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Cyclical differences between euro area Member Sates peaked at historical highs in 2012-2013 and it is essential that policies at national and euro area level prevent these asymmetries from becoming entrenched and affecting potential output.

The main reasons for these asymmetries are well-known. Some Member States entered the global financial crisis in a much more precarious situation than others, due to imbalances they had accumulated. The effects of these vulnerabilities were compounded by shock amplifiers specific to Europe's Economic and Monetary Union, including the bank-sovereign feedback loops, cross-border contagion effects, and sudden stops in capital inflows. Due to sluggish domestic demand and depreciated real exchange rates, other countries accumulated surpluses which persisted during the crisis period.

The changes in EMU governance put in place since the crisis reduce the risk of such asymmetries. The broadening and strengthening of macroeconomic surveillance are designed to limit the emergence of imbalances and thereby differences in vulnerability between countries. The creation of the European Stability Mechanism and the launch of the Banking Union should also help to muffle shock amplifiers. Nevertheless risks of large asymmetric shocks will not disappear altogether.

Monetary unions are equipped with a market-based adjustment mechanism. When faced with asymmetric shocks, relative prices adjust across regions or states so as to restore cyclical convergence. As shown in this special issue of the Quarterly Report on the Euro Area, this relative price mechanism has been at work in the euro area since the crisis, helping to reduce cyclical divergences. However, the mechanism remains slow, weakened by structural rigidities and by financial frictions. It is hampered by the very low level of inflation in the euro area, which exacerbates the effect of downward nominal rigidities. Furthermore, Member States that have seen their relative prices adjust downwards have also had to cope with higher nominal interest rates than the rest of the euro area due to financial fragmentation. This has amplified the pro-cyclical effect of the so-called real interest rate mechanism. Finally, adjustment has been slowed by persistently weak domestic demand in surplus countries.

What can policies do to contain the risks of strong cyclical divergences? A policy strategy to contain cyclical asymmetries should be organised around two objectives: mitigating the risks of large asymmetric shocks from the outset; and strengthening our capacity to absorb any asymmetric shocks that materialise through effective market-based adjustments and better risk-sharing. The two objectives are largely self-reinforcing and, in many cases, indispensable complements. Risk reduction and risk sharing must go hand in hand. Action is required in four areas.

Completing the Banking Union and achieving the Capital Markets Union is indispensable to reduce the risks of systemic financial shocks that have proved so damaging and such a powerful source of divergence during the recent crisis. A full banking union requires a complete set of measures that aim to both mitigate financial risks in each Member State and to share the burden of resolution when necessary. Risk reduction has to go hand in hand with risk-sharing, which in turn is indispensable to sever the sovereign-bank loop, avoid contagion and counter financial fragmentation forces, thereby reducing further the risk of future systemic crises and ultimately, of large cyclical divergence. By limiting the risks of fragmentation, a full banking union would also dampen the real interest rate mechanism and thereby accelerate market-based adjustment to asymmetric shocks.

Capital Markets Union, by helping the recycling of excess saving in surplus countries via equity rather than debt will also help to mitigate the effect of persistent external surpluses.

Dealing with the legacy of high debt in some Member States is essential to reduce differences in Member States' balance sheet vulnerabilities and thereby differences in their exposure to shifts in the

risk appetite of investors. It will also improve shock absorption, notably by restoring fiscal space where it has been lost. Full adherence to our fiscal rules is essential in this respect. To tackle the private sector debt overhang, significantly more coordinated efforts are needed to ensure a gradual reduction of non-performing loans and put in place efficient insolvency infrastructures.

Improving our shock absorption capacity calls for **stronger market-based adjustment**. Moving out of the low inflation regime, which has prevailed in recent years, is also critical to make adjustment easier by making nominal downward rigidities less binding and facilitating price rebalancing. The ECB's unconventional monetary policy measures are essential in this respect. Market based adjustment can also be strengthened by further structural reforms, notably in labour markets. To ensure a more symmetric adjustment process, these reforms must be carried out across the entire euro area, i.e. in the countries which have been hit more strongly by the euro area debt crisis as well as in the others. In the latter group of countries in particular, reforms that support the development of the service sector may help reduce the large external surpluses.

Finally, we also need to **strengthen risk sharing** between Member States beyond the Banking Union. It is important to recognise that better risk prevention will not eliminate asymmetric shocks altogether. Furthermore, relative price adjustments within a monetary union will never occur as quickly as exchange rate adjustments. And we have seen that market pressures can deprive countries of their fiscal stabilisers in a deep crisis. This means that some shocks cannot be absorbed internally only. So for all economies to be permanently better off inside the euro area, some risks will have to be shared within the EMU, both through capital and credit markets (market risk sharing) and through fiscal means (public sector risk sharing). After all, even in a successful monetary union like the US – which enjoys a full banking union, flexible labour and product markets, powerful financial market risk-sharing and effective private-sector debt resolution mechanisms – public risk sharing plays a role in the absorption of regional shocks.

I. An overview of market-based adjustment in the euro area in the light of the crisis

The global and euro area debt crises have shown that the effect on individual economies of a common economic shock can be very different across the euro area. This has rekindled interest in the role of market-based adjustment processes in mitigating cyclical differences in the euro area. The objective of this special edition of the Quarterly Report on the Euro Area is to review the issue of shocks and adjustment in the light of the recent crisis. This overview chapter reviews the main findings of the report. It discusses the main features of the shocks that can have large asymmetric effects on individual Member States. The analysis distinguishes between the factors that leave an individual economy particularly exposed to shocks, and features of EMU's set up which may amplify the effects of certain shocks. This overview also summarises the main results of the three subsequent chapters which are devoted to the 'relative price mechanism,' the 'real interest rate mechanism' and the role of balance sheets in adjustment processes. The 'relative price mechanism' has been at work both before and since the global financial crisis. Member States in comparatively weaker cyclical positions have benefited from falls in relative costs and prices which helps to buttress their cyclical positions. However, the mechanism has been slow to kick-in since the global financial crisis and its stabilising function has been hampered by frictions in labour and financial markets. The current low level of inflation in the euro area also tends to exacerbate the nominal downward rigidities documented by the empirical literature on the euro area. The report also shows that financial fragmentation has exacerbated the destabilising effect of the 'real interest rate mechanism' and that balance sheet consolidation can substantially prolong adjustment processes. Policies can help mitigate risks of large asymmetric shocks in the euro area both by reducing Member States' exposure to shocks and by strengthening their adjustment capacity. The Banking Union, structural reforms and measures to address the debt legacy of the crisis all have a role to play. Action is needed in both debtor and creditor countries.

I.1. Introduction ([1])

Asymmetric shocks – i.e. shocks which originate in one Member State or common euro area shocks which affect national economies very differently – are a key policy concern in the euro area. Coping effectively with such shocks is a necessary condition for a smooth functioning of a monetary union. Going back to the Optimal Currency Area theory, the economic profession has a long tradition of analysing the types of asymmetric shocks that may buffet monetary unions and possible adjustment mechanisms.

Both before the launch of the euro and during its first decade of existence, much effort was directed towards understanding the specificities of the Economic and Monetary Union (EMU). ([2]) In contrast to most other monetary unions, risk-sharing mechanisms between euro area Member States are very limited. Contrary to a large federation like the US, EMU is not equipped with a central budget designed to cope with asymmetric shocks.

This feature explains the interest of economists and policy makers for the role that markets can play to absorb asymmetric shocks in the euro area. The issue was analysed extensively before and after the launch of the euro. It is now being reassessed in the light of the global financial crisis and, above all, the euro area debt crisis. In many Member States, fiscal policy is currently constrained by the crisis legacy of high public sector debt and can therefore not play fully its role as a shock absorber. Better understanding market-based adjustment is therefore particularly important in the current context.

Because they allow the private sector to share risks across regions or states, financial markets have a well-known stabilisation function in monetary unions in case of asymmetric shocks. Unfortunately, private risk sharing is much more limited in the euro area than in the US or in a federation like Germany. Empirical evidence shows that, until today, private risk sharing can smooth only a limited part of cyclical divergences between Member States during normal times and is particularly ineffective during times of severe

([1]) The section was prepared by Eric Ruscher.

([2]) For a comprehensive assessment of the functioning of EMU released on the verge of the Great Recession see: European Commission (2008), 'EMU@10 – Successes and challenges after 10 years of Economic and Monetary Union', *European Economy*, No. 2, DG ECFIN, European Commission.

recessions. ([3]) Financial markets have even played a risk-magnifying role in some Member States during the euro area debt crisis, particularly via the bank credit channel. Acknowledging this weakness, euro area policy makers have engaged or announced important reforms of EMU: the Banking Union (BU) and the Capital Market Union (CMU) are expected to enhance considerably the euro-area's private risk sharing capacity. ([4])

Risk sharing is not the only area where markets can help absorbing asymmetric shocks. The present report contributes to ongoing reassessment of market-based adjustment in EMU by focusing on three aspects: the *relative price mechanism,* the *real interest rate mechanism* and deleveraging.

In the euro area, changes in relative prices are an important way in which national economies can adjust to asymmetric shocks. Member States in a weaker cyclical position than the rest of the union tend to see their labour costs and prices fall relative to the rest of the union. The resulting improvement in the real effective exchange rate helps strengthen their cyclical position via its effect on exports and import substitution. This relative price mechanism is the main market-based stabilising mechanism in the face of asymmetric shocks and is analysed in depth in Chapter 2 of this QREA. ([5])

The *real interest rate mechanism* is a well-known impediment to the stabilisation function of the relative price mechanism. Changes in relative prices also affect real interest rates. A Member State experiencing a demand boom will see its inflation rate rise above the euro area average. With a common nominal interest rate throughout the euro area, higher inflation will bring a fall in real interest rates relative to the rest of the euro area, which will in turn magnify the original demand boost. This destabilising mechanism, also known as the 'Walters' critique', is the focus of Chapter 3. ([6])

Finally, Chapter 4 sheds some light on the role of balance sheets in adjustment. Balance sheets and deleveraging were largely absent from the pre-crisis debate on the functioning of EMU. The crisis has since highlighted the strong interactions between public or private balance sheets and growth. High levels of debt magnify the exposure to shocks and complicate the subsequent adjustment phase.

Against this background, the objective of the present chapter is to provide an overview of the analyses presented in the rest of the report and set them in the broader perspective of the types of asymmetric shocks that may hit the euro area economy. Drawing on the pre- and post-crisis experience, Section I.2 discusses the main features of asymmetric shocks in the euro area. It analyses how Member States' exposure to shocks depends on macroeconomic imbalances accumulated before shocks occur and highlights a number of euro area-specific shock magnifiers. Section I.3 reviews the various features of market-based adjustment in the euro area as presented in Chapters 2 to 4, stressing in particular the lessons learned since the global and euro area debt crises. Section I.4 concludes.

I.2. Shocks and amplifiers in the euro area

The euro area debt crisis: a typical example of asymmetric transmission of a common shock

An optimistic pre-crisis view was that the euro would lead to greater business cycle synchronisation among Member States as a result of rising trade and financial linkages, broad convergence in macroeconomic policies, and some convergence in economic structures. ([7])

Until the outbreak of the global financial crisis, this optimistic view seemed to be, at least partly, vindicated by the facts. Results of empirical studies

([3]) Furceri, D. and A. Zdzienicka (2013), 'The euro area crisis: Need for a supranational fiscal risk sharing mechanism?', *IMF Working Paper*, No. 198.

([4]) See in particular:
'Completing Europe's Economic and Monetary Union', report by Jean-Claude Juncker in close cooperation with Donald Tusk, Jeroen Dijsselbloem, Mario Draghi and Martin Schulz.
European Commission (2015), 'Action plan on building a capital markets union', Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions, 30 Sept. 2015.

([5]) In the economic literature on EMU, the 'relative-price channel' is frequently called the 'competitiveness channel' but this may be a source of misunderstanding. In the media and policy debates, the word competitiveness is very loosely defined and can cover a range of issues, from relative costs and prices to product quality and productivity.

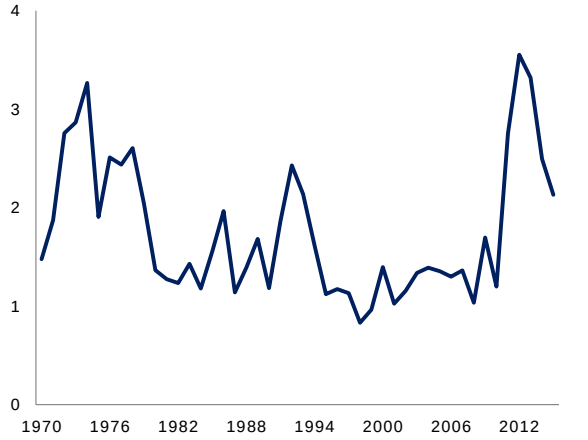
([6]) After Sir Alan Walters, an economic advisor to Margaret Thatcher who strongly opposed British membership of the Exchange Rate Mechanism.
Walters, A. (1990), 'Sterling in danger: the economic consequences of pegged exchange rates', Fontana Press, London.

([7]) This is the well-known argument of the endogeneity of the Optimal Currency Areas, pioneered by Frankel and Rose (1998).
Frankel, J. A. and A. K. Rose (1998), 'The endogeneity of the Optimum Currency Area criteria', *Economic Journal*, 108(449), pp. 1009–1025.

on the effect of the single currency on business cycle synchronisation were mixed but they generally pointed to a high level of synchronisation between Member States and, at least, a convergence trend in the 1990s, i.e. before the inception of the euro. ([8])

Graph I.1: **Cyclical synchronisation, euro area (1)**

(1970 – 2015, stand. dev. of output gaps in %)

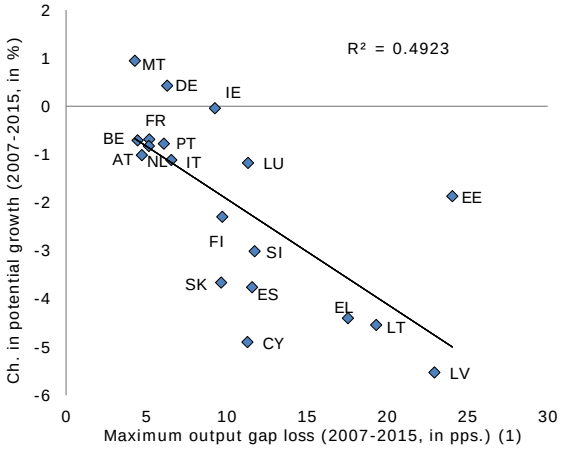


(1) Standard deviation of output gaps for 12 Member States: BE, DE, IE, EL, ES, IT, FR, LU, NL, AT, PT, FI. Output gap estimates are based on the European Commission production function methodology.
Source: AMECO, DG ECFIN calculations.

The relatively close alignment of business cycles prior to the crisis is confirmed by a simple measure of dispersion in output gaps among the 12 earliest members of the euro area (Graph I.1). Business cycles remained relatively closely aligned during the first phase of the global financial crisis, as Member States' economies reacted relatively similarly to the freezing of money markets and the collapse in global confidence and world trade.

Things changed radically when the global financial crisis morphed into the euro area debt crisis. Over 2011-2014, the dispersion of output gaps surged to levels last seen in the 1970s, reaching four-decade highs in 2012-2013. Since 2014, the dispersion of output gaps has come down significantly, but the dispersion of potential growth has increased. ([9]) Those Member States which incurred the biggest cyclical shock (as measured by the difference between the highest and the lowest output gap over the period 2007-2015) have also incurred the largest losses in potential growth since the beginning of the crisis (Graph I.2). This suggests that some of the cyclical differences brought by the euro area debt crisis have become entrenched. ([10]) ([11])

Graph I.2: **Losses in output gap and potential growth, euro area**



(1)The maximum output gap loss is calculated as the difference between the highest and lowest output gap over 2007-2015.
Source: AMECO, DG ECFIN calculations.

Overall, the euro area crisis has dashed pre-crisis hopes that trade and financial integration, combined with a convergence of macroeconomic policies would ensure a reasonably high degree of business cycle synchronisation in the euro area. Member States can be subject to powerful and persistent asymmetric shocks or to large asymmetries in the transmission of common shocks.

([8]) For a review of the pre-crisis empirical literature see de Haan, Inklaar and Jong-A-Ping (2008). Some studies identified a positive effect of the euro on business cycle synchronisation but a majority did not. These differences reflect differences in methodology but also difficulties in identifying the appropriate period as some of the benefits of the euro may have been front loaded in the 1990s.
de Haan, J., R. Inklaar and R. Jong-A-Pin (2008), 'Will business cycles in the euro area converge? A critical survey of empirical research', *Journal of Economic Surveys*, Vol. 22(2), pp. 234-273.

([9]) In 2015, the dispersion remained significantly above the 1995-2007 average. High dispersion was partly explained by a very low output gap in Greece but dispersion remained above this average when excluding Greece.

([10]) It should, however, be stressed that potential growth at the peak of the cycle was probably artificially boosted by the credit boom in some Member States.

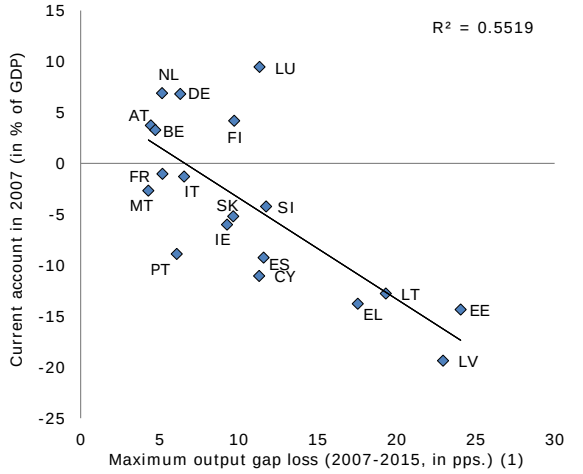
([11]) For a recent analysis of growth differences in the euro area see: Valdes, I. (2014), 'Growth differences in the euro area since the crisis', *Quarterly Report on the Euro Area*, Vol. 13, No. 2, pp. 7-20.

Imbalances accumulated before the crisis have led to large asymmetries in shock exposure

A broad narrative is now emerging from the economic literature on the causes of the euro area debt crisis and therefore of these asymmetries in the transmission of the global financial crisis. (12) The narrative, which is relatively consensual among academic economists if not among policy makers, involves both country-specific vulnerabilities and euro area-specific shock amplifiers.

Asymmetries in the impact of the global financial crisis across Member States reflect large differences in shock exposure among countries. In particular, external exposure (as measured by the current account or net foreign assets) is closely correlated with the cyclical shock incurred by Member States (Graph I.3). (13) The countries of the periphery or in the Baltics which had accumulated large current account deficits before the crisis also incurred the biggest cyclical shock in the crisis.

Graph I.3: **Losses in output gap and current account exposure, euro area**



(1)The maximum output gap loss is calculated as the differences between the highest and lowest output gap over 2007-2015.
Source: AMECO, DG ECFIN calculations.

The accumulation of external imbalances before the crisis in the periphery reflects first and foremost demand shocks in those countries. Excessive demand relative to production capacity fuelled price pressures, particularly in the non-tradable sector, weighing on price competitiveness and, thereby, further aggravating current account deficits. (14) The demand shocks can be explained by a range of factors, including reductions in risk premia (due to euro accession, financial liberalisation and a rise in global risk appetite), the real interest rate mechanism (see Section I.3) and over-optimistic growth expectations. (15)

Current account deficits are of course not a bad thing in themselves (especially for catching-up economies) but, in the case of the euro area periphery, their accumulation reflected a build-up of vulnerabilities for several reasons.

First, the capital inflows that financed the current account deficits were largely debt based, particularly short-term cross-border bank lending. (16) Debt financing makes the borrowers' balance sheets more fragile and exposed to cyclical shocks, particularly reversals in investors' sentiment.

Second, a large part of the capital inflows were used to support consumption or were invested in the non-tradable sector, limiting the debt repayment capacity. (17) There is also evidence of capital misallocation, as capital was not always channelled to the sectors with the highest returns. (18)

(12) See for instance (2015), 'The Eurozone crisis – A consensus view of the causes and a few possible solutions', *a VoxEU.org Book* edited by Baldwin, R. and F. Giavazzi, CEPR.

(13) The relationship between current account imbalances and the growth performance since the crisis also holds for non-euro area countries. See: Lane, P. R. and G. M. Milesi-Ferretti (2014), 'Global imbalances and external adjustment after the crisis', *IMF Working Paper*, WP/14/151.

(14) See, among others, Gaulier and Vicard (2012) who stress the importance of demand shocks relative to competitiveness losses in explaining current account imbalances in the euro area.
Gaulier, G. and V. Vicard (2012), 'Current account imbalances in the euro area: competitiveness or demand shock', Bank of France, *Quarterly Selection of Articles*, No. 27.

(15) See Kang and Shambaugh (2015) for a review of these drivers. The authors stress, in particular, the importance of drops in EU cross-border transfers. Lane and Phelps (2012) highlight the importance of expectations.
Kang, J. S. and J.C. Shambaugh (2015), 'The rise and fall of European current account deficits', *Economic Policy*, Sixty-first Panel Meeting, Bank of Latvia, Riga, 17-18 April 2015.
Lane, P. R. and B. Pels (2012), 'Current account imbalances in Europe', *Moneda y Credito*, Vol. 234, pp. 225-261.

(16) Lane, P. R. (2013), 'Capital flows in the euro area', *European Economy - Economic Papers*, No. 497, DG ECFIN, European Commission.
Baldwin and Giavazzi (2015), op. cit.

(17) Giavazzi, F. and L. Spaventa (2011), 'Why the current account matters in a monetary union', in *The euro area and the financial crisis*, edited by M. Beblavy, D. Cobham and L. Odor, Cambridge University Press, pp. 59-80.

(18) Balta, N. (2013), 'Catching up processes in the euro area', *Quarterly Report on the Euro Area*, Vol. 12, No. 1, pp. 7-18.

The accumulation of vulnerabilities is also closely related to the credit cycle. ([19]) The counterpart to the accumulation of external imbalances in the periphery was a rapid expansion of domestic credit and increased balance sheet vulnerability in the public sector and private sector. The associated deterioration of balance sheets was particularly acute in the public sector in Greece and in the private sector in Spain and Ireland (or in the Baltic countries before euro accession). Portugal experienced deterioration in both sectors.

The global and financial crisis has spawned a large and still expanding literature that documents the existence of financial cycles (as opposed to the traditional business cycle) best encapsulated by developments in house prices and private sector credit. ([20]) Peaks in financial cycles tend to be followed by deeper and longer recessions and more sluggish recoveries than standard business cycles, particularly when associated with financial and banking crises. ([21])

Finally, it is worth stressing that if the pre-crisis build-up of vulnerabilities in some Member States can be explained by a range of country-specific factors (e.g. shift in credit supply, over-optimistic growth expectations), it also reflects inappropriate policies both in the fiscal area and in terms of macro-prudential supervision. While Member States of the periphery failed to identify and correct the build-up of their own vulnerabilities, creditor countries also failed to identify the accumulation of credit risk linked to the cross-border lending activities of their own banking sectors.

Vulnerabilities and shock amplifiers can lead to sudden stops in capital flows

Although differences in Member States' exposure to shocks can go a long way in explaining recent cyclical divergences within the euro area, they fail to explain why the euro area debt crisis only occurred in the euro area. Several other advanced economies also entered the global financial crisis with significant vulnerabilities, notably weak private sector balance sheets, bloated housing sectors or large current account deficits. ([22]) Yet, with the notable exception of Iceland, these countries did not experience a debt crisis and no episodes of sudden stops in foreign private capital inflows.

Indeed, a hallmark of the euro area debt crisis has been a succession of episodes of abrupt reversal of inflows of foreign private capital into several Member States. ([23]) These sudden stops had much to do with investors pulling out of sovereign markets but they were also broader, affecting non-sovereign assets. Their effects were somewhat mitigated by the accumulation of liabilities in the Eurosystem's Target 2 interbank payment system and financial assistance programmes but the sudden stops nevertheless triggered rapid and painful closures of current account deficits. ([24])

The strong asymmetry in the transmission of the global financial crisis within the euro area and the related sudden stops in private capital flows, reflect the joint effect of vulnerabilities accumulated in pre-crisis years and of euro area-specific shock amplifiers. Two shock amplifiers have been particularly harmful: the harmful, self-reinforcing mutual dependence between banks and sovereigns and the existence of self-fulfilling equilibria.

The bank-sovereign feedback loop. In most Member States, bank balance sheets expanded very rapidly in the 1990s and the 2000s, reaching multiples of GDP on the eve of the global financial

([19]) Sy, M (2016), 'Overborrowing and balance of payment imbalances in a monetary union', *Review of International Economics*, forthcoming for African Development Bank Group, *Working Paper Series*, No. 228, October.

([20]) Standard references are: Borio, C. (2014), 'The financial cycle and macroeconomics: What have we learned from the crisis?', *Journal of Banking and Finance*, Vol. 45, pp. 182-198.
Claessens, S., M. A. Kose and M. E. Terones (2012), 'How do business and financial cycles interact?', *IMF Working Paper*, WP/11/88.

([21]) See for instance: Jorda, O., M. Schularick and A.M. Taylor (2013), 'When credit bites back', *Journal of Money, Credit and Banking*, Supplement to Vol. 45, No. 2, pp. 3-28, December.

([22]) The extent of these vulnerabilities was, however, on some counts less dramatic. For instance, the external imbalances were generally smaller.

([23]) Merler and Pisani-Ferry (2012) use the methodology developed by Calvo et al. (2004) to identify formally episodes of sudden stops in the euro area. For the period 2008-2011, they identify three distinct phases of sudden stops in 2008-2009 (EL, IE), Spring 2010 (EL, PT), end 2011 (IT, ES). The Baltic countries also experienced sudden stops before their euro adoption (Gros and Alcidi 2013).
Merler, F. and J. Pisani-Ferry (2012), 'Sudden stops in the euro area', *Review of Economics and Institutions*, Università di Perugia, Vol. 3(3).
Calvo, G. A., A. Izquierdo and L. F. Mejia (2004), 'On the empirics of sudden stops: the relevance of balance-sheet effects', *NBER Working Paper*, No. 10520.
Gros, D. and C. Alcidi (2013), 'Country adjustment to a "sudden stop": Does the euro make a difference?', *European Economy - Economic Papers*, No. 492, DG ECFIN, European Commission.

