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In 2007 all ECB publications feature a motif taken from the €20 banknote.

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ABSTRACT

Despite the remarkable economic and financial convergence over the last ten years in the euro area, mortgage interest rates still differ across countries. This note presents some stylised facts on the heterogeneity of mortgage interest rates across euro area countries on the basis of the Eurosystem's harmonised MFI interest rate statistics. We also attempt to provide some insights into the reasons behind these cross-country differences using the methodology recently proposed by Affinito and Farabullini (2006). We differ from Affinito and Farabullini (2006) in that we focus on one particular banking market: the market for mortgage loans. This allows us to identify more clearly the role of specific structural features characterising that market in explaining mortgage rate dispersion. More specifically, we investigate the extent to which various mortgage loan demand and supply determinants help explaining the observed dispersion. It turns out that some of the heterogeneity can be explained by these factors, in particular those that relate to the supply side. However, a substantial part of the dispersion remains unexplained suggesting that much of the heterogeneity also reflects country-specific institutional differences that are likely to be caused by differences in the regulatory and fiscal framework of the mortgage markets. In order to test this, we extend our analysis to also include institutional factors and indeed find that cross-country differences in enforcement procedures, tax subsidies and loan-to-value ratios influence the level of mortgage rates.

JEL classification: C23, E4, F36, G21, N24
Keywords: Mortgage markets; bank interest rates; euro area countries; financial integration; panel econometrics

NON-TECHNICAL SUMMARY

Despite the remarkable economic and financial convergence over the last ten years in the euro area, mortgage interest rates still differ across countries. This paper illustrates some of these differences and provides a few insights into why they arise. The analysis is useful not only to better understand the developments for the euro area as a whole, but also to assess financial market integration in general and the convergence in retail banking markets in particular. The mortgage market is of particular importance from the perspective of monetary policy as it plays an important role in the mechanism that transmits changes in the ECB's key policy rates to housing investment and consumption by households, and ultimately to output and prices.

As an analytical starting point, we review some recent studies that have examined the characteristics and integration of the European mortgage markets and related studies. Insights into the institutional differences across the European Union or across the euro area are provided by various reports of the European Commission and of the European Central Bank. At the national level, price dispersion has also been analysed using bank-level data in several euro area countries. A related strand of the literature focuses on the degree to which changes in market interest rates induce changes in the interest rates set by banks – the so-called interest-rate pass-through process – and the many factors that influence this process.

Building on this latter strand of the literature, we apply the methodology recently proposed by Affinito and Farabullini (2006) to the mortgage market. This approach basically consists of computing tests of coefficient equality for pairs of estimated country dummies obtained from a regression first without and then with a set of control variables. These control variables comprise the factors that the economic literature typically identifies to determine bank interest rates in general and mortgage interest rates in particular. These include borrower-specific demand-side determinants (such as GDP growth, residential property prices and credit risk), lender-specific supply-side determinants (such as bank balance sheet characteristics, funding methods and competition) as well as other structural factors (such as country-specific institutional features reflecting the regulatory and fiscal framework). In contrast to Affinito and Farabullini (2006), by focusing on one particular banking market, namely the mortgage market, we are able to make a more precise identification of the cyclical, structural and institutional factors, which are likely to influence the price setting behaviour of banks in this market segment. We furthermore differ from Affinito and Farabullini (2006) in the sense that we control for differences in the initial period of interest rate fixation, we use longer time series and we include more explanatory variables, some of which pertain particularly to the mortgage loan demand and supply.

The heterogeneity in mortgage interest rates across euro area countries is assessed on the basis of four instrument categories from the Eurosystem's MFI interest rate statistics. The main advantage of this dataset is that the statistics are collected using a common framework, hence ensuring harmonised definitions and procedures, and resulting in a high degree of cross-country comparability. Also, the data measure interest rates on new mortgages so that the interest rates are contracted in the various countries at the same time.

Our results suggest that much of the observed mortgage interest rate heterogeneity disappears once account is taken of differences in national demand and supply conditions. We find that differences in output growth, household debt and residential property prices affect mortgage interest rates, and that supply-side (lender-specific) factors appear to exert an even stronger influence. These latter factors include, in particular, bank liquidity as well as funding cost and practices. Although the evidence is relatively weak, our results also suggest that a lower concentration in the banking sector may have some tendency to exert a downward pressure on mortgage interest rates. Finally, our results indicate that part of the differences in observed mortgage interest rates may be due to measurement problems in the sense that the MFI interest

rate statistics do not include fees and other non-interest related costs that households incur when taking out a loan.

