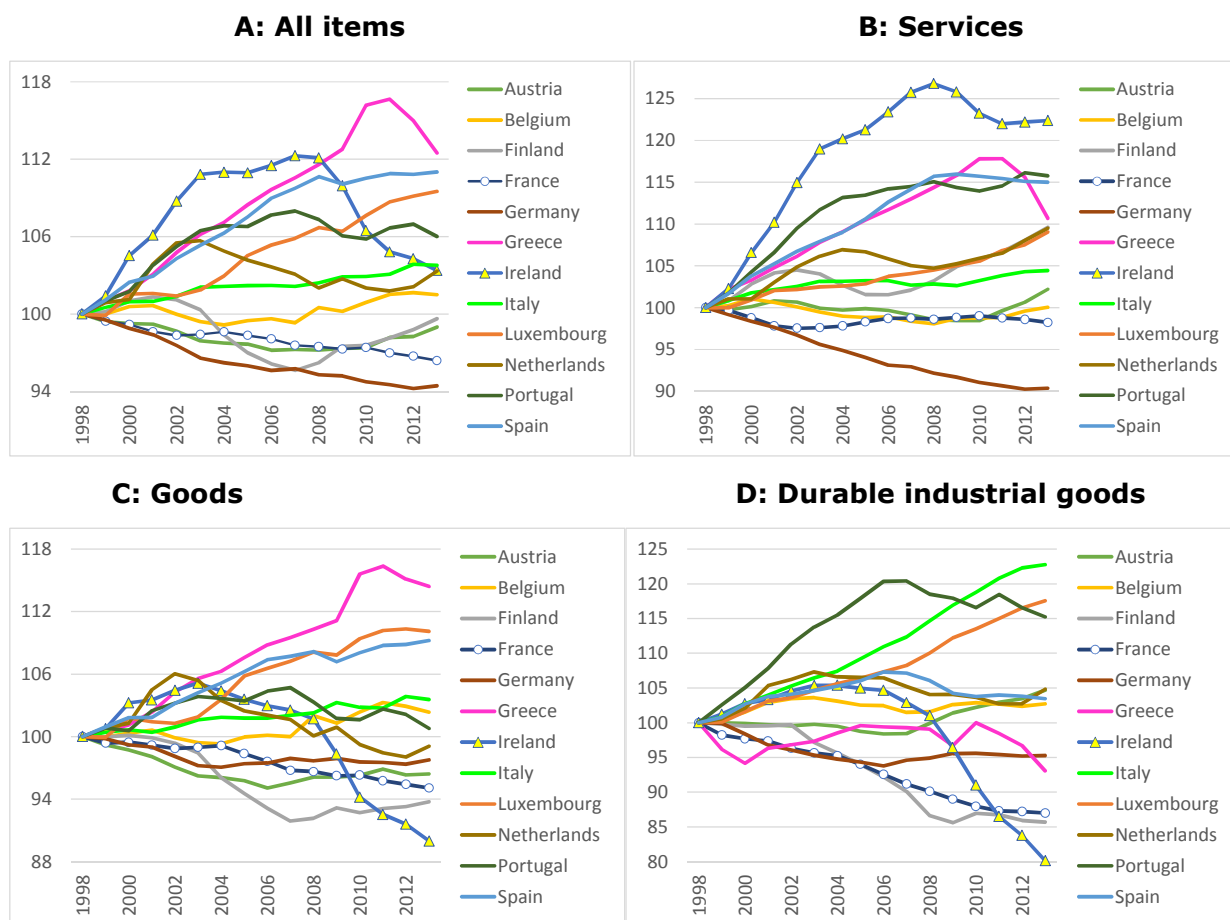
³ See For example, Garcia and Wolff (2014).

2. THE MAGNITUDE AND PERSISTENCE OF INFLATION DIFFERENTIALS WITHIN CURRENCY AREAS

Figure 1 reports the cumulative consumer price inflationary differences relative to the average of the euro area for the initial 12 countries that joined the euro. Relative to the headline inflation rate (all items) before the crisis, inflation was persistently above average in Ireland, Greece, Luxembourg, Spain and Portugal, and below average in Germany, Finland, Austria and France. During the crisis, the differential increased initially in Greece (partly due to increases in consumption taxes), but declined later. There was a major relative decline in Ireland and a smaller decline in Portugal, while in Luxembourg and Spain the cumulative inflationary difference remained or even increased further. Among the pre-crisis low-inflation countries, there was an increase in Austria and Finland, but not in Germany and France.

The two major components of the consumer basket, goods and services, show even wider variations in different countries and over time than the headline index. Even the sub-index of durable industrial goods, which includes items that are the most exposed to foreign trade and competition, shows very diverse developments in different euro-area countries.

Figure 1: Inflation developments in euro-area countries relative to the euro area average (1998 = 100)

