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.

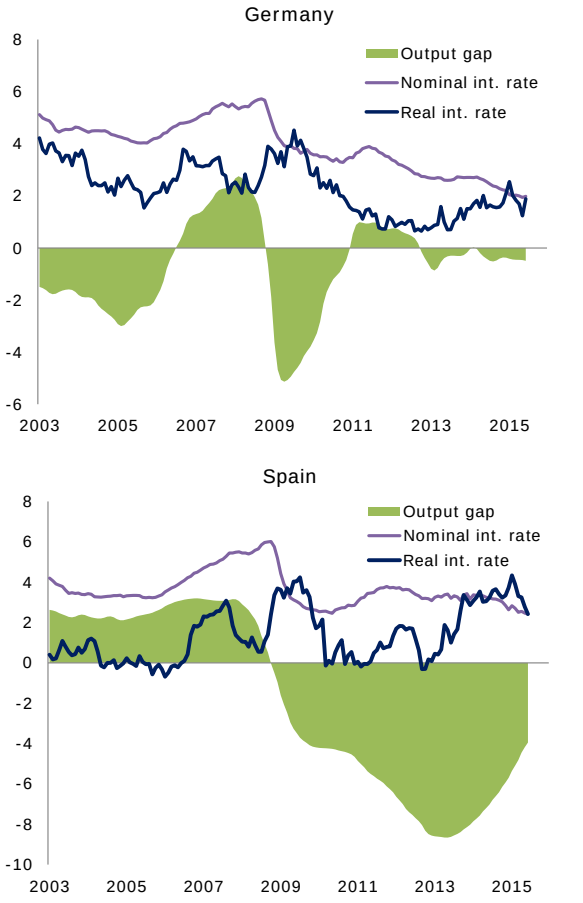
Section III.5 provides some conclusions.

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.

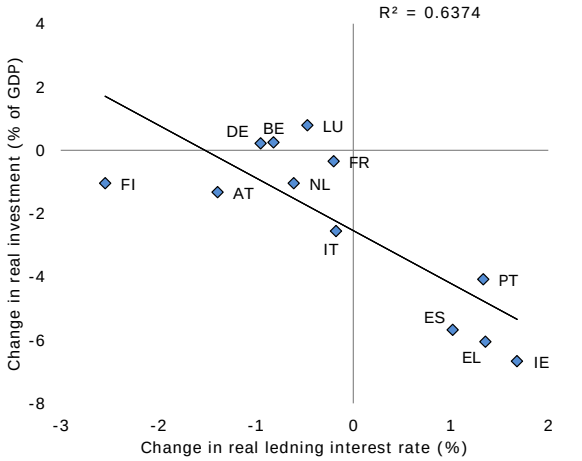
The real interest rate mechanism was driven by inflation differentials in the pre-crisis period

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

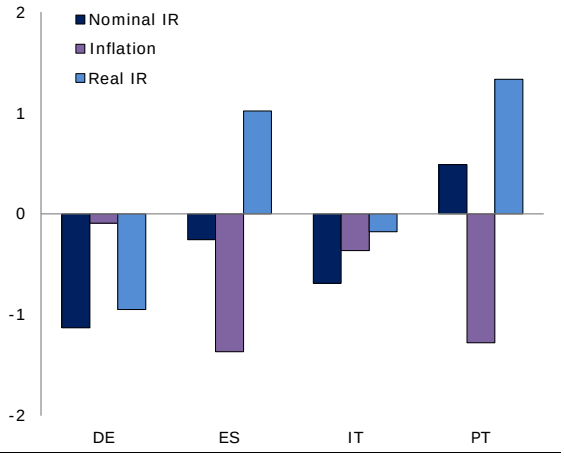
The global financial crisis has added a new dimension to the real interest rate mechanism. The traditional view of the real interest rate mechanism assumed that differentials in real interest rates were mainly driven by inflation differentials as the common monetary policy and financial integration induced 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])