([24]) On the role of Target II and financial assistance programme in cushioning the sudden stops see: Loublier, A. (2015), 'Recent developments in cross-border capital flows in the euro area', *Quarterly Report on the Euro Area*, Vol. 14, No. 1, pp. 7-18.

crisis. Before the launch of the Banking Union, Member States were, implicitly or explicitly, the only lenders of last resort for their domestic banking sectors. Combined with extensive holdings of domestic sovereign bonds by banks, this paved the way for strong negative feedback loops between banks and sovereigns. ([25]) ([26])

Multiple equilibria. Some Member States have experienced large swings in sovereign spreads that are difficult to explain by changes in macroeconomic fundamentals. A number of economists have argued that this is suggestive of the existence of multiple equilibria, in which a deterioration in investor confidence about a country's sovereign sustainability can cause increases in interest expenditure and lower growth that may ultimately make the change in expectations self-fulfilling. ([27])

In theory, these two shock magnifiers could also have played out in other advanced economies with oversized sovereigns and weak banking sectors. In practice, they only occurred in some euro area Member States. This can be explained by two specific features of EMU:

- **Single currency** – As first analysed in de Grauwe (2011), Member States' governments issue debt in a currency that they don't control. ([28]) The loss of monetary policy (that could act as a lender of last resort) and of nominal exchange rate flexibility entails the loss of two critical shock absorbers in the event of a sovereign liquidity crisis.
- **A fragmented banking sector** – Obviously this is also true of members of a monetary union like the US, where neither the central government nor the Federal Reserve can act as lenders of last resort to individual States. But in euro area, the effect of the loss of the two shock absorbers is compounded by the fragmentation of the banking sector and the fact that Member States were, until the launch of Banking Union, the lenders of last resort for their own banking sectors. In the US, individual States are not responsible for local banks and their debt levels are generally much smaller than in the euro area. Moreover, the banking sector is much more integrated in the US than in the euro area. Overall, there is therefore little scope for feedback loops between banks and States in the US.

Reassessing the nature of asymmetric shocks in in light of the euro area debt crisis

The experience of the euro area debt crisis demonstrated the importance of imbalances and shock amplifiers in generating powerful asymmetric shocks in the euro area. Europe's Economic and Monetary Union has since been equipped with additional surveillance procedures to limit the build-up of new imbalances and with a number of mechanisms to mitigate the shock amplifiers described above (e.g. the European Stability Mechanism and the Banking Union). However, risks of large asymmetric shocks remain. Fully severing the bank-sovereign loop requires the establishment of a European deposit insurance scheme and reduced exposure of banks to their own sovereigns. Moreover, despite the rapid correction of current account deficits in the periphery, debt imbalances remain high in these countries (see Section I.4) and so does their exposure to shocks. In addition, there has been only limited overall convergence in economic structures across euro area Member States since the launch of the euro. This suggests that there are still risks of asymmetric shocks in the euro area.

The experience of the sovereign crisis also points to two features of asymmetric shocks that are worth highlighting: i) these shocks can have both demand and supply features and ii) they can propagate across Member States via contagion effects.

([25]) The feedback loop has been labelled the "deadly embrace" by Paul De Grauwe and the "doom loop" by Maurice Obstfeld.
De Grauwe, P. (2013), 'Design failures in the eurozone - Can they be fixed?' *European Economy - Economic Papers*, No. 491, DG ECFIN, European Commission.
Obstfeld, M. (2013), 'Finance at center stage: some lessons of the euro crisis', *European Economy - Economic Papers*, No. 493, DG ECFIN, European Commission.

([26]) Empirical evidence confirms the existence of the two-way interaction between banks and sovereigns in some euro area countries. See for instance:
Acharya, V. V., I. Drechsler and P. Schnabl (2014), 'A Pyrrhic victory? Bank bailouts and sovereign credit risk', *Journal of Finance*, Vol. 69, No. 6, December.

([27]) For a discussion of multiple equilibria and their policy implications see De Grauwe (2011) or Blanchard and al. (2013).
De Grauwe, P. (2011), 'The governance of a fragile Eurozone', *CEPS Working Document*, No. 346.
Blanchard, O., G. Dell'Ariccia and P. Mauro (2013), 'Rethinking macro policy II: Getting granular', *IMF Staff Discussion Note*, No. 13/03, April.

([28]) De Grauwe (2011), op. cit.

Asymmetric shocks can have both supply and demand effects. The sovereign crisis has blurred the traditional dividing line between supply and demand shocks. By shutting out foreign capital inflows the sovereign crisis has triggered sharp negative demand shocks in the Member States of the periphery. But it has also forced an adjustment of their bloated non-tradable sectors. The process has a strong supply dimension, as it requires a reallocation of capital and labour from the non-tradable to the tradable sector. ([29])

Cross-border contagion effects can magnify exposure to shocks. Empirical work on sudden stops in capital flows in the euro area shows that stops tend to occur in clusters of countries. ([30]) Sovereign yield data since the global financial crisis provide similar evidence of contagion in the form of clusters of sharp rises in yields in some Member States. There is also evidence that spreads in one Member State can be affected by news in other Member States. ([31]) Contagion can be explained by several factors including panic effects and 'wake-up calls'. The latter occur when investors reassess the fundamentals of one country in light of the experience of another. ([32]) Distinguishing between panic and 'wake-up calls' is not straightforward empirically but econometric evidence suggests that both factors were at work in the euro area during the sovereign crisis. ([33])

([29]) Demand booms are more easily associated with an over-extension of the non-tradable sector in a monetary union than in countries which control their monetary policy. In the latter, the demand boom will be cooled off by a monetary tightening which will affect both the tradable and non-tradable sector. In a monetary union, a country-specific demand shock will lead to an increase in wage inflation that will be more detrimental to the tradable sector because of its exposure to international competition. Activity will therefore tend to expand more in the non-tradable sector.

([30]) Merler and Pisani-Ferry (2012), op. cit..

([31]) For a review of financial spillovers in the euro area see:
D'Auria, F., S. Linden, D. Monteiro, J. in 't Veld and S. Zeugner (2014), 'Cross-border spillovers in the euro area', *Quarterly Report on the Euro Area*, Vol. 13, No.4, pp. 7-22.

([32]) For a discussion of the various forms of contagion see:
Forbes, K. (2013), 'The 'Big C': Identifying and mitigating contagion', *2012 Jackson Hole Symposium hosted by the Federal Reserve Bank of Kansas City*, pp. 23-87.

([33]) For example, Beirne and Fratscher (2013) report strong evidence of wake-up call effects in the euro area. By contrast, Saka et al. (2014) conclude that the announcement by the ECB of its OMT programme resulted in a substantial reduction of sovereign yield contagion, suggesting that panic effects were also present. The possibility of waves of panic is closely related to the existence of multiple equilibria.
Beirne, J., and M. Fratzscher (2013), 'The pricing of sovereign risk and contagion during the European sovereign debt crisis', *Journal of International Money and Finance*, Vol. 34, pp. 60–82.

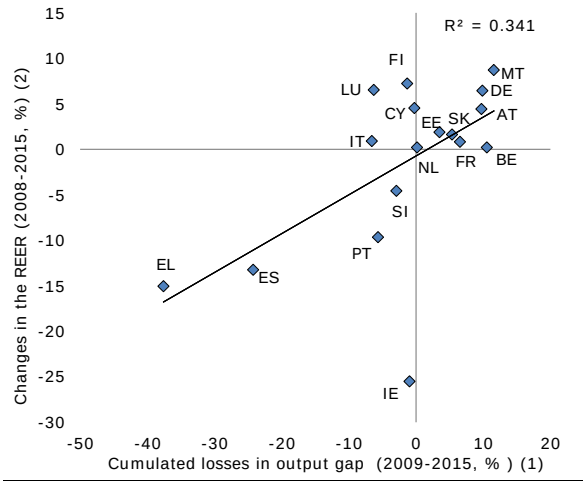
I.3. Market-based adjustment in the euro area

The previous section emphasised the importance of asymmetric shocks in the euro area. The current one assesses how Member States' economies respond to these shocks. It reviews evidence on market-based adjustment processes presented in Chapters 2 to 4. The *relative price mechanism*, the *real interest rate mechanism* and balance sheet adjustment are discussed in turn.

The relative price mechanism

The *relative price mechanism* has been at work in the euro area since the global financial crisis. Compared with their peak at the beginning of the crisis, the real effective exchange rates based on unit labour costs of the periphery have decreased by 10 to 25% depending on the country considered. The falls are, however, smaller when considering prices rather than unit labour costs.

Graph I.4: **Relative prices and output gap, euro area countries**



(1) Output gap estimates are based on the European Commission production function methodology.
(2) Real effective exchange rate based on unit labour costs relative to the rest of the euro area.
Source: AMECO, DG ECFIN calculations.

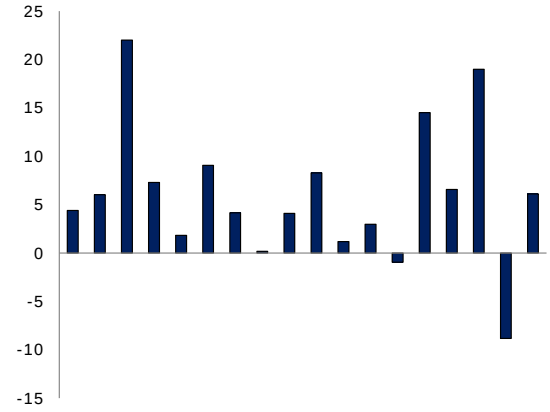
As shown in Graph I.4, there is a clear link between the output gap losses experienced since 2009 and the extent of the relative price (or relative cost) changes. Cyclical differences have been accompanied by a rebalancing of relative prices.

Saka, O., A.M. Fuertes and E. Kalotychou (2014), 'ECB policy and eurozone fragility: was de Grauwe right?', *CEPS Working Document*, No. 397.

To what extent has price rebalancing contributed to cyclical rebalancing? Many non-price factors can affect trade performance (degree of integration in world trade, product quality etc.) but it is clear that, with the exception of Greece, Member States of the periphery have benefited from solid gains in export markets shares in recent years (Graph I.5). The effect of relative prices on trade performance is also supported by a range of empirical studies that have estimated the elasticity of trade with respect to the real exchange rate. ([34])

The econometric analysis presented in Chapter 2 further confirms that the relative price mechanism has been at work both before and since the global financial crisis. However, it suggests that the mechanism has been slow to kick-in during the early stage of the global financial crisis although it appears to have functioned more strongly as from the sovereign crisis. The econometric analysis also shows possible room for improvement in the effectiveness of the mechanism, as it identifies three impediments:

Graph I.5: **Export performance, euro area countries (1)**
(2010-2014, in pps.)



(1) Ratio of exports to import demand of main trading partners.
Source: AMECO.

First, despite the reforms put in place by some Member States in recent years, the operation of the relative price mechanism remains hindered by structural rigidities. In particular, labour market rigidities hamper both the response of prices to output gap differences and the speed of the adjustment.

Second, price rebalancing has been slowed by sharp rises in the non-cyclical component of unemployment in periphery Member States. The rises may reflect the existence of downward wages rigidities in a context of low inflation but also the challenges of reallocating workers from the non-tradable to the tradable sector. ([35])

Third, there is some evidence that, since the crisis, financial frictions have slowed the price rebalancing process. More work is needed to understand the role of financial frictions but a possible explanation is that deleveraging firms may have taken advantage of lower wages to raise their mark-ups in order to accumulate savings to fix their balance sheets. ([36])

Finally, and beyond the econometric results presented above, it is worth pointing out that impediments to the price rebalancing process have not been confined to the periphery. In Germany, for instance, wage developments have remained moderate despite a stronger cyclical position than in the periphery. Furthermore, the low level of inflation that has prevailed in the euro area in the more recent past has complicated price adjustment in the periphery by exacerbating the effect of downward rigidities. ([37])

The real interest rate mechanism

As analysed in detail in Chapter 3 of this report, the *real interest rate mechanism* has been at work in the euro area, both before and since the crisis. ([38])

([34]) See for instance: European Commission (2014), 'Member State vulnerability to changes in the euro exchange rate', *Quarterly Report on the Euro Area*, Vol. 13, No.3, pp. 27-33.

([35]) It is noteworthy that the non-cyclical component of unemployment has also increased in Ireland where the labour market is far more flexible than in the rest of the euro area.

([36]) See for instance; Antoun de Almeida, L. (2015), 'Firms' balance sheets and sectoral inflation in the euro area during the financial crisis', *Economics Letters*, No. 135, pp. 31-33.

([37]) In Europe, only very few workers experienced wage cuts before the crisis. For a survey evidence of nominal rigidities see for instance:
Babecky, J., P. Du Caju, T. Kosma, M. Lawless, J. Messina, and T. Room (2010), 'Downward nominal and real wage rigidity: survey evidence from European firms', *Scandinavian Journal of Economics*, Vol. 112, No. 4, pp. 884-910.

([38]) Some pre-crisis studies have also documented the existence of a real interest rate channel in the US (see for instance Arnold and Kool 2004). However, if inflation differences do not seem to be much lower within the US than within the euro area, they tend to be more persistent in the latter (see for instance Angeloni and Ehrmann 2007). This suggests that the interest rate channel could be more potent in the euro area.

Inflation differentials have tended to be persistent during the two periods. Assuming that a significant proportion of economic agents form their inflation expectations on the basis of past inflation developments, such persistence opens the door to differences in real interest rates.

As shown by the econometric analysis in Chapter 3, an important lesson from the crisis is that the real interest rate channel is not only rooted in inflation differences but can also be driven by financial market fragmentation. As discussed in the previous section, Member States of the periphery have entered into price adjustment processes that have brought their inflation rates below the euro area average. The resulting rise in real interest rates has been magnified by an increase in nominal bank lending rates and tighter lending conditions in these countries due to financial fragmentation. A well-known cause of this fragmentation is the fears of redenomination risks that have gripped financial markets during the height of the euro area debt crisis. The fears have largely receded by now, notably in the wake of the ECB's OMT programme, and the differences in retail rates between the periphery and the rest of the euro area have narrowed again but they have not reverted to pre-crisis levels. This is because nominal lending rates are also determined by local economic factors. Two such local factors are worth stressing:

- As argued when discussing the bank-sovereign loop mentioned in Section I.2, changes in the credit risk of sovereigns can affect the balance sheets of banks and, thereby, their borrowing costs and lending policies.

- A deterioration of economic conditions can lead to a weakening of borrowers' balance sheets which will in turn push up banks' lending rates due to higher risk-premia (to cover the higher risk of borrower default).

The existence of these local determinants of bank lending rates magnifies the real interest rate channel but also sets the stage for two possible negative feedback loops where a deterioration of activity leads to a rise in lending rates that weakens activity further. The sovereign component of the feedback loop is the bank-sovereign loop already discussed in Section I.2 and should therefore be eliminated by the establishment of a full banking union. The second component of the loop, however, reflects the segmentation of the euro area's banking sector along national lines and can only be (partly) resolved by genuine cross-border banking integration. ([39])

Finally, the crisis has shown that real interest rates may have effects that go beyond the traditional cyclical dimension explored in Chapter 3. The central tenet of the real interest rate mechanism is that differences in real interest rates tend to magnify cyclical differences via their effect on spending. Some authors have identified an additional destabilising effect. To the extent that they contribute to a local boom, low real interest rates may also discourage policy makers from engaging in necessary structural reforms and may reduce incentives for private agents to adopt performance improving strategies. This 'super Walters' effect' broadens the effect of the real interest rate channel beyond the business cycle to structural growth. ([40])

The relative price vs real interest rate mechanisms

An important question for the stability of the euro area is whether the stabilisation effect of the relative price mechanism is stronger than the destabilising effect of the real interest rate mechanism. The conventional answer is that even if the real interest effect may dominate in the short-term, the relative price effect ultimately prevails because it strengthens continuously as long as inflation differentials persist.

Arnold, I. J. M. and C. J. M. Kool (2004), 'The role of inflation differentials in regional adjustment: Evidence from the US', *Credit and Capital Markets*, Vol. 37, pp. 67-85.
Angeloni, I. and M. Ehrmann (2007), 'Euro area inflation differentials', *The B.E. Journal of Macroeconomics*, Vol. 7, No. 1, pp. 1-34.

([39]) The loop is likely to be much weaker in the US where the banking sector is far more integrated.

([40]) The expression "super Walter effect" was coined by Buti and Turrini (2015). The authors, focusing on structural reforms, argue that a "super Walters' effect" operated during the first EMU decade, whereby not only cyclical positions, but also economic structures were driven by persistent real interest rate differences. Fernandez-Villaverde et al. (2013) analyse the inflows of capital into the periphery in pre-crisis years and how they reduce the incentives for policy makers to implement structural change and the private sector to monitor performance.
Buti, M. and A. Turrini (2015), 'Three waves of convergence. Can Eurozone countries start growing together again?', *EU VOX* 17 April.
Fernandez-Villaverde, J. L. Garicano and T. Santos (2013), 'Political credit cycles: the case of the Eurozone', *Journal of Economic Perspectives*, Vol. 27, No. 3, pp. 145-166.

This conclusion appears to be supported by empirical modelling exercises. Simulations with estimated or calibrated models suggest that the competitiveness channel tends to dominate, although the stabilisation process can be slow. ([41]) Model simulations also indicate that the relative price channel has a significant role to play in restoring internal balance in the periphery after the global financial crisis. ([42]) Some economists have identified modelling assumptions under which the 'real interest rate channel' may prevail even in the long run. ([43]) The conclusions of the above mentioned simulations, however, suggest that these assumptions are rarely fulfilled in existing empirical models.

Deleveraging: an important additional adjustment mechanism

Balance sheets and deleveraging were largely absent from the pre-crisis debate on the functioning of EMU. Wealth effects were generally estimated to be relatively low in European countries. Significant empirical and modelling work had been done on the interactions between housing and the business cycle but the balance sheet dimension of adjustment to asymmetric shocks in EMU remained relatively unexplored.

The crisis has since highlighted the importance of stock-flow interactions. Balance sheet consolidation in the private and the public sectors have been an important part of adjustment processes in the periphery since the global financial crisis (for the former) and the sovereign crisis (for the latter). In these countries, balance sheet developments amplified the pre-crisis boom in activity and were at the root of the sudden stops in capital inflows experienced during the crisis. They have also contributed to prolonging the adjustment period.

As analysed in detail in Chapter 4, the presence of deleveraging modifies the standard narrative of adjustment to shocks in at least three ways.

First, **adjusting to shocks takes much more time** when deleveraging is involved. For instance, the process of rebalancing current accounts flows in the periphery is by now well advanced with most of countries showing surpluses, sometimes sizeable ones. However, the reduction of external debt (stocks) has only hardly started. A similar observation applies to internal public and private sector debt levels. This has serious implications for growth, as protracted debt overhangs weigh on investment and increase exposure to shocks.

Second, there is a fundamental **asymmetry between economic agents with weak and strong balance sheets**. Lenders can force the former to reign in their spending but they cannot force the latter to spend more. This asymmetry has been strong in the euro area in recent years. Sudden stops in capital flows and rises in risk premia have forced agents in periphery countries to cut spending to consolidate their balance sheets, whereas domestic demand in surplus countries has remained chronically weak. As a result of the latter, export opportunities for the periphery countries have remained limited and the rebalancing of relative prices between the core and the periphery slow, making the adjustment processes in the periphery more protracted and painful. It has also led to a growing current account surplus for the euro area as a whole.

Finally, the failure to consolidate balance sheets as indicated by a **persistently high level of non-performing loans** (NPL) may also have important microeconomic consequences. An efficient adjustment to shocks requires the capacity to reallocate labour and capital resources rapidly across sectors (e.g. from the non-tradable to the tradable sector) or within sectors (e.g. from low to high performing firms). Persistently high levels of NPLs hamper the capacity of banks to support this reallocation process and lock in resources in high debt firms that are also frequently poor performers. Insolvency frameworks that facilitate the rapid resolution of non-viable private debt and the rehabilitation of viable firms are essential for an efficient adjustment process. This aspect was largely overlooked in the pre-crisis debate on adjustment in the euro area.

([41]) European Commission (2006), 'The EU economy: 2006 review', *European Economy*, No. 6, DG ECFIN, European Commission.
European Commission (2008), op. cit.

([42]) See for instance:
Angelini, E., A. Dieppe and B. Pierluigi (2013), 'Learning about wage and price mark-ups in euro area countries', *ECB Working Paper Series*, No. 1512, February.
Angelini, E. M. Ca' Zorzi and K. Forster (2014), 'External and macroeconomic adjustment in the larger euro area countries', *ECB Working Paper Series*, No. 1647, March.

([43]) Landmann, O. (2012), 'Rotating slumps in a monetary union', *Open Economies Review*, Vol. 23, pp. 303-317
Allsopp, C. and D. Vines (2008), 'Fiscal policy, intercountry adjustment and the real exchange rate', *European Economy - Economic Papers*, No. 344, DG ECFIN, European Commission.

I.4. Conclusion

This chapter has reviewed the issue of market based adjustment to asymmetric shocks in the euro area. The global and sovereign crises have triggered a rethink of the nature of the economic shocks that can affect the euro area and shown that business cycles can diverge sharply. Due to the imbalances accumulated during the first decade of the euro, some Member States have turned out to be much more exposed than others to the shift in investor risk appetite brought by the global financial crisis. Shock amplifiers particular to the euro area, such as the bank-sovereign feedback loop, and the resulting sudden stops in capital inflows have further magnified the asymmetric effect of the global financial crisis, pushing cyclical divergence to historical highs.

With the strengthening of macroeconomic surveillance, the establishment of the ESM and the launch of the Banking Union, significant measures have been taken in recent years to improve the functioning of Europe's Economic and Monetary Union. This should help reduce the occurrence of asymmetric shocks by reducing the differences of countries in their exposure to shocks and by mitigating the effect of the shock amplifiers. Nevertheless, 'stock' imbalances (as opposed to 'flow' imbalances) are receding only very slowly in the periphery. This means that some Member States will remain considerably more vulnerable than others to economic shocks for some time and that risks of strong asymmetric shocks will not fade rapidly.

Given the persistence of these risks, it is important to better understand the role of market-based stabilising forces. The present report contributes to this understanding by presenting new econometric analyses of the relative price and real interest rate mechanisms. It also discusses the critical role played by balance sheets in adjustment processes. These analyses show that the relative price mechanism has been at work before and since the beginning of the crisis. Its effect since the crisis appears to be stronger than it was before the crisis. However, the mechanism remains hindered by rigidities in labour markets and the slow speed of the reallocation processes across sectors and firms that are ongoing in the periphery. It has also been hampered by frictions in financial markets. In addition, financial fragmentation has reinforced the destabilising effect of the real interest rate mechanism by pushing up nominal interest rates in the periphery. Finally, the crisis has shown that balance sheet consolidation can substantially prolong adjustment processes and introduce an asymmetry between consolidating and non-consolidating countries, i.e. debtor and creditor countries. Weak domestic demand in the latter has contributed to make the adjustment processes in the former more protracted and painful.

The analysis also offers some signposts for policy design. First, reducing shock exposure is key and the Macroeconomic Imbalance Procedure has an important role to play in this respect. Second, a full Banking Union would reduce the fragmentation of the banking sector, notably by severing the sovereign bank loop and would therefore considerably mitigate the strength of the EMU-specific shock amplifiers. Third, structural policies can also contribute to improving market-based adjustment. There is evidence that labour market reforms can strengthen the stabilisation power of the relative price mechanism by reducing price persistence or by enhancing the response of prices to the output gap. Addressing the problem of non-performing loans would facilitate balance sheet adjustment processes. Improved macroeconomic conditions at the euro area level would facilitate adjustment, notably by allowing the euro area to move out of an environment of very low inflation. Last but not least, policies that strengthen domestic demand in surplus countries would also facilitate adjustment both directly, by increasing export opportunities in the periphery and, indirectly, by supporting euro area inflation. These policies could include the use of available fiscal space to boost public investment and structural reforms that boost non-tradable activity.

II. Revisiting the relative price mechanism

In the absence of national exchange rates, euro area Member States need to respond to asymmetric shocks via internal adjustment processes. This section analyses the functioning of a key built-in internal adjustment process in EMU, namely the "relative price mechanism" (frequently called the "competitiveness channel"), which links price developments to both the cyclical phases of the business cycle as well as to structural developments.

The findings of panel data estimations suggest that the relative price mechanism has indeed worked since the launch of the euro: differentials in cyclical conditions and structural reforms have contributed to closing price differentials across the euro area. The observed relative price mechanism is stronger when measured using unit labour costs (ULCs) compared with the GDP deflator, which could be explained by the fact that many Member States are (small) open economies acting as price takers. ULCs are determined largely by domestic factors, while the GDP deflator is also influenced by world prices, especially when exporters act as price takers.

In the post-2009 period, however, the relative price mechanism has acted with a delay, kicking in only after the start of the European debt crisis in 2011. The response to output gap differentials was more rapid in the private than in the public sector when ULCs are calculated separately for the two sectors. Furthermore, the functioning of the mechanisms has remained hampered by structural rigidities, in particular in the national labour, product and financial markets. The wider related literature suggests that, due to downward nominal rigidities, price adjustment could be stronger once the euro area moves out of the current low inflation environment. Overall, the findings stress the relevance of structural reforms in both vulnerable and core countries not only for raising growth potential, but also for accelerating the adjustment to asymmetric shocks in euro-area countries.

II.1. Introduction ([44])

In the absence of flexible nominal exchange rates, euro area Member States need to respond to asymmetric shocks via internal adjustment processes. There is an automatic built-in adjustment process in a currency union, namely the "relative price mechanism" (frequently called the "competitiveness channel"). ([45]) Countries that have lost price competitiveness will eventually experience recessionary forces in the form of negative output gaps that, in turn, help re-establishing relative prices via lower inflation.