At the same time, a significant part of the differences in mortgage rates across euro area countries cannot be explained by either conjunctural or structural factors. This may owe to the fact that some additional factors contributing to the observed heterogeneity reflect country-specific institutional aspects - such as enforcement procedures, loan-to-value ratios and fiscal arrangements. In order to test this presumption, we extend the empirical analysis to also include such institutional factors. Our results suggest that country-specific institutional features, such as enforcement procedures, tax subsidies and loan-to-value ratios, indeed seem to influence the level of mortgage rates in addition to what can be explained by demand and supply factors. Moreover, it should be borne in mind that banking products to some extent are not easily comparable across the euro area countries, which therefore somewhat hampers a direct comparison of rates across countries. Such product heterogeneity may be caused by a lack of supply of some products in certain countries (which would not exist in an integrated banking market) and/or by a lack of demand of some products in certain countries (owing to cultural or economic preferences).

1. INTRODUCTION

This paper analyses the cross-country heterogeneity of mortgage interest rates in the euro area. This analysis is useful not only to better understand the developments for the euro area as a whole, but also to assess convergence in retail banking markets. The mortgage market is of particular importance from the perspective of monetary policy as it plays an important role in the mechanism that transmits changes in the ECB's policy rates to housing investment and consumption by households, and ultimately to output and prices.[3]

As a starting point, we present some stylised facts on the cross-country heterogeneity of mortgage interest rates in the euro area, which serve the purpose of illustrating that despite the considerable economic and financial convergence in the euro area over the last ten years, mortgage interest rates still differ across countries.

As the monetary policy implications of a heterogeneous pass-through of policy rates to bank interest rates is likely to hinge on whether the heterogeneity is mainly driven by underlying economic factors or by institutional and product-related factors, we also attempt to provide some insights into the reasons behind these cross-country differences. We use the harmonised MFI interest rate statistics (MIR) and apply the methodology recently proposed by Affinito and Farabullini (2006) to the mortgage market. This approach basically consists of computing tests of coefficient equality for pairs of estimated country dummies obtained from a regression first without and then with a set of control variables. These control variables comprise the factors that the economic literature typically identifies to determine bank interest rates in general and mortgage interest rates in particular. These include borrower-specific demand-side determinants (such as GDP growth, residential property prices and credit risk), lender-specific supply-side determinants (such as bank balance sheet characteristics, funding methods and competition) as well as other structural factors (such as country-specific institutional features reflecting the regulatory and fiscal framework). We differ from Affinito and Farabullini (2006) by focusing on one particular banking market, namely the mortgage market. This enables us to identify more precisely the role of the various cyclical, structural and institutional factors pertaining directly to this market segment on banks' pricing of mortgage loans.

We find that there are significant differences in the level of mortgage rates across the euro area countries. Our results furthermore suggest that this heterogeneity can partly be explained by conjunctural (demand-side) factors and to a larger extent by more structural (supply-side) factors. In particular, the explanatory power of structural factors may reflect a continued lack of integration of the euro area mortgage markets. That said, a significant part of the differences in mortgage rates across the euro area countries cannot be explained by either conjunctural or structural factors. This may suggest that banking products to some extent are not easily comparable across the euro area countries. Such product heterogeneity may be caused by a lack of supply of some products in certain countries (which would not exist in an integrated banking market) and/or by a lack of demand of some products in certain countries (owing to cultural or economic preferences).

The remainder of this paper is structured as follows. Section 2 provides a brief literature overview. Section 3 illustrates some of the country differences in mortgage interest rates. Section 4 briefly describes the methodological approach to assess interest rate dispersion proposed by Affinito and Farabullini (2006), which we apply to the mortgage market. The results are presented in Section 5. Additional country-specific factors that are difficult to measure over time -

[3] See also Issing (2005).

such as institutional arrangements or differences in fiscal and regulatory framework - are examined in Section 6. Finally, Section 7 concludes.

2. LITERATURE REVIEW

In recent years, a considerable number of studies have examined the characteristics and integration of the European mortgage markets. For example, Low et al. (2003) point to a number of shortcomings in terms of market completeness and efficiency, including price differentials, when comparing across European mortgage markets. Obstacles to the integration of European mortgage markets are also evidenced by Baele et al. (2004) and ECB (2005, 2006c), as well as by the European Commission (2005) Green Paper on "Mortgage credit in the EU" and London Economics (2005). More specifically, regarding cross-country differences in mortgage interest rates a recent report of the European Central Bank (ECB (2006b)) provided descriptive evidence of the degree of heterogeneity and its potential determinants.[4] This report underlines notable differences in the period of initial rate fixation, the existence of housing market schemes, the fiscal and regulatory framework, and collateral treatment as some of the main factors driving cross-country mortgage interest rate heterogeneity in the euro area.