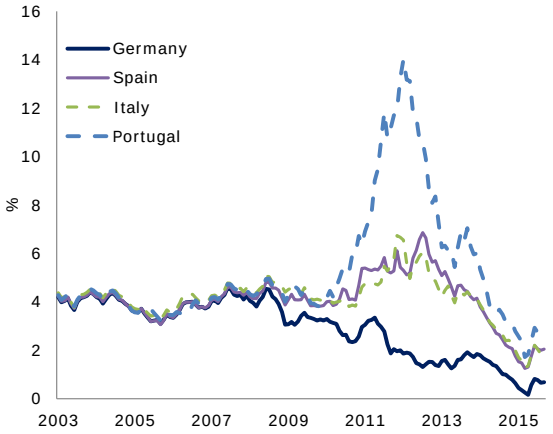
Since the ECB adopted outright monetary transactions (OMT), this perceived redenomination risk has receded and sovereign bond yields have started to converge again. However, these are still far from the pre-crisis convergence level, especially

([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)

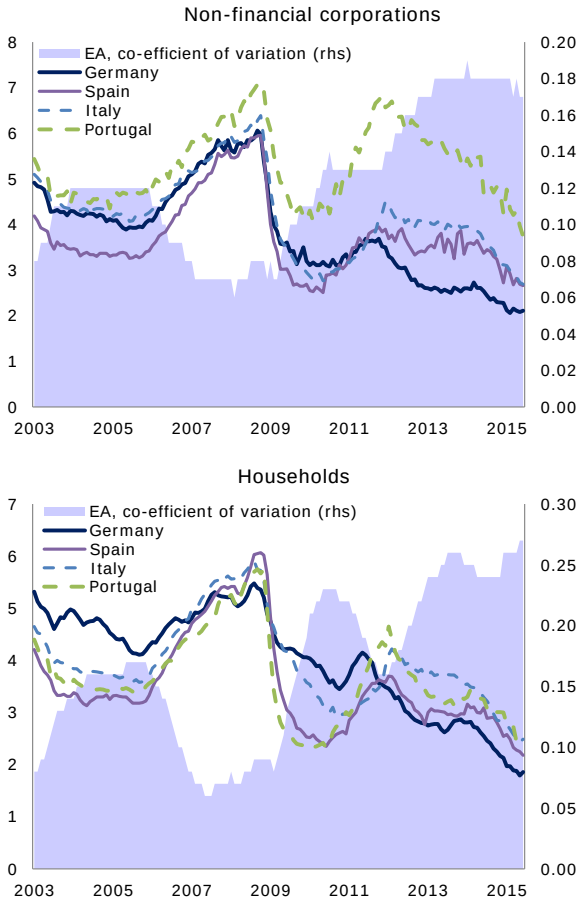
Graph III.4: **10-year sovereign bond yields, selected euro area countries**
(Jan 2003 — Sep 2015, in %)



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.

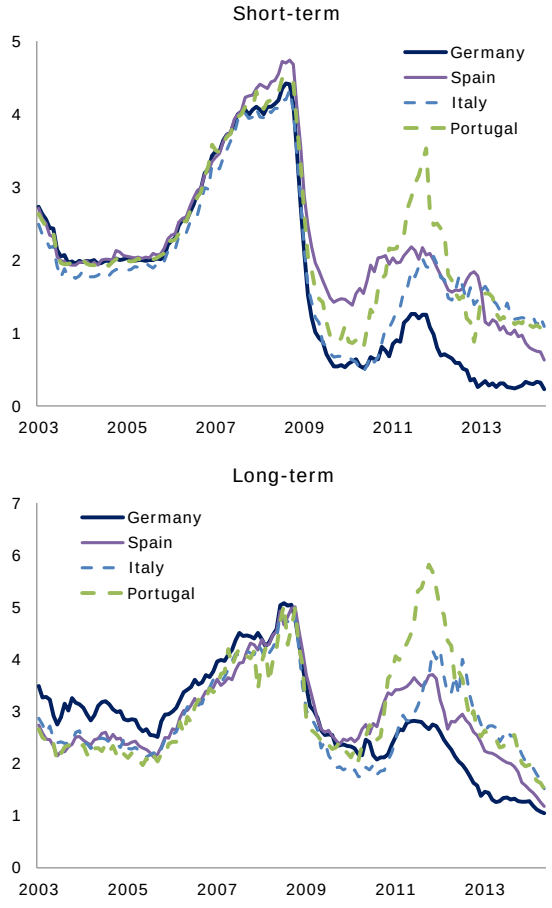
([81]) See for example: de Bondt, G. (2005), 'Interest rate pass-through: Empirical results for the euro area', *German Economic Review*, Vol. 6, Iss. 1, pp. 37-78.
Belke, A., J. Beckmann and F. Verheyen (2014), 'Interest rate pass-through in the EMU — New evidence from nonlinear cointegration techniques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