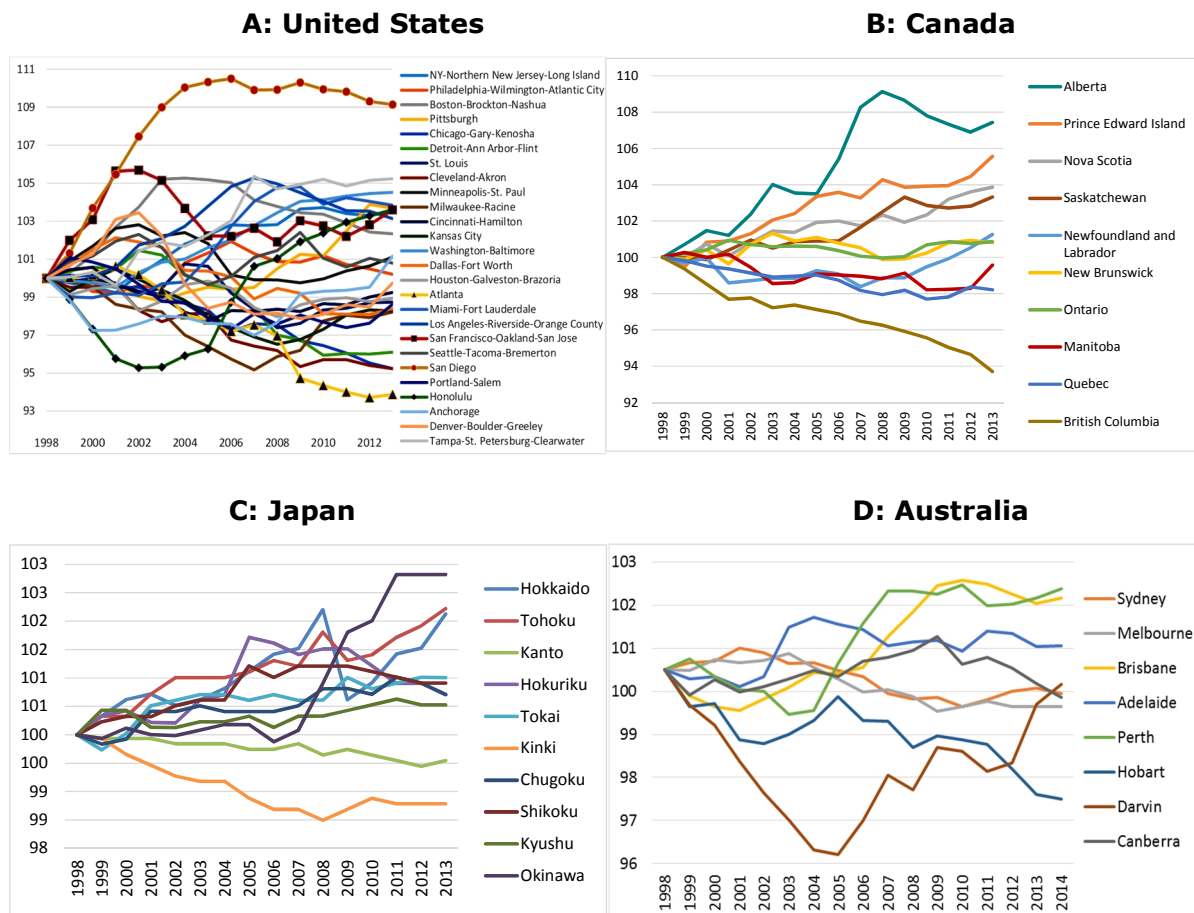


Source: Eurostat's Harmonised Index of Consumer Prices (HICP) database.

Within-country differences, including their persistence, are somewhat smaller in the US and Canada than in the euro area, and significantly smaller in Japan and Australia (Figure 2). Taking the US example, Figure 2 shows that the price level in San Diego increased by 9.1% relative to the average between 1998-2013 while in Atlanta it decreased by 6.1%. In Canada, the increase relative to the national average in Alberta was about 8-9%, while in British Columbia there was a fall of more than 6% during the same period. Persistent differences in inflation rates are therefore not uncommon for monetary unions. However, in Japan and Australia the regional differences are much smaller. In Japan the difference between the districts with the highest and the lowest inflation relative to the national average is 4 percentage points while it is 4.6 percentage points in Australia when looking at state capitals. In Canada the difference in inflation between the ten main provinces amounts to 13.7 percentage points, while in the US there is a differential of 15.3 percentage points for the 26 key metropolitan areas.

While in Canada and Japan these differences look rather persistent, it is the opposite for the US. Most US metropolitan areas alternate between higher and lower inflation than the national average. In Australia some state capitals have a persistent positive or negative inflation differential relative to the national average; others like Perth or Brisbane, however, switch between periods of positive and negative inflation differentials. Darwin, for instance, had the highest negative inflation differential between 1998 and 2005, but this was later compensated for by higher inflation, and in the full period of 1998-2014 the cumulative difference relative to the national average was almost zero. In the euro area, by contrast, most inflation differentials had a rather persistent nature between 1998 and 2013, with the notable exception of Ireland. The cumulated difference between the country with the highest rate (Greece) and the lowest rate (Germany) was a staggering 23 percentage points in CPI developments in 2011 compared to the base year of 1998.

Figure 2: Regional inflationary developments in US, Canada, Japan and Australia relative to the national average (1998=100)



Source: Bureau of Labour Statistics, Statistics Canada, Statistics Bureau Japan, Australian Bureau of Statistics

Note: Due to regional data availability constraints we use 25 metropolitan areas for US, 10 main provinces for Canada, 10 districts for Japan and 8 state capitals for Australia. For Australia, the 2014 data is the average of the first two quarters of the year.

3. THE CONSEQUENCES OF INFLATION DIFFERENTIALS AND POLICY IMPLICATIONS

When prices and wages increase faster than productivity in a region within a monetary union, significant imbalances can emerge because of deteriorated competitiveness. The higher inflation rate drives divergence further, by making borrowing cheaper in real terms and thereby fuelling credit inflows and sustaining further demand that again contributes to inflation. As a result, inflation divergences can become quite persistent until creditors start doubting the solvency of their debtors⁴. Without a stand-alone exchange rate and monetary policy, the correction of such imbalances is painful and difficult. Financial constraints can drive up nominal interest rates in the region compared to the area-wide average, increasing the real interest rate and pushing the region into a cyclical downturn. The weak supply of tradable goods and net exports further reduces growth and increases unemployment. The cyclical downturn and high unemployment in turn rebalances the earlier inflationary divergence.

Regaining the lost competitiveness through price and wage disinflation is a slow process. If wage developments have gone unchecked for too long and the loss of competitiveness is significant, the tradable goods sector might have lost substantial market share and the industrial sector is accordingly weak. It might be difficult to regain strength in this sector in particular if certain skills are lost. Moreover, wages typically do not fall in nominal terms because of heavy resistance from workers. As a result, the adjustment speed is limited.