At the national level, Martin et al. (2005a) using a sample of Spanish banks and controlling for product differentiation point to the existence of price dispersion in retail banking markets due to information differentiation and borrower search costs. In a related study of the Dutch mortgage market, Hassink and Van Leuvensteijn (2006) provide evidence of price dispersion on mortgages even within lending banks' loan portfolio. They relate this dispersion to the lack of market transparency owing to the presence of imperfect information and heterogeneous search costs. Affinito and Farabullini (2006) analyse the dispersion across euro area countries using the harmonised MFI interest rate statistics and find that the euro area banking markets are still highly segmented (and more so than within national borders). Moreover, they find that some of this dispersion may be explained by certain bank loan demand and supply factors.

Related to studies of dispersion of mortgage interest rates and their determinants are studies examining the dynamic adjustment of mortgage interest rates (to changes in market interest rates) – i.e. the interest rate pass-through. For example, Mojon (2001) observes that the bank interest rate pass-through differs across euro area countries and relates this to differences in financial structure, including bank competition. In a somewhat related study, Kok Sørensen and Werner (2006) find a significant degree of heterogeneity in the bank interest rate pass-through across the euro area countries. Likewise, Gropp et al. (2007) find that differences in the pass-through of bank interest rates is significantly affected by the degree of competition from other banks as well as from financial markets and that this fact also result in asymmetric pricing behaviour over the interest rate cycle. In a study of the Dutch mortgage market using high-frequency bank-level data de Haan and Sterken (2005) likewise find asymmetric pricing behaviour, which to some extent seem to be due to bank market power. Moreover, Martin et al. (2005b) using a sample of Spanish bank-level data with which they are able to control for credit risk premia and product heterogeneity find in a test of the relative law of one price among similar bank products that price dispersion exists within the Spanish loan market. This dispersion seems especially to reflect bank-specific effects owing to different credit policies, including relationship lending. In addition, they find that bank market power affects the speed of adjustment of bank interest rates to changes in market rates.

[4] This report has been prepared by a group of experts at the ECB and at national central banks under the joint mandate of the Monetary Policy Committee and the Statistics Committee.

Our study basically applies the Affinito and Farabullini (2006) approach to measuring the degree of mortgage interest rate cross-country heterogeneity and its determinants for the euro area. We differ from Affinito and Farabullini (2006) in the sense that we control for differences in initial rate fixation, use longer time series and we include more explanatory variables. With respect to the choice of determinants we select a number of variables that have been pointed out in the literature on bank interest margins[5], such as bank balance sheet and income statement characteristics as well as banking market structures (concentration). In addition, we include a number of variables that pertain particularly to the mortgage loan demand and supply.

3. INTEREST RATE HETEROGENEITY - SOME STYLISED FACTS

Harmonised MFI interest rate statistics have been published by the Eurosystem starting with the reference month January 2003. This dataset includes four broad instrument categories relating to MFI loans to households for house purchase. A detailed illustration of the cross-country differences in these interest rates is provided in ECB (2006b) and this section briefly highlight some main features starting with the levels and then turning to the changes. We use the interest rates on new business (rather than on outstanding amounts) because these rates have been contracted at the same time across the different countries.[6]

The degree of cross-country heterogeneity of the level of mortgage rates in the euro area and its development over time can be illustrated by the cross-country coefficient of variation. This is shown in Chart 1. According to that measure, the cross-country heterogeneity is non-negligible and moreover its development over time does not point to any significant reduction since January 2003. Although the level dispersion for MFI interest rates on loans to households for house purchase is lower than in many other lending categories (especially in comparison with consumer credit), there are still some observable differences across the euro area. Based on US data from Freddie Mac's Primary Mortgage Market Survey, the dispersion of mortgage rates between US regions could be even lower than between euro area countries (ECB (2006a)).[7]