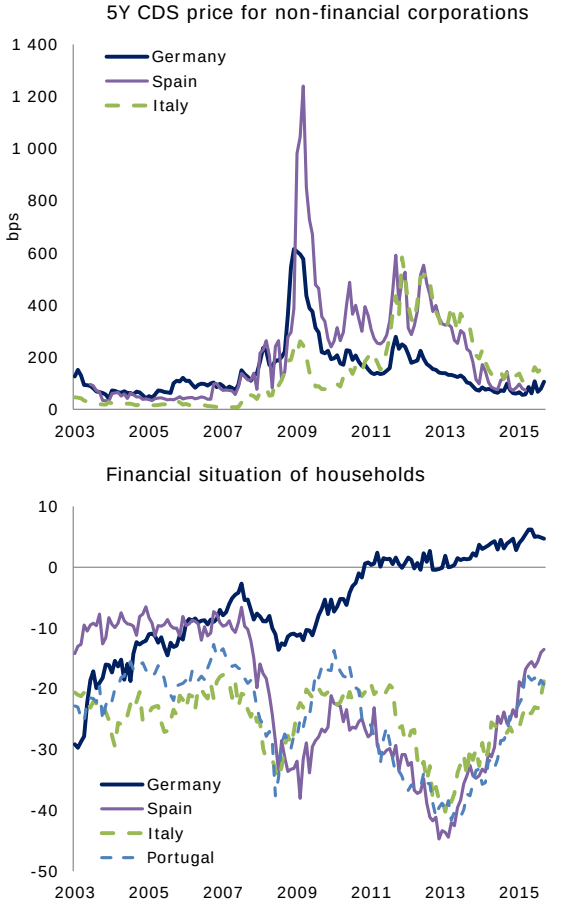
divergence across Member States since 2009 both for short- and long-term funding. The short-term financing that makes up the bulk of the bank funding cost ([86]) diverged from complete unification at the money market rates before the crisis. The observed divergence of costs may reflect several factors. 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.

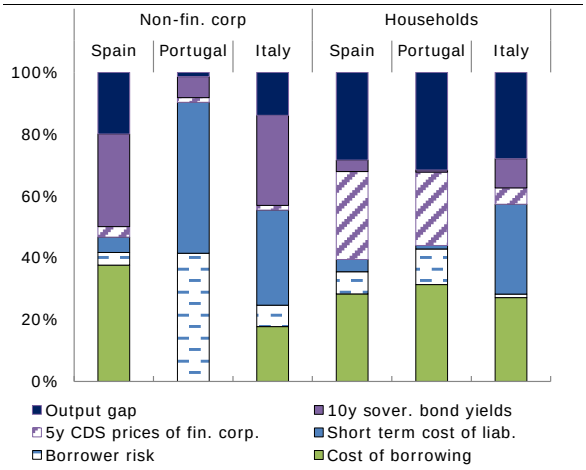
(iii) Another important driver of lending interest rates **for households** is bank credit risk. Specifically, a deterioration of bank credit quality is compensated by higher mark-up. This could, for instance, be explained in the following way: when facing unexpected asset losses banks raise lending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

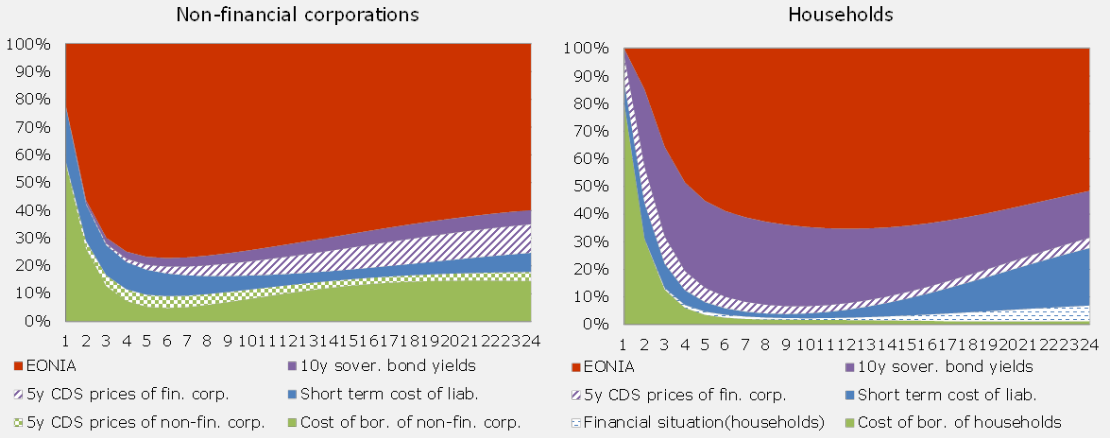
Box (continued)

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.

