Asymmetric Effects on Financial Cycles in a Monetary Union with Diverging Country Preferences for Variable- and Fixed-Rate Mortgages[*]

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*A*bstract: Before as well as at the time when the European Monetary Union (EMU) was launched, a number of economists were discussing possible asymmetrical effects of monetary transmission stemming from apparent structural differences between national credit markets. On the one hand, they hoped that the single currency would lead to a process of harmonization and on the other hand, they focused on asymmetric effects on output and inflation. In the current article, it will be argued that, additionally, consideration needs to be given to an asymmetrical impact on the national financial cycles in a monetary union. This is especially true given a diverging prevalence of variable-rate and fixed-rate mortgages, as can be observed within the EMU. We propose a "new credit channel" and an "interest burden channel" as analytical concepts for a better understanding of such effects. These working hypotheses will be constructed using (formally) stylized transmission channels and hardened by stylized facts for the euro area. Our main findings based on stylized facts are that, first of all, average initial interest rates for newly originated mortgages in Ireland and Spain – as countries with a prevalence of variable-rate contracts – were 1.2 percentage points lower from 2003 to 2005 in comparison to Germany. This may have supported a development towards a "debt sustainability-illusion" in these countries. Secondly, aggregated interest payments for mortgages doubled in Ireland and Spain as a percentage of GDP from 2005 to 2008. In the end, the results may imply that countries with predominantly variable rate mortgages are *ceteris paribus* more likely to need macroprudential policy activities in the first place and do so with a higher intervention frequency than their EMU counterparts with a prevalence of fixed-rate mortgages.

Keywords: Financial stability; Mortgage market; Interest rate fixation periods; Monetary union; Monetary transmission; Housing cycle; Financial cycle; Household debt service

JEL Classifications: E42, E43, E58, G21

1. Introduction

Among the member states of the European Monetary Union (EMU) a wide divergence in the prevalence of variable-rate mortgages and fixed-rate mortgages exists.[1] Figure 1 illustrates these differences for newly originated mortgages in selected EMU countries. While Germany and France, for example, traditionally only have a small percentage of variable-rate mortgages, this contract type dominates the mortgage market in countries like Ireland, Italy, Portugal and

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[*] This article represents the author's personal opinions and does not necessarily reflect the views of the Deutsche Bundesbank or its staff.

[1] Sometimes the range of variable-rate contracts is limited by caps and floors. However, in the case of Spain many floor-components of mortgage contracts are subject to legal proceedings.

Spain.[2]

In the context of the European economic crisis, the question arises as to whether such differences in interest rate fixation periods are part of a bigger picture needed for an explanation of the crisis. This is especially the case with respect to the boom-bust-cycles in the housing markets of some EMU member states. Our starting hypothesis is that diverging interest rate fixation periods constituted an additional factor leading to irrational exuberance in some countries. This aspect may not yet have received sufficient consideration in the consensus view of the European debt crisis.[3]
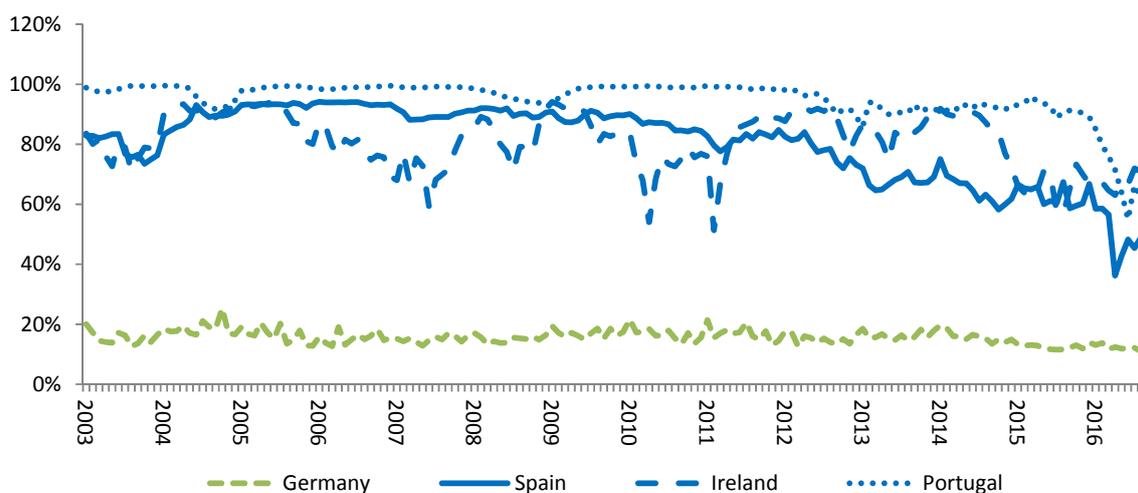
Source: ECB .
* As a proxy for variable rate mortgages, mortgages with an initial interest fixation until 1 year are considered.

Figure 1. Percentage of variable rate loans in mortgage origination in selected countries*

The article analyses the question raised above and is structured as follows: First of all, it will be argued that a variety of explanatory factors may be relevant for the diverging prevalence of variable-rate compared with fixed-rate mortgages. In order to understand the tectonic forces resulting from such credit market differences within a monetary union, (formally) stylized transmission channels are constructed.[4] We distinguish between a "new credit channel" and an "interest burden channel" in order to capture the asymmetric transmission of monetary policy to national housing cycles, which constitute a central component of financial cycles.[5] Subsequently, we discuss selected stylized facts for the Euro area with relevance for these channels.

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[2] See also European Mortgage Federation (2012) regarding diverging interest rate fixation periods in Europe.

[3] For a reference to the consensus view of the European crisis, see Baldwin and Giavezzi (2015).

[4] The aim here is to develop "working hypotheses" in the sense of Popper's understanding of science, see Popper (2002).

[5] See, for example, the compound indicator for financial cycles in Drehmann, et al. (2012a), which combines data on house prices, credit and the credit-to-GDP-ratio. Subsequently, if we speak about the housing cycle or the credit cycle we implicitly address a part of the financial cycle in the rest of the article.