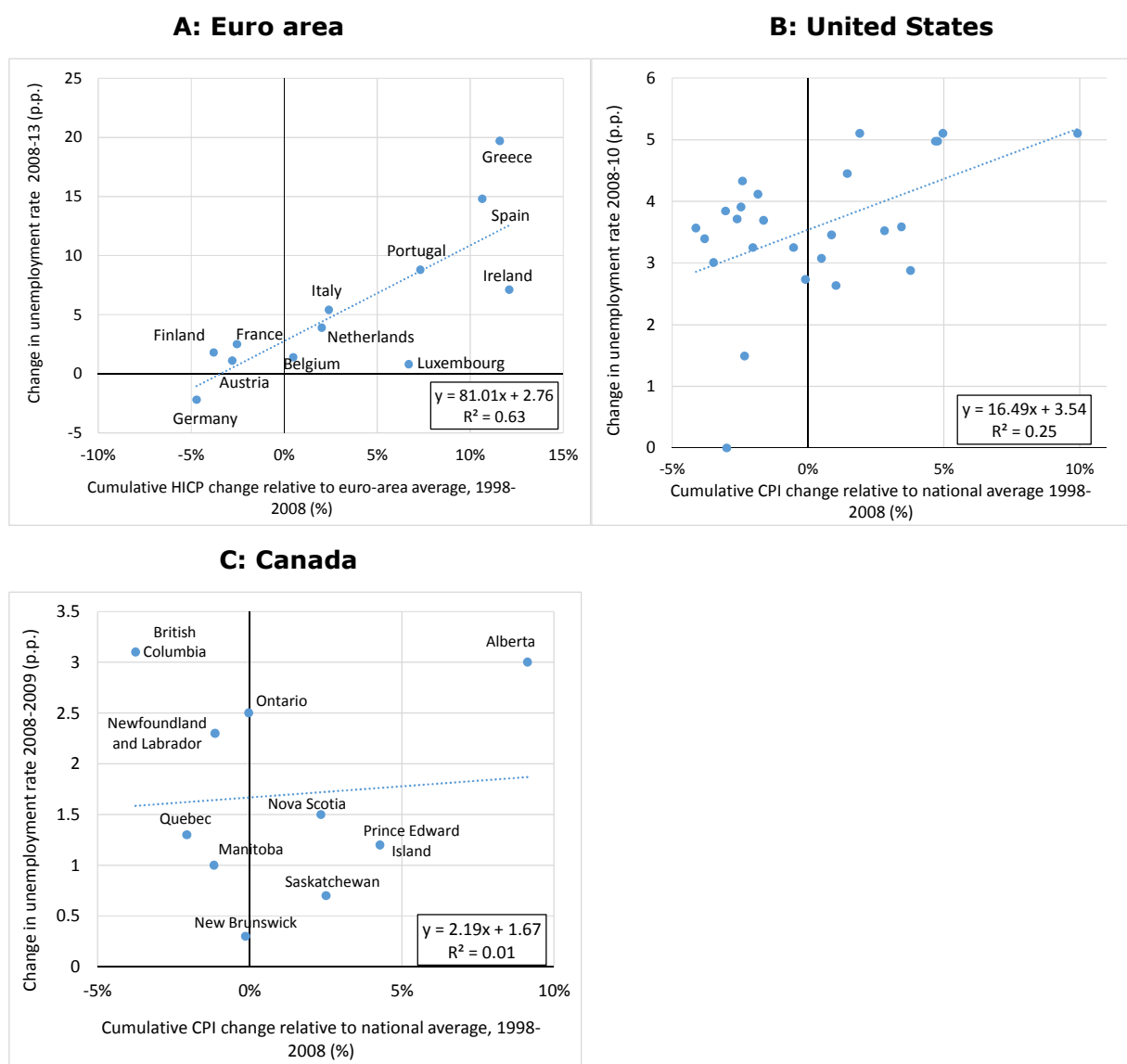
More worrying than inflation differentials as such is, however, the much more significant increase in unemployment in those euro-area countries that had higher inflation rates prior to the crisis (Figure 3). In the main US metropolitan areas unemployment developments were less diverse, less related to pre-crisis inflation and less persistent, while in Canada differences were even lower than in the US⁵. This suggests that persistent inflation rate differentials are a particularly big problem in Europe's monetary union. Other adjustment mechanisms such as labour mobility or financial and fiscal risk sharing, are far less developed than in the US or Canada, which makes those inflation differences more problematic in the euro area (van Beers et al, 2014; Sapir and Wolff, 2013).

This situation raises significant questions for the European Central Bank and in particular for the conduct of monetary policy and macroprudential policies.

⁴ Darvas and Merler (2013) argue that regional differences and macroeconomic imbalances can hamper the proper transmission of the ECB's monetary policy.

⁵ Figure 3 shows that the largest increase in US regional unemployment rate was about 5 percentage point, much below the largest value for the euro area, which was 20 percentage points for Greece and therefore US developments were less diverse. The coefficient of determination (R^2), which measures the goodness of fit of the regression line, was 0.63 for the euro area and 0.25 for the United States, underling that the relationship was much weaker in the US than in the euro area. Since the peak in unemployment was in 2010 for the US, in panel B of Figure 2 we show the increase in unemployment from 2008-2010. If we extend the sample period for the US up to 2013, the R^2 falls to 0.05, suggesting practically no relationship and lower persistence than in the euro area.

Figure 3: Pre-crisis inflation differentials and the increase in unemployment during the crisis



Source: Bruegel calculation using data from Eurostat and BLS. Note: the dots on panel B indicate 26 US metropolitan areas. The peak in unemployment was in 2013 in the euro area, in 2010 in the US and in 2009 in Canada, therefore we show the change in unemployment from 2008-2013 for the euro area, from 2008-2010 for the US and from 2008-2009 for Canada.

3.1 Monetary policy

An important question for the ECB is how to decide on and implement monetary policy when there are inflation differentials. In principle, monetary policymakers in a currency area (even when there are different regional inflation rates) should base their decisions on the average inflation rate and average economic developments. In changing a single interest rate, i.e. only one policy instrument, they can influence only the average developments, according to the Tinbergen rule. In fact, before the crisis, monetary policy was found to have roughly similar effects throughout the euro area (Angeloni and Ehrmann 2003). A cut to the ECB main rate therefore led to a roughly similar lowering of the rate in all euro-area countries. Even though transmission channels are different, the work of the ECB showed that the overall effect on inflation in the EU countries was comparable. Currently however, it is less certain if monetary policy has roughly comparable effects on

all euro-area countries. While an empirical assessment of different transmission effects is difficult to undertake in the current circumstances, there are a number of reasons to think that policy transmission has become less even.

First, an important transmission channel for monetary policy is the banking system. If the quality of the banking system's balance sheets is low, a reduction or increase in interest rates might not be transmitted to firms and households. As a consequence, monetary policy would not have the desired effect on economic activity and inflation. Bank credit default swap spreads in different countries suggest that the healthiness of bank balance sheets differed and still differs in different euro-area countries, and thereby the transmission of monetary policy likely differs too.

A second reason for different effects in different countries is that nominal interest rates have reached the zero lower bound. As a consequence, "unconventional" monetary policy measures such as targeted longer-term refinancing operations (TLTRO) purchases of asset backed securities (ABS) and bank covered bonds have been decided on.