Some price differentials across countries are inevitable in a monetary union, reflecting, *inter alia*, different catching-up mechanisms, economic structures, institutions and adjustment processes. However, large and persistent price differentials across euro area Member States can hamper the smooth functioning of the Economic and Monetary Union (EMU) for mainly three reasons:

First, they can be a symptom of deeper structural economic imbalances and policy mistakes. For instance, they can be caused by booms in house prices, sectoral misallocation or large indebtedness in euro area Member States. These kinds of inefficiencies cannot be addressed by the single monetary policy.

Second, internal adjustment can be slow and painful. ([46]) A period of excessive overheating would likely require a protracted period of low growth to rebalance relative prices. This is particularly painful in economies characterised by a significant degree of price and wage rigidity.

Finally, the global economic and financial crisis revealed that excessive imbalances are not only a national problem, but can spill over to other countries, notably through financial contagion. These negative spillover effects can endanger the stability of the euro area.

It is therefore essential for the smooth functioning of EMU that relative prices can adjust quickly to cyclical and structural differences. This channel

([44]) The section was prepared by Philipp Mohl and Thomas Walsh.

([45]) See e.g. European Commission (2008), 'EMU@10. Successes and challenges after ten years of Economic and Monetary Union', *European Economy*, 2.

([46]) Jaumotte, F. and P. Sodsriwiboon (2010), 'Current account imbalances in the southern euro area', *IMF Working Paper*, No. 10/139, June.

becomes even more important in the absence of other potentially stabilising adjustment channels in the euro area, such as a high degree of labour mobility from depressed to booming regions or large fiscal transfers across Member States.

While the relative price mechanism is a quasi-automatic process, its effectiveness is an open empirical question, which is addressed here, focusing on the original 11 euro area countries and Greece ([47]). It extends previous empirical work to the period after the global economic and financial crisis using panel data. ([48]) The findings suggest that the relative price mechanism in the post-2009 period occurred with a delay and it was hampered by structural rigidities, in particular in the national labour, product and financial markets.

The section is structured as follows. Section II.2 presents some stylised facts on relative price differentials in EMU before and after the crisis. Section II.3 outlines the main transmission channels on the drivers of relative price differentials. Section II.4 presents the empirical results of the panel analyses. Finally, Section II.5 concludes.

II.2. Stylised facts

The pre-crisis period was characterised by large capital inflows and subsequent credit booms in several euro area countries such as Spain and Ireland. Cheap domestic credit, in particular, contributed to an overheating housing market and to misallocations of resources into non-tradeable sectors such as construction and real estate.

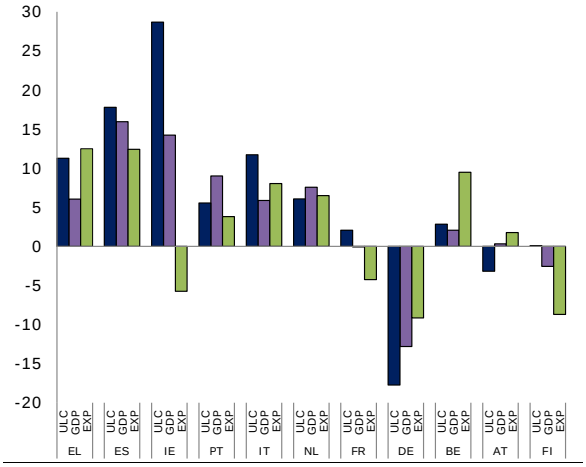
Peripheral euro area countries more broadly lost relative price competitiveness over the period 1999-2009 (see Graph II.1). In Greece, Spain, Ireland and Italy the unit labour cost (ULC)-based real exchange rate vis-à-vis the group of twelve euro area Member States appreciated by more than 10 percent relative to the position at the start of EMU in 1999.

([47]) Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain.

([48]) Previous work among others by: Honohan, P. and P. Lane (2003), 'Inflation divergence', *Economic Policy*, October, pp. 357-394; Biroli, P, G. Mourre and A. Turrini (2010), 'Adjustment in the euro area and regulation of product and labour markets: an empirical assessment', *CEPR Discussion Paper Series*, 8010: European Commission (2014) 'Help firms grow', European Competitiveness Report 2014.

Given the primacy of the relative price mechanism in the euro area, recouping lost competitiveness is seen as an essential component of post-crisis recovery. Using carefully constructed counterfactual scenarios, it has been shown, at least in countries such as Ireland and Spain, that if lost price competiveness had been fully regained during the crisis period, the subsequent cyclical positions could have been substantially improved. ([49])

Graph II.1: **Pre-crisis developments in REERs, selected euro area countries**
(1999-2008, %)



Source: DG ECFIN calculations based on AMECO. REER vis-à-vis the EA-12 measured using the unit labour cost, GDP and export deflator.

Another group of countries, in particular Germany, experienced a significant fall in unit labour costs in the pre-crisis period.

Post-crisis rebalancing

Since the outbreak of the global economic and financial crisis, several euro area countries have regained part of their lost competitiveness (see Graph II.2). This seems to be the case especially for countries which went through a macroeconomic adjustment programme.

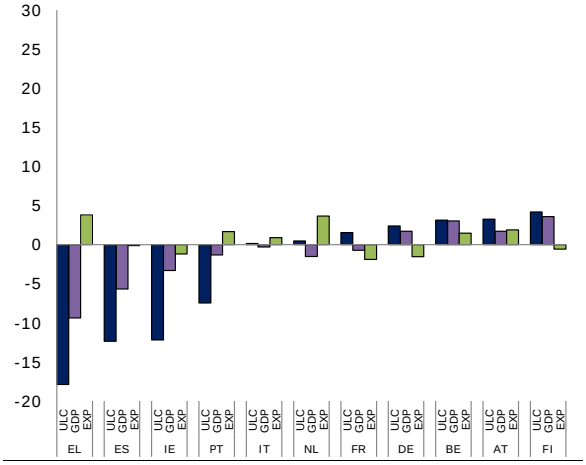
Greece and Portugal have now regained the lost ground, and even moved to a net position lower than at the start of EMU. Spain is also very close to a balanced position with respect to ULC.

Meanwhile, those countries which experienced reductions in relative unit labour costs before the

([49]) Martin,P. and T. Philippon (2014), 'Inspecting the mechanism - Leverage and the great recession in the eurozone', *CEPR Discussion Paper Series*, 10189.

crisis have shown increases of relative prices in the post-crisis period. All northern euro area countries (Finland, Austria, Belgium and Germany) have shown at least some rebalancing, with small to moderate increases in their ULC and GDP-based REERs.

Graph II.2: **Post-crisis developments in REERs, selected euro area countries (2009-2014, %)**



Source: DG ECFIN calculations based on AMECO. REER vis-à-vis the EA-12 measured using the unit labour cost, GDP and export deflator.

The degree of rebalancing depends on the deflator used. For instance, while Greece, Spain and Portugal show substantial progress in relative price adjustment based on the GDP and ULC deflators, the rebalancing is less strong using an export deflator. ([50])

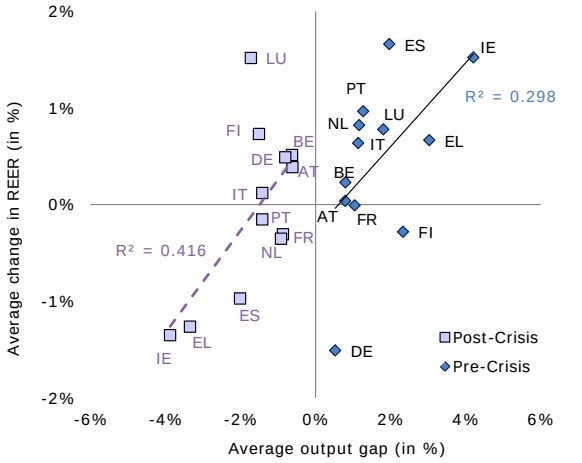
II.3. Factors affecting relative prices in EMU

Several factors have been identified as drivers of relative price developments. ([51])

Cyclical conditions

According to modern macroeconomic theory, cyclical conditions (as measured for instance by the output gap) can be a key determinant of inflation. ([52]) Negative output gaps and spare resources in an economy put downward pressure on prices and wages, resulting in a depreciation of relative prices. ([53]) This relationship appears to be slightly stronger in the post-crisis period (see Graph II.3).

Graph II.3: **Output gaps and REER (EA-12) (1)**



(1) Output gap calculated using Hodrick-Prescott filter techniques. REER vis-à-vis the EA-12 based on the GDP deflator. Pre-crisis period: 1999-2008; post-crisis period: 2009-2014.
Source: DG ECFIN calculations based on AMECO.

A key factor behind this development is the labour market, as the unemployed bid down the wages of those in work. In competitive markets, these labour cost savings then pass through to lower prices.

The strength of the response of relative prices to relative cyclical conditions is, however, likely to vary with characteristics of the institutional labour,

([50]) The differences in strength between the deflators may indicate that many Member States are (small) open economies acting as price takers. ULCs are determined largely by domestic factors, while prices based on the GDP/export deflator are partly/largely influenced by world prices, especially when exporters act as price takers.

([51]) For a survey see also de Haan, J. (2010), 'Inflation differentials in the euro area: a survey', in: de Haan, J. and H. Berger (editors), *The European Central bank at Ten*, Springer-Verlag Berlin Heidelberg, pp. 11-32.

([52]) Phillips, A.W. (1958), 'The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1861–1957', *Economica*, 25(100), pp. 283-299.

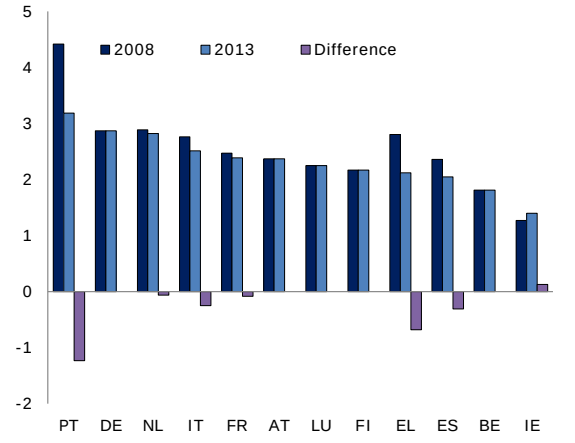
([53]) In recent years inflation in advanced economies has remained higher than would be expected from previous historical relations between inflation and the size of recent output gaps (IMF (2013), 'The dog that didn't bark: Has inflation been muzzled or was it just sleeping?', *IMF World Economic Outlook*, pp. 1-17). There are several explanations for this so-called "missing disinflation", in particular the impact of changes in the short-term (not total) unemployment rate in the determination of wage inflation (see Coibion, O. and Y. Gorodnichenko (2013), 'Is the Phillips curve alive and well after all? Inflation expectations and the missing disinflation', *National Bureau of Economic Research,* 19598; Gordon, R.J. (2013); 'The Phillips curve is alive and well: inflation and the NAIRU during the slow recovery', *National Bureau of Economic Research*, 19390; Llaudes, R. (2005), 'The Phillips curve and long-term unemployment', *ECB Working Paper*, 440; February; Rudebusch, G.D. and J.C. Williams (2015), 'A wedge in the dual mandate: monetary policy and long-term unemployment', *Journal of Macroeconomics,* in press).

product, and financial market set-ups at the national level.

Labour market institutions

Institutions which do not allow for a sufficient degree of flexibility of prices and quantities of labour can hamper the strength of relative price adjustment (see Graph II.4). While labour market flexibility is generally crucial for the smooth functioning of the euro area, it is more challenging to define it with a single indicator, since there are several possibilities to achieve a sufficient degree of flexibility.

Graph II.4: **Employment protection legislation (EA-12) (1)**



(1) Employment protection legislation is measured with the synthetic OECD indicator for individual and collective dismissals (regular employment) on a scale from 0 (least restrictions) to 6 (most restrictions).
Source: DG ECFIN calculations based on OECD data.

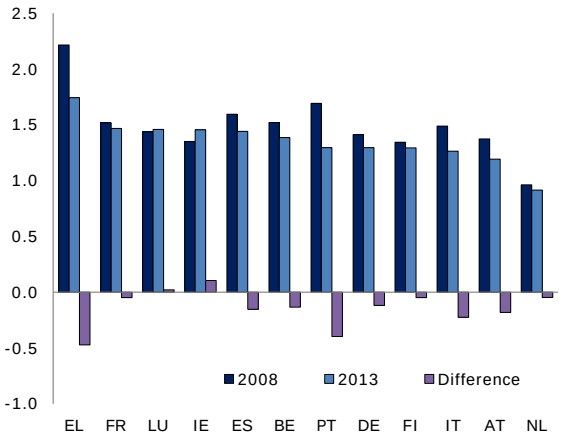
On the price side, labour market institutions can be too rigid to allow firms to pay the wages they can afford. For instance, a minimum wage that is set too high could prevent the employment of the lowest skilled workers in particular. Since minimum wages frequently set a wage floor for an economy as a whole, they can further artificially push up other wage levels. Moreover, in case of an asymmetric shock, minimum wage levels typically do not fall. Similarly, the nature of the wage bargaining process, the power of workers' unions ([54]) can be important factors in shaping the labour market adjustment process. ([55])

On the quantity side, the ease with which businesses can hire and dismiss staff, set out in employment protection law, can affect the flexibility in working hours. In addition a too generous unemployment replacement scheme could aggravate the reduction of long-term unemployment.

Product market institutions

Rigid product market regulation can result in less competitive markets, where firms acquire more monopoly power and higher mark-ups (see Graph II.5). These firms will be able to absorb part of an economic shock in their mark-ups, while in competitive markets one would expect that a larger part of the shock passes through to prices. As such we might expect to see a weaker transmission from labour cost shocks to changes in prices in markets that are less competitive.

Graph II.5: **Product market regulation index (EA-12) (1)**



(1) Product market regulation is measured with an OECD indicator on a scale from 0 (least restrictions) to 6 (most restrictions).
Source: DG ECFIN calculations based on OECD data.

Some evidence from the euro area and the UK shows that firms which face stronger competition in their industry also review and reset their prices more often. ([56])

([54]) The relationship between wages and union size may in fact take an inverse-U shape, with very large unions aware of the aggregate consequences that their wage demands have on employment. Internalising such processes, large unions might then moderate wage developments to maintain employment.

([55]) Biroli et al. (2010), op. cit.
Jaumotte, F. and H. Morsy (2012), 'Determinants of inflation in the euro area: the role of labor and product market institutions', *IMF Working Paper*, pp. 12-37, January.

([56]) Fabiani, S., M. Druant, I. Hernando, C. Kwapil, B. Landau, C. Loupias and A.C. Stokman (2005), 'The pricing behaviour of

Financial frictions

While credit market disruption can affect the size of output gaps directly, ([57]) recent research concludes that financial frictions can also affect the process by which relative prices adjust to output gaps and therefore alter the speed with which output gaps close. ([58])

For instance, it has been shown theoretically and empirically that firms in the US and euro area facing financial constraints are more likely to increase their mark-ups in order to build a buffer-stock of internal finance, and this mechanism significantly attenuates the response of prices to output gaps.

Possible explanations for such a channel are falling capital productivity, restrictions on credit supply, high deleveraging needs, and weaker competition. The channel is also a potential explanation for the increase in margins observed through the crisis in vulnerable euro area countries.

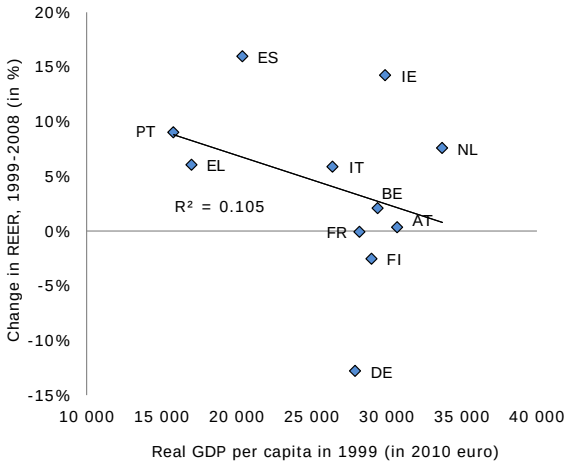
Catch-up mechanism

Apart from cyclical position, price level convergence can generate temporary inflation differentials. Empirical evidence suggests that in the early years of EMU a significant part of the price differentials can be explained by price level convergence. ([59])

Aggregate productivity can further drive relative price developments via the "Balassa-Samuelson" effect. Competition from global markets ensures that price pressures in the tradeable sector remain contained. However, higher wage levels in the comparatively productive tradeable sector will compete for resources with other sectors and put upward pressure on wages in the rest of the economy. This raises prices levels in other sectors which have experienced no similar rise in productivity. This effect can explain higher price levels in richer, more productive countries.

Countries with lower levels of GDP per capita can be expected to grow faster as they converge to the same levels as the richest, and so we would expect to see a relationship between the starting level GDP per capita and the appreciation in the REER over the medium term (see Graph II.6).

Graph II.6: **Real GDP per capita and REER (EA-12) (1)**



(1) REER vis-à-vis the EA-12 based on the GDP deflator.
Source: DG ECFIN calculations based on AMECO.

Inflation expectations

Inflation expectations are found to be an important driver of prices. ([60]) Ceteris paribus, an increase in today's expectations about future prices will reduce the real interest rate and will cause firms and households to bring forward their spending. Through this mechanism, increased expectations of inflation in the future can cause today's inflationary pressures to rise.

firms in the euro area: new survey evidence', *Banque de France Working Paper*, No. NER-E 135, November.
Hall, S., M. Walsh and A. Yates (2000), 'Are UK companies' prices sticky?', *Oxford Economic Papers*, 52(3), pp. 425-446.

([57]) Chodorow-Reich, G. (2014), 'The employment effects of credit market disruptions: firm-level evidence from the 2008–2009 financial crisis', *The Quarterly Journal of Economics*, 129(1), pp. 1-59. Amiti, M. and D.E. Weinstein (2013), How much do bank shocks affect investment? Evidence from matched bank-firm loan data' *National Bureau of Economic Research*, No. 18890.

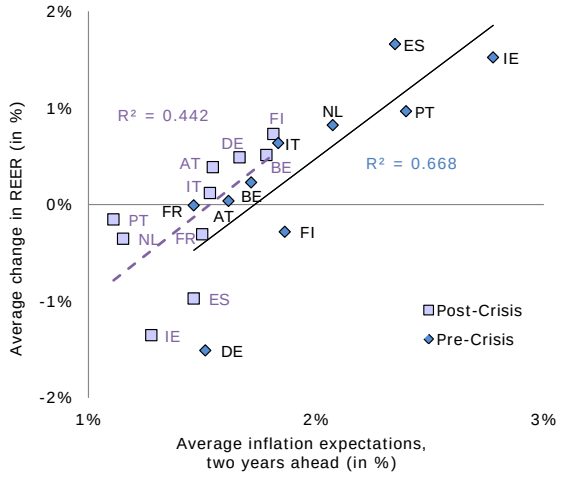
([58]) Breitenfellner A., A. D. Dragu and P. Pontuch (2013), 'Labour costs pass-through, profits and rebalancing in vulnerable Member States', *Quarterly Report on the Euro Area,* 12(3), pp. 19-25. Montero, J.M. and A. Urtasun (2014), 'Price-cost mark-ups in the Spanish economy: a microeconomic perspective', *Bank of Spain Working Paper,* No. 1407.
Gilchrist, S., R. Schoenle, J. Sim and E. Zakrajsek (2015), 'Inflation dynamics during the financial crisis', *Federal Reserve Board, Finance and Economics Discussion Series*, 2015 (012); Gilchrist, S. and E. Zakrajsek (2015), 'Customer markets and financial frictions: implications for inflation dynamics', *prepared for the 2015 Economic Policy Symposium organised by the Federal Reserve Bank of Kansas City and held at Jackson Hole*, WY, August, pp. 27–29; de Almeida, L.A. *(2015*), 'Firms' balance sheets and sectoral inflation in the euro area during the financial crisis', *Economics Letters*, 135, pp. 31-33.

([59]) Honohan and Lane (2003), op. cit.

([60]) Coibion and Gorodnichenko (2013), op. cit.

Since the onset of the crisis, the relationship between inflation expectations and REER evolution has remained stable, as captured by a similar gradient in trend lines. However, the explanatory power of inflation expectations has fallen (see Graph II.7).

Graph II.7: **Inflation expectations and REER (EA-12) (1)**



(1) REER vis-à-vis the EA-12 based on the GDP deflator. Pre-crisis period: 1999-2008; post crisis period: 2009-2014.
Source: DG ECFIN calculations based on AMECO. Inflation expectations taken from the Consensus forecast.

House prices

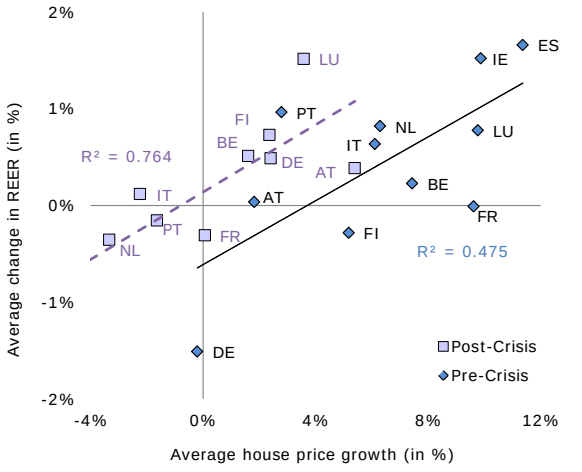
Changes in house prices may also influence relative prices, through changes in consumption patterns and consumer wealth effects. ([61])

If there is an asymmetry between the fluctuations in the output gap and the housing market due to divergent financial and real cycles, the effect of rising house prices and increased consumption will to some extent become embedded as structural with respect to the business cycle and measures of the output gap. Therefore including house prices also measures the extent to which the wealth effect generated by house price changes influences demand, beyond the frequency of the business cycle.

House prices appear to have a moderate to strong relationship with price developments in both periods (see Graph II.8).

([61]) Case, K.E., J.M. Quigley and R.J. Shiller (2005), 'Comparing wealth effects: the stock market versus the housing market', *The B.E. Journal of Macroeconomics*, 5(1), pp. 1534-6013.

Graph II.8: **House prices and REER (EA-12) (1)**



(1) REER vis-à-vis the EA-12 based on the GDP deflator. Pre-crisis period: 1999-2008; post crisis period: 2009-2014.
Source: DG ECFIN calculations based on AMECO.

External dimensions

The external dimension can play an important role in affecting prices.

The oil price is a key determinant of the external component of inflation, given its use as a fuel for transportation and heating, as well as an input in production processes more generally.

Oil price shocks will directly affect the price adjustment mechanism to the extent that oil price shocks feed into headline consumer or producer prices. A second order effect will be the impact of higher consumer price inflation on inflation expectations formed by firms and households, which will in turn affect wage-bargaining and price-setting behaviour and future prices.

While all countries are exposed to the same oil price, the knock-on effects of oil shocks will not be equal across all euro area Member States, since they will be hit by shocks to the extent that they are reliant on oil.

Finally, the nominal exchange rate is a key factor in determining net exports. While all euro area members will experience the same appreciations and depreciations in nominal terms, they are not all equally open, and may have very different demand and supply elasticities, different trading partners etc.

II.4. Empirical evidence of the functioning of the relative price mechanism

Previous studies of the price adjustment mechanism in euro area countries from the pre-crisis decade found that the relative price adjustment mechanism was indeed present. Empirical evidence suggests that after the start of EMU, relative prices appear to have become less reactive to country-specific shocks but also less persistent. ([62]) Empirical analyses further show that price level convergence played a major role in driving price differentials in the early years of EMU. ([63]) In addition, inflation differentials seem to be particularly driven by cyclical conditions ([64]) and inflation persistence. ([65])

Some findings from the recent literature on internal devaluation and adjustment in euro area deficit countries suggest that although relative prices have indeed adjusted to negative output gaps, such price changes might not have triggered the redistribution of productive resources within the countries yet (i.e. from non-tradeable to tradeable). ([66])

Own empirical analysis for the post-crisis era

To get a better understanding on the functioning of the relative price mechanism in the euro area for the post-crisis period, a panel data model was estimated for 12 euro area countries over the period 1999 to 2014 (see Box II.1).

In contrast to the existing literature, this work focuses on the possible effect of the global economic and financial crisis on the functioning of the relative price mechanism. Furthermore, the empirical approach controls not only for the role of product and labour market institutions in shaping the relative price adjustment., but also takes into account the latest findings of the literature by investigating the role of financial frictions in the price adjustment process.

As highlighted in the previous section a weak responsiveness of relative prices to comparative excess supply or demand conditions will tend to prolong the adjustment process.

The empirical work delivers the following stylised findings:

- The relative price adjustment mechanism seems to play an important role in the euro area. Relative prices tend to react positively and significantly to output gap differentials.

- The relative price mechanism is stronger when based on unit labour cost compared with GDP deflators. This could be explained by the fact that many euro area Member States are (small) open economies acting as price takers. ULCs are driven to a large extent by domestic factors, whereas prices based on the GDP deflator are also determined by world prices, in particular when exporters act as price takers.

- The global economic and financial crisis had a significant impact on the functioning of the relative price mechanism.

- The relative price mechanism has responded with a significant delay to the economic and financial crisis, proving to be weak during the first phase of the crisis and then strengthening significantly after the European debt crisis in 2011. The strengthening could be linked to some catching-up effect (after the weak response of the first phase of the crisis) and the effect of the implementation of structural reforms.

- While public sector prices show a pro-cyclical pattern in the first phase of the crisis, private sector wages, in particular, contributed to the relative price adjustment during 2012 to 2014.

- In addition, price persistence appears to have been reduced in the post-crisis period. These results are, however, only statistically significant in the case of the GDP deflator and the initial crisis years.