2. Factors Underlying the Diverging Prevalence of Variable-rate and Fixed-rate Mortgages

Following a working paper by the ECB (2009), we distinguish between supply-side, demand-side and institutional factors that may explain why there is a differing prevalence of interest rate fixation periods among the EMU member states:

- *Supply-side factors*: With regard to the supply side of different mortgage contract offerings, the diverging refinancing characteristics of national banking systems may play a role.[6] It might be argued in this context that banks forward incentives of their refinancing structure via their mortgage offerings to potential borrowers.[7] However, the ECB (2009) has emphasized that there were, in principle, no obvious hurdles to a longer-term refinancing – which is an important condition for offering longer-term interest rate fixation periods. On the one hand, this is not true for the period of the European debt crisis. On the other hand, some differences in bank refinancing were apparent before the crisis too.

- *Demand-side factors*: In terms of the demand-side, several factors should be considered. First of all, diverging experience with macroeconomic stability or instability in the past may influence current decisions by households. Fixed-rate mortgages could be a more natural choice in countries with longer experience of rather low inflation; in contrast, variable-rate loans predominate in countries with higher inflation prior to joining the EMU. This could be due to longer planning horizons in a low inflation environment, which implicitly promotes longer-term interest rate fixation periods.[8] In the end, the choice between fixation periods might also be influenced by different cultural backgrounds, which may result in diverging preference settings or some kind of a "myopic bias" favouring short-term advantages of variable-rate loans.[9] Thus, interest rate discounts for variable-rate loans usually provide an incentive to select this contract type in order to gain short-term advantages, whereas, in the case of a longer-term interest rate fixation, a higher degree of planning security is provided. Several studies show that mortgage choices are influenced by the level of the interest fixation spread (i.e. the interest rate of a typical fixed-rate mortgage compared with the interest rate of a variable-rate mortgage) and expectations about future interest rates. As the spread between variable- and fixed-rate mortgages varies across EMU member states (see Figure 2), it also contributes to a differing prevalence of fixation periods within the EMU.[10]

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[6] On the role of banking advice for the choice of loan contract characteristics, see Foá, et al. (2015) and Hullgren (2012).

[7] Regarding evidence on this pass-through of a bank's refinancing characteristics to its customers for the example of the British mortgage market, see Koblyakova and White (2016).

[8] According to MacDonald and Winson-Geideman (2012) stronger inflation expectations may result in a larger percentage of variable-rate loans.

[9] For a psychological explanation of the choice between variable-rate and fixed-rate mortgages, see Mugerman et al. (2016).

[10] The data used for Figure 2 could entail a certain degree of bias as the distribution within the interest rate fixation interval from 5 to 10 years may differ between the countries selected for the graph. The unusual negative difference between long-term vs. short-term mortgage rates in Germany might be a result of quantitative easing policies and its status as a safe haven during the crisis.

- ***Institutional factors***: The degree of mortgage market regulation – for example, regarding penalties for early contract dissolution – has been put forward in some studies as an additional reason for the prevalence of variable-rate mortgages in some countries.[11] Furthermore, there also could be some influence from incentives (implicitly) given by the Basel banking regulation. These incentives emerge as in the case of variable-rate loans the risk of changing interest rates ultimately rests with the borrower (i.e. private households with mortgage debt). Thus, banks may be able to calculate lower risk weights in their internal risk models therefore. As a consequence, this may lead to lower equity demands.[12] Through the financial advice they provide, banks could pass on these incentives to potential borrowers.[13]
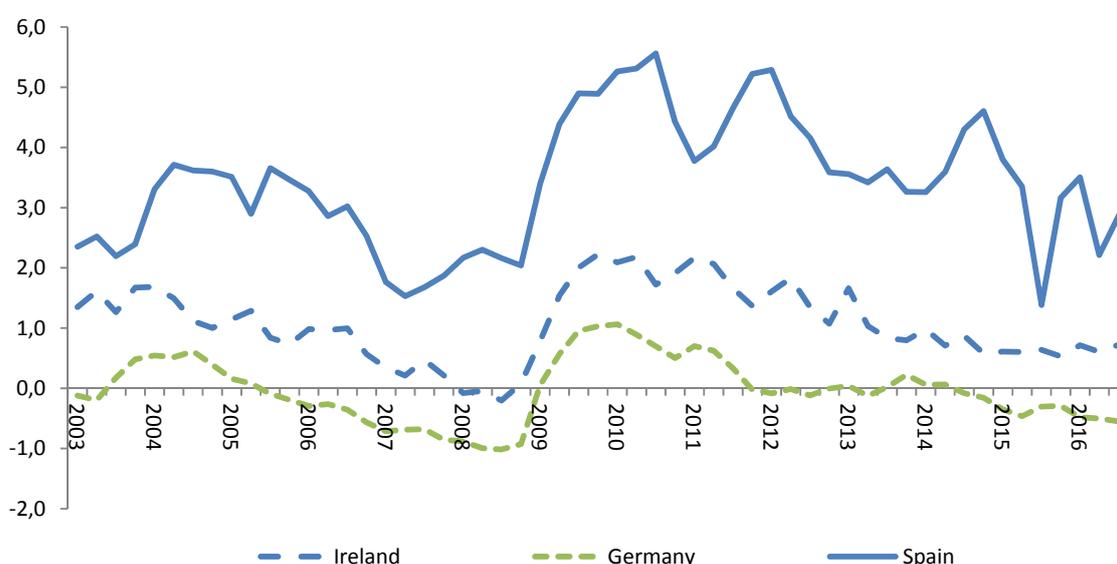
Source: ECB.

Figure 2. Interest rate fixation spread for mortgages in selected EMU countries (percentage points; 5 to 10-year interest rate mortgage minus the interest rate of variable-rate mortgage)

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[11] However, Germany may be a counter-example, as mortgage contracts often entail rather uncomfortable early dissolution conditions. Nevertheless, most German borrowers seem to prefer fixed-rate contracts.

[12] On the role of banking regulation for mortgage choice, see also Dungey, et al. (2015).

[13] See Foá, et al. (2015).