The take-up of TLTRO will likely be different in different euro-area countries, depending on their access to private long-term financing options. So far, the main refinancing operations (MRO) and the two 3-year longer term refinancing operations (LTRO) also channelled liquidity unevenly across the euro area (see Figure 4). In particular, while before the crisis banks in Germany relied extensively on ECB liquidity, during the crisis liquidity was provided to banks suffering from particular stress, which were often banks in countries at risk of low inflation. However, it is important to note that the liquidity operations are not defined based on geographic criteria.

In terms of asset purchases, the eligibility criteria cannot and should not include geographic location. However, the size, liquidity and characteristics of such markets are different in different countries. For example, almost half of euro-area residential mortgage-based ABS has been issued in the Netherlands (the outstanding stock was €250bn in 2013Q4), while in France the outstanding stock was very small (€10bn)⁶. As a result, the purchases will have different impacts on different countries.

A third reason lies in the still remaining financial fragmentation. While financial fragmentation was much greater two years ago than now, there are still differences in interest rates for assets of comparable quality. This fragmentation means that policy signals do not get transmitted equally to capital markets.

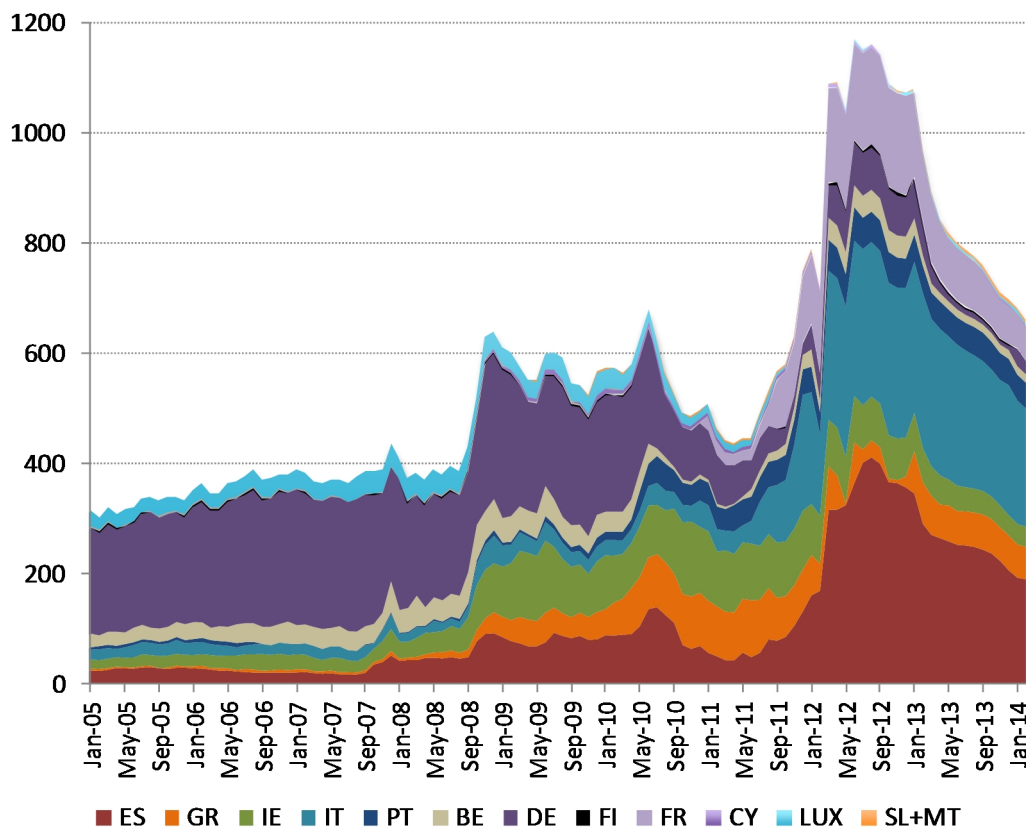
Monetary policy in current circumstances therefore can take into account the heterogeneity of the monetary union, including inflation differentials, because it employs more than one policy instrument that can have a different impact in different countries. However, the ECB's primary objective is to maintain price stability in the euro-area as a whole and the ECB should consider regional differences only to the extent that they have an impact on its mandate. For example, when financial fragmentation hinders the proper transmission of monetary policy in some regions, measures to improve the transmission mechanisms are justified. For example, some central bank policy measures are specifically targeted at addressing fragmentation in specific markets. The ECB's Outright Monetary Transactions (OMT) programme announcement was the most important policy measure to address fragmentation. Such measures are justified if they ensure the proper functioning of monetary policy and contribute to fulfilling the mandate of the ECB.⁷ Also, when too-low inflation or deflation in certain regions can threaten the achievement of area-wide financial

⁶ See a detailed examination of the outstanding stocks of various assets that the ECB could purchase in Claeys et al (2014).

⁷ See Darvas (2012) and Wolff (2013, 2014).

stability, the ECB should be especially vigilant and act, within its mandate, to minimise threats to financial stability. For example, lasting deflation in Italy would undermine public debt sustainability, which in turn could have negative repercussions for financial stability and inflation in the euro area as a whole. To avoid deflation in Italy at time when average euro-area inflation is well below the 2% threshold, the ECB should step-up efforts to push average euro-area inflation back to the 2% threshold in order to allow intra-euro inflationary divergence without any country falling into deflation. But the ECB should not try to balance inflationary differences, which are the results of economic distortions resulting from segmented markets and insufficient competition.

Figure 4: Use of Eurosystem liquidity (in EUR bn, 01/2005 – 02/2014)



Source: Updated from Pisani-Ferry and Wolff (2012) using data from the ECB and national central banks.

Overall, while monetary policy measures in normal times only take into account the average developments in the monetary union, in times of crisis or financial fragmentation the impact of non-conventional measures on different jurisdictions must be considered. In aiming to fulfil its mandate, the ECB has to ensure that monetary policy transmission operates properly and that it contributes to financial stability throughout the union. In current circumstances, it is particularly important that the ECB achieves its goal of an inflation rate close to 2% in order to allow the process of adjustment to go on without countries that need to regain competitiveness having to fall into deflation.