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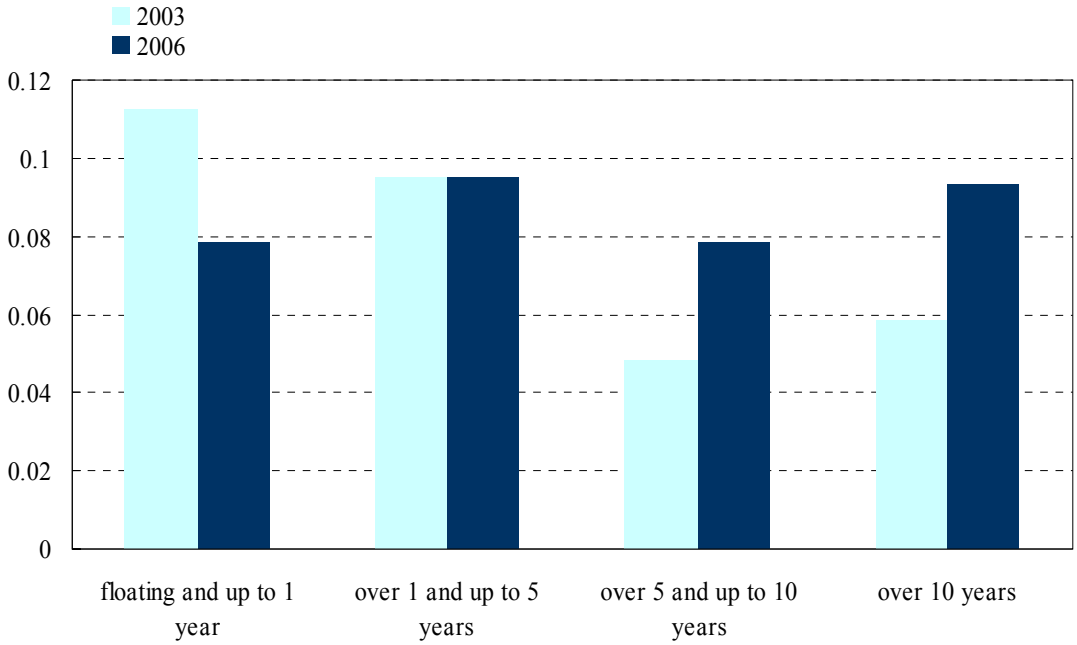
5 See for example Saunders and Schumacher (2000), Corvoisier and Gropp (2002), and Maudos and Fernàndez de Guevara (2004).

6 For ease of exposition, this paper uses the terms "loans to households for house purchase" and "mortgage loans" interchangeably, although from a methodological point of view there are a few differences.

7 However, the US and euro area data are not strictly comparable, notably because the US data consider only five large regions (Northeast, Southeast, North Central, Southwest and West); some of the dispersion within those regions (i.e. across the US States) may thus not be captured.

Chart 1: Cross-country variation coefficients of the level of MFI interest rates on loans to households for house purchase (by period of initial rate fixation)
(period averages)



Source: ECB.
Note: figure for 2006 is the average for the period January 2006 to June 2006.

An assessment of the degree of interest rate heterogeneity should also comprise cross-country differences in the changes of MFI interest rates over time. This is of relevance from the perspective of the analysis of the monetary policy transmission mechanism in general and the degree to which changes in market interest rates are passed on to MFI interest rates in particular. Most factors that exert an influence on the levels are also likely to affect changes, although the latter may be expected to be somewhat less sensitive to country-specific factors.[8]

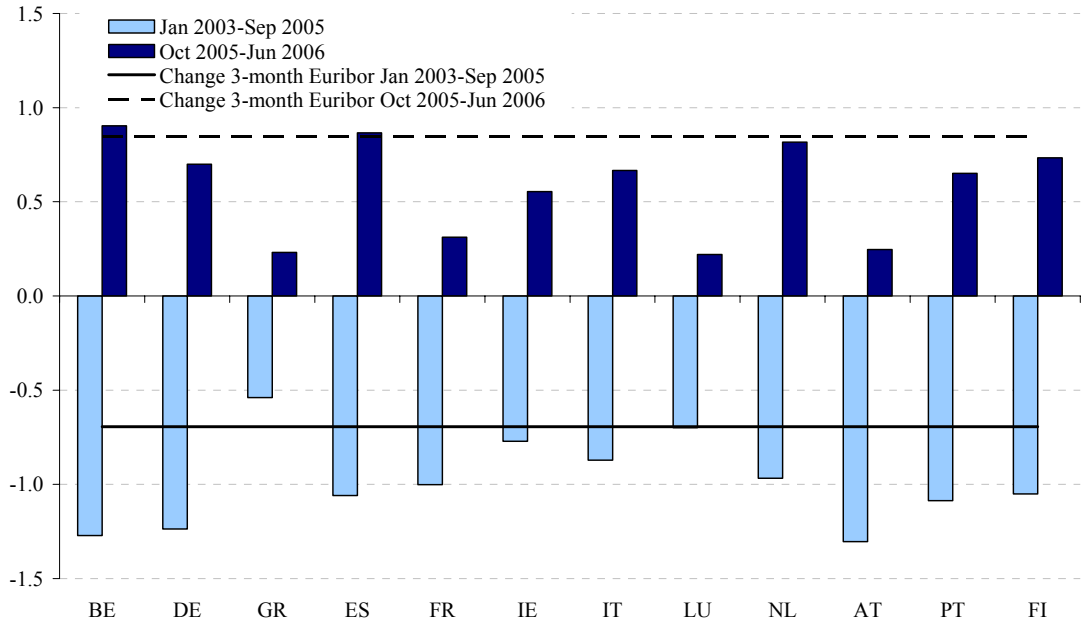
While this paper will not consider changes in more detail (due to the limited time period available in the MFI interest rate dataset), recent empirical evidence of cross-country heterogeneity in the bank interest rate pass-through has recently been reported by Kok Sørensen and Werner (2006).[9] Chart 2 illustrates the changes in MFI interest rates on mortgages, for example, in the segment "floating rate and up to 1 year initial rate fixation period" in comparison with the changes in market interest rates of a comparable maturity. The changes cover the period January 2003-September 2005 of declining interest rates and the period of increasing interest