To sum up, a mixture of factors can claim relevance for the diverging prevalence of variable-rate compared with fixed-rate mortgages.[14] An additional factor which should not be neglected because of its simplicity is the force of customization. Thus, the positive experience of many households with variable-rate loans in some countries during the secular downward trend in interest rates could be a reason for them to stick with this kind of mortgage. Or, as Neumann (2016) puts it for the case of Spain: *"most Spaniards opt to stick with variable-rate mortgages out of habit and see no urgency to switch as long as they believe interest rates will remain low."*

Besides country-specific reasons for the choice of the interest-rate fixation period, household-specific factors should be taken into account, too.[15] A number of studies highlight the fact that especially households facing financial constraints prefer variable-rate loans owing to the immediate monetary relief provided by the interest rate discount of such credit contracts in comparison to fixed-rate loans.[16] Subsequently, households in some EMU countries might prove especially reluctant to switch to fixed-rate contracts, as their financial situation is still suffering from the impact of the last crisis.[17]

3. Stylized Transmission Channels

In order to illustrate the implications of different interest-rate fixation periods within a monetary union, we distinguish between country type *(a)*, i.e. comprising countries with a high percentage of variable-rate mortgages, and country type *(b)*, i.e. countries with a low percentage of variable-rate mortgages. As main transmission channels, we propose a "new credit channel" and an "interest burden channel".[18] While the new credit channel dominates during the build-up of a housing boom, the interest burden channel is more important in terms of the build-up of over-indebtedness in the household sector and during the transition to a correction phase of the housing cycle. The following function set is intended as a proposal to formally describe these channels.

3.1 New credit channel

(1.) *New credit channel*: $mortgage_{i,t}^{new} =$
$f(share\_var_i, \Delta p_{i,t-1}, m + x_{i,t} + y_{i,t}, interest\_expt_{i,t}, income\_expt_{i,t}, E_{i,t},)$,

where
$mortgage_{i,t}^{new}$ = change in the stock of mortgages in country *i* in year *t* against *t-1*

$share\_var_i$ = share of variable-rate mortgages in the mortgage stock in country *i*

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[14] A change in these factors may also lead to a country shifting from predominantly fixed-rate mortgages to variable-rate loans or vice versa, see Dübel, et al. (2009).

[15] For the literature on "mortgage choice" in general, see for example Bacon and Moffat (2012) and Badarinza, et al. (2014).

[16] See Johnson and Li (2014).

[17] Although fixed-rate contracts dominate strongly in the United States, a certain market segment with variable rate mortgages was increasing strongly before the last crisis. Often, such borrowers were in a constrained financial situation compared with borrowers in the normal 30 years fixed-rate market.

[18] A comparable approach is used by Garriga, et al. (2015) in the context of a general equilibrium analysis.

$\Delta p_{i,t-1}$ = change in house prices in country i (year on year)

m = single monetary policy rate set by the ECB as an implicit reference rate for variable-rate loans [19]

$x_{i,t}$ = vector of explanatory factors of risk surcharges for mortgages in country i

$y_{i,t}$ = other interest rate mark-ups in country i (due to divergences in the refinancing of banks, varying degrees of competitive intensity in the national banking systems etc.)

$E_{i,t}$ = vector of further institutional factors for country i (selected examples: *i.* transaction costs, *ii.* characteristics regarding the prevailing debtors liability scheme, *iii.* configuration and importance of securitizations, *iv.* tax treatment of interest payments etc.)[20]

Regarding the "new credit channel" we assume the following relationships:

- $m \downarrow \rightarrow \Delta mortgage^{new}_{i,t,country\_type\_a} > \Delta mortgage^{new}_{i,t,country\_type\_b}$, i.e. the larger the share of variable-rate loans is, the more strongly a cut in the monetary policy rate will *ceteris paribus* promote credit growth. This relationship holds because, owing to maturity mark-ups, variable interest rates are usually systematically lower than fixed-rate loans. Additionally, monetary policy rate changes are typically aimed at influencing short-term interest rates, which are used as a benchmark for variable-rate contracts. Thus, short-term rates and variable-rate loans are typically very sensitive to monetary policy decisions, unlike longer-term rates (which are relevant for fixed-rate mortgages).[21] As the use of variable-rate loans and the usually corresponding interest rate discount of such mortgages makes it possible for individuals to borrow higher amounts (which we term "maximum financial scope" in the sense of a total potential purchasing power for housing), stronger financing dynamics in countries with predominantly variable rate mortgages are likely.[22] Therefore, a more significant boost to credit-based housing transactions may follow via stronger financing dynamics for country type *a* (i.e. high share of variable-rate loans) than in country group *b* (i.e. high share of fixed-rate mortgages).[23]

- $\Delta p_{i,t-1,country\_type\_a} > \Delta p_{i,t-1,country\_type\_b} > 0 \rightarrow \Delta mortgage^{new}_{i,t,country\_type\_a} > \Delta mortgage^{new}_{i,t,country\_type\_b}$, i.e. a house price increase – which is promoted via stronger financing activities in the first place – may trigger additional demand for mortgages due to an initiation of positive expectations. This holds especially at the beginning of a new cycle, which *inter alia* may encourage the expectation of further price growth in this phase of the housing cycle. Both effects are *ceteris paribus* stronger in country type *a*.

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[19] In Spain variable-rate loans are typically linked to the Euribor, for example.

[20] See EU (2011) regarding institutional differences of housing markets in the European context.

[21] See Liu, et al. (2008).

[22] See McQuinn and O'Reilly (2008) on the impact of interest rates and disposable income on house prices via influencing the demand for housing through the maximum amount which individuals can borrow from financial institutions.

[23] This assumption is supported by results from Furlong, et al. (2014).

3.2 Interest burden channel

(2.)   *Interest burden channel*: $interest\_burd_{it} = f\ (m_t + x_{i,t})(share\_var_i *$
$mortgage_{i,t}^{total}) + i_{i,t}(1 - share\_var_i) + cons\_credit_{i,t}(P_{t-1}, m + x_{i,t} + y_{i,t}),$

where
$interest\_burd_{it}$ = interest payments by households from credit debt as a percentage of GDP

$mortgage_{i,t}^{total}$ = total stock of mortgages in country *i* in year *t*

$cons\_cred_{i,t}$ = stock of consumer loans of private households in country *i* in year *t*

$i_{i,t}$ = average interest rate of loans with fixed interest rate in country *i* in year *t* .

Regarding the "interest burden channel" we assume the following relationships:

- $(m_t + x_{i,t} + y_{i,t}) \downarrow \rightarrow \Delta interest\_burd_{it,country\_type\_a} \downarrow >$
  $\Delta interest\_burd_{it,country\_type\_b} \downarrow$, i.e. a cut in the monetary policy rate implies *ceteris paribus* a bigger reduction of the interest burden for the household sector in country type *a* (predominantly variable rate loans) than in country type *b* (prevalence of fixed-rate loans).