3.2 Macroprudential policies

The key question for macroprudential policy is if the ECB should use some of its new macroprudential powers when inflation in a country becomes significantly higher than the average inflation rate⁸. There is no easy answer to this. Macroprudential policies can certainly play a role in dampening excessive credit developments in some regions and could thereby be used to reduce inflation divergences from the average. However, the ECB needs to be cautious and act only when there is an objective risk or an imbalance emerging. As we have argued, many inflation developments and deviations from the average are normal developments in a large currency area and reflect underlying structural changes or adjustments. The ECB is therefore confronted with a significant information problem. It needs to assess in real time whether a certain regional inflation development is an equilibrium development reflecting sustainable underlying fundamentals or whether there is a need to act pro-actively, which is a difficult task. When using country-specific macroprudential tools, the ECB would face significant political-economy problems as it would need to act against substantial national interests. Overall, while macroprudential tools would allow the ECB to address country specific inflation rates, their practical value may be less than is often suggested.

In conclusion, we have argued that monetary policy should above all ensure that area-wide inflation does not fall below the 2% objective. This would allow the adjustment process in terms of different inflation rates to continue between euro-area countries, without any country entering deflation. Persistent deflation in some countries would endanger public debt sustainability and thereby undermine financial stability and inflation in the euro area as a whole. The ECB should use unconventional policy measures to achieve the 2% area-wide objective and also to reduce financial fragmentation and improve monetary transmission in countries that undergo deep structural adjustments in the wake of too-high inflation in the past.

⁸ Macroprudential policy can at best address credit booms and high inflation, but its scope is certainly very limited in fostering credit growth and reversing low inflation during an economic downturn.

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Inflation differentials in the euro area

Anne SIBERT

IN-DEPTH ANALYSIS

Abstract

This note describes how inflation differentials can arise in a common currency area. It explains that some of the differences in inflation are desirable and that the ones that are harmful are the result of distortions that cause consumers in different countries to face different prices for the same goods. Fundamental economic reform of these distortions is the responsibility of the national governments; there is little that the central bank can do.

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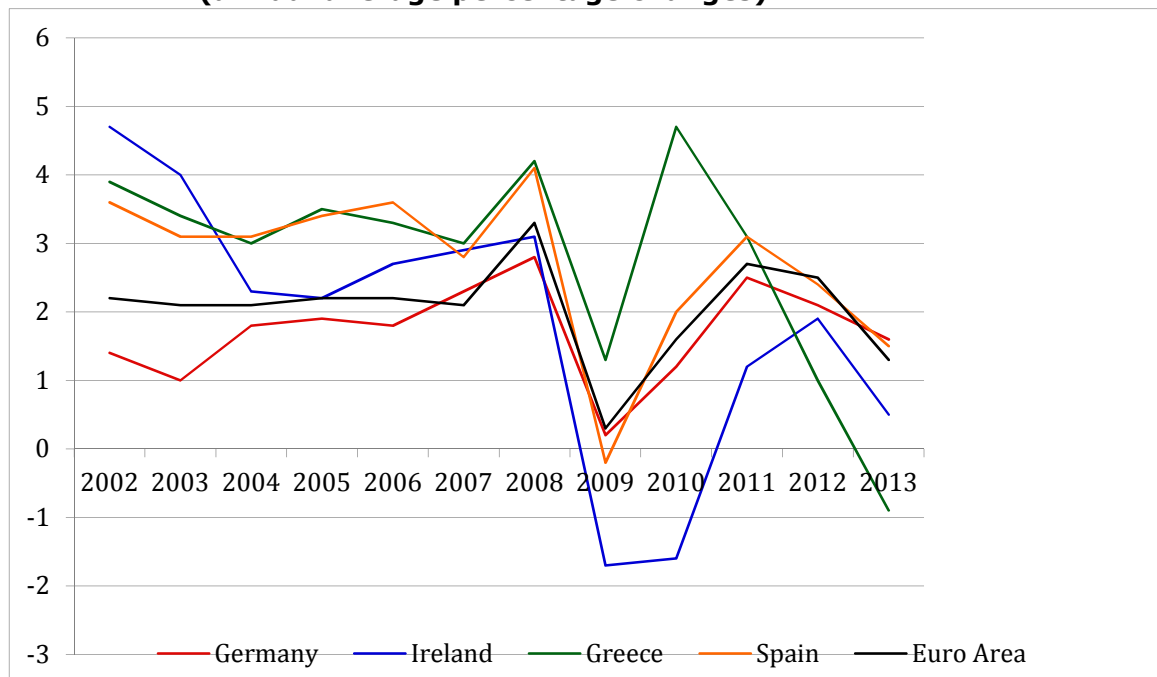
EXECUTIVE SUMMARY

- Prior to the financial crises inflation was persistently higher in some euro area countries than in others and since then it has been significantly more variable in some countries than in others. Differences in the path of inflation across countries in a common currency area could be due to different measurement methods, different consumption baskets or to households in different countries paying different prices for the same goods.
- Euro area policy makers have attempted to ensure that inflation is measured consistently across countries. Unfortunately, owner-occupied housing consumption is omitted from the HICPs. This causes actual and measured inflation to diverge in different ways across countries.
- Some countries' inflation is weighted more heavily than others in the computation of euro area inflation. Thus, in its conduct of monetary policy the ECB puts more weight on some countries than on others. This may result in some countries having more variable inflation than others.
- Even if households in different countries in a common currency area pay the same price for each good, they can have different inflation because they consume goods in different proportions. If the relative price of a particular good goes up, then this tends to increase inflation more in countries that consume proportionally more of the good that has become relatively more expensive.
- A country in a common currency area might experience more inflation than other countries in a common currency area if it has lower long-run real output growth; if it is in an earlier stage of development; if the relative prices of its imports from outside the common currency area are rising faster than the relative prices of the imports from outside the common currency area of other countries in the common currency area.
- Because of distortions, households in a common currency area can pay different prices for the same good and this can lead to inflation differentials.
- Inflation differentials in a common currency area that are caused by different consumption baskets are desirable. Relative price changes ensure that resources are allocated efficiently. Distortions that cause households to pay different prices for the same goods are usually harmful.
- With a common risk-free nominal interest rate, higher inflation in one country in a common currency area can be associated with a lower interest rate in that country. This might or might not be associated with an incentive for the government of that country to borrow more than it otherwise would and it might lead to an increase in demand that would tend to perpetuate the positive inflation differential.
- Suppose that members of a common currency area abandoned the common currency and moved to a system of floating exchange rates. Even if each country attempted to attain the same inflation rate it is not obvious that the inflation differentials would be less severe than they were in the common currency area.
- The problem is not the inflation differentials that are the result of different consumption baskets and relative price changes. Instead, it is the distortions that lead to households facing different prices for the same good and, hence, to inflation differentials. The responsibility for dealing with these distortions lies with the national governments. There is little that the central bank can do about them.