- The analysis further shows that the dynamics in relative price developments reveal a significant element of inertia. In addition, relative prices tend to be mean-reverting, i.e. that the price level tends to be stable over time. Both features

([62]) Biroli et al. (2010), op. cit.
([63]) Honohan and Lane (2003), op. cit.
([64]) Andersson, M., K. Masuch and M. Schiffbauer (2009), 'Determinants of inflation and price level differentials across the euro area countries', *ECB Working Paper*, 1129, December.
([65]) Angeloni, I. and M. Ehrmann (2004), 'Euro area inflation differentials', *ECB Working Paper*, 388, September.
([66]) For a summary of the recent work done by the IMF on this topic, see Tressel, T., S. Wang,, J. S. Kang., and J. Shambuagh (2014), 'Adjustment in euro area deficit countries: progress, challenges, policies', *IMF Staff Discussion Note,* 14/7.

can be seen irrespective of the sample period and estimation approach chosen.

- The empirical model also reveals that stricter employment protection legislation, more generous unemployment benefit schemes, higher long-term unemployment and stricter price controls reduce the responsiveness of the relative price mechanism. In addition, high costs of borrowing and sovereign bond spreads seem to have had a harmful effect on the adjustment speed of relative prices to cyclical divergences during the crisis period.

- Finally, stricter employment protection legislation, higher minimum wages, stricter price controls and sovereign bond yields seem to increase the price persistence in the euro area.

II.5. Conclusions

The smooth functioning of the relative price mechanism (frequently also called the "competitiveness channel") is key to responding to asymmetric shocks in the euro area given the absence of national exchange rates to act as a 'shock absorber' – cushioning recessions and restraining overheating during boom phases.

This section sheds new light on the functioning of the relative price mechanism in EMU since 1999, examining how relative prices adjust to the relative slack in national economies.

In brief, the findings of panel data estimations suggest that the relative price mechanism has indeed been active: cyclical conditions and structural reforms contributed to closing price differentials across the euro area.

However, the strength of the mechanism varies along several different dimensions.

- The relative price mechanism is stronger when based on unit labour cost compared with GDP deflators. This could be explained by the fact that many euro area Member States are (small) open economies acting as price takers. ULCs are influenced mainly by domestic factors, while the GDP deflator is also determined by world prices, in particular when exporters act as price takers.

The mechanism in the post-2009 period acted with a lag, and only took effect after the European debt crisis in 2011.

Furthermore, it has been hampered by structural rigidities: More flexible labour and product markets, as well as less stressed financial markets, would have enabled a stronger response of relative prices to the business cycle position. The reservation must be made that it is challenging to define the sufficient degree of labour market flexibility with a single indicator, since there are complex interactions within the field of labour market institutions.

The wider related literature suggests that, due to downward nominal rigidities, relative price adjustment could be stronger once the euro area moves out of the current low inflation environment which could be hampering the downwards adjustment of prices in certain vulnerable euro area Member States.

Overall, the findings stress the relevance of structural reforms not only for raising the growth potential, but also for accelerating the adjustment to asymmetric shocks to euro-area countries.

Box II.1: Relative price adjustment in EMU – an empirical assessment

This box provides empirical evidence on the main drivers of relative price adjustment in the euro area, with a particular focus on the period following the global economic and financial crisis.

Empirical specification

The drivers of relative prices (P) are analysed using a dynamic panel data approach. The analysis focuses on 12 euro area countries (i) throughout the whole of the EMU period (t) 1999 to 2014. The basic specification follows Biroli et al. (2010): [1]

(*a*) *Baseline specification:* $\Delta P_{i,t} = \beta_0 + \beta_1 \Delta P_{i,t-1} + \beta_2 \ln(P_{i,t-1}) + \beta_3 GAP_{i,t-1} + \varepsilon_{i,t}$

(*b*) *Interaction specification to test for a regime switch following the global economic and financial crisis:*

$$\Delta P_{i,t} = \beta_0 + \beta_1 \Delta P_{i,t-1} + \beta_2 \ln(P_{i,t-1}) + \beta_3 GAP_{i,t-1} + \beta_4 C_{t-1} + \beta_5 (C_{t-1} * GAP_{i,t-1}) + \beta_5 (C_{t-1} * P_{i,t-1}) + \beta_6 X_{i,t-1} + \varepsilon_{i,t}$$

(*c*) *Interaction specifications to test for the impact of institutional variables*:

(*c1*)
$$\Delta P_{i,t} = \beta_0 + \beta_1 \Delta P_{i,t-1} + \beta_2 \ln(P_{i,t-1}) + \beta_3 GAP_{i,t-1} + \beta_4 X_{i,t-1} + \beta_5 Z_{i,t-1} + \beta_6 (Z_{i,t-1} * GAP_{i,t-1}) + \beta_7 C_t + \ldots$$
$$\ldots + \beta_8 (C_t * GAP_{i,t-1}) + \beta_9 (C_t * Z_{i,t-1}) + \beta_{10} (C_t * Z_{i,t-1} * GAP_{i,t-1}) + \varepsilon_{i,t}$$

(*c2*)
$$\Delta P_{i,t} = \beta_0 + \beta_1 \Delta P_{i,t-1} + \beta_2 \ln(P_{i,t-1}) + \beta_3 GAP_{i,t-1} + \beta_4 X_{i,t-1} + \beta_5 Z_{i,t-1} + \beta_6 (Z_{i,t-1} * \Delta P_{i,t-1}) + \beta_7 C_t + \ldots$$
$$\ldots + \beta_8 (C_t * \Delta P_{i,t-1}) + \beta_9 (C_t * Z_{i,t-1}) + \beta_{10} (C_t * Z_{i,t-1} * \Delta P_{i,t-1}) + \varepsilon_{i,t}$$

All variables are expressed in differences to the simple arithmetic mean of the sample excluding the given country, and are z-standardised for each year to have mean zero and unit variance. Since the impact of the variables tends to occur only gradually, they are included with a lag of one year. We use different measures for prices, ranging from the real effective exchange rate relative to the 12 euro area countries based on the GDP deflator to measures of deflators expressed in differences to the sample average excluding the country concerned using the GDP deflator as well as the unit labour cost (ULC) deflator for the total economy, the public and private sector. [2]

As a first step, relative prices are regressed in a baseline specification on three independent variables (see equation *a*). The inclusion of the lagged price growth variable (ΔP) captures a potential inertia factor in the dynamics of relative price adjustment. The lagged level of prices ($ln\ P$) controls for a mean reversion effect. The output gap (GAP) indicates the strength of the price adjustment channel, measuring the reaction of relative prices to country-specific cyclical differences relative to the euro area average. The output gap is measured using HP filter techniques, but the results are broadly unchanged when based on a production function methodology. [3]

(1) Biroli, P., G. Mourre and A. Turrini (2010), 'Adjustment in the euro area and regulation of product and labour markets: an empirical assessment', *European Economy, Economic Papers*, No. 428, October.

(2) Biroli et al. (2010) use as a dependent variable the growth of real effective exchange rates (REERs) based on the GDP deflator, which implies using double export weights that take into account export competition both on own and third markets. In order to ensure consistency with the independent variables used, we do not use REERs, but construct a price measure in differences to simple arithmetic averages of the sample excluding the country concerned.

(3) See D'Auria, F., C. Denis, K. Havik, K. Mc Morrow, C. Planas, R. Raciborski, W. Roeger und A. Rossi (2010), 'The production function methodology for calculating potential growth rates and output gaps', *European Economy Economic Papers*, No. 420, July.

(Continued on the next page)

As a second step, the baseline specification is augmented with a dummy variable (*C*) to test for the impact of the global economic and financial crisis (see equation *b*). To be more precise, the panel models are estimated using dummies for two sub-periods since the outbreak of the crisis, namely 2009 to 2011 and 2012 to 2014. In addition, the specification is estimated by adding further control variables (X) with a potential impact on prices. The selection of these variables was guided by a review of the literature (see section I.3. in the main text).

Finally, some *interaction specifications* are estimated to find out whether the impact of the output gap and the price persistence on relative prices occurs conditional on the labour, product and financial market institutions at the national level (*Z*) (see equations *c*). For this purpose, the output gap (see equation *c1*) and the lagged price growth (see equation *c2*) are interacted with the institutional variable. An additional interaction term with a post-2009 crisis dummy (*C*) is added to analyse whether the conditional impact has changed since the crisis. To avoid biased estimates due to multicollinearity, the institutional variables are added consecutively but separately into the specification and the interaction relative to the output gap and inflation persistence is estimated separately.

Data

Our matrix of controls *X* in the augmented baseline specification uses data on the growth rate of total factor productivity (TFP), the level of the real GDP per capita, the government primary balance, the change in VAT rates, the growth rate of the nominal effective exchange rate relative to 37 industrial countries, the change in the nominal house price index according to the European Commission indicator, today's expectations of future inflation rates (as measured by Consensus economics).

The interaction terms using variables *Z* are constructed to account for the institutional settings of labour, product and financial markets. The following proxies are used:

- Employment protection indicator and real unemployment benefit replacement ratio (as a measure of *labour market institutions*),
- Product market regulation index and price controls (as measures of *product market institutions*),
- Sovereign 10 year yields and a composite indicator of the cost of financing (measures of *financial frictions).*

To allow for a better interpretation of the results, again for each year all variables are centred on a zero mean, and have variance of one. They are measured in difference to the simple arithmetic average of the sample excluding the country concerned. Labour and product market variables are taken from the OECD. Financial variables are available via the ECB. Sovereign yields are taken from Bloomberg.

Results

Baseline specification

The results of the baseline specifications reveal that the relative price adjustment channel seems to play an important role in the euro area (see Table 1). Relative prices tend to react positively and significantly to output gap differentials. In addition, relative prices exhibit a significant degree of price persistence and appear to be strongly mean-reverting. The results are robust to the estimation approach used and the price measure (REER based on GDP vs. GDP deflator) chosen.

(Continued on the next page)

Box (continued)

Table 1: **Baseline specifications for GDP price measures (1)**

	REER based on GDP			***GDP deflator***		
	FE	LSDVc	SYS-GMM	FE	LSDVc	SYS-GMM
	(1)	(2)	(3)	(4)	(5)	(6)
Prices growth (t-1)	0.534***	0.714***	0.639***	0.707***	0.829***	0.695***
	(4.258)	(10.33)	(2.882)	(8.587)	(13.18)	(6.482)
Log prices (t-1)	-0.940***	-0.976***	-0.120	-0.930***	-0.686**	-0.162**
	(-3.715)	(-3.021)	(-1.437)	(-4.488)	(-2.548)	(-2.105)
Output gap (t-1)	0.129*	0.117**	0.247***	0.0447	0.0521	0.131**
	(2.014)	(2.066)	(2.865)	(1.057)	(0.992)	(2.209)
Lt. elasticity (size)	0.277	0.408	0.684	0.153	0.305	0.429
Lt. elasticity (p-value)	0.058	0.035	0.014	0.393	0.302	0.043
AR(1) (p-value)			0.075			0.022
AR(2) (p-value)			0.805			0.984
Hansen (p-value)			0.330			0.308
#instruments			12			12
R-squared	0.357			0.467		
Observations	192	180	192	192	180	192
# countries	12	12	12	12	12	12

(1) The specifications control for time fixed effects (via z-standardisation on an annual basis) and country fixed effects (via the estimation approach chosen). FE shows the results of the fixed effect estimator using heteroskedasticity-robust Huber-White standard errors. Due to the dynamic nature of the panel estimation approach, the simple FE estimations suffer from the well-known Nickell bias (Nickell, 1981). Two estimation approaches are used to control for it. First, the bias-corrected least square dummy variable estimator (LSDVc) proposed by Kiviet (1995) and extended by Bruno (2005) to unbalanced panel data, which turns out to have better properties in the case of small N. Second, the two-step system GMM (SYS-GMM) estimator following Blundell and Bond (1998), which not only allows controlling for endogeneity of the lagged dependent variable, but also for other potential endogenous variables. In the specification shown above internal instruments were used for the lagged prices and output gap variable. Due to the small sample size the set of internal instrumental variables is restricted by "collapsing" the matrix of instruments and restricting its lags up t-3. The standard errors are corrected following Windmeijer (2005). AR(1,2) and Hansen tests confirm the validity of the system GMM specifications. ***, ** and * denote respectively statistical significance at 1, 5 and 10%. (4)
Source: DG ECFIN calculations.

The relative price mechanism becomes stronger when measured with the unit labour cost rather than the GDP deflator (see Table 2). Since this pattern prevails for the pre- and post-crisis period, it could be explained with a general phenomenon of open economies acting as price takers. Within the group of ULC, the response to the output gap is more rapid in the private than in the public sector. At the same time, prices appear to be more persistent and more-rapidly mean-reverting in the private than in the public sector.

Table 2: **Baseline specification for different ULC deflators (1)**

	ULC total economy			***ULC private sector***			***ULC public sector***		
	FE	LSDVc	SYS-GMM	FE	LSDVc	SYS-GMM	FE	LSDVc	SYS-GMM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Prices growth (t-1)	0.428***	0.525***	0.540***	0.408***	0.514***	0.505***	0.253*	0.344***	0.202**
	(5.759)	(8.084)	(7.534)	(5.914)	(7.98)	(6.549)	(2.095)	(5.652)	(1.962)
Log prices (t-1)	-0.867***	-0.802***	-0.193**	-0.905***	-0.956***	-0.187**	-0.611***	-0.638***	-0.342***
	(5.025)	(3.633)	(2.540)	(4.120)	(3.589)	(2.398)	(3.979)	(5.887)	(2.695)
Output gap (t-1)	0.283***	0.280***	0.328***	0.280***	0.272***	0.342***	0.137**	0.130**	0.244***
	(3.155)	(4.806)	(6.181)	(3.416)	(4.637)	(5.748)	(2.605)	(2.059)	(3.573)
Lt. elasticity (size)	0.495	0.588	0.713	0.472	0.560	0.690	0.184	0.198	0.306
Lt. elasticity (p-value)	0.012	0.000	0.000	0.006	0.000	0.000	0.003	0.036	0.000
AR(1) (p-value)			0.008			0.023			0.006
AR(2) (p-value)			0.111			0.160			0.153
Hansen (p-value)			0.566			0.422			0.514
#instruments			12			12			12
R-squared	0.397			0.361			0.242		
Observations	192	180	192	192	180	192	192	180	192
# countries	12	12	12	12	12	12	12	12	12

(1) For a description of the estimation procedure see footnote of Table 1.
Source: DG ECFIN calculations.

(4) See: Blundell, R. and S. Bond (1998), 'Initial conditions and moment restrictions in dynamic panel data models', *Journal of Econometrics*, 87, pp. 115-143; Bruno, G. (2005), 'Approximating the bias of the LSDV estimator for dynamic unbalanced panel data models', *Economic Letters*, 87, pp. 361-366; Kiviet, J.V. (1995), 'On bias, inconsistency and efficiency of various estimators in dynamic panel data models', *Journal of Econometrics*, 68, pp. 53-78; Nickell, S. (1981), 'Biases in dynamic models with fixed effects', *Econometrica*, 49, pp. 1417-1426; Windmeijer, F. (2005), 'A finite sample correction for the variance of linear efficient two-step GMM estimators', *Journal of Econometrics*, 126(1), pp. 25-51.

(Continued on the next page)

The global economic and financial crisis had a significant impact on the functioning of the relative price mechanism (see Table 3). The relative price adjustment channel was only effective in the last three years of the investigation (2012-14), but not in the first three years following the crisis (2009-11). From 2009 to 2010, the unit labour costs of the public sector increased significantly despite the strong decline of the output gap, which points to a pro-cyclical pattern. Between 2011 and 2013, the relative price adjustment was substantially stronger in the private than in the public sector. Overall, the results seem to suggest that the relative price mechanism only acted with a delay, but was then comparatively stronger than in the pre-crisi period which could be linked to some catching-up effect and the effect of the implementation of structural reforms.

In addition, price persistence appears to have been reduced in the post-crisis period. The results are, however, only statistically significant in the case of the GDP deflator and the initial crisis years.

Table 3: **Impact from the global economic and financial crisis (1)**

Prices:	*GDP deflator*		*ULC private sector*		*ULC public sector*	
Period dummy (years of coverage):	2009-11	2012-14	2009-11	2012-14	2009-11	2012-14
	(1)	(2)	(3)	(4)	(5)	(6)
Prices growth (t-1)	0.768***	0.661***	0.459***	0.572***	0.306***	0.285**
	(4.807)	(4.222)	(2.612)	(4.806)	(2.711)	(2.139)
Log prices (t-1)	-0.182**	-0.0907	-0.133*	-0.226***	-0.390**	-0.338**
	(-1.971)	(-0.814)	(-1.648)	(-3.225)	(-1.996)	(-2.199)
Output gap (t-1)	0.127**	0.0505	0.548***	0.238***	0.406***	0.290**
	(2.077)	(0.427)	(9.105)	(3.692)	(5.563)	(2.497)
Period dummy (t-1)	-0.0779	-0.0646	0.00113	-0.0564	0.142	-0.127
	(-0.296)	(-0.317)	(0.00744)	(-0.442)	(0.672)	(-0.555)
Output gap x period dummy (t-1)	-0.163	0.451*	-0.458*	0.532***	-0.852***	0.0640
	(-1.120)	(1.812)	(-1.841)	(3.472)	(-4.314)	(0.187)
Prices growth x period dummy (t-1)	-0.321	-0.522*	-0.193	-0.518***	0.0276	-0.418***
	(-1.034)	(-1.852)	(-0.795)	(-3.333)	(0.115)	(-3.393)
Short-term elast. output gap:						
Period dummy = 1 (size)	-0.036	0.502	0.090	0.771	-0.447	0.354
Period dummy = 1 (p-value)	0.834	0.085	0.724	0.000	0.020	0.374
Short-term elast. prices growth:						
Period dummy = 1 (size)	0.447	0.139	0.266	0.054	0.333	-0.133
Period dummy = 1 (p-value)	0.009	0.475	0.478	0.645	0.105	0.311
AR(1) (p-value)	0.023	0.027	0.062	0.019	0.019	0.072
AR(2) (p-value)	0.904	0.742	0.200	0.151	0.568	0.103
Hansen (p-value)	0.168	0.102	0.238	0.614	0.432	0.498
#instruments	13	11	13	10	10	11
Observations	192	192	180	180	180	180

(1) The ULC for the public (private) sector is measured as the compensation in NACE sectors O-Q (total compensation excluding compensation in NACE sectors O-Q) divided by real gross value added (GVA) in sectors O-Q (total real GVA excluding GVA in sectors O-Q). Sectors O-Q represent a rather broad interpretation of the government sector, covering public administration, defence, education, human health and social work activities. We also run the same analysis using a narrower definition of the public sector (NACE sector O, representing public administration and defence; compulsory social security) and the results remain broadly unchanged. Data are taken from Eurostat national accounts data. The regressions displayed above are based on two-step system GMM estimations following Blundell and Bond (1998) using internal instruments for the lagged prices and output gap variable. Due to the small sample size the set of internal instrumental variables is restricted by "collapsing" the matrix of instruments and restricting its lags up t-3. The standard errors are corrected following Windmeijer (2005). AR(1,2) and Hansen tests confirm the validity of the System GMM specifications. t-statistics are displayed in parentheses. ***, ** and * denote respectively statistical significance at 1, 5 and 10%.
Source: DG ECFIN calculations.

Furthermore, the empirical analysis points to a significant impact of additional explanatory variables in line with the literature review (see Table 4). In particular, a marginal increase in the TFP growth rate, real GDP per capita, the government primary balance and the house price index tend to lead to an increase, i.e. an appreciation, of relative prices. An increase in the top marginal income tax rate, the growth rate of the nominal effective exchange rate appears to reduce prices, therefore leading to depreciations.

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Box (continued)

Table 4: **Impact of additional independent variables (1)**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Prices growth (t-1)	0.541***	0.557***	0.554***	0.545***	0.574***	0.601***	0.362***	0.609***
	(2.937)	(3.514)	(5.091)	(2.680)	(4.777)	(4.375)	(5.037)	(5.516)
Log prices (t-1)	0.476*	-0.241***	-0.230***	-0.122	-0.252***	-0.234***	-0.348***	-0.284*
	(1.748)	(-3.839)	(-3.178)	(-1.238)	(-4.104)	(-3.624)	(-3.071)	(-1.878)
Output gap (t-1)	0.265**	0.250***	0.204**	0.492***	0.246***	0.229***	0.318***	0.278***
	(2.007)	(2.945)	(2.076)	(4.172)	(4.247)	(3.293)	(4.942)	(3.142)
Period dummy (t-1)	0.0987	-0.0997	-0.0228	-0.0642	-0.0295	-0.00576	0.154	0.0504
	(0.670)	(-0.648)	(-0.188)	(-0.324)	(-0.229)	(-0.0460)	(0.690)	(0.156)
Output gap x period dummy (t-1)	0.252**	0.552***	0.573***	0.458*	0.544***	0.631***	0.269*	0.276*
	(2.059)	(3.140)	(3.469)	(1.719)	(3.707)	(3.378)	(1.694)	(1.743)
Prices growth x period dummy (t-1)	-0.746***	-0.524***	-0.586***	-0.616**	-0.547***	-0.612***	-0.540***	-0.636***
	(-3.395)	(-2.611)	(-5.333)	(-2.452)	(-3.794)	(-2.908)	(-4.753)	(-3.073)
TFP growth (t-1)	0.324***							
	(3.628)							
Real GDP per capita (t-1)		0.120**						
		(2.259)						
Govt. primary balance (t-1)			0.113*					
			(1.759)					
Δ VAT				-0.166				
				(-1.372)				
Top marginal income tax rate (t-1)					-0.0850*			
					(-1.946)			
NEER rel. IC37 growth (t-1)						-0.150**		
						(-2.152)		
Δ House prices							0.222***	
							(5.028)	
Δ Inflation expectations								0.0259
								(0.136)
Short-term elast. output gap:								
Period dummy = 1 (size)	0.577	0.564	0.457	1.082	0.577	0.573	0.498	0.712
Period dummy = 1 (p-value)	0.010	0.006	0.002	0.023	0.005	0.014	0.000	0.017
Short-term elast. prices growth:								
Period dummy = 1 (size)	1.127	1.809	1.743	2.089	1.854	2.152	0.919	1.417
Period dummy = 1 (p-value)	0.012	0.007	0.002	0.040	0.001	0.026	0.131	0.484
AR(1) (p-value)	0.016	0.023	0.011	0.093	0.018	0.026	0.008	0.017
AR(2) (p-value)	0.426	0.167	0.946	0.483	0.178	0.336	0.340	0.482
Hansen (p-value)	0.907	0.463	0.751	0.159	0.657	0.724	0.713	0.597
#instruments	14	11	11	12	11	11	11	10
Observations	180	179	173	168	180	180	164	150
#countries	12	12	12	12	12	12	11	10

(1) Prices are measures using the ULC deflator for the private sector. The period dummy covers the years from 2011 to 2014. Regressions were run using internal instruments for the lagged prices and output gap variable using the two-step system GMM estimator by Blundell and Bond (1998). Due to the small sample size the set of internal instrumental variables is restricted by "collapsing" the matrix of instruments and restricting its lags up t-3. The standard errors are corrected following Windmeijer (2005). AR(1,2) and Hansen tests confirm the validity of the System GMM specifications. t-statistics are displayed in parentheses. ***, ** and * denote respectively statistical significance at 1, 5 and 10%.

Source: DG ECFIN calculations.

Despite adding additional control variables, the findings of the baseline specification still hold. In particular, relative prices show a positive and significant reaction to changes in output gap differentials. This points to a rather robust relationship in spite of the relatively small sample size.

Interaction specification

The interpretation of the empirical model with interaction terms is less straightforward. ([5]) The impact of a change in the output gap or the price persistence on relative prices needs to be assessed based on partial derivatives, which depend on the institutional setup (Z) and the crisis state (C) as shown below:

$$(d)\left(\frac{\partial RP_{i,t}}{\partial GAP_{i,t-1}}\middle| C_t, Z_{i,t-1}\right) = \begin{cases} (\beta_3 + \beta_8) + (\beta_6 + \beta_{10}) Z_{i,t-1} & if\ C = 1 \\ \beta_3 + \beta_6 Z_{i,t-1} & if\ C = 0 \end{cases}$$

To derive meaningful results we assess the size and statistical significance of the partial derivatives of the output gap or price persistence for low (L), mean (M) and high (H) observed values of the institutional variables (see Chart 1 for an illustration). Due to the z-standardisation of the institutional variables, values below (above) the mean indicate more (less) rigid regulations. For example, in the illustrative chart below, the relative price mechanism becomes weaker with increasing values for the institutional variable, i.e. for stricter regulation, and it is no longer statistically significant for high values of the institutional variable.

([5]) For the interpretation of interaction terms see e.g. Braumoeller, B.F. (2004), 'Hypothesis testing and multiplicative interaction terms', *International Organization*, 58(4), October, pp. 807-820 or Brambor, T., W.R. Clark, M. Golder (2006), 'Understanding interaction models: improving empirical analyses', *Political Analysis*, 14, p.p. 63-82.

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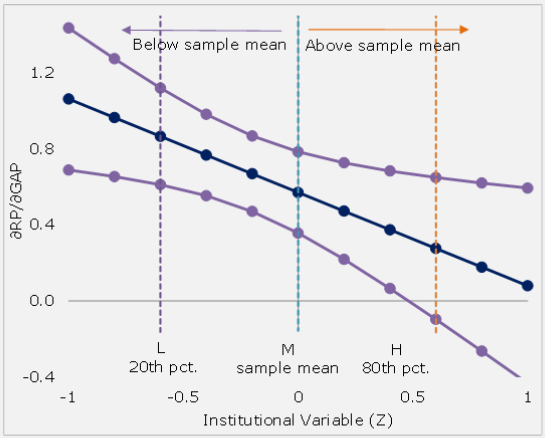
Box (continued)

Chart 1: **Illustration interaction specification**



Source: DG ECFIN calculations.