- $(m_t + x_{i,t} + y_{i,t}) \uparrow \rightarrow \Delta interest\_burd_{it,country\_type\_a} \uparrow >$
  $\Delta interest\_burd_{it,country\_type\_b} \uparrow$, i.e. an increase in the monetary policy rate will *ceteris paribus* lead to a stronger rise in the interest burden for countries with mainly variable-rate loans (country type *a*) than in countries with a higher share of fixed rate loans (country type *b*).

While these are the two main specifications of the proposed analytical concept, we additionally suggest the following two functions for a complementary analysis:

(3.) $share\_var_i = f\ (Pref_{mortg_{i,t}}, interest_{expt_{i,t}}, interest\_spread_{i,t}, E_{i,t}),$

where
$Pref\_mortg_{i,t}$ = dominating preferences of banks and households in country *i* regarding the selection of mortgage contract characteristics

$Expt\ (m + x + y)$ = expectations regarding different components of retail interest rates

$interest\_spread_{i,t,}$ = interest rate spread of fixed-rate mortgages (5 to 10 years) compared with variable-rate loans

(4.) $interest\_expt_{i,t} = f(HICP_{t-1}, Expt\_HICP_{t+1}, Expt(m + x + y), cap\_flows_{i,t}),$

where
$HICP_{t-1}$ = harmonized inflation rate in period *t-1*; $Expt\_HICP_{t+1}$ = expected harmonized inflation rate in period *t+1*

$cap\_flows_{i,t}$ = capital inflows or outflows to / from country *i* in year *t*

The suggested function set could be extended for further aspects such as private consumption and wealth effects in order to analyse macro-financial linkages. As these questions are beyond the scope of our analysis, this article does not go into the details here.

4. Stylized Facts for the Euro Area

Building on the stylized transmission channels described above, we track the potential impact of these mechanisms based on stylized facts for the euro area.[24] The "ceteris paribus" condition used in this methodological context should be taken seriously, however. First of all, the results may depend crucially on the existence of other factors favouring asymmetric financial cycles, like the diverging prevalence of interest-only mortgages, which itself could be connected to a significant degree of tax-deductibility for mortgage interest payments in some countries.[25] Borrowers benefiting from such tax advantages may not wish to pay back their mortgage at all, as they prefer to keep the maximum tax advantage and this advantage would certainly decrease over time if they choose to amortize. In general, it is clear that the method of stylized facts – which we applied in this analysis – is subject to methodological shortcomings (as is the case for any method). Thus, we isolated a certain aspect of housing and mortgage markets – i.e. the prevalence of different interest rate fixation periods – from a much more complex macroeconomic structure. Nevertheless, we think that an analysis based on stylized facts is helpful in getting closer to an understanding of the tectonic forces operating inside a monetary union with a high degree of differing interest rate fixation periods.

4.1 New credit channel

Although the economic reasoning behind the "new credit channel" is rather strong − (i.) a more immediate impact of (traditional) monetary policy decisions on short-term interest rates in contrast to long-term rates[26] and (ii.) a tendency towards a higher "maximum financial scope" on the borrower's side due to interest rate discounts of variable rates −, it proves rather difficult to illustrate these effects by using stylized facts. This may be due to the influence of other factors (see section on formally stylized transmission channels regarding other relevant factors). Figure 3 highlights the fact that there was a much stronger mortgage growth in countries like Spain prior to the crisis than in Germany with a predominance of fixed-rate mortgages.[27] However, as formally described in our function set for the proposed transmission channels, many factors influence mortgage supply and demand. Therefore, it clearly is not possible to attribute these different credit dynamics only to diverging interest rate fixation periods. In France – to give just one example of another country with a prevalence of fixed-rate mortgages – credit dynamics were much stronger than in Germany, albeit weaker than in countries like Spain.

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[24] For a methodological assessment of the method of stylized facts, see Abad and Khalifa (2015).

[25] In Germany, tax deductibility is only granted for landlords, for example. In other countries it is also available to owner occupiers (as, for example, in the Netherlands). Van den Noord (2005) finds that house price volatility increases with higher tax subsidies for home ownership.

[26] However, it needs to be reminded here that "quantitative easing" policies applied by most central banks recently helped to additionally influence long-term interest rates in comparison to the traditional monetary policy options aiming at short-term rates.

[27] Cyprus, Greece and Ireland experienced similar credit dynamics.
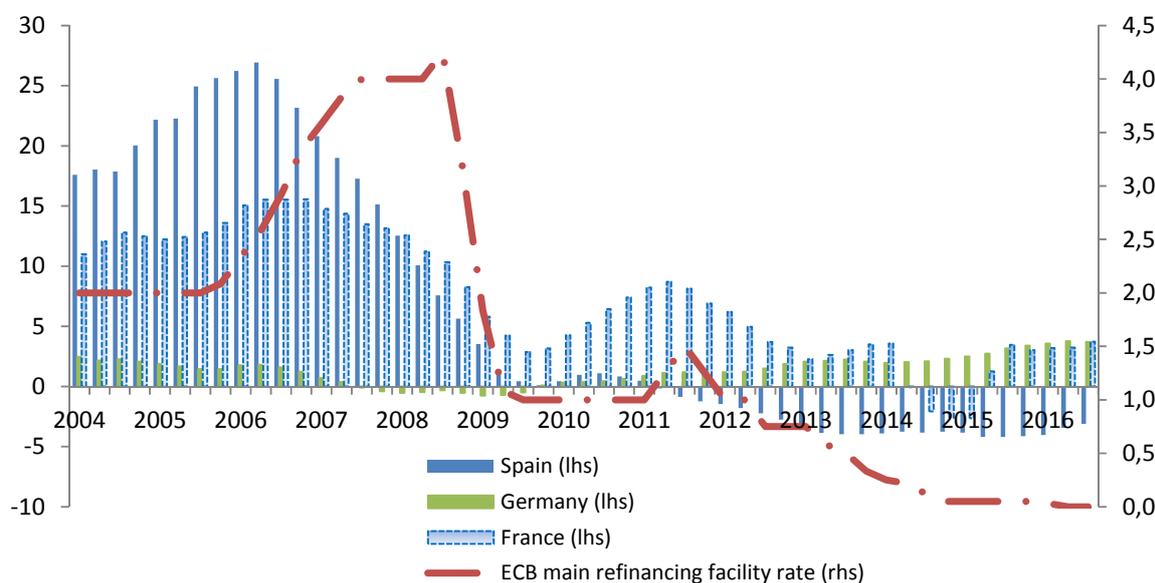
Source: ECB, own calculations.
*Calculation of mortgage growth rates based on indices of notional stocks.