1. INTRODUCTION

As seen in Figure 1, below, despite having a common currency, euro area countries have experienced large and persistent (measured) inflation differentials. Since the inception of the euro area and until the credit crisis of 2008, inflation in Ireland, Greece and Spain, for example, was persistently higher than inflation in the euro area as a whole. Inflation has also been more variable in some countries than in others; inflation in Ireland and Greece, for example, has been subject to greater swings since 2008 than inflation in Germany.

Figure 1: Inflation Rates in selected euro-area countries (annual average percentage changes)



Source: Eurostat, http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database

The inflation rates in Figure 1, above, are annual percentage inflation rates as measured by the HICPs and there are three reasons why these inflation rates might differ across countries in the euro area. First, measuring inflation is not straightforward and it is possible that some of the differences in measured rates is due to different measurement methods in different countries rather than to differences in actual inflation. Second, different countries have different consumption baskets. Third, different countries can pay different market prices for the same good.

2. WHY ARE THERE INFLATION DIFFERENTIALS IN THE EURO AREA?

2.1. Measuring inflation in the euro area

In the euro area the ECB operationalises its price stability mandate as the pursuit of an annual inflation rate, in the medium term, below but close to two percent for the euro area Harmonised Index of Consumer Prices (HICP), which is calculated as a weighted average of individual countries' HICPs. The aim in establishing the HICPs was to provide the statistical means necessary for calculating comparable indices of consumer prices. Article 4 of Council Regulation (EC) No. 2494/95 of October 1995 concerning harmonised indices of consumer prices states:

HICPs shall be considered to be comparable if they reflect only differences in price changes or consumption patterns between countries. HICPs which differ on account of differences in the concepts, methods or practices used in their definition and compilation shall not be considered comparable.

The HICPs are Laspeyres-type indices. With a Laspeyres index, inflation between a past reference period and the current period is computed by calculating the ratio of the value of the reference-period consumption basket at current prices to the value of the reference-period consumption basket at the reference-period prices. So, for example, if there are two types of goods, type 1 and type 2, and the reference period is period zero, then the Laspeyres index for period one is:

$$L_{01} = \frac{p_1^1 c_0^1 + p_1^2 c_0^2}{p_0^1 c_0^1 + p_0^2 c_0^2} = w_0^1 \frac{p_1^1}{p_0^1} + w_0^2 \frac{p_1^2}{p_0^2}, \text{ where } w_0^i = \frac{p_0^i c_0^i}{p_0^1 c_0^1 + p_0^2 c_0^2}, \quad (1)$$

where p_t^i is the price of good i in period t and c_0^i is consumption of good i in period 0, $i = 1, 2$; $t = 0, 1$. Using the index, inflation between period zero and period one is then found as $(L_{01} - 1) \times 100$ percent.¹

In practice the weights on the price ratios in the HICP indices are the shares of the aggregate consumption of households on the particular type of good as a proportion of total expenditure on all types of goods. The index is computed in a pyramid style with the types of goods in the index being quite broad and the price of a particular broad class of goods being itself an index of more narrowly defined goods. The price of the more narrowly defined goods is an index of yet more narrowly defined goods.

There are many complications associated with computing price indices. Some of these are the following. How often should the reference period be updated? What should be done about new goods or goods where the quality changes over time? How should goods such as housing that have both an investment and a consumption component be included? Should the prices used in the index be prices at stores or those on the internet?²

¹ The alternative to Laspeyres Indices are Paasche Indices which compare the value of the current-period consumption basket at current prices with the value of the current-period basket at reference-period prices. Consumer price indices must be computed frequently and quickly. This makes the Laspeyres Index appealing, as it does not require computing new weights for the consumption basket. The Laspeyres Index overstates inflation, as it does not take into account consumers changing their consumption in response to inflation. Likewise the Paasche Index understates consumption.

² The economic crises brought their own set of complications. What should be done about goods or services that are not available in the usual manner? What happens if consumption baskets change abruptly making the reference-year basket less relevant? What should be done if the relationship between listed prices (for example,

The European Commission and the Council have attempted to ensure that the regulations are detailed enough that cross-country methods are as similar as is practicable, but it is always possible that some of the differences in measured inflation are due to different methodologies and practices. In addition, the particular practices that are specified may tend to cause measured inflation to overstate or understate actual inflation in one or more countries.

Perhaps the most important methodological drawback of the HICP is that it excludes owner-occupied housing costs. Price indices should measure the purchasing power of current consumption and, as mentioned above, the purchase price of a house includes an investment component. Perhaps the best, if not a perfect, measure of a household's owner-occupied consumption of housing services is the amount of money it would take to rent a similar home. Thus, a solution to the problem of how to include housing prices in the HICP might be to use rental prices as substitutes for owner-occupied housing costs, as is done in the United States' consumer price index. Unfortunately for measurement purposes, the nature of the renter-occupied housing market differs across countries. It is distorted to varying degrees by rent controls and subsidies, tenant protection rights differ and rental properties can be more or less dissimilar to owner-occupied housing. Presumably because of the severity of the cross-country differences, the harmonised index currently excludes owner-occupied housing consumption prices. If these prices had been included in the HICP then measured inflation in Germany might have appeared even less variable relative to measured inflation in, for example, Ireland over the period of the euro.³

The ECB's overall measure of inflation is a weighted average of inflation in the individual countries that make up the euro area. Each country's weight is a reflection of its final monetary consumption expenditures expressed in euros. Thus, for example, in 2014 the weight put on German inflation is 27.7 percent and the weight put on Greek inflation is 2.6 percent.⁴ This suggests that one reason that German inflation has been more stable than Greek inflation is that German inflation is much more important to the Governing Council in its conduct of monetary policy than is Greek inflation.