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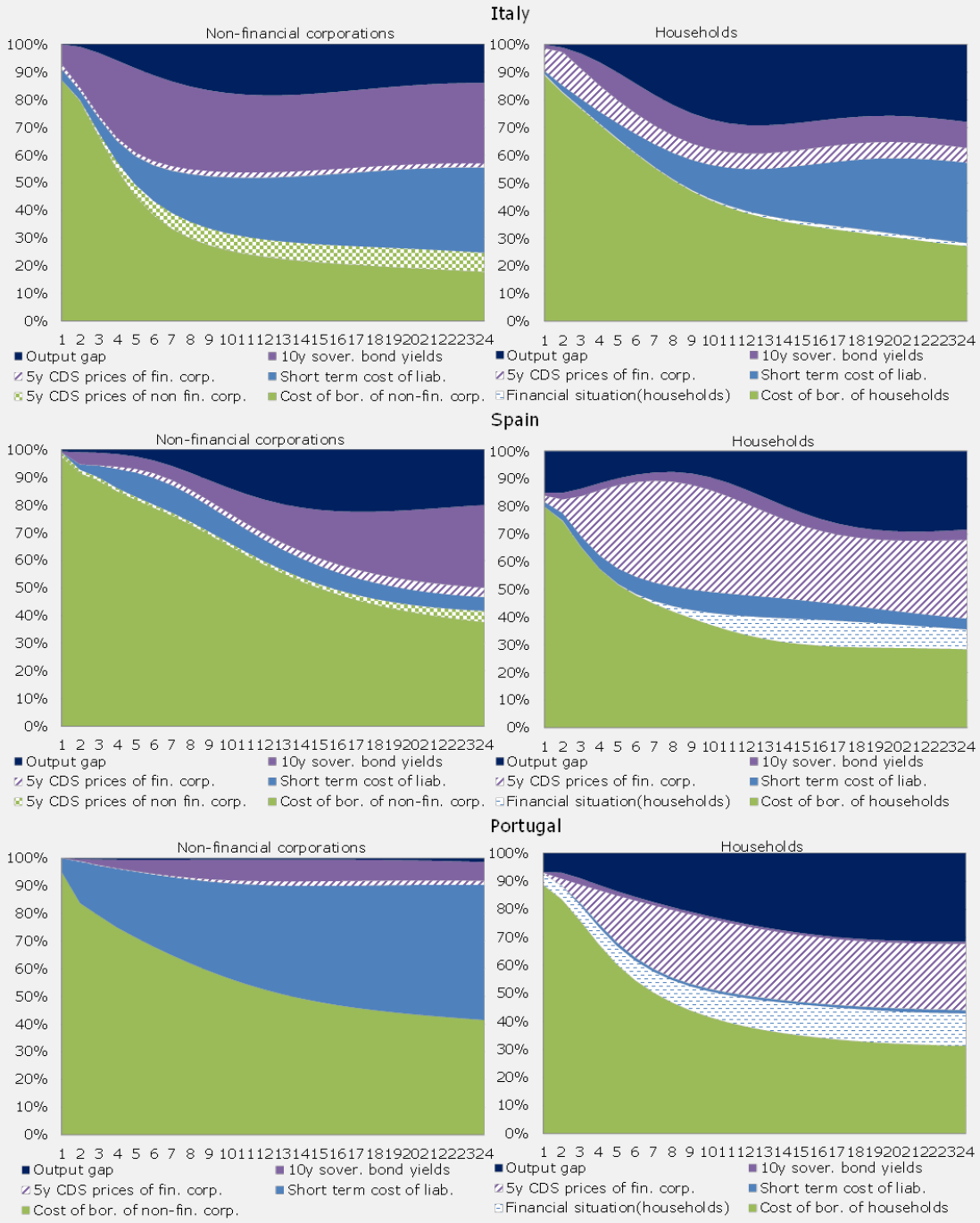
Box (continued)

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



(1) VAR with two lags, horizon 24 months

Source: DG ECFIN calculations.