Figure 3. Year-on-year mortgage growth rate vs. ECB main refinancing facility rate (in %)*

While credit dynamics itself are not unambiguously able to provide definite evidence regarding the effects via the new credit channel, it is more obvious from the average interest rates of newly originated mortgages that some influence should be undeniable. Figure 4 shows that, before the crisis, lower average interest rates of new mortgages in Ireland and Spain than in Germany owing to a prevalence of variable-rate mortgages may have contributed to the build-up of a housing bubble in these countries. Thus, advantages resulting from lower interest rate spreads for variable rate loans might have spurred higher mortgage growth in this instance.[28] On average, interest rates for new mortgages were 1.2 percentage points lower in Ireland and Spain from 2003 to 2005 than in Germany. These advantages declined gradually afterwards, until, in 2008, average rates in Germany went below those in its aforementioned EMU counterparts. While capital inflows clearly delivered the main part via a lowering and harmonization of country-specific interest rates after the EMU's inception in the first place $(x_{i,t} + y_{i,t})$[29], the prevalence of different interest rate fixation periods contributed to a significant degree to the interest rate advantages during the boom years in these countries.

As shown in Figure 4, interest rates spreads during the following bust were dominated by a return of differing risk spreads for EMU countries. Monetary policy rate cuts conducted at this time were unable to compensate for these strongly rising risk mark-ups $(\Delta(x_{i,t} + y_{i,t}) \uparrow >$

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[28] Another factor inducing higher mortgage growth might be seen in a stronger use of securitizations and equity withdrawals.

[29] In line with the consensus view on the euro crisis, see, for example, Baldwin and Giavezzi (2015).

$m\downarrow$).[30] It follows that depending on the share of variable-rate and fixed-rate mortgages, the household sector of country i is more strongly or more weakly affected by such risk mark-ups (see next section on the "interest burden channel").
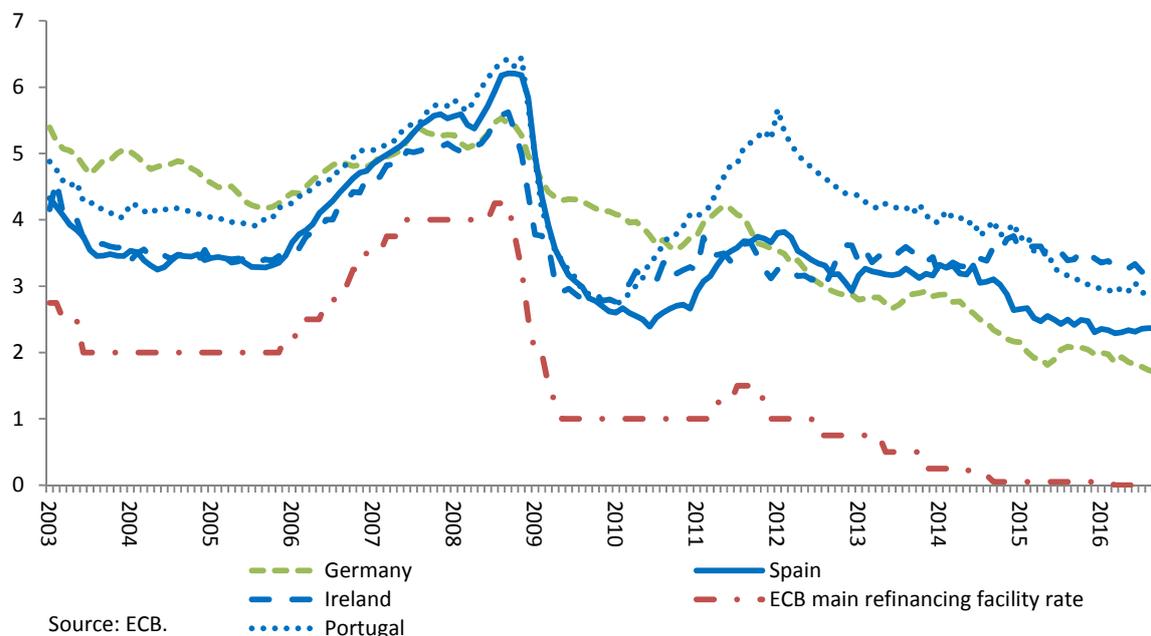

Figure 4. Average initial interest rates of newly originated mortgages in selected EMU countries and ECB main refinancing facility rate

4.2 Interest burden channel

As the interest burden looks small initially in countries with variable-rate loans, this may imply a stronger incentive for the build-up of household over-indebtedness than in countries with a prevalence of fixed-rate mortgages owing to a kind of a myopic decision bias, what we term a "debt sustainability-illusion" (i.e. households may underestimate their financing costs over the whole time period of their mortgage, especially if they started financing in a low interest rate environment). But finally, a tightening of the monetary policy stance beginning at the end of 2005 contributed to the transition of the boom into the bust (or correction) phase of the housing cycle via increasing debt costs (see Figure 5 on the average interest rate of the total (outstanding) mortgage stock for selected EMU countries).

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[30] See Goggin, et al. (2012) for the pricing of mortgage interest rates in Ireland during the financial crisis.