2.2. Different consumption baskets

Even with identical inflation measurement methodologies and practices and even if consumers in different countries pay the same price for each good, inflation can differ across countries with a common currency. To see this, assume that there are two countries, country *A* and country *B*, with a common currency. Assume further that there are two goods, good 1 and good 2 and that residents of country *A* always spend three-quarters of their income on good 1 and one-quarter of their income on good 2 and that residents of country *B* always spend one-quarter of their income on good 1 and three-quarters of their income on good 2. Suppose that in period zero the money price of good 1 is one and the relative price of good 2 in terms of good 1 is one. This implies that the money price of good 2 in period zero is one. Suppose further that the money price of good 1 continues to be one in period one but that something causes the relative price of good 2 in terms of good 1 to be two in period one. Then, the money price of good 2 in period one is two. Using equation (1) the Laspeyres Index is equal to $\frac{3}{4} \times 1 + \frac{1}{4} \times 2 = \frac{5}{4}$ in country *A* and to $\frac{1}{4} \times 1 + \frac{3}{4} \times 2 = \frac{7}{4}$ in country *B* in period one. Thus, inflation is 25 percent in

of cars) and the transaction prices become less stable? See Eurostat, *Compendium of HICP Reference Documents*, Luxembourg, European Union, 2013.

³ Commission Regulation (EU) No 93/2013 of 1 February 2013 establishes owner-occupied housing price indices with the intent improving the HICPs and making them more comparable.

⁴ "Important Information," Harmonised indices of consumer prices (HICP): http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database

country *A* and 75 percent in country *B* between periods zero and one, even though the two countries share a common currency.

The result is intuitively sensible. If two countries consume two goods in different proportions and something causes a relative price change that causes the price of one of the goods to rise more than the price of the other good then inflation is higher in the country that consumes proportionally more of the good that becomes relatively more expensive.

This result is applicable to other scenarios as well. Within a country, different regions will have different inflation rates if they consume different goods. In general, inflation in Texas is different from inflation in New York. Different socio-economic classes also experience different inflation rates. Over the last twenty years, those in the euro area who consumed the services of second homes and nannies have typically experienced more inflation than average; those who consumed mainly computers, televisions, smart phones and other electronics have experienced less.

2.3. Why are there inflation differentials in the euro area

If differences in consumption baskets are a driver of differential inflation rates, it is interesting to ask what are the sources of the relative price changes that cause the different consumption baskets to matter.

It is often suggested that higher inflation in a particular country is associated with a loss of competitiveness for that country. The usual interpretation is that if relative prices do not adjust quickly then higher inflation causes a lack of competitiveness. However, the causality could run the other way. In a canonical intertemporal optimising model – the overlapping generations model – if people have the commonly specified preferences that result in consumers spending constant shares of their income on different goods, then a stationary outcome must have nominal GDP growing at the same rate across countries. Thus, if one country's real output growth is lower than other countries' real output growth, then the price of its output must rise faster than the prices of other countries' output. If residents of the country with the lower output growth tend to consume proportionally more of their own country's output than do residents of other countries, then they will face more inflation than do the residents of the other countries.⁵

The above paragraph suggests that higher growth in a country can lead to lower inflation, but the pre-crisis experience of many euro area countries suggests that is not necessarily the case. In a second explanation for inflation differentials, growth can increase inflation. Suppose that countries consume both traded and non-traded goods. If the price of non-traded goods is rising faster over time in some countries than in others this can cause inflation to be systematically higher in those countries. If the non-traded goods are services and if the price and expenditure on services rise as a country becomes more developed then this effect, known as the Balassa-Samuelson effect, tends to cause developing countries to have higher inflation than developed ones if they have a common currency.⁶

⁵ Consider a two-country overlapping generations model inhabited by a constant population of two-period-lived agents. There are two goods, each produced by one country, and agents have log-linear preferences where in each period in country *i* a weight $c^i \in (0,1)$, $i = 1,2$, is put on the consumption of the home good. Suppose the common currency grows at a constant proportional rate and is the only form of saving. In a stationary equilibrium, inflation is higher in the country with the lower output growth if and only if $1 < c^1 + c^2$.

⁶ The Balassa-Samuelson effect can be important for regions as well as countries. A famous example is English beer. While the price of (traded) supermarket beer is nearly the same across England, the price of (non-traded) beer consumed in pubs is higher in the south of England than the north.

Variations across countries in the share of imported goods in the domestic consumption baskets can also lead to inflation differentials. Consumer price indices include imported goods as well as domestically produced goods. Thus, the HICPs include imported goods from outside of the euro area. If the prices of non-euro area goods are rising or falling relative to the prices of euro area goods in a particular period then this will tend to cause inflation to be higher or lower during that period in euro area countries that consume more goods imported from the rest of the world than in countries that consume less. Even if countries have the same openness to trade they may consume different traded goods and their imports can be invoiced in different currencies, leading to different inflation rates. Thus Ireland, which is relatively open to non-euro area trade and which consumes a significant share of imported goods invoiced in sterling, can be expected to have a different inflation rate from France, which is less open to non-euro-area trade and where sterling is less important as an invoice currency.⁷

The above reasons for inflation differentials are benign. In a common currency area the relative price changes that allow for resources to be allocated efficiently inevitably lead to inflation differentials. However, equation (1) implies that there is another and less benign reason for inflation differentials.

Countries that consume similar goods in similar proportions can have dissimilar inflation rates if they pay different prices for the same goods. In the presence of imperfectly integrated markets, imperfect competition, wage and price rigidities and other distortions can cause similar goods to have markedly different prices that adjust to shocks at varying rates over time.⁸

The importance of different factors in euro area inflation differentials has been the subject of much debate. Measurement is difficult and it is likely that different and multiple factors have been important in different countries and at different times.

⁷ Honohan et al (2003) discuss the importance of this traded goods effect.

⁸ See Beck et al (2009) for a discussion of the importance of these factors for regional inflation differentials in the euro area.

3. INFLATION DIFFERENTIALS AND INTEREST RATES

It has been suggested that a consequence of inflation being systematically higher in one country than another is that real interest rates may be lower in that country and this might be associated with an increased incentive for governments to delay fiscal reform. However, this depends upon the circumstances. I consider two scenarios where this need not be the case. The first is where inflation differentials reflect productivity differences and the second – of particular relevance at present – is where the borrowing country is insolvent or nearly so. It has been suggested that another possible effect of lower real interest rates is that they can cause a feedback loop where higher inflation today is associated with higher inflation in the future. I discuss how this might or might not occur.