The interaction specifications show that stricter employment protection legislation, more generous unemployment benefit schemes and stricter price controls have reduced the responsiveness of relative prices to cyclical divergences as indicated by the negative slope parameter (see Chart 2). During the crisis period, high costs of borrowing and sovereign bond spreads seem to have had a harmful effect on the adjustment speed of relative prices to cyclical divergences.

The interaction models further show that stricter employment protection legislation, higher minimum wages, stricter price controls and sovereign bond yields seem to have prolonged the price persistence in the euro area.

Chart 2: **Interaction specifications**

	No crisis period				Crisis period				No crisis period				Crisis period			
	Slope	L	M	H	Slope	L	M	H	Slope	L	M	H	Slope	L	M	H
Labour markets																
Employment protection	-	■	■	□	-	■	■	□	-	□	□	□	+	□	■	■
Minimum wage	+	□	□	□	+	□	□	□	+	□	■	■	+	□	■	■
Unemp. benefits repl. rate	-	■	■	■	-	■	■	■	+	□	□	□	-	□	□	□
Product markets																
PMR	-	□	□	□	+	□	□	□	-	□	□	□	+	□	□	□
Price controls	-	■	▨	□	-	■	▨	□	+	□	□	▨	+	□	□	▨
Financial markets																
Cost of financing	-	▨	□	□	-	■	■	■	-	□	□	□	+	□	□	□
Sovereign bond yields	-	■	□	□	-	■	■	□	-	□	□	□	+	□	▨	▨

(1): The table shows the derivative of relative prices with respect to the output gap (two blocks on the left) or price persistence (two blocks on the right) for low (L), median (M) and high (H) values of the observed values of the labour, product and financial market variable, corresponding to the 20th/50th/80th percentile of the observed distribution. "Slope" indicates the direction of the slope parameter (- negative, + positive). The calculations are done for the crisis (i.e. the period from 2009 to 2014) and non-crisis period. Black and striped fields denote statistical significance at the 1 and 10% level, whereas white fields point to a no statistically significant coefficient.

Reading example: More stringent employment protection legislation (EPL) appears to reduce the responsiveness of relative prices to cyclical conditions both during crisis and non-crisis times. In case of low or medium values of the EPL relative to the EA-12 average, the relative price channel is statistically significant, i.e. it works successfully, whereas it is no longer significant for high values of EPL, i.e. very strict employment protection legislation. In addition, more rigid EPL tends to raise inflation persistence in crisis times.

Source: DG ECFIN calculations.

III. Revisiting the real interest rate mechanism

The pro-cyclical effect of real interest rates is a well-known impediment to market-based adjustment to asymmetric shocks in a monetary union. This real interest rate mechanism has been at work in the euro area since its inception, partially offsetting the stabilising effect of the relative price mechanism discussed in the previous chapter. Member States with stronger cyclical positions than the rest of the euro area have experienced comparatively higher inflation rates and as a result lower real interest rates. These real interest rate differences have tended to reinforce cyclical differences via the investment channel.

Before the global financial crisis, nominal interest rates were converging as a result of financial integration, while persistent inflation differentials were the main cause of significant Member State differences in real interest rates. Since the crisis, real rate differentials have been magnified by a rise in nominal interest rate dispersion due to financial fragmentation. This has added a nominal component to the traditional real interest rate mechanism.

Given the dominant role of bank loans in financing the euro area economy, this chapter assesses the importance of this new nominal component by looking at the drivers of lending rates for households and non-financial corporations. Econometric analysis shows that the divergence in bank lending rates since the global financial crisis can be explained not only by the perceived redenomination risks at the height of the euro area debt crisis but also by country-specific factors, including divergences in sovereign spreads, in domestic activity and in the quality of bank balance sheets. The identified effects of sovereign spreads and bank balance sheets on lending rates should be mitigated by past or ongoing policy and governance changes in EMU. However, the link between lending rates and domestic activity is likely to persist. Therefore, the nominal magnifier of the traditional real interest rate mechanism should not be seen as a temporary effect of the euro area debt crisis but rather as an integral part of adjustment in EMU although its magnitude is expected to be lower in the future in the absence of perceived redenomination risk.

III.1. Introduction ([67])

The construction of EMU was based on the assumption that monetary unification would lead to convergence in a broad range of macroeconomic variables and that appropriate policies and adjustment forces would offset potential asymmetric shocks. Under EMU, bond yields and bank lending rates did indeed gradually converge, creating common financial conditions across all euro area Member States.

However, the interaction between a single monetary policy and inflation differentials was also seen as a potential force of **divergence**. With a common nominal interest rate, Member States with higher inflation rates would have lower real interest rates. This would boost their economies, further reinforcing the inflation differential with other Member States. This mechanism, which we will call the 'real interest rate mechanism', was the core argument of the well-known Walters' critique. ([68]) The destabilising effect of the real interest rate mechanism can, at least partially, offset the stabilising effect of the 'relative price mechanism' discussed in the previous chapter.

The objective of this chapter is to revisit the real interest rate mechanism in the light of the global financial crisis. It is now well-established that the global financial crisis and, above all, the euro area debt crisis have unleashed powerful fragmentation forces on financial markets within the euro area. Financial fragmentation can be defined as a decrease in cross-border holdings of a wide range of asset classes, resulting in a divergence of related asset prices. Fragmentation has also affected bank balance sheets, causing divergence in banks' funding sources and in their costs. ([69]) These forces have at least partly reversed the convergence trend in nominal interest rates observed before the crises on a range of markets, including bonds and lending rates. As the largest rate increases have also taken place in the most cyclically depressed countries,

([67]) The section was prepared by Eric Ruscher and Bořek Vašíček.
([68]) Walters, A.A. (1990), 'Sterling in danger: The economic consequences of pegged exchange rates', Fontana Press, London.
([69]) See for example: Al-Eyd, A. and S.P. Berkmen (2013), 'Fragmentation and monetary policy in the euro area', *IMF Working Paper*, No 13/208.

they have tended to amplify the traditional real interest divergences caused by inflation differentials.

This chapter looks further into the relationship between fragmentation and the real interest rate mechanism. It presents an econometric analysis of bank lending rates for households and non-financial corporations. These bank lending rates are the most relevant rates for the financing of the euro-area private sector. The euro-area private sector is, in turn, the core player in the market-based adjustment mechanisms analysed in this special edition of the 'Quarterly Report on the Euro Area'.

The econometric analysis suggests that the amplification of the traditional real interest rate mechanism by nominal rate divergences may not be just a one-off consequence of the euro area debt crisis but could also, to some degree, be a more lasting feature of adjustment to asymmetric shocks in the EMU, one that could continue even after the establishment of a full Banking Union.

The chapter is organised as follows:

Section III.2 presents the traditional interest rate mechanism driven by inflation differentials.

Section III.3 discusses financial fragmentation in the euro area, specifically the nominal interest rate differentials that have become a new facet of the real interest rate mechanism since the crisis. This section focuses in particular on differentials in lending rates for non-financial corporations and households.

Section III.4 presents the results of an econometric analysis of the drivers of the divergence in lending rates, focusing in particular on country-specific factors that can be a source of feedback loops between rates and local economic conditions.

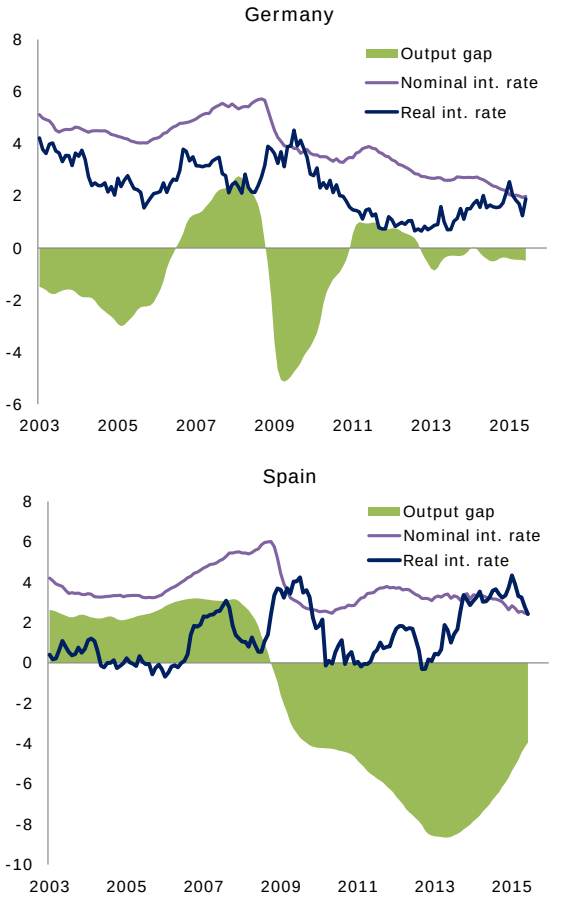
Section III.5 provides some conclusions.

III.2. The traditional view of the real interest rate mechanism in the euro area

The real interest rate mechanism has been at work both before and after the crisis

Graph III.1 illustrates the pro-cyclical properties of real interest rate mechanism by comparing nominal and real lending interest rates to the output gap for Germany and Spain. The nominal lending interest rates are calculated on the basis of the unweighted mean for non-financial corporations and households. Whereas nominal rates were largely similar in both countries in the pre-crisis period, persistently higher inflation pushed Spanish real interest rates to close to zero, i.e. around 2 pp. below German rates. This contributed to a substantially more favourable cyclical position in Spain, as evidenced by the output gap.

Graph III.1: **Nominal and real lending interest rates and output gap**
(Jan 2003 — Jun 2015, in %) (1)



(1) The nominal lending interest rates are calculated as the mean of composite indicators of the cost of borrowing for non-financial corporations and households. The year-on-year HICP inflation rate is used as a deflator to obtain the real lending rate. The output gap is a European Commission estimate based on a production function approach (annual estimates are interpolated to monthly frequency).
Source: AMECO, ECB

For the period since 2013, we can see the opposite pattern, with real interest rates in Spain exceeding those in Germany by almost 2 pp. despite a substantially larger negative output gap. Real interest rates have clearly played a pro-cyclical role in Spain, first providing unnecessary stimulus to an

economy operating above its potential and subsequently delivering tight monetary conditions when an easing of monetary conditions was what was most needed.

Several studies have provided evidence of the existence of a real interest rate channel in the euro area in the pre-crisis period. ([70]) This includes evidence of persistent inflation differences and that real interest rates affect real activity.

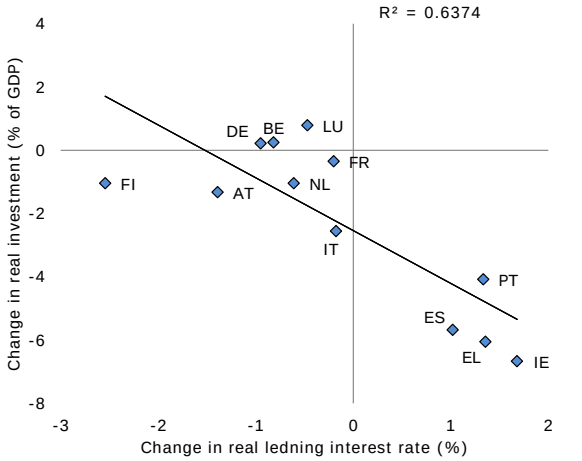
The real interest rate mechanism was driven by inflation differentials in the pre-crisis period

The existence of inflation differentials has been documented both for US regions ([71]) and euro area Member States ([72]). Possible reasons for these inflation differentials include Balassa-Samuleson effects, asymmetric supply and demand shocks (and asymmetric adjustment mechanisms to common shocks), structural characteristics of labour, product and other markets and related wage and price rigidities. ([73])

A critical point is that unlike in the US, inflation differentials have generally been found to be quite persistent in the euro area. An important cause of the persistence of differentials appears to be the persistence of inflation itself, as captured by a significant autoregressive term in estimated Phillips curves for euro area countries. ([74]) The presence of such an autoregressive term is suggestive of a strong backward-looking component in inflation expectations. The persistence of inflation differences makes it more likely that these differences will feed into agents' expectations and, as a result, into real interest rates, making the real interest rate mechanism more powerful. This will, however, depend on whether private agents base their decisions on domestic rather than euro-area real interest rates. This will more likely be the case for households (i.e. the housing sector) or small firms that are mostly dependent on the domestic market.

Investment is arguably the main channel through which real interest rate differentials turn into real activity differentials. This investment channel can be simply illustrated by comparing the changes in the ratios of real investment to GDP between the pre-crisis period (2003-07) and post-crisis (2008-14) and the corresponding changes in real interest rates for 12 euro area countries (see Graph III.2.). There is a clear negative correlation across euro area Member States: in these countries, higher increases in real interest rates relative to the pre-crisis period are associated with more severe declines in investment activity.

Graph III.2: **Changes in real interest rates vs changes in real investment**
(2008-14 vs 2003-07, in %) (1)



(1) The real lending interest rates are calculated as the mean of the composite indicators of the cost of borrowing for non-financial corporations and households. The year-on-year HICP inflation rate is used as a deflator.
Source: AMECO, ECB

The correlation shown in Graph III.2 is naturally only illustrative and cannot be interpreted as showing a causal relationship. However, the effect of the real interest rate mechanism on economic activity is supported by a range of pre-crisis econometric studies. Based on estimates of what is called the 'IS curve', these studies have generally confirmed the effect of real interest rate differentials on differentials in activity across the euro area. Nevertheless, the results appear to be sensitive to modelling assumptions, in particular to

([70]) For a pre-crisis review of the evidence on the real interest rate mechanism see: European Commission (2008), 'EMU@10 — Successes and challenges after 10 years of Economic and Monetary Union', *European Economy*, No 2, DG ECFIN, European Commission.

([71]) Arnold, I. and C.J.M. Kool (2003), 'The role of inflation differentials in regional adjustments: Evidence from the United States', *Kredit and Kapital*, Vol. 37, No 1, pp. 62-85.

([72]) See for example: Altissimo, F., P. Benigno and D. Rodriguez Palenzuela (2011), 'Inflation differentials in a currency area: facts, explanations and policy', *Open Economies Review*, Vol. 22, pp. 189-233.
Hofmann, B. and Remsperger, H. (2005), 'Inflation differentials among the euro area countries: Potential causes and consequences', *Journal of Asian Economics*, Vol. 16, pp. 403-419.

([73]) de Haan, J. (2010), 'Inflation differentials in the euro area: a survey', in J. de Haan and H. Berger (eds.), *The European central bank at ten*, Springer-Verlag Berlin Heidelberg.

([74]) See for example: Angeloni, I. and M. Ehrman (2007), 'Euro area inflation differentials', *The B.E. Journal of Macroeconomics*, Vol. 7, No 1 (Topics), Article 24.

the treatment of the relationship between house prices and the output gap. ([75])

III.3. Fragmentation and the real interest rate mechanism in the euro area

Since the crises, fragmentation has added a new dimension to the real interest rate channel

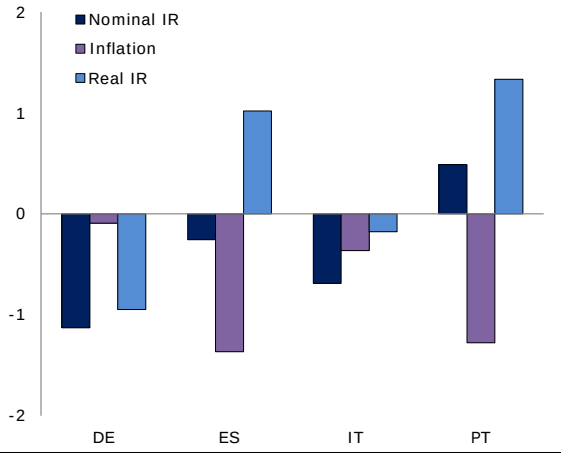
The global financial crisis has added a new dimension to the real interest rate mechanism. The traditional view of the real interest rate mechanism assumed that differentials in real interest rates were mainly driven by inflation differentials as the common monetary policy and financial integration induced convergence of capital market rates, funding rates and, in turn, lending rates. However, since the global financial crisis and above all the euro area debt crisis, powerful fragmentation forces have been at work on the euro area financial markets. These forces have, at least partly, offset the convergence in nominal interest rates observed before the crisis and acted as an amplifier of the classical real interest rates mechanism.

The changing forces behind the real interest rate mechanism can be illustrated by comparing nominal lending interest rates, inflation rates and real lending interest rates before and after the global financial crisis (see Graph III.3).

Between 2003-07 and 2008-14, the real interest rate decreased in Germany but increased in Spain and Portugal. Compared with Germany, differences in real rate developments in Spain and Portugal between the two periods are explained not only by the usual differences in inflation developments but also by differences in nominal interest rate developments.

Taking again the example of Germany and Spain, it is apparent from the graph that, for Germany, the real interest rate was on average 1 pp. lower in the post-crisis period, whereas for Spain it was 1 pp. higher. This intra-period difference is clearly explained both by nominal interest rate developments and inflation developments.

Graph III.3: **Changes in nominal lending interest rates, in inflation and in real interest rates**
(2008-14 vs 2003-07, pp.) (1)



(1) The nominal lending interest rates are calculated as the mean of the composite indicators of the cost of borrowing for non-financial corporations and households. The year-on-year HICP inflation rate is used as a deflator to obtain the real lending rate.
Source: AMECO, ECB

A closer look at divergences in nominal interest rates

The global financial crisis and the subsequent turmoil in the euro area affected many parts of the euro area's financial system. Therefore, fragmentation has been documented for a wide set of asset classes and has been particularly marked for sovereign bonds. While sovereign bond yields had completely converged in the pre-crisis period, since the global financial crisis they started to diverge. The divergence trend strengthened sharply during the euro area debt crisis, when the perceived redenomination risk, i.e. the risk that a Member State will leave the euro area and that all its assets and liabilities will be redenominated in a new currency, magnified the traditional sovereign credit risk. ([76])

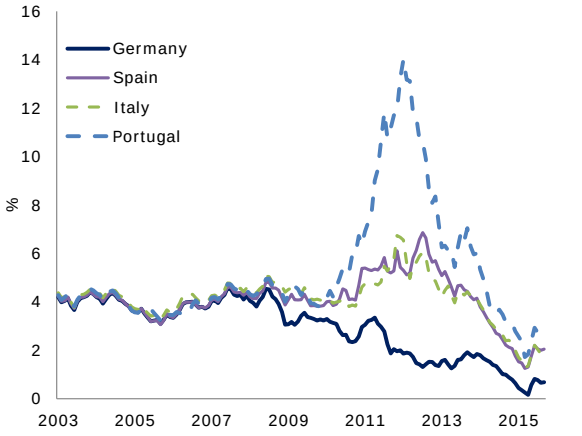
Since the ECB adopted outright monetary transactions (OMT), this perceived redenomination risk has receded and sovereign bond yields have started to converge again. However, these are still far from the pre-crisis convergence level, especially

([75]) Goodhart, C. and B. Hofmann (2005), 'The Phillips curve, the IS curve and monetary transmission: evidence for the US and the euro area', *CESifo Economic Studies,* Vol. 51, pp. 757-775. Angeloni, I. and M. Ehrman (2007), 'Euro area inflation differentials', *The B.E. Journal of Macroeconomics*, Vol. 7, Iss. 1 (Topics), Article 24.

([76]) Klose, J. and B. Weigert (2014) found that redenomination risk represented a systemic component in determining sovereign yields between September 2011 and August 2012 on top of common sovereign default risk.
Klose, J. and B. Weigert (2014), 'Sovereign yield spreads during the euro crisis: fundamental factors versus redenomination risk', *International Finance*, No 17(1), pp. 25-50.

when the overall low interest rate environment is taken into account (Graph III.4). (77)

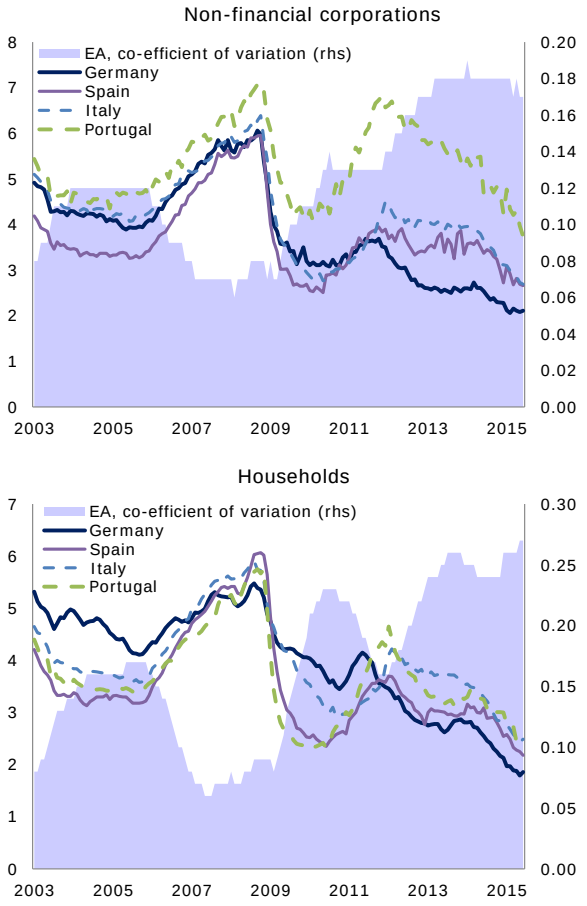
Graph III.4: **10-year sovereign bond yields, selected euro area countries**
(Jan 2003 — Sep 2015, in %)



Source: Bloomberg

Besides capital markets, the banking sector has also been significantly hit by fragmentation forces. Fragmentation has affected bank lending interest rates for both non-financial corporations and households (see Graph III.5). (78) For a range of structural reasons, retail lending rates were not completely aligned before the crisis. However, since 2009 the differences have widened considerably. (79) Despite their generalised decline since 2012, country differences remain significantly higher than in pre-crisis years. This is particularly problematic as bank loans represent the main source of finance for the euro area private sector.

Graph III.5: **Lending interest rates, selected euro area countries**
(Jan 2003 — Jun 2015, in %)



(1) Composite indicator of the cost of borrowing
Source: ECB.

A range of possible explanations for nominal rate divergences

A very large and still growing economic literature has looked into the possible causes of the observed divergence in nominal rates, especially sovereign

(77) Al-Eyd, A. and S.P. Berkmen (2013) report some facts (such as a decline in speculative short euro currency positions) suggesting that the OMT significantly reduced, if not completely eliminated, the redenomination risk. However, as shown by Ehrmann, M. and M. Fratzscher (2015), some degree of financial fragmentation remained even after the OMT, reflecting persistent differences in credit risk. It should, however, be noted that the analysis only considers data up to the end of 2013.
Al-Eyd, A. and S.P. Berkmen (2013), 'Fragmentation and monetary policy in the euro area', *IMF Working Paper*, No 13/208.
Ehrmann, M. and M. Fratzscher (2015), 'Euro area government bonds — integration and fragmentation during the sovereign debt crisis', *CEPR Discussion Paper*, No 10583.

(78) Graph III.4 displays the ECB's composite indicators of the cost of borrowing (see ECB (2013), 'Assessing the Retails Bank Interest Rate Pass-through in the Euro area at times of financial fragmentation', *ECB Monthly Bulletin*, August 2013). These composite indicators are based on detailed MFI (monetary financial institutions) interest rate statistics. The individual interest rates are aggregated by maturity and size. New business volumes over the last 24 months are used for aggregation. The ECB provides four main composite lending rates: for households (loans for house purchases only), for non-financial corporations (including overdrafts), for short-term loans for households and non-financial corporations and for long-term loans for households and non-financial corporations. For most countries, the indicators for non-financial corporations are almost identical to the indicators for short-term loans. The same also applies in a few countries where the indicator for households and long-term loans coincide. The divergence between the indicator for households and long-term loans is common mostly in the periphery Member States, where the indicator for long-term loans is not only substantially higher but also more volatile.

(79) These structural reasons include different degrees of competition in the financial sector and the diverse range of banking products across Member States.
See for example: Arnold, I. and van Ewijk, S. (2014), 'The impact of sovereign and credit risk on interest rate convergence in the euro area', *DNB Working paper,* No 425.

bonds. However, given the importance of bank financing for the euro area private sector, the remainder of this chapter focuses on bank lending rates. In this area, much of the related empirical literature has focused on the effectiveness of monetary policy transmission in the euro area. ([80]) The literature has typically analysed the response of lending interest rates to money market rates or policy rates in order to assess the quality of the interest rate pass-through. The pass-through was mostly deemed complete in the pre-crisis period i.e. after some time, the changes in ECB policy rates were largely reflected in lending rates. ([81])

The dispersion of lending rates since the global crisis gives the general impression that the interest rate pass-through has been impaired. Indeed, some studies suggest that the pass-through has changed and that banks have changed their loan pricing behaviour compared with the pre-crisis period. ([82]) However, other studies argue that transmission has not really changed. They argue that policy rates and in turn money market rates have become less dominant drivers of lending rates. ([83]) This latter group of studies proposes a number of potential sources of divergence in lending rates, including the bank-sovereign feedback loop, perceived redenomination risks, divergence in banks' funding costs and divergence in borrowers' risks. These factors are discussed in the remainder of this section.

([80]) For an overview of the issue see: ECB (2013), 'Assessing the retails bank interest rate pass-through in the euro area at times of financial fragmentation', *ECB Monthly Bulletin*, August 2013.