Germany
Ireland
Spain
Portugal
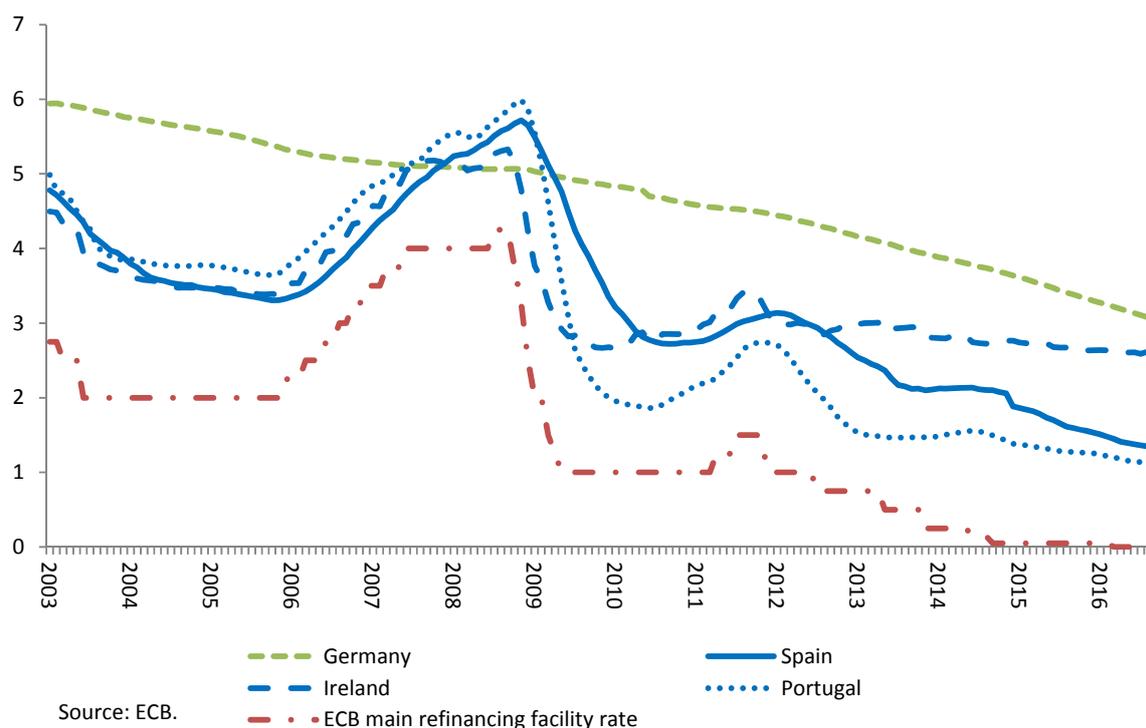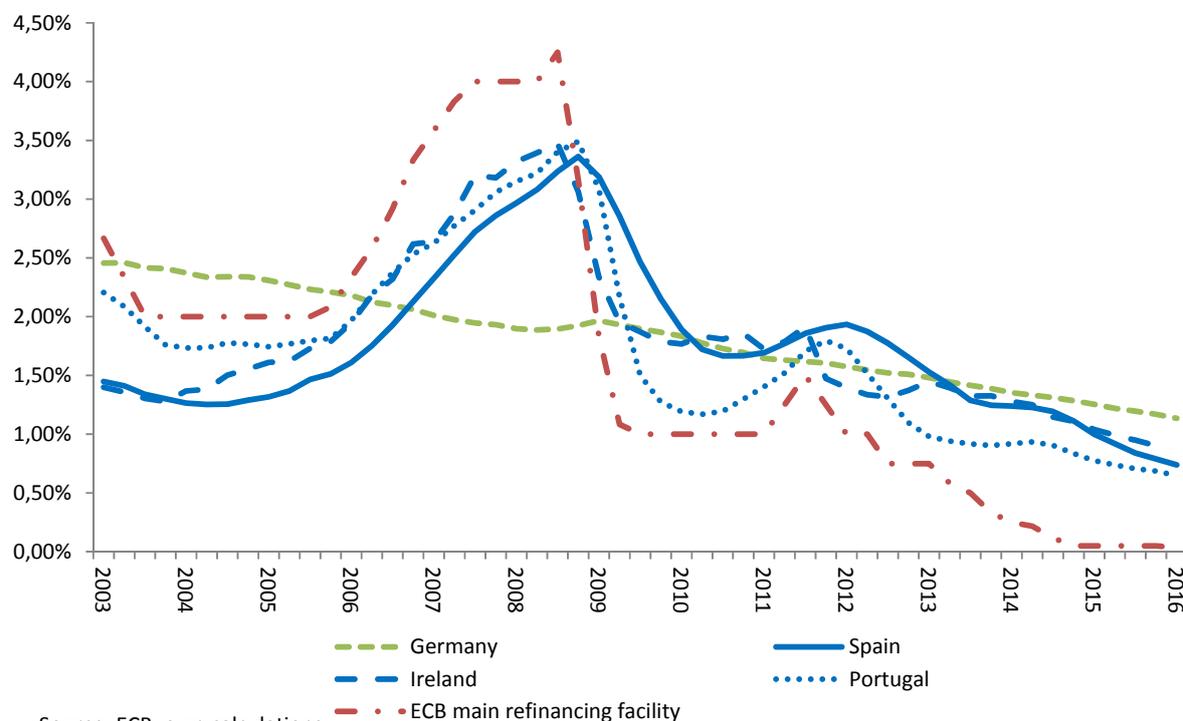ECB main refinancing facility rate

Source: ECB.

Figure 5. Average interest rate in the mortgage stock of selected countries and ECB main refinancing facility rate

According to several empirical studies, the total debt service burden provides a reliable short-term indicator of financial stress.[31] Due to the limited availability of data on principal payments for mortgages, we restrict our analysis to interest payments.[32] Interest payments typically constitute the more dynamic part of the total debt service (interest and principal) due to more pronounced fluctuations in average interest rates (see Figure 6).

During the period of a tightening monetary policy stance aggregated interest payments for outstanding mortgages from banks to private households doubled from 1.65 % of GDP at the end of 2005 to 3.35 % at the end of 2008 in Ireland and Spain on average (see Figure 6). This development was driven by a higher volume of outstanding mortgages – supported by a "debt sustainability-illusion" as described above – in combination with a tightening of the monetary policy stance which increased the interest rates of variable-rate loans almost immediately.

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[31] See Drehmann and Juselius (2012b), and Juselius and Drehmann (2015).