3.1. Borrowing when inflation differentials are due to productivity differences

The possibility of arbitrage implies that nominal interest rates must be the same for financial assets with identical risk and liquidity characteristics. Thus, if the government debt in two countries in a common currency area is perceived to be nearly riskless and highly liquid then the nominal interest rates on this government debt will be similar across the countries. But, this does not mean that it is necessarily more tempting for the higher inflation country's government to borrow. To see this, consider the government's within-period budget constraint:⁹

$$P_t S_t + B_t = (1 + i_t) B_{t-1},$$

where P_t is the price level, S_t is the real value of the primary budget surplus (tax revenue minus non-interest spending), B_t is the nominal amount of debt outstanding at the end period t (and beginning of period $t+1$) and i_t is the nominal interest rate between period $t-1$ and period t .

Dividing both sides by the price level, the budget constraint can be rewritten as:

$$S_t + \frac{B_t}{P_t} = (1 + i_t) \frac{P_{t-1}}{P_t} \frac{B_{t-1}}{P_{t-1}} = \frac{1 + i_t}{1 + \pi_t} \frac{B_{t-1}}{P_{t-1}} = (1 + r_t) \frac{B_{t-1}}{P_{t-1}},$$

where π_t is the inflation rate between period $t-1$ and period t and r_t is the real interest rate between period $t-1$ and period t .

Letting s_t be the real value of the time- t primary budget surplus as a share of time- t real GDP and b_t be the real value of time- t government debt as a share of time- t real GDP, the budget constraint can be further rewritten as:

$$\frac{S_t}{Y_t} + \frac{B_t}{Y_t} = (1 + r_t) \frac{Y_{t-1}}{Y_t} \frac{B_{t-1}}{Y_{t-1} P_{t-1}} \Leftrightarrow s_t + b_t = \frac{1 + r_t}{1 + \gamma_t} b_{t-1},$$

where γ_t is the rate of real GDP growth between period $t-1$ and period t . From the above equation, it is seen that how easy it is to borrow depends not just upon the real interest rate but also upon the rate of output growth. A lower than average real interest rate lowers a country's borrowing costs. However, if it is associated with lower than average real output growth it may not be easier for a government to service its debt in the future.

⁹ Seigniorage is ignored.

3.2. Borrowing when countries are threatened with insolvency

In the example in section 3.1 it was assumed that there was no default risk and therefore there was a common nominal interest rate. If, however, it is perceived as likely that a euro area government will (partially) default on its debt, then it will not face the same essentially risk free nominal interest rate enjoyed by area country governments that are more fiscally prudent.¹⁰ Instead, it will pay a higher nominal interest rate that reflects a risk premium. Even if this country's inflation is higher than that of less profligate countries, its borrowing costs may be higher as well. If an increase in its borrowing increases its default risk, this will cause further increases in both the nominal and real interest rate that it faces.

It is likely that any past postponement of fiscal reforms in fiscally impaired countries in the euro area was due more to political expediency or a lack of will than it was to positive inflation differentials exerting downward pressure on their borrowing costs.

3.3. Interest rates and domestic demand

Angeloni and Ehrmann (2007) find that an important predictor of current inflation differentials is past inflation differentials. One story is that price inflation can generate wage increases that are not justified by productivity. Another story is that the lower real interest rates in countries that have higher inflation than the euro area as a whole tend to cause domestic demand to be higher in those countries, leading to persistent positive inflation differentials. However, if the higher domestic demand is primarily in the form of investment demand, then the tendency for this to perpetuate the positive inflation differential should be mitigated by an increase in domestic output. In addition, if the higher inflation causes a loss of competitiveness, then this will dampen demand for domestically produced goods and tend to lower the inflation differential.

Lower real interest rates also increase the real value of the discounted stream of future rental payments. This effect tends to increase house prices. Thus, all other things being equal, inflation differentials could be expected to cause house price inflation to diverge across the euro area. While a change in house prices is a redistribution of wealth from tenants to owners rather than an increase in net wealth, to the extent that housing wealth is collateralisable and that households are liquidity constrained, an increase in house prices may be associated with an increase in domestic consumption. This can further increase a positive inflation differential.

¹⁰ This depends to some extent on how likely creditors perceive it to be that support from the Eurosystem, the IMF or some other entity would forestall such an event.

4. IMPLICATIONS FOR POLICY MAKERS

As discussed in Section 2, there are two reasons that (actual) inflation rates might differ across countries. The first is that consumers in different countries consume different consumption baskets. Inflation differentials arising from different consumption baskets are desirable; they are a reflection of relative price changes that bring about an efficient allocation of resources. The second reason is that market segmentation coupled with distortions and imperfect competition cause consumers in different countries to pay different prices for different goods. Outcomes with inflation differentials arising from this reason are inefficient and undesirable. In this case the underlying problem is the distortions and the imperfect competition.

Given that underlying distortions and imperfect competition exist, it is not clear that having a common currency is worse than the alternatives. Abandoning the common currency and adopting a floating exchange rate would permit each country to attempt to attain its most preferred inflation rate. Exchange rates would adjust to bring about changes in relative prices. This might appear alluring, as exchange rates are determined nearly instantly in financial markets whereas distortions ensure that changes in goods prices can be subject to long and variable lags. However, sticky goods prices and flexible exchange rates can cause exchange rate overshooting. This and imperfect rationality and non-fundamental equilibria can cause exchange rates to be a source of shocks that may make it difficult to conduct monetary policy. Even if all countries have the same desired inflation, country-specific monetary policies might lead to *more* inflation divergence in the euro area than has occurred with a common currency and a single monetary policy.

If a particular country suffers from significant and persistently divergent inflation or from more variable inflation than other countries that is the result of market segmentation and distortions then it is up to domestic policy makers in that country to address this issue. The existence of inflation differentials should be one more incentive for dilatory governments to summon the political will to enact fundamental economic reforms.

It has been suggested that a possible policy response to persistent inflation differentials resulting from rigidities is to give the countries with the greater rigidities more weight than would result from final consumption expenditure shares when the euro area HICP is constructed from individual countries' HICPs.¹¹ While this is an interesting theoretical idea, political concerns likely render it infeasible. Countries that have undertaken costly economic reforms may not want to give greater weight to countries that have been unable to summon the political will to do the same. In addition such a rule would reduce the incentives of countries with distortions to carry out fundamental economic reforms.

There is little that a central bank can do about inflation differentials resulting from rigidities and other distortions. There is, however, some evidence that stabilizing inflation reduces inflation differentials across countries.¹² This seems sensible in that aggregate monetary policy shocks can cause inflation differentials if the monetary transmission mechanism differs between countries because of country-specific nominal or real rigidities and distortions.

¹¹ See Benigno and López-Salido (2006).

¹² See Angeloni and Ehrmann (2007).

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