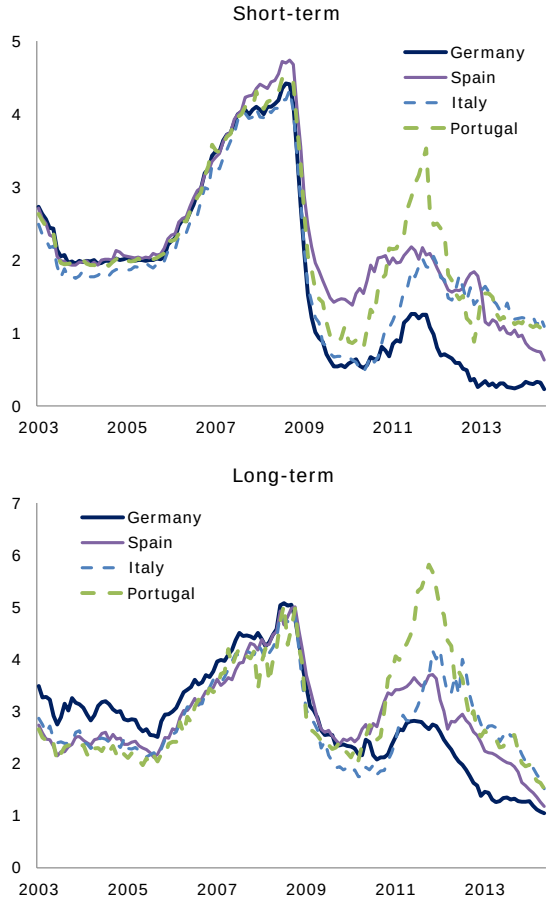
([81]) See for example: de Bondt, G. (2005), 'Interest rate pass-through: Empirical results for the euro area', *German Economic Review*, Vol. 6, Iss. 1, pp. 37-78.
Belke, A., J. Beckmann and F. Verheyen (2014), 'Interest rate pass-through in the EMU — New evidence from nonlinear cointegration techniques for fully harmonised data', *Journal of International Money and Finance*, Vol. 37, pp. 1-24.

([82]) See for example: Aristei, D. and M. Gallo (2014), 'Interest rate pass-through in the Euro area during the financial crisis: A multivariate regime-switching approach', *Journal of Policy Modeling*, Vol. 36, pp. 273-295.
Hristov, N., O. Hülsewig and T. Wollmershäuser (2014), 'The interest rate pass-through in the euro area during the global financial crisis', *Journal of Banking and Finance*, Vol. 48, pp. 104-119.

([83]) See for example: ECB (2013), 'Assessing the retails bank interest rate pass-through in the euro area at times of financial fragmentation', *ECB Monthly Bulletin*, August 2013.
IMF (2013): 'Global Financial Stability Report' (October).
Gambacorta, L., A. Illes and M. Lombardi (2014), 'Has the transmission of policy rates to lending rates been impaired by the Global Financial Crisis?', *BIS Working Paper* No 477.
von Borstel, J., S. Eickemeier and L. Krippner (2015), 'The interest rate pass-through in the euro area during the sovereign debt crisis', *CEMA (Australian National University) Working paper* No 15/2015.

The euro area debt crisis has uncovered previously unforeseen risks. One of these is the negative feedback loop between sovereign and bank credit risk due to banks' holdings of sovereign debt and the implicit guarantee of bank liabilities by the sovereign. ([84]) At the peak of the euro area debt crisis we also saw the emergence of the perceived redenomination risk.

Graph III.6: **Funding cost of the banking sector**
(Jan 2003 — Jun 2014, in %)



(1) Weighted average cost of liabilities
Source: Illes, A., M. Lombardi and P. Mizen (2015), 'Why did bank lending rates diverge from policy rates after the financial crisis?', BIS Working Papers No 486.

Graph III.6 plots the overall funding cost of the banking sector. ([85]) The graph shows significant

([84]) Brutti, F. and P. Saure (2014) document the increase of home bias in the sovereign debt holdings, especially in the countries affected by sovereign debt crisis.
Brutti, F. and P. Saure (2014), 'Repatriation of debt in the euro crisis: Evidence for the secondary market theory', *Swiss National Bank, Working Papers* No 2014-03,.

([85]) The bank funding cost is proxied here and in the subsequent analysis by the weighted average cost of liabilities (WACL) constructed in Illes et al. (2015). The weights are based on the

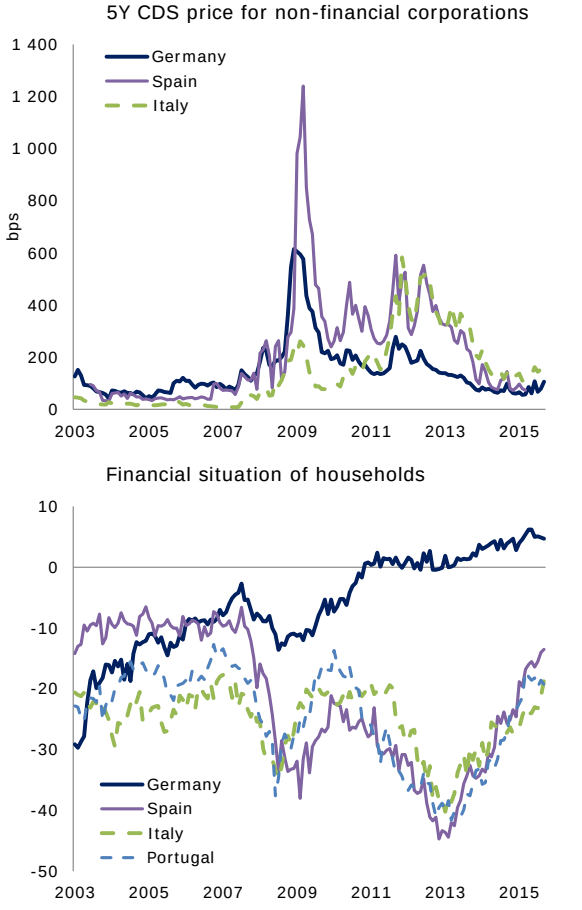
divergence across Member States since 2009 both for short- and long-term funding. The short-term financing that makes up the bulk of the bank funding cost ([86]) diverged from complete unification at the money market rates before the crisis. The observed divergence of costs may reflect several factors. These include the previously mentioned redenomination risks and bank-sovereign loop, but also the divergence in the quality of banks' balance sheets.

The dispersion of lending rates might also be driven by factors that are unrelated to bank funding costs but which affect the mark-up that the banks charge on lending loans. Borrower risk should be an important driver of the mark-up. The protracted financial turmoil and related economic downturn in some euro area countries have affected the credit quality of households and corporations. These developments have varied widely across Member States (see Graph III.7).

The borrower risk is also related to economic developments at large. Mark-ups can increase or decrease during low or high phases of the business cycle as debtors carry higher or lower credit risk. ([87]) However, there could be also more persistent effects on the mark-up if the crisis caused lower competition on the banking market, allowing banks to apply a higher mark-up irrespective of the borrower risk and cyclical situation of the economy. ([88]) Yet, there is no evidence that the degree of banking competition was indeed reduced in the euro area following the global financial crisis.

Graph III.7: **5-year CDS prices for non-financial corporation and financial situation of households, selected euro area countries**

(Jan 2003 — Sep 2015, in %)



(1) 5-year CDS price is the unweighted mean of available CDS prices of non-financial corporations; the figure is not available for Portugal.

Source: Bloomberg and DG ECFIN.

The effect of some of the factors discussed above on the lending rates can be limited or even eliminated by proper institutional arrangements such as banking union. This applies in particular to sovereign risk and perceived redenomination risk.

However, there are also other factors whose effect on the lending rate dispersion can be more difficult to suppress. Here we are referring especially to real economic developments (and the related borrower

outstanding stock of liabilities, while the interest rates are based on new transactions. Therefore, WACL represent the marginal cost of funding as long as the composition of the balance sheet remains unchanged. This seems a reasonable assumption given that the source of funding cannot be quickly changed.
Illes, A., M. Lombardi and P. Mizen (2015), 'Why did bank lending rates diverge from policy rates after the financial crisis?', *BIS Working Papers* No 486.

([86]) The maturity transformation is one of the key functions of the banks. It means that banks fund themselves at a short maturity in order to provide loans at a longer maturity.
See for example: Banerjee, A., V. Bystrov and P. Mizen (2013), 'How do anticipated changes to short-term market rates influence banks' retail interest rates? Evidence from the four major euro area economies', *Journal of Money, Credit and Banking,* Vol. 45, No 7, pp. 1375-1414.

([87]) Nevertheless, there is also a quantitative dimension to borrower risk that goes beyond the mark-ups. While credit standards were tightened in the whole EMU, the pace of tightening has diverged across Member States and seems to have been working in a pro-cyclical way. Tighter credit standards imply higher rejection rates for loan applications. Therefore many loans to corporations and households are not granted, even at higher retail lending rates.

([88]) See for example: Van Leuvensteijn, M., C.K. Sørensen, J.A. Bikker and A.A. Van Rixtel (2013), 'Impact of bank competition on the interest rate pass-through in the euro area', *Applied Economics*, 45(11), pp. 1359-1380. They find evidence that stronger competition implies significantly lower spreads between bank and market interest rates for most loan market products.

risks) that are not completely aligned across the Member States and also the fact that the banking sector is not fully integrated across the euro area. Inevitably, both the real economy and the banking sector can undergo idiosyncratic shocks and this will lead to a divergence in retail lending rates.

To better understand the real interest rate mechanism, we must determine whether the divergence in lending rates is a one-off consequence of the global and euro area crises or a more long-lasting phenomenon. The answer to this question depends precisely on the relative strength of the different factors behind this divergence. The econometric analysis presented in the next section aims to shed some light on this issue.

III.4. A new econometric analysis of the determinants of lending interest rates in the euro area

While the previous section presented different possible reasons for divergence in lending interest rates across the euro area, this section aims to assess their relative importance using econometric techniques.

The econometric analysis uses a set of vector autoregressive (VAR) models that link the lending interest rates both for non-financial corporations and households to their possible determinants. In line with the existing literature on the pass-through of monetary policy, ([89]) these variables include:

- real economic activity (the output gap);
- the credit risk of the sovereign (10-year sovereign bond yield);
- the credit risk of the banking sector (5-year CDS price for financial corporations);
- the funding cost of banks (weighted-average cost of banking liabilities);
- the credit risks of the borrowers (5-year CDS prices in case of non-financial corporations and financial situations of households from EC survey in case of households).

More details on the methodology are provided in Boxes III.1 and III.2.

The analysis uses monthly data from September 2007 to June 2014. ([90]) It therefore covers the entire period since the global financial crisis and includes phases of greater and lesser financial turmoil in the euro area. The VAR uses a time dummy to control for the perceived redenomination risk that arguably affected the path of some variables. The data availability allows for the inclusion of nine euro area countries: Austria, Germany, Spain, Finland, France, Ireland, Italy, the Netherlands and Portugal.

The VAR analysis is first carried out for the euro-area as a whole, more specifically using a weighted average of those nine euro area countries in order to understand the overall response of lending rates to common shocks (e.g. monetary policy).

Subsequently, developments at country level are tracked by country-level VARs using the differences of each country-level variable compared with the euro area weighted average. The country-specific VARs, which focus on three Member States (Spain, Italy and Portugal), enable us to assess how lending rates respond to idiosyncratic (i.e. country-specific) shocks.

There has been so far relatively little empirical evidence on the interplay between idiosyncratic developments in the euro area countries and their respective lending rates. However, a better understanding of this interplay is essential to better understand: the 'nominal component' of the real interest rate mechanism discussed in the previous section; and whether this 'nominal component' should be seen as an accident of the global financial and euro area debt crises or a more lasting feature of the real interest mechanism and of adjustment to asymmetric shocks in the EMU.

([89]) These studies use a great variety of empirical frameworks such as traditional cointegration techniques, nonlinear cointegration, a non-stationary dynamic heterogeneous panel model, Markov-switching VAR, panel VAR with sign restrictions and factor-augmented VAR.

([90]) The sample is adjusted to the availability of the series defined above. While most interest rates from MFI statistics are available from 2003, some risk measures, particularly bank risk and risk of non-financial corporations, are available only from 2007 onwards.

Lending interest rates are not driven only by policy rates…

The results for the overall euro area (see Box III.1) suggest the following:

(i) Around half of developments in lending interest rates in the euro area since the beginning of the global financial crisis can be linked to money market rates (EONIA), and in turn to monetary policy. The response is higher for lending rates for non-financial corporations than for lending rates for households.

(ii) The remaining part of developments in lending rate (both for non-financial corporations and households) can be attributed to other bank funding costs, fluctuations in bank credit risk and (in the case of households) also to changes in the overall sovereign risk in the euro area.

An increase in bank credit risk affects lending rates via higher bank funding costs but also via a higher mark-up on lending interest rates (i.e. an increase in the difference between funding costs and lending rates). The euro area banking sector increases its mark-up when faced with higher credit risk (e.g. due to asset impairment). The response of lending rates for households to the overall euro-area sovereign risk may be related to the maturity structure of household financing. Mortgage loans, which represent the bulk of household loans and mortgages, have a relatively long maturity, like sovereign debt.

(iii) Similar to the results at the country level presented below, specific borrower risk has very little effect on both types of lending rates. This is probably because borrower risk largely evolves in line with the real economy and is captured by the monetary policy variable used in the model (i.e. EONIA).

These overall results suggest that while about half of lending rate dynamics in the euro area is driven, via money market rates, by policy rates, the other half of lending rate dynamics reflects risks, particularly those related to the banking and the sovereign sectors. It is important to stress that the VAR model explicitly controls for the peculiarities of the period of the most acute phases of the euro area debt crisis, when perceived redenomination risks were significantly affecting some model variables, particularly sovereign bonds.

…and their dispersion can be linked to domestic factors

The country VAR models for Italy, Spain and Portugal suggest that a significant part of the deviation of lending rates from the euro area average observed in these countries since 2007 can be explained by domestic (or idiosyncratic) factors (see Graph III.8 and Box III.2) in addition to: the common factors (documented above), asymmetric transmission of common monetary policy (not explicitly addressed here but well-documented in the economic literature) ([91]) and the effect of the redenomination risk (controlled for in this analysis).

Specifically, the VAR results show the following important linkages (all variables mentioned are in deviation from the euro area average):

(i) Lending interest rates for **non-financial corporations** (and to a much lesser degree for households) show a significant response to the sovereign risk, which is transmitted via bank credit risk and bank funding costs. An increase in sovereign risk increases the riskiness and funding cost of banks and thereby increases lending rates.

(ii) Lending interest rates for **households and for financial corporations** (but only in Italy and Spain for the latter) respond significantly to fluctuations in the real economy via changes in the mark-up. The mark-up increases when the state of the economy deteriorates. An intuitive explanation for this finding is that a negative shock to domestic output increases the riskiness of borrowers. This induces banks to charge higher risk premiums and therefore to raise their lending rates even if their funding cost is not affected.

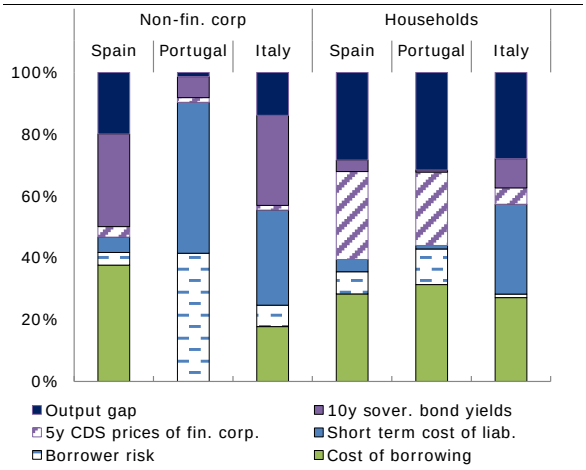
(iii) Another important driver of lending interest rates **for households** is bank credit risk. Specifically, a deterioration of bank credit quality is compensated by higher mark-up. This could, for instance, be explained in the following way: when facing unexpected asset losses banks raise lending rates to offset the fall in profitability due to higher provisions.

(iv) Some of **the linkages between other variables** that were not present at euro area level

([91]) See for instance: Clausen, V. (2012), '*Asymmetric monetary transmission in Europe*', Springer Science & Business Media.

are visible for the three periphery Member States (see also Box III.2). For example, the sovereign credit risk affected the bank credit risk at euro area level from 2010 to 2012 only. In the periphery Member States, this effect is more permanent and there is also an apparent feedback loop from bank credit risk to sovereign risk. There is also another link between bank funding costs and banking credit risk running in both directions. Finally, the bank and sovereign risks have significant feedback on real economy activity (especially in Spain and Portugal).

Graph III.8: **Variance decomposition of lending interest rates**



(1) VAR with two lags, decomposition at the horizon of 24 months. Borrower risk is proxied by 5-year CDS prices for non-financial corporation or financial situations of households.
Source: DG ECFIN calculations.

Overall, these econometric results suggest that bank lending rates in the euro area countries are significantly affected by factors unrelated to the single monetary policy.

A substantial part of country-specific developments in lending rates both for non-financial corporations and households can be explained by **idiosyncratic** factors. This is even after having corrected for the temporary effect of perceived redenomination risks, which were a significant driver of financial fragmentation during the euro area debt crisis. These idiosyncratic factors include fluctuations in sovereign spreads, the quality of bank balance sheets (reflected both in the perceived credit risk and the funding cost of the banking sector) and domestic activity. The last of these three factors probably reflects the impact of borrower risk on banks' pricing decisions.

III.5. Conclusions

Since the onset of the EMU there has been concern that the convergence of nominal interest rates in a context of persistent inflation differentials would lead to pro-cyclical real interest rate differentials. The pre-crisis years of the EMU did indeed witness a significant dispersion of real interest rates across Member States due to persistent inflation differentials. The real interest rate dispersion affected mostly investment activity and tended to magnify cyclical asymmetries across the euro area.

Since the global financial crisis the euro area has seen a significant fragmentation of its financial markets, including renewed divergences in nominal interest rates. These have added to inflation differentials in driving the real interest rate dispersion. This nominal interest rate divergence has been very apparent for capital market rates (sovereign bonds), bank funding costs and, in turn, bank lending rates. The divergence was particularly sharp during the euro area debt crisis, reflecting in particular an increase in perceived redenomination risks. Since summer 2012 these perceived redenomination risks have receded and interest rate differences have come down again. However, some divergence still persists.

Given the importance of bank loans for financing the euro area economy, we presented in this chapter some new econometric evidence on the drivers of lending rates for non-financial corporations and households. The results suggest that, after controlling for the effects of perceived redenomination risks and other common factors, a significant part of the divergence in lending rates can be ascribed to country-specific factors. These include divergences in sovereign spreads (while the divergence of sovereign spreads reached extreme values during the period of perceived redenomination risk between 2010 and 2012, some degree of divergence had been present since the onset of the global financial crisis in 2008 and has persisted at moderate levels to the present day), in the quality of bank balance sheets and in real economic activity.

To what extent is the nominal part of the real interest rate differentials discussed in this chapter a one-off effect of the global and sovereign crises and to what extent is it a more permanent feature of adjustment in the EMU? Some of the country-specific drivers of lending rates identified in the

econometric analysis might be limited or even eliminated by past or ongoing policy and governance changes. The ECB's OMT programme, combined with changes in the EMU's governance (particularly with the creation of the European stability mechanism) and structural reforms in the countries concerned, have strongly reduced the perceived redenomination risk and in turn sovereign bond risk premiums. A full banking union should help to sever the link between banks and sovereigns, eliminating the risk of feedback loops between the two sectors. ([92]) Improved banking supervision should also reduce the occurrence of country-specific banking turmoil that caused significant differences in bank funding costs in the past. Therefore, a combination of the banking union and the emerging Capital Market Union (the latter aiming to diversify the funding sources, especially for small and middle-sized corporations) should reduce differences in financing conditions across the Member States. However, some differences in bank lending conditions at country level are likely to remain as long as divergences in cyclical conditions or in the quality of bank balance sheets persist.

([92]) See for example: Goyal, R., P. Koeva-Brooks, M. Pradhan, T. Tressel, G. Dell'Ariccia and C. Pazarbasioglu (2013), 'A banking union for the euro area', *IMF Staff Discussion Notes* No 13/1.

Box III.1: Bank lending interest rate adjustment in the euro area

The analysis explores *the final part of the interest rate channel of monetary policy*. Therefore, it links lending rates for non-financial corporations and households (composite indicator of the cost of borrowing) ([1]) in a VAR ([2]) to:
a) the monetary policy rate (proxied by money market rate, namely EONIA); ([3])
b) a sovereign credit risk measure (10-year sovereign bond yield);
c) a banking-sector credit risk measure (5-year CDS price, which is the unweighted mean of available CDS prices of all available financial corporations from Bloomberg);
d) a funding cost of banks measure (weighted average cost of short-term liabilities) ([4]);
e) a borrower risk measure, which is the CDS spread of non-financial corporations (the 5-year CDS price, which is the unweighted mean of the available CDS prices of all available non-financial corporations from Bloomberg) or the financial situation of households ('Financial situation of households over last 12 months' variable from EC consumer survey).

The VAR in this first box uses data for the euro area as a whole. The next box proposes a number of country specific VARs.

Given the logic of monetary transmission the following ordering of variables is used: EONIA, sovereign risk, banking-sector risk, funding cost of banks, borrower risk (non-financial corporations/households), lending interest rate (non-financial corporations/households). The endogeneity of all variables in the VAR controls for diverse feedback loops e.g. between bank credit risk and its funding cost or between sovereign and banking risk. The ordering of the variables reflects the logic of monetary transmission. Therefore, the Cholesky decomposition seems largely appropriate. However, alternative orderings of variables are tested as well but do not alter the results.

To control for perceived redenomination risks that arguably affected the path of some variables during the most acute phase of the euro area debt crisis, an exogenous time dummy is included for the period from April 2010 (when the market perceived Greek debt to be unsustainable and when the European Commission and the IMF provided consecutive financial assistance) to August 2012 (when the OMT programme was announced by the ECB). This dummy turned out to be mostly significant in the VAR equations for sovereign risk and banking-sector risk, confirming the common view that these sectors were the most affected by redenomination risks. On the other hand, this risk does not seem to have significantly propagated to the lending interest rates.

The VAR analysis for the overall euro area (presented in this box) uses *a weighted average of the nine euro area countries* (Austria, Germany, Spain, Finland, France, Ireland, Italy, the Netherlands and Portugal) in order to understand the commonalities. Graph 1 shows the variance decomposition of lending interest rates for non-financial corporations and households. ([5])

The results suggest that lending interest rates for **non-financial corporations** can to a great extent be explained by money market rates (60 %) and in turn by common monetary policy. However, there are additional factors explaining a significant part of changes in lending interest rates. Specifically, bank credit risk and the funding cost of banks account for around 20 % of changes in lending rates. This reflects the fact that

([1]) ECB (2013), 'Assessing the Retails Bank Interest Rate Pass-through in the Euro area at times of financial fragmentation', *ECB Monthly Bulletin*, August 2013.
([2]) This enables to explore the short-term dynamics rather than structural factors such as bank competition that might cause cross-country differences in the levels of retail lending rates.
([3]) For the euro-area wide VAR (presented in this box) the money market rate is used as a proxy for common policy rate that in turn reflect real economic activity. For the country-level VARs (presented in Box III.2) idiosyncratic measures of economic activity are used instead.
([4]) Illes, A., M. Lombardi and P. Mizen (2015), 'Why did bank lending rates diverge from policy rates after the financial crisis?', *BIS Working Papers* No 486.
([5]) The variance decomposition from a VAR measures the relative importance of each random innovation/shock on each endogenous variable. Given that some of the factors can affect lending interest rates indirectly and with a significant lag, the analysis is based on a horizon of 24 months.

(Continued on the next page)

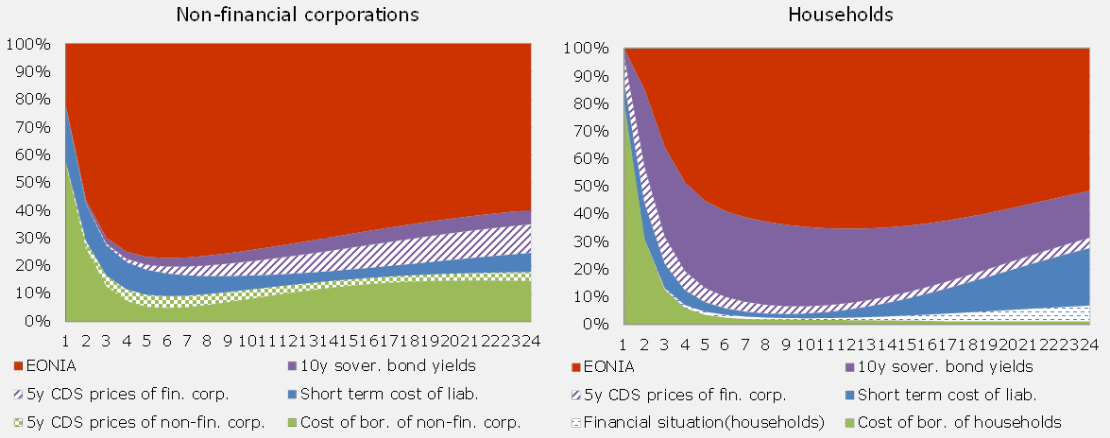
Box (continued)

banks rely on funding sources other than money market financing (EONIA). These sources are more costly and the cost is passed through to lending interest rates. However, the direct impact of banking credit risk on lending interest rates (on top of the indirect effect through the funding cost) supports the hypothesis that banks offset potential losses on some assets in their portfolio by increasing the mark-up. (6)

The variance decomposition of lending interest rates for **households** features some notable differences compared with non-financial corporations. In particular, the lending rates for households are less responsive to money market rates (which explain only around 40 %) and in turn to monetary policy, but they are substantially more responsive to overall sovereign risk premiums in the euro area (accounting to 20 – 30% of changes in lending rates). This difference might be related to the fact that loans for non-financial corporations tend to have different maturities from those for households. While non-financial corporation make significant use of short-term financing akin to money market financing (EONIA), mortgage loans, which account for the bulk of household loans (7) they have a longer maturity, like that for sovereign debt.

While this analysis is aimed mainly at retail lending rates, the impulse response analysis (8) between other variables in the VAR shows some **other interesting linkages**:
i) a positive shock (i.e. an increase) to sovereign risk causes an increase in banking risk but less so vice-versa (i.e. the feedback loop is not strong at the euro area level). However, this effect occurred only when perceived redenomination risks were high (2010-2012) (9);
ii) a positive shock to the bank funding cost raises the bank credit risk but the opposite effect is much weaker holds much less vice-versa;
iii) an increase in banking risk is passed on to the risk of non-financial corporations but not vice versa.