[32] From the perspective of bank risk management, interest payments could be more relevant as banks initially need to cover their refinancing costs. Principal payments are more often subject to renegotiations in order to structure a financing schedule which the debtor is able to meet.
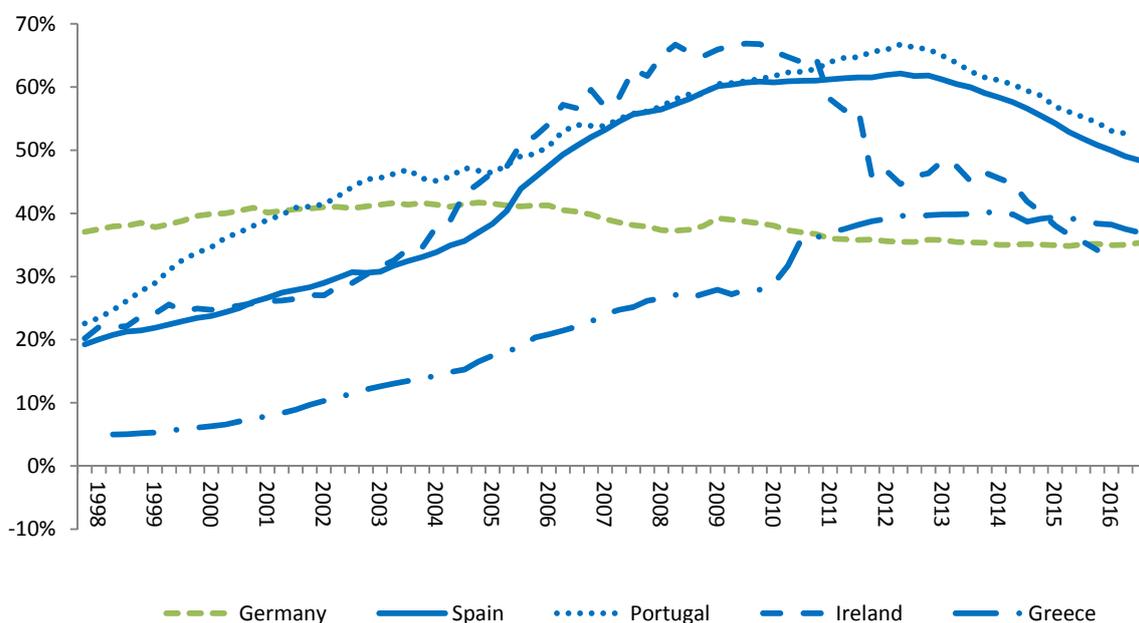
Source: ECB, own calculations.

Figure 6. Aggregated interest burden of households from MFI mortgages as a percentage of GDP and ECB main refinancing facility rate

In comparison to 20 years earlier, the importance of the interest burden channel gained importance because of a dynamic credit expansion during the last financial cycle in some EMU countries. Most often, these were the countries which were later hit hardest by the economic crisis (see Figure 7, which shows that, prior to joining EMU, mortgage financing played only a minor role in some of these countries). As stated above, an important supporting factor for this domestic loan growth was given by massive capital inflows prior to and after joining EMU. In combination with a prevalence of variable-rate loans, these capital inflows contributed to a faster and stronger credit expansion (see section on the "new credit channel").[33] The following housing boom went hand in hand with significant second-round effects, which carried the boom, via corresponding income and wealth effects, a long time into the period of a tighter monetary policy stance.[34] However, the increasing burden of interest payments – as shown above – finally contributed to a transition from the boom of the cycle to its correction phase (or bust).

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[33] In some countries this credit expansion was also supported by an increasing role of securitizations.

[34] See Calza, et al. (2013) regarding macro-financial linkages of mortgage financing and housing booms.

Source: ECB, own calculations.

Figure 7. Book value of outstanding mortgages from MFIs to households in selected EMU countries as a percentage of GDP

5. Conclusions

5.1 Analytical implications

Before as well at the time the European Monetary Union was launched, some economists were already pointing to the potential problems of an asymmetric transmission of monetary policy stemming from differing national credit market structures.[35] On the one hand, they hoped that the establishment of the single currency would initiate a process of harmonization and, on the other hand, their analyses were focused on the possible consequences for output and inflation. Some of these economists came to the conclusion that there was *inter alia* an "urgent need for action" to promote fixed-rate mortgages and for fixed-rate loans in general. Furthermore, they concluded that a regulatory fixing of maximum loan-to-value-ratios could help to limit the asymmetric implications for output and inflation.

Against this focus on output and inflation, the main hypothesis of our analysis is that consideration should also be given to the potential asymmetric effects on national financial cycles.[36] Thus, in countries with predominantly fixed-rate loans, the immediate impact of

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[35] See for example McLennan, et al. (1998), Fase and de Bondt (1999), Hughes Hallett and Piscitelli (2000) and Belke, et al. (2002). In the context of the financial crisis a renewed interest in the topic can be seen by Ehrmann and Ziegelmeyer (2014), and Burke (2015).

[36] See Merler (2015) regarding an increasing divergence of national financial cycles since EMU's inception.

monetary policy on the financial cycle is not as strong as in countries with a preference for variable-rate loans. Countries with a prevalence of variable-rate loans therefore may face *ceteris paribus* a higher risk profile. On the one hand, a propensity to exaggerations could be more likely in these countries because of mortgage lending reacting more sensitively to monetary policy rate cuts (see analysis of the "new credit channel" above). On the other hand, a tightening of the monetary policy stance could imply more serious distortions, especially as the debt service (i.e. the interest burden) is subject to a stronger reaction in such countries.

Our main findings based on stylized facts are, first of all, that average initial interest rates for newly originated mortgages were 1.2 percentage points lower from 2003 to 2005 on average for Ireland and Spain in comparison to Germany. While capital inflows to Southern European countries after the EMU's inception contributed to a convergence of interest rates in the first place, the aforementioned interest rate advantage was mainly caused by a discount on variable-rate mortgages in comparison to fixed-rate ones.[37] Lower financing costs − driven by these two main factors − contributed to a credit boom and supported a "debt sustainability-illusion" in these countries. The following tightening of the monetary policy stance may have led to a transition of the boom into the bust (or correction) phase of the housing cycle via increasing debt servicing costs. Thus, interest payments for mortgages of private households as a percentage of GDP doubled from 2005 to 2008 in Ireland and Spain. This development was caused by a higher stock of outstanding mortgages in combination with increasing interest rates.

Against this backdrop, monetary policy can also induce more immediate financial relief for households and other borrowers during a bust in countries with a preference for variable-rate loans.[38] But in the end, the possibility of monetary counter-action does not change the higher *a priori* probability of countries with a prevalence of variable rate loans experiencing a boom-bust-cycle. For EMU counterparts with predominantly fixed-rate loans, both effects (up-swing and correction) are *ceteris paribus* likely to be not as pronounced as in countries with a prevalence of variable-rate mortgages. Adjustments tend to be rather smooth and longer-term with lower amplitude. However, in a monetary union reacting inter alia to a crisis in some of its member countries, risks on the housing and mortgage markets of the other member states may build-up finally too. Thus, side effects regarding a tendency towards irrational exuberance on these markets may emerge, especially in the case that interest rates are kept on a low level for too long.