Chart: **Variance decomposition of lending interest rates, the euro area**



(1) VAR with two lags, horizon 24 months
Source: DG ECFIN calculations.

(6) The impulse response functions cannot be shown due to space constraints. However, they are statistically significant at conventional confidence levels and with the expected sign for all the variables detailed above.
(7) In fact, the ECB's composite indicator of the cost of borrowing for households includes only interest rates on mortgage loans.
(8) Generalised impulse responses that are invariant to variable ordering are used.
(9) This effect is strong in a VAR without the time dummy for 2010-2012 and substantially decreases when the dummy is included.

Box III.2: Idiosyncratic lending interest rate adjustment in selected euro area countries

The VAR setting used for individual countries is the same as for the whole euro area (see Box III.1). However, in order to identify the effect of *idiosyncratic shocks* the analysis is performed using *variables expressed in deviation from the euro area aggregate* (i.e. the weighted mean of nine euro area countries). [1] This makes it possible to disregard the common policy rate (proxied in the whole euro area model by EONIA) as it does not vary across Member States. The output gap (again in deviation from the euro area mean) is used instead to track country-specific developments in the real economy. Therefore, while monetary policy can transmit asymmetrically to lending rates across Member States, as has been shown in the economic literature, the monetary policy shocks are *common*. [2] Here, however, the focus is on shocks that are by nature *idiosyncratic*. [3] Finally, as was done for the whole euro area (see Box III.1), an exogenous time dummy is included for the period from April 2010 to August 2012 to control for perceived redenomination risks during the most acute phase of the euro area debt crisis. This dummy turned out to be mostly significant in the VAR equations for sovereign risk but not for the lending interest rates. This suggests that the redenomination risk did not significantly propagate to lending interest rates.

Individual VAR models were estimated for Italy, Spain and Portugal. The graphs at the end of this box plot the variance decomposition of lending interest rates for non-financial corporation and households for the three countries. The overall results suggest that, even after controlling for the effects of a temporary period of high perceived redenomination risks, a significant part of these countries' idiosyncratic developments in lending interest rates (i.e. developments that are unrelated to the overall euro area) is clearly linked to idiosyncratic shocks. This becomes apparent because the importance of 'own shock' (i.e. a shock to the lending interest rate itself) in the variance decomposition of lending interest rate fades off with time (green area) and there is a substantial increase in the importance of other factors. In the longer term (a 24-month horizon is used), around two thirds of country-specific developments of retail lending rates can be explained by idiosyncratic shocks to other variables considered in the VAR.

Specifically, the country-specific components of lending rates for **non-financial corporations** are mostly driven by the sovereign risk (Italy and Spain), real economic developments (Italy and Spain) and the bank funding cost (Italy and Portugal). The country-specific component of lending interest rates for **households** is mainly affected by real economic developments (all three countries) alongside the banking risk (Spain, Portugal). The impact of the real economy on the country-specific lending rates (both for non-financial corporations and households) comes via a mark-up effect. Therefore, negative shocks to the real economy increase the interest rate mark-up charged by the banking sector. These findings suggest that a significant part of country-specific lending rates is driven by idiosyncratic shocks. The strength of these linkages at country level hinders the monetary transmission and reinforces the fragmentation of the nominal interest rates and, in turn, in the real interest rates.

The impulse response analysis [4] of other variables in the VAR shows **some country-specific linkages**:

[1] This follows the logic of monetary VARs that aim to identify asymmetric shocks using home variables relative to foreign variables. See for example: Clarida, R. and J. Gali (1994), 'Sources of Real Exchange Rate Fluctuations: How Important are Nominal Shocks?', *Carnegie-Rochester Conference on Public Policy*, No 41, pp. 1-56, Farrant, K. and G. Peersman (2006), 'Is the Exchange Rate a Shock Absorber or a Source of Shocks? New Empirical Evidence', *Journal of Money, Credit and Banking*, Vol. 38, No 4, pp. 939-961.

[2] The asymmetries in monetary transmission are in principle controlled for by estimating the individual country VARs in deviations from the euro area aggregate. Specifically, if the differences in monetary transmission across countries do not change across time (e.g. Portuguese lending rates are always affected to the same degree by the ECB policy rates), the country-specific part of the variables (i.e. the difference from the euro area aggregate) is not affected. If this is not the case, the asymmetric transmission will be mostly reflected in the unexplained part of the country-specific lending rate (that is attributed in the variance decomposition to 'own shock').

[3] The logic of this analysis is the opposite to von Borstel, J., S. Eickemeier and L. Krippner (2015), 'The interest rate pass-through in the euro area during the sovereign debt crisis', CEMA (Australian National University) Working paper No 15/2015. While the authors of that paper focus on common factors (one of the observable factors being the monetary policy rate), this analysis focuses on the idiosyncratic constituents of country-level variables.

[4] Generalised impulse responses that are invariant to variable ordering are used.

(Continued on the next page)

Box (continued)

i) For **Italy**, a positive shock (i.e. an increase) to the sovereign risk induces an increase in the banking risk (but not vice versa), the bank funding cost and the risk of non-financial corporations. A positive shock to bank funding cost induces an increase in the banking credit risk but not vice versa. Finally, a positive shock to the riskiness of non-financial corporations implies an increase in the banking risk and bank funding cost. Overall, these results suggest that banking credit risk was not the origin of the turmoil in Italy but that it was induced instead by other weaknesses.

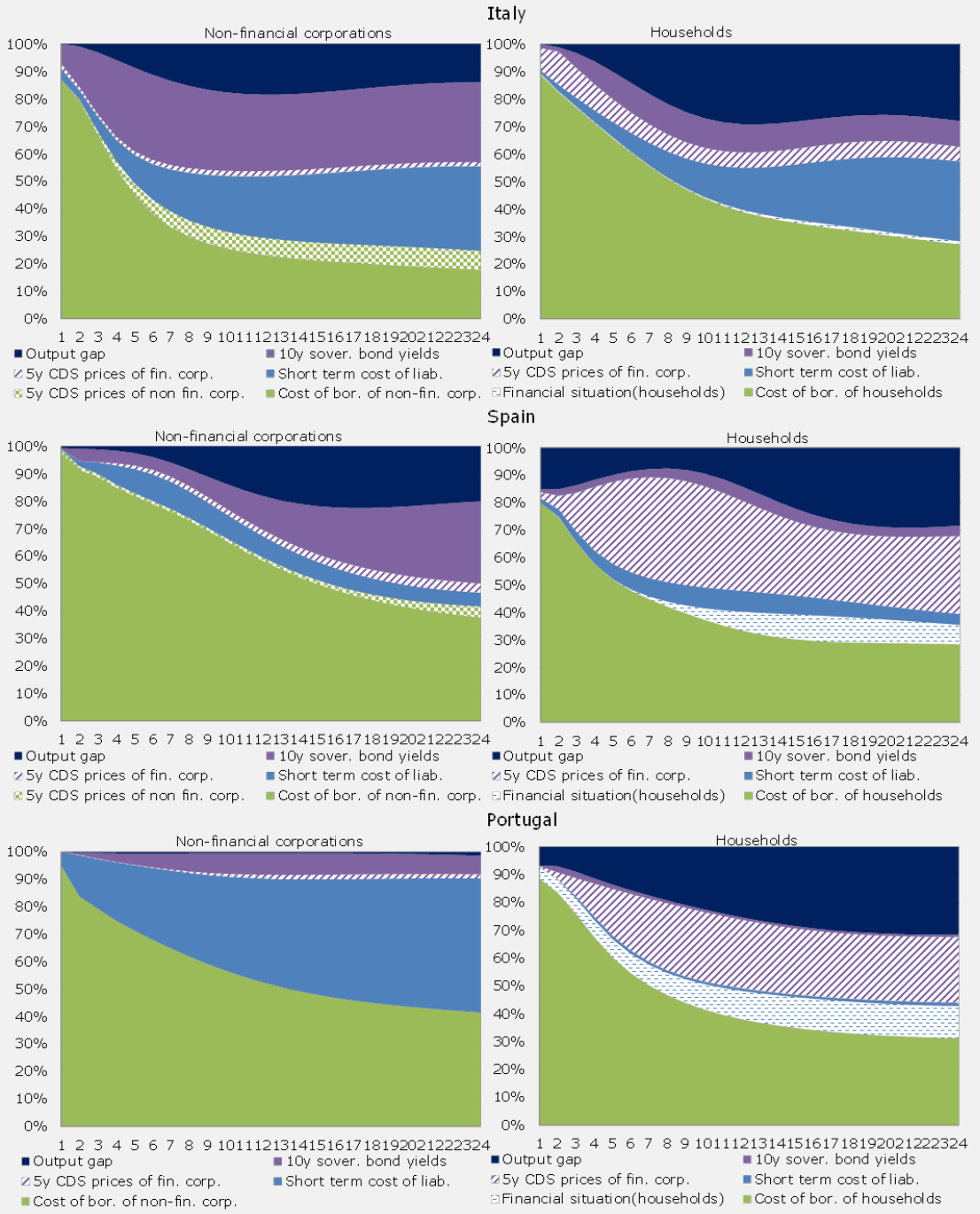
ii) For **Spain**, the sovereign risk is a dominant factor affecting many other variables (even when the redenomination risk period of 2010-2012 is controlled for). A positive shock (i.e. an increase) to sovereign risk induces an increase in the banking risk (and vice versa) and the bank funding cost and has a long-term negative effect on real economy. A positive shock to the banking credit risk induces an increase in the bank funding cost but not vice versa. In overall, Spain is a country with a strong feedback loop between banking and sovereign risk.

iii) For **Portugal**, a positive shock (i.e. an increase) to the sovereign risk induces an increase in the banking credit risk (and vice versa) but its propagation to other variables is limited. In contrast, a positive shock to the banking risk not only feeds back to the sovereign risk but also represents a major drag on the real economy. The bank funding cost, which has a very asymmetric development in Portugal (see Graph III.6), also has a strong feedback effect both on the banking and sovereign credit risk. Overall, the banking sector in Portugal seems to be a more pronounced risk generator than the sovereign sector.

(Continued on the next page)

Box (continued)

Chart: **Variance decomposition of lending interest rates, selected countries of euro area**



(1) VAR with two lags, horizon 24 months
Source: DG ECFIN calculations.

IV. Deleveraging and adjustment

The global economic crisis and the euro area sovereign debt crisis have highlighted the aggravating influence of excessive leverage and related internal and external macroeconomic imbalances on the exposure of Member States to common shocks when financial markets are not fully integrated. This chapter reviews different mechanisms implied by the presence of high levels of indebtedness which were not sufficiently considered in the pre-crisis view. The reduction of high levels of indebtedness, both internal and external, private and public, tends to be very slow and the adjustment in flows (credit flows, current account) takes time to translate into a significant reduction in vulnerabilities and risks. The adjustment process implies constrained domestic demand and growth for a protracted period of time, which makes deleveraging more difficult and exacerbates vulnerabilities, especially in a context where creditor countries continue to record large current account balances on the back of weak domestic demand. In addition, the necessary reallocation from non-tradable to tradable activities is hampered by rigidities in the capital allocation process, especially when high levels of non-viable debt are not addressed efficiently. The set-up of adequate insolvency frameworks turns out to be of major importance to foster the adjustment in the euro area.

IV.1. Introduction ([93])

Excessive indebtedness and its implications on adjustment capacity were not sufficiently appreciated in the pre-crisis debates about the resilience of the euro area. The discussions on the capacity of euro area economies to withstand shocks generally centred around three main avenues: the 'competitiveness channel' and the 'interest rate channel' (see previous chapters), quantity adjustment through cross-border labour mobility and financial risk sharing, as well as fiscal transfers. Surprisingly, little attention was paid to the large current account divergences that were emerging, ultimately feeding large stocks of external and internal liabilities in the private and public sectors. ([94]) The implicit assumption was that current account balances do not matter in a complete monetary union, as is the case of the United States. Large current account deficits in poorer countries concomitant with large current account surpluses in richer countries were even considered a natural consequence of closer linkages in goods and financial markets, with no specific worries with regards to the external sustainability of the deficits. ([95])

The crisis that broke out in 2008 highlighted the negative consequences of excessive indebtedness accumulated in the past on output, employment and the adjustment process. The euro area proved to be far from complete, in particular regarding the functioning of the capital markets. During the pre-crisis period, capital was mobile but the financial markets and the banking system were not fully integrated across Member States. As discussed in Chapter I, high exposure to shocks due to excessive indebtedness and policy mistakes combined with the lack of integration of financial markets and faults in the design of EMU meant that the propagation of the global financial crisis was very asymmetric across Member States. In particular, some of them faced sudden stops in foreign capital inflows and negative feedback loops between banks and sovereign.

Seven years after the outbreak of the global financial crisis, large current account deficits have reversed. However, the adjustment has mainly occurred at the expense of output and employment, and debt levels are still concentrated at unprecedented levels in a number of euro area economies. In addition, the impact of high debt levels on the recovery and the adjustment is still perceptible. Not only do elevated debt levels make a country vulnerable to macroeconomic shocks, but the deleveraging pressures related to their necessary unwinding result in a persistent drag on domestic demand, including investment, eventually

([93]) The section was prepared by Alexis Loublier.

([94]) See Giavazzi, F. and Spaventa, L.(2010), 'Why the current account may matter in a monetary union: lessons from the financial crisis in the euro area', *CEPR Discussion Papers,* No. 8008.

([95]) For example, Portugal and Greece were even considered examples of 'good' imbalances in that they were seen as countries with attractive investment opportunities and buoyant growth prospects capitalising on the advent of the euro and the deeper financial integration.
See Blanchard, O. and F. Giavazzi (2002), 'Current account deficits in the euro area: the end of the Feldstein-Horioka puzzle?', *Brookings Papers on Economic Activity* 2, pp.148-186, and Gourinchas, P.-O. (2002), 'Comment on current account deficits in the euro area: the end of the Feldstein-Horioka puzzle', *Brookings Papers on Economic Activity* 2, pp.196- 206.

leading to lower potential output. Moreover, current account adjustment in the euro area has been asymmetric, as current account surpluses in creditor countries persist and look unlikely to correct in the near future. At the euro area aggregate level, the persistence of a high current account surplus is a reflection of the weakness of aggregate domestic demand, which does not help ease the trade-off faced by highly indebted countries between the need to deleverage and boost growth simultaneously. Furthermore, large debt levels have also been associated with a surge in non-performing loans, reflecting the presence of rigidities in the debt restructuring process, which eventually lead to a misallocation of capital. This, in turn, further impedes the recovery but also to the structural shift from non-tradable activities with low productivity to more productive and tradable ones.

This chapter reviews the main channels through which high debt levels hamper the recovery and the adjustment process. The first part presents how large liabilities, both external and internal, private and public, are persistent in a number of economies despite a major adjustment in flow variables (current account, credit). The second part describes how, in a context of simultaneous deleveraging processes, the adjustment has so far been mainly the result of reduced domestic demand and to a lesser extent of enhanced export capacity, leading to significant output and employment losses. The third part highlights how high debt levels have in general been associated with capital market rigidities hampering an efficient financial intermediation as evidenced by the rise in non-performing loans, leading to an inefficient allocation of capital, and ultimately slowing down the structural shift from non-tradable to tradable activities.

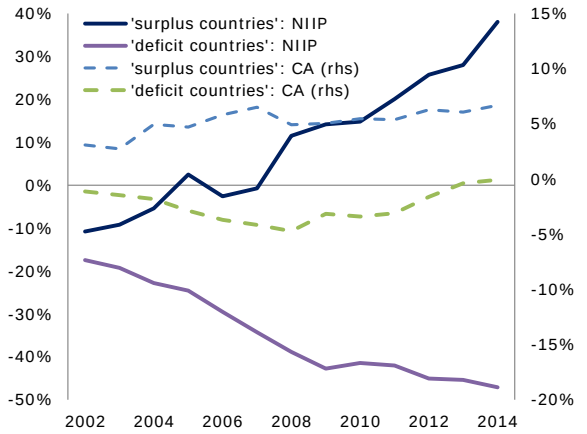
This chapter focuses on a selected number of euro area economies that used to be identified as the main 'deficit' countries in the late 2000s, namely Spain, Portugal, Cyprus, Greece, Italy, Slovenia, Ireland and Estonia. For the sake of comparison, Germany is also looked at in some cases. ([96])

([96]) Latvia and Lithuania are not included as they joined the euro area in 2014 and 2015.

IV.2. An adjustment marked by the persistence of high levels of indebtedness

The first decade following the launch of the euro was marked by a growing current account divergence between 'surplus' countries and 'deficit' countries in a context of diverging cost competitiveness (see Chapter II – 'Revisiting the competitiveness channel'). Since the outbreak of the global financial crisis, current account balances have in general adjusted significantly in 'deficit' economies (see Graph IV.1).

Graph IV.1: **Current account and net international investment position (1)**
(% of GDP)



(1) 'surplus countries': Belgium, Germany, Luxembourg, the Netherlands, Austria and Finland. 'deficit countries': Estonia, Ireland, Greece, Spain, France, Italy, Cyprus, Malta, Portugal, Slovenia and Slovakia.
Source: AMECO (except Italy: BPM6)

Between 2008 and 2014, current account balances improved by more than 10 pps. of GDP in Portugal, Greece, Cyprus, Slovenia and Spain. In Ireland and Italy, an improvement of nearly 10 pps. and 5 pps. respectively was also observed. With the exception of Greece and Cyprus, these countries are now registering moderate surpluses (Spain, Portugal, and Italy) or somewhat larger surpluses (Ireland, Slovenia) and large and unsustainable balances look unlikely to return. Cyclically-adjusted figures are in general lower than the headline balances (Spain, Italy, Portugal, Greece, Cyprus), suggesting that further increases in current account balances are not to be expected as the recovery brings back output close to potential (see Table IV.1).

The accumulation of current account deficits during the first ten years of the euro resulted in the build-up of very large net international investment

positions (NIIPs), as depicted in Graph IV.1. In 2009, the NIIP was below -100% of GDP in Ireland, Cyprus and Portugal and around -90% of GDP in Spain and Greece. However, seven years after the first signs of the crisis, large net external liabilities in general show no clear sign of adjustment despite the marked improvement in the current account balances. In 2014, the majority of the countries analysed here were still plagued with net external liabilities of the same magnitude or in the case of Greece and Cyprus, even higher (see Table IV.1).

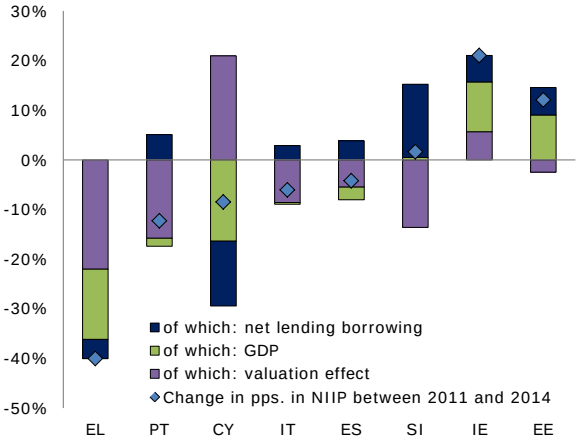
Table IV.1: **Current account balance required for external sustainability (1), (2)**

		CY	EL	PT	IE	ES	SI	EE	IT
2014 actual figures	NIIP	-141	-125	-113	-105	-96	-44	-43	-28
	NED (neg)	-129	-133	-104	468	-96	-39	11	-61
	CA	-3.8	-2.9	0.3	3.6	1.0	6.5	1.3	2.0
	Cycl.-adj. CA	-7.0	-7.0	-0.7	4.1	-1.4	5.6	3.8	0.9
	TB	0.7	-2.6	0.4	18.3	2.5	7.9	3.4	3.0
	KA	0.2	1.8	1.4	0.1	0.6	0.5	1.1	0.2
stab. NIIP over 2015-16	req. CA	-0.9	0.1	-4.7	-7.4	-3.8	-2.1	-2.9	-0.8
	req. TB	-3.2	-0.1	-3.5	8.3	-3.0	-0.1	-0.7	0.1
reach -35% NIIP in 2024	req. CA	8.4	5.8	3.9	3.6	3.4	-1.3	-2.2	-
	req. TB	5.8	4.8	5.0	18.6	3.8	0.5	1.8	-

(1) NIIP: net international investment position; NED: net external debt (negative sign); CA: current account balance; TB: trade balance; KA: capital account; req. CA and req. TB: required current account and trade balances. (2) Cyclically-adjusted balances are calculated using the output gap estimates underlying the Commission Autumn Forecasts 2015. Current account and trade balances required for external sustainability rest on the following assumptions: nominal GDP projections stem from the Commission Autumn Forecasts (up to 2017) and the Commission T+10 methodology projections beyond that; valuation effects are conventionally assumed to be zero; capital account balances are assumed to remain constant as a % of GDP at a level that corresponds to the median over 2014 and 2015-2017 projections.
Source: Current account is displayed in the national account concept. NIIP and net external debt are in balance of payments concept. Own calculations.

Moreover, in all these countries, volatile forms of investment like portfolio debt make up a large proportion of gross and net foreign liabilities. ([97]) In countries which benefited from financial assistance programmes, a non-negligible share of the net marketable debt is accounted for by loans granted during the programmes. ([98]) Even the recent developments between 2011 and 2014 do not point to a marked adjustment. Despite a positive cumulated net lending position in Portugal, Spain and Slovenia, the NIIP-to-GDP ratios deteriorated or stagnated. In particular, in a macroeconomic environment characterised by weak growth and low inflation, the contribution of nominal GDP growth to the change in NIIP has been either negligible (Spain, Portugal, Slovenia) or significantly negative (Greece, Cyprus) (see Graph IV.2). This suggests that the adjustment of current account balances has been insufficiently combined with efforts to generate nominal growth robust enough to allow for a smooth adjustment of the NIIP-to-GDP ratio. Ireland and Estonia stand out as exceptions. In all countries except Cyprus and Ireland, negative valuation effects, mainly on portfolio liabilities, probably resulting from sovereign spreads movements, have also weighed, sometimes significantly, on the reduction of the negative NIIP. ([99])

Graph IV.2: **Evolution of the net international investment position (NIIP) between 2011 and 2014**
(in pps.)



Source: Eurostat, own calculations.

Looking ahead, much higher trade and current account balances than those observed so far would in general be required to bring down NIIPs to safer levels (see Table IV.1). For example, for the NIIP to reach -35% by 2024, an average trade balance of 5.8%, 5.0%, 4.8% and 3.8% in 2015-2024 would be required in Cyprus, Portugal, Greece and Spain.

([97]) Sustainability risks and vulnerabilities are in general judged higher when a large share of the liabilities is accounted for by fixed-income instruments (debt) implying payment of principal or interests. Conversely, equity instruments are less likely to cause payment incident as dividends payments can be more easily adjusted during downturns. They are, however, not immune to a rapid withdrawal of capital.

([98]) In 2014, the *other investment* balance of general government, a financial account entry that mainly records the outstanding loan amount granted in the context of financial assistance programme, amounted to -126% of GDP in Greece, -54% in Cyprus, -46% in Portugal, -29% in Ireland and -5% in Spain. The corresponding flows helped to cover the financing needs of these countries.

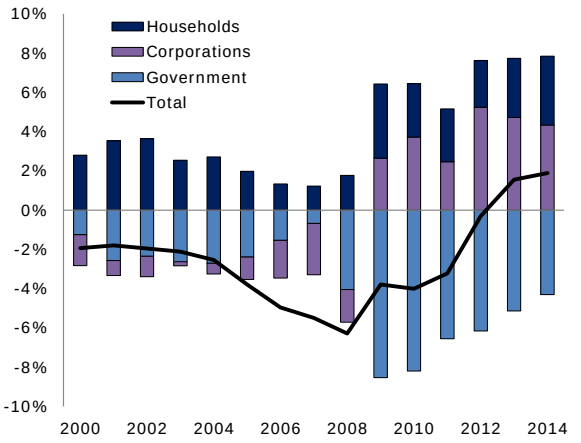
([99]) In Cyprus, the positive valuation effect between 2011 and 2014 mainly comes from a cumulated positive valuation effect on long term debt instruments.

The figures recorded in 2014, by contrast, were only 0.7% for Cyprus, 0.4% for Portugal, -2.6% for Greece and 2.5% for Spain. In the case of Ireland and Slovenia, the current account and trade balances need to be maintained in order to obtain a significant reduction of their NIIP close to -35% within a decade. Italy does not face the same external pressure since its NIIP was relatively contained in 2014 (above -35%). However, it seems to be running trade surpluses that are higher than what is necessary to stabilise its NIIP. This suggests that the surpluses observed in Italy until 2014, which were less needed from a purely external sustainability perspective compared to other countries analysed here, may be more a reflection of constrained domestic demand than a boost in productivity and export potential. ([100])

The large and negative NIIPs in the countries analysed here partly mirror the build-up of internal imbalances during the pre-crisis period in all sectors (households, corporations and government). Such imbalances were in general permitted by an easy access to credit through cross-border capital flows after the introduction of the euro. ([101]) In Cyprus, Ireland, Portugal, Spain and Greece, household debt amounted to 129%, 84%, 82%, 73% and 63% of GDP in 2014 (consolidated terms), often reflecting the legacy of housing bubbles and distortionary housing-related tax incentives in the past. Corporate debt amounted to 220%, 180%, 108%, 93%, 76%, 72% of GDP in Cyprus, Ireland, Portugal, Spain, Italy and Slovenia, partly as a result of tax incentives favouring debt versus equity and financial deregulation. In general, loose fiscal policy after the introduction of the euro and the impact of the crisis, including banking system rescues and the effect of the double dip recession on taxes and revenues, have sent public debt to levels ranging from 81% in Slovenia and 99% in Spain to nearly 180% in Greece. ([102])

The current account adjustment observed in 'deficit' countries is a reflection of the deleveraging pressures related to the necessary unwinding of all these internal imbalances. One way to put in evidence this deleveraging process is to look at the net lending/borrowing positions of these economies by sectors. As depicted in Graph IV.3, private sector deleveraging started early on, when the crisis broke out, and the process is still ongoing. In 2014, households in the 'deficit' countries had a net lending position twice as high as in 2008. Corporations, which often record net borrowing needs in normal times, were still posting a positive net lending position in 2014. In Portugal, Spain, Slovenia and Ireland, deleveraging has occurred mainly in an *active* mode, through negative credit flows, which adversely affects economic activity. Despite negative credit flows to the private sector, Cyprus and Greece saw indebtedness rise due to weak nominal GDP growth. ([103]) Government deleveraging started later, as the first phase of the recession prompted stimulus packages in 2009-2010. Since then, governments have entered a consolidation phase, and budgetary policy has led to a progressive reduction in the public deficit.