Another analytical implication is that the choice between variable-rate and fixed-rate loans also influences the allocation of interest rate risks between households and banks. As a consequence, decisions on the monetary policy rate in a monetary union have diverging consequences regarding the risk situation of the households and banking sectors depending on the country in question. On the one hand, an overly strong adoption of interest rate risks by households via variable-rate mortgages could overburden many households in the event of a pronounced interest rate reversal. Therefore, banks could ultimately face strong credit risks from such overburdened households. On the other hand, banks may carry too much interest rate risks given long fixation periods, which may contribute to a possible maturity mismatch (as was

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[37] Other possible factors like a differing degree of banking competition are not explicitly considered in our analysis.

[38] See *ESRB* (2015).

the case in the US savings and loan crisis during the 1980s).[39] In view of such experiences, interest rate risks are considered in the Basel banking regulation.[40] However, this may favour a bias towards underestimating the implicit credit risks of variable rate loans discussed above. This is even more the case, as internal based risks models often are calculated with rather short time series covering only a part of the financial cycle. Subsequently, they may contain an overoptimistic bias if they exclusively cover boom years of the housing cycle, for example.[41]

5.2 Policy implications

As a policy implication of our analytical results presented above, countries with predominantly variable-rate loans may need a higher degree of macroprudential activity with a more frequent intervention interval in order to smooth the credit cycle and the real estate cycle (i.e. the financial cycle).[42] From a point of view of macroprudential policy, it should also be noted that a significant transition in the average mortgage stock characteristics could take several years. This is well illustrated by the case of the recent change among UK mortgage borrowers from predominantly variable-rate loan contracts to fixed-rate ones (see Figure 8). Due to a highly uneven relationship between the volume of new mortgages and the volume of total outstanding mortgages (i.e. flows compared with stock) the process needs several years in order to have a significant impact on the average stock characteristics. Therefore, this would require an early start for macroprudential policy if a change in the mortgage stock characteristics has been identified as a policy goal.

A potential policy option for the encouragement of a switch from variable-rate loans to fixed-rate contracts could be the macroprudential instrument of an interest rate stress test, which has been introduced in some European countries recently.[43] In these tests, households have to prove that they could also bear the debt service in the event of an interest rate level which is assumed to be x% higher. Depending on the calibration of this test, it could implicitly promote amortizations in contrast to interest-only loans. This is especially the case, as it should be easier to pass the interest rate stress test if a part of the total mortgage has been amortized by the end of the fixation period. Additionally, explicit amortization requirements could provide a more direct policy option to increase principal payments in mortgage contracts. By repaying their mortgages, the roll-over risk of private household debt will be lowered.

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[39] Regarding a potential contribution of securitizations towards a maturity congruent transformation, see for the US: Fuster and Vickery (2015); a special case is given by the Danish covered bond system (see IMF, 2014).

[40] See BIS (2015a).

[41] This may serve as a rationale for the increasing use of risk-weight add-ons (as, for example, in Belgium) and risk-weight floors (for example in Finland) as a macroprudential policy tool.

[42] Rubio (2015) finds that macroprudential measures are also more effective in countries with a prevalence of variable interest rates.

[43] The following countries activated an interest rate stress test (examples): Estonia (+2 percentage points or 6%), Finland (6%), Slovakia (+2 percentage points) and the UK (+3 percentage points).
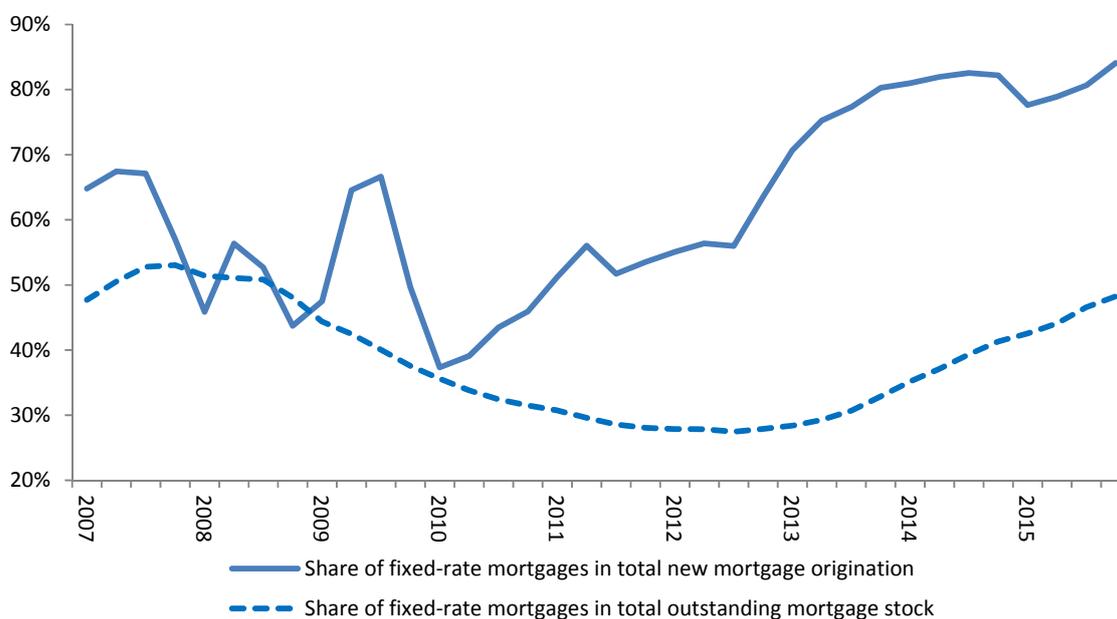
Source: Haver Analytics, own calculations.

Figure 8. Percentage of fixed-rate mortgages in the UK

Finally, the diverging prevalence of interest rate fixation periods within the EMU needs to be considered on account of its relevance to monetary policy by itself.[44] An asymmetric transmission of monetary policy decisions to national financial cycles within a monetary union like EMU supports the hypothesis that monetary policy decisions orientated at average statistical values for the euro area as a whole may deviate significantly from policy decisions based on the best outcome in each individual country. This holds especially insofar as the discussed credit market varieties may persist in the future. A complementary role played by national macroprudential policy is therefore undoubtedly an important supplement to the structure of a monetary union facing such structural differences in its national housing and mortgage markets.

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[44] See also the chapter "Integrating financial stability concerns into monetary policy frameworks", 85th BIS Yearly Report, pp. 74-82.

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