Graph IV.3: **Net lending/borrowing position of "deficit" economies**
(2000-2014, in % of GDP)



Source: AMECO.

All in all, this section shows that the adjustment that has taken place in 'deficit' economies since the onset of the crisis is characterised by the persistence of elevated levels of debt affecting all

([100]) Since 2012, declining consumption has been a major driver of current account developments in Italy. See Box I.3 in 'European Economic Forecast-Spring 2015', *European Economy*, 2015(2).

([101]) For an example of analysis documenting the dominant role of 'core' countries in financing the euro area periphery's current account deficits before the financial crisis, see: Hobza, A. and S. Zeugner (2014), 'Current accounts and financial flows in the euro area', *Journal of International Money and Finance* Vol. 48, Part B, pp. 291-313.

([102]) For evidence regarding the procyclicality of public finances in the pre-crisis period, see for example: Fatas, A. and Mihov, I. (2009), 'The euro and fiscal policy', *NBER Working Paper Series,* 14722.

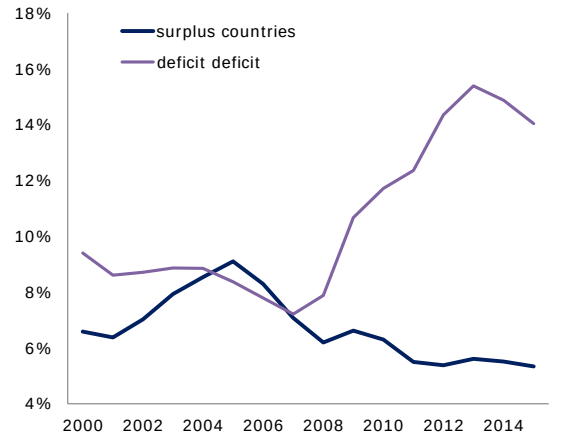
([103]) For an analysis of the private sector deleveraging, see Pontuch, P. (2014), 'Private sector deleveraging: where do we stand?', *Quarterly Report on the Euro Area*, Vol. 13 (2014), No 3, or European Commission (2015), 'Macroeconomic imbalances, main findings of the in-depth reviews 2015', *European Economy-Occasional Papers,* 228.

economic actors. Moreover, these stock imbalances are unlikely to significantly deflate in the near future. While an adjustment in flows (current account, credit flows) can be undertaken relatively rapidly, the legacy of high indebtedness accumulated in the pre-crisis period is proving much more difficult to reverse, even more so in a low inflation environment, with negative implications for economic growth and exposure to shocks as well as a slow shift to more profitable activities, as the next two subsections will highlight.

IV.3. Excessive debt and the quality of the adjustment

Economic developments observed since the crisis show that as long as deleveraging pressures linked to private and public debts remain, economic activity may struggle to pick up, with negative implications for employment (see Graph IV.4). ([104])

Graph IV.4: **Evolution of the unemployment rate in the euro area (1)**



(1) 'surplus' countries: Belgium, Germany, Luxembourg, the Netherlands, Austria and Finland. 'deficit' countries: Estonia, Ireland, Greece, Spain, France, Italy, Cyprus, Portugal, Slovenia and Slovakia.
Source: AMECO

First, in the short run, high external liabilities imply high refinancing needs which make a country vulnerable to country-specific macroeconomic shocks such as a fall in income, an interest rate shock, or a sudden stop in capital inflows. This was confirmed by the euro area sovereign crisis that culminated in 2012. The crisis, which eventually set in motion the process of establishing a proper banking union, made it clear that countries are even more vulnerable in the absence of a fully integrated banking system or common backstops for the banking sector. ([105])

Second, even in less tense situations such as the present, the weight of existing debt held by corporations and households can prevent them from undertaking new investments and hold back consumption for a long period of time. ([106])

Third, when deleveraging pressures affect many economic actors simultaneously, the negative impacts on economic activity tend to reinforce each other. Corporate deleveraging occurs via a combination of lower investment and higher savings, the latter generally implying wage moderation and/or labour shedding. The consequential reduction in disposable income may in turn make household deleveraging more difficult with further knock on effects on consumption and growth. Conversely, household deleveraging affects corporate deleveraging via reduced consumption and demand. In addition, private sector deleveraging is made harder by government deleveraging via a negative impact on household disposable income and corporate profitability. ([107]) Empirical evidence shows that the impact of the debt overhang on aggregate investment can be quite sizable. Ozcan et al (2015) argue that the debt overhang explains about a third of the decline in investment observed during the crisis in the euro area. ([108])

([104]) See Bank for International Settlements (2014), '84th Annual Report', June 2014.

([105]) Note that since 2008, the adjustment in current account balances has been somewhat smoothed out by the ample liquidity provided by the Eurosystem (e.g. full allotment, LTROs, SMP, covered bond purchases) as evidenced by the emergence of TARGET2 imbalances allowing for a shift from private to official capital flows. See Loublier, A. (2015), 'Recent developments in cross-border capital flows in the euro area', *Quarterly Report on the Euro Area*, Vol. 14 (2015), No 1.

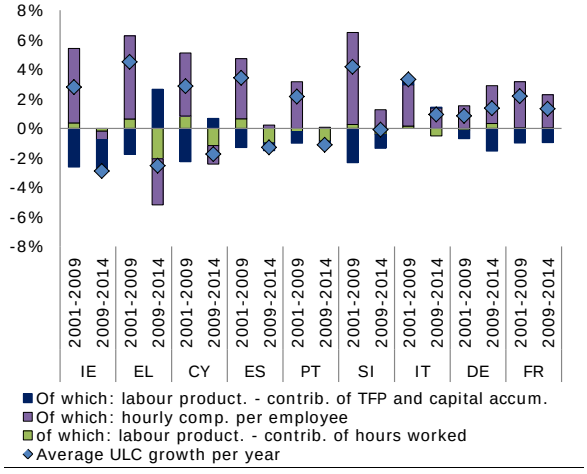
([106]) This problem is known as the debt overhang problem. Debt overhang is originally defined as a situation where a firm's high levels of debt act as a disincentive to new investment (Myers, Stewart C. (1977), 'Determinants of corporate borrowing', *Journal of Financial Economics*, 5 (2), pp. 147-175). When a firm has outstanding debts that make default likely, it becomes reluctant to engage in new investments, even if the latter are economically viable and profitable. Similar arguments apply to households, whose, incentives to supply labour are reduced if a large part of their income is used to repay debt. The compression of consumption of highly indebted households is a further drag on short-term growth prospects.

([107]) Empirical evidence of these various channels can be found in Bricongne J.-C. and Mordonu A. (2015), 'Interlinkages between household and corporate debt in advanced economies', *European Commission Discussion Papers,* No 17 (October 2015)

([108]) Ozcan, S. K., L. Laeven and D. Moreno (2015), 'Debt overhang in Europe: evidence from firm-bank-sovereign linkages', manuscript, March.

Since the onset of the crisis, deleveraging pressures in the private and public sectors have coincided with wage moderation and a considerable slowdown in the evolution of unit labour costs (ULCs) in the 'deficit' countries. Chart IV.5 presents a comparison of average annual ULC growth in 2001-2009 and 2009-2014 allowing for a decomposition based on the standard breakdown of ULC growth into hourly compensations and labour productivity, the latter being further broken down into the contribution of hours worked, total factor productivity and capital accumulation using a standard growth accounting framework. In the 'deficit' countries analysed, wage moderation appears to be the most important driver of the slowdown in ULCs compared to pre-crisis dynamics. An overall decline has even been recorded in Greece, Cyprus and Ireland. Wage growth is now lower in 'deficit' economies than in core countries. Furthemore, consistent with the rise in the unemployment rate in recent years, productivity gains through labour shedding have been reducing ULC growth in most of the countries looked at here. For example, in Spain, ULCs decreased at an annual rate of 1.3 % between 2009 and 2014, of which 1.0 % is attributable to labour shedding.

Graph IV.5: **Evolution of unit labour costs (ULCs) (1)**



(1) The decomposition is based on the standard breakdown of ULC growth into hourly compensations and labour productivity, the latter being further broken down into the contributions of hours worked, total factor productivity and capital accumulation using a standard growth accounting framework.
Source: AMECO, own calculations.

The adjustment in cost competitiveness in the 'deficit' countries has first coincided with a current account reversal mirroring a demand compression. As is now well documented, the early phase of rebalancing was largely driven by the contraction of private domestic demand components across the board. The contraction was particularly pronounced in construction investment (see also next section). Only recently have exports started to pick up. ([109]) Overall, in euro area economies, between 2009 and 2014, lower ULC growth coincided on average with an increase in current account balances, as evidenced by a correlation coefficient of -0.5. ([110]) However, over the same period, the correlation of ULC growth with real import growth was positive and elevated (+0.4), while the correlation with real export growth was also positive (+0.1). Various factors may have affected export performance during the adjustment period (e.g. an export market evolution constrained by the euro area-wide recession). ([111]) Nonetheless, this tends to show that reduced ULCs took time to translate into a durable improvement in export dynamics, with the presence of rigidities in the adjustment process possibly being one important limiting factor (see next subsection). This is in the same vein as the findings of Gaulier and Vicard (2012) and Gabrisch and Staehr (2014) who show that changes in ULCs are not well correlated with or do not precede changes in exports. ([112])

All in all, this section shows that high levels of private and public debt have certainly affected the quality of the adjustment process. The deleveraging pressures related to their necessary unwinding and the much-needed improvement in cost competitiveness have mainly, at least during the first years of adjustment, coincided with a compression in domestic demand and a surge in unemployment, rather than a boost in exports. Furthermore, as discussed in the next section, high levels of debt not only represent a drag on demand and growth, but are also likely to weigh on the more structural rebalancing of the economy towards more productive or export-oriented activities.

([109]) See Box I.3 in 'European Economic Forecast-Spring 2015', *European Economy*, 2015(2).
([110]) The correlations presented in this paragraph are calculated as the cross-sectional correlations between the growth rate of ULCs between 2009 and 2014 and the pp. change in current account balance, the growth of real exports and imports over the same period. All euro-area Member States are included in the calculations.
([111]) See Chapter I.
([112]) Gaulier, G. and Vicard, V. (2012), 'Current account imbalances in the euro area: competitiveness or demand shock?', *Quarterly Section of Articles*, No 27, Autumn 2012, Banque de France;
Gabrisch, H. and K. Staehr. (2014), 'The Euro Plus Pact: competitiveness and external capital flows in the EU countries', *Journal of Common Market Studies,* 2014, pp. 1-19.

IV.4. High non-performing loans and the misallocation of capital

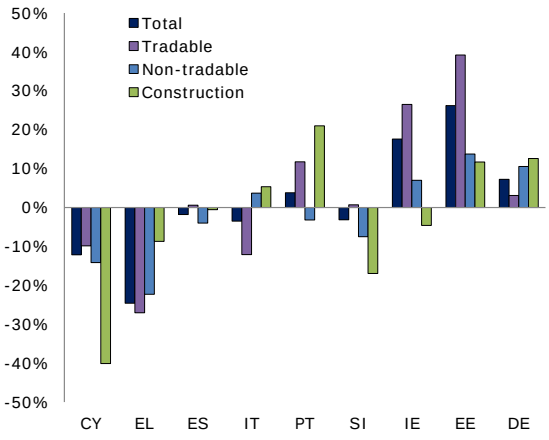
Growth-friendly external rebalancing in 'deficit' countries requires a shift of resources from low productivity to high productivity activities, which in general corresponds to a shift from the non-tradable to the tradable sector, leading to an increase in the export capacity and eventually actual exports and income. As resources are driven by their expected returns, one would expect a rebalancing in which the attractiveness of the tradable sector increases relative to the non-tradable one. As described in the previous section, despite a marked adjustment in wages, the effect on exports has been slow to kick in.

One way to assess the rebalancing is to consider the evolution of operating margins in the tradable and non-tradable sectors since 2008 (see Graph IV.6). The operating margin is defined as the value added minus compensation of employees and can be considered an indicator of the profitability of an economy. It encompasses various effects, including price-cost margins and demand (or scale of activity) effects. ([113]) In Cyprus, Greece and Italy, the operating margins fell between 2008 and 2014 with the tradable sector playing a major role. In Spain, the operating margins in the total economy fell too, but this was compatible with an increase in the margins in the tradable sectors. Portugal, and especially Ireland and Estonia, have enjoyed both an increase in total margins which was more pronounced in the tradable sector, suggesting a faster adjustment.

The explanations for the heterogeneity in the progress made towards rebalancing may lie in the presence of rigidities affecting the production process. Such rigidities can be present in the labour and product markets. The swift implementation of structural reforms in labour and product markets helped Ireland and Estonia record a faster and stronger recovery than other euro area Member States. ([114]) The presence of product and labour market rigidities as an obstacle to the adjustment process was well known in the pre-crisis debate. However, the impact of rigidities associated with the persistence of high debt levels and deleveraging pressures hampering an efficient allocation of capital sheds light on a new challenge.

The different pace of adjustment in the vulnerable economies may indeed be linked to the presence of rigidities in the capital allocation process, i.e. in the transmission of savings to productive investments. One way of evidencing disparities among 'deficit' euro area economies is to put in perspective the evolution of investment in the tradable and the non-tradable sectors with that of non-performing loans (NPLs). In general, the 'deficit' economies analysed here are those that experienced the most significant surges in NPLs.

Graph IV.6: **Evolution of operating margins in the tradable and non-tradable since 2009 (1), (2), (3)**
(in %)



(1) Operating margins are defined as value added (B1) minus compensation of employees (D1)
(2) Tradable sector includes: A - agriculture, forestry and fishing, B_E - industry except construction, G_I - wholesale and retail trade, transport, accommodation and food service activities, J - information and communication.
(3) Non-tradable sector includes: F - construction, K- financial and insurance activities, L - real estate activities, M_N - professional, scientific and technical activities, administrative and support activities, O_Q - public administration, defence, education, human health and social work activities, R_U - arts, entertainment and recreation, other service activities, activities of household and extra-territorial organisations and bodies.
Source: Eurostat, own calculations.

A high NPL stock can have implications for growth prospects and adjustment via the allocation of capital between viable and non-viable firms. High stocks of NPLs are often associated with a relatively large proportion of credit being locked up with non-viable firms (mostly in the non-tradable

([113]) For an in-depth analysis of the pass-through of wage cuts into prices, see Breitenfellner, A., A. D. Dragu, and P. Pontuch, (2013), 'Labour costs pass-through, profits and rebalancing in vulnerable Member States', *Quarterly Report on the Euro Area*, Vol. 12 (2013), No 3.
([114]) See Chapter II for an econometric analysis of rigidities in the labour market hampering the adjustment process.

sector). ([115]) If banks refinance the non-tradable sector in order to delay the moment when loan losses have to be disclosed, this is done at the expense of the supply of credit to new and viable projects in the tradable sector. More precisely, the presence of non-performing debt on bank balance sheets weighs on their ability to provide funding to the real economy through several channels. ([116]) NPLs imply higher provisioning needs, which in turn may weigh on bank profits. The willingness of banks to finance risky projects may also be reduced by the perception of increased asset riskiness linked to NPLs. ([117]) Moreover, higher capital requirements linked to increased riskiness of assets tie up banks' resources and crowd out new credit. Profits are further reduced by the increased amount of human resources needed to monitor and manage a high NPL stock. ([118])

The evolution of investment in the tradable and non-tradable sectors since 2008 is depicted in Graph IV.7 and put in perspective with the evolution of non-performing loans (NPLs). The picture that emerges is that the shift between investment in the tradable sector and the non-tradable one has not taken place, or has taken place at a much lower pace, in countries that experienced a higher or more persistent surge in NPLs. In Cyprus and Greece, investment fell by more than 60% between 2008 and 2014, corresponding to a 59% and 53% decrease in the tradable sector. In parallel, NPLs skyrocketed to 45% and 34% in 2014 respectively. In Italy too, the continuous increase in NPLs between 2008 and 2014 (reaching 18% in 2014) coincided with a fall of more than 20% in investment in the tradable sector. In Spain, the rise in NPLs was relatively less pronounced and peaked in 2013. The fall in construction accounts for a large share of the fall in total investment while investment in the tradable sector performed comparatively well. Conversely, Ireland and Estonia stand out as countries which were able to undertake a rapid adjustment in investment. In Ireland, total investment in 2014 was still 21% lower than in 2008, but had been on an upward trend since 2010 and investment in the tradable sector was 20% higher than in 2008. NPLs surged but a marked decrease has been underway since 2013. In Estonia, after a marked adjustment in 2009 and 2010, investment in the tradable sector has grown faster than total investment, concomitant with a small increase in NPLs rapidly corrected.

Naturally the correlations considered here between NPLs and investment do not necessarily imply causality, as these two variables have a strong cyclical component. The faster recovery in Ireland and Estonia could explain much of the improvement in NPLs and investment without causality from the former to the latter. However, some empirical studies tend to support the view that efficient insolvency frameworks have a positive impact on the speed and cost of corporate and household deleveraging. For example, the IMF reckons that given the current level of impaired assets, a timely resolution could unlock new lending of more than 5% of GDP. Moreover, Carcea et al (2015) show that factors measuring the efficiency of the restructuring process are positively associated with a speedier adjustment of the NPL rates, i.e. to their swifter reaction and subsequent normalisation following a negative macroeconomic shock. They also show that the negative relationship between corporate deleveraging and GDP growth (hence potentially investment) appears to be significantly lower in Member States with a more efficient bank rescue and recovery framework. ([119])

All in all, this section highlights the importance of dealing with high stocks of non-viable debt in order to facilitate the structural shift from non-tradable to tradable activities and make the adjustment process more growth-friendly. One way of tackling high NPLs is to ensure that insolvency frameworks are adequate to address the stocks of non-viable debt, free-up economic resources, and reallocate capital efficiently. This is what happened in Spain and Ireland where NPLs began to decline once insolvency reforms were implemented. This is also the objective of a true capital markets union

([115]) Regarding the link between profitability and the tradable sector, see Breitenfellner et al. (2013) Using data up to 2011, they show that profitability was in 2011 higher in the tradable sector than in the non-tradable one, with Greece being an exception. Breitenfellner et al. (2013) op. cit..

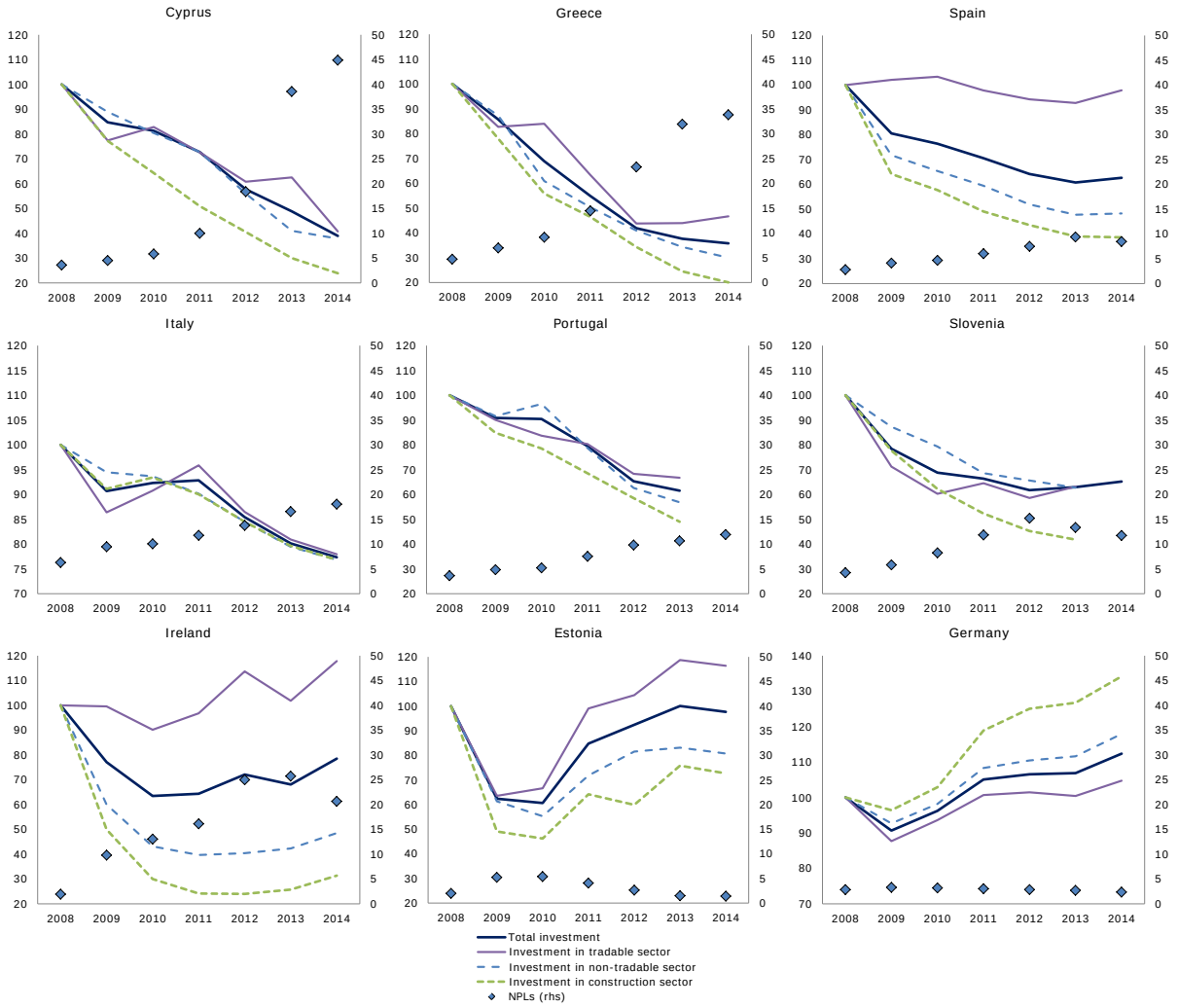
([116]) See IMF (2015), 'Euro area policies, selected issues: policy options for tackling non-performing loans in the euro area', *IMF Country Report,* No. 15/205, July 2015.

([117]) For example, see Diwan, I. and Rodrik, D. (1992), 'Debt reduction, adjustment lending, and burden sharing', *NBER Working Paper Series*, No. 4007.

([118]) The negative impact of high NPLs on banks' profitability needs, however, to be weighed against the costs linked to the restructuring of the NPL portfolio that is likely to result in losses, thus reducing profitability and capital positions.

([119]) See Carcea, M. C., Ciriaci, D., Cuerpo, C. Lorenzani, L. and Pontuch, P. (2015), 'The economic impact of rescue and recovery frameworks in the EU', *European Economy Discussion Paper* 004, September 2015.

Graph IV.7: **Non-performing loans and investment in the tradable and non-tradable sectors (1)**
(2008-2014, in %)



(1) For the definition of tradable and non-tradable sectors, see previous Graph.
Source: NPLs: IMF, investment: Eurostat. For Spain, data are not available for all industry. Therefore, the following assumptions are retained: (i) investment in the construction sector is extrapolated in 2013 and 2014 using the growth rate of construction-assets; (ii) investment in sector K is extrapolated in 2013 and 2014 using the growth rate of total investment; (iii) the share of investment in sectors M_N, R_U, and O_Q in total investment is assumed to be constant (25% which corresponds to the average 2008-2010 based on ESA95 data).

whose aim is to make the funding structure more diversified and loss absorbing.

IV.5. Conclusion

This chapter highlights the prominent role played by excessive indebtedness throughout the adjustment process of euro area 'deficit' economies since the outbreak of the global financial crisis. Although built up during the pre-crisis period, high debt levels and their impact on growth and adjustment were not paid sufficient attention in the pre-crisis view of the functioning of the euro area. In a context where financial markets are not fully integrated, activity in 'deficit' economies has been adversely affected by excessive indebtedness through various channels over the past seven years. High debt levels made some of these countries particularly vulnerable to the shock linked to the global financial crisis, contributing to a disorderly and asymmetric correction. The simultaneous deleveraging pressures linked to the necessary unwinding of excessive indebtedness in all economic sectors have also been weighing on domestic demand, contributing to major output losses and a persistent rise in unemployment. Moreover, at the euro area aggregate level, domestic demand has not been sufficiently

supported by net creditor countries with large saving-investment balances or low deleveraging needs, which has made the deleveraging process even more difficult. High debt levels have also been associated with a surge in NPLs, possibly reflecting inefficient insolvency frameworks. This has hampered the adjustment as credit locked up in firms in the non-tradable sector has not been efficiently allocated to more productive or tradable activities.

Looking ahead, dealing with high stocks of non-viable debt is essential in an overall context of low inflation and low growth. Efficient insolvency frameworks and a fully-integrated capital markets union would help mitigate the negative impact of high debt levels on demand and output by freeing up resources locked-up in unproductive activities, thus easing credit supply constraints and boosting structural adjustment. In parallel, this adjustment should be facilitated by countries with fiscal space, a large current account surplus or low deleveraging pressures. By boosting domestic demand and investment, they would contribute to put the rebalancing process on a more stable footing by making it more symmetric, while making the recovery more self-sustainable.

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