[8] Differences in the initial period of rate fixation, for example, lead to differences in the average level of the lending rate (through the yield curve) and to differences in the changes when the market interest rates of a duration comparable to the period of initial rate fixation follow different developments. In contrast, factors like a cap on the variability of interest rates may exert a stronger and more direct influence on changes than on the average level of the interest rate.

[9] The authors chain link the MFI interest rate dataset with its predecessor – the retail interest rate dataset – in order to obtain a longer historical time series.

rates between October 2005 and June 2006. While changes in mortgage interest rates in all countries appear to broadly follow the direction of changes in corresponding market rates, in both periods there are marked differences regarding the size of the changes across countries as well as across instrument categories. These latest developments tend to suggest that there is considerable heterogeneity in the pass-through of changes in market rates to mortgage interest rates across the euro area countries.

Chart 2: Change in MFI interest rates on loans to households for house purchase at floating rate and up to 1 year initial rate fixation period
(in percentage points)



Source: ECB.

4. EMPIRICAL METHODOLOGY

This section briefly describes the methodological approach to assess dispersion in MFI interest rates proposed by Affinito and Farabullini (2006), which we apply to the mortgage market in the euro area. This approach – summarised in section 4.1 - basically consists of computing pairwise tests of equality of coefficients obtained from a regression first only on country dummies and then in a separate step from a regression that also includes control variables that are usually taken to affect bank interest rates. These control variables (or determinants) are described in section 4.2.

4.1. The empirical specification

Recent empirical studies have examined the determinants underlying the heterogeneity in bank interest rates across euro area countries. For example, focusing on the level differences, Affinito and Farabullini (2006) provide a first empirical analysis of cross-country differences using only the harmonised MFI interest rate dataset. They carry out tests of equality of

coefficients for binary country dummies estimated from first a regression without controlling for any explanatory factors, and in a second step add to that regression determinants that control for various demand and supply-side characteristics. The comparison of the coefficient equality tests resulting from the regression without control variables and from the regression with control variables provides some indication of whether the observed heterogeneity in MFI interest rates disappears once differences in national demand and supply conditions are taken into account.

Thus, in the first step we estimate the following equation for the four instrument categories in as many regressions:

$$r_{it} = \alpha_t^{'} T_{it} + \beta_i^{'} C_{it} + \varepsilon_{it} \qquad [1]$$

where r_{it} is the interest rate for a given instrument category for country i in month t. The number of countries is i=1, 2, …, N with N=12. The number of monthly observations for each country is t=1, 2, …, M with M=40 (corresponding to January 2003 to April 2006). The total number of observations therefore amounts to 480 (N*M). T_{it} is an (NM*M) matrix of monthly time dummies and C_{it} is an (NM*N) matrix of binary country dummies. The error term is denoted ε_{it}.

The estimated coefficients on the country dummies, β_i, are used for the statistical Wald tests of the significance of bilateral differences for each pair of countries (i, j):

$$H_0: \beta_i = \beta_j \qquad i \neq j \qquad [1a]$$

on the basis of the F[$1,NM$-k] statistic, where k is the number of regressors, which in this first step regression is equal to (k=N+M-1). When the null hypothesis of coefficient equality can not be rejected (at the 5% significance level), the bilateral difference between two national interest rates is considered to be insignificant, suggesting that the interest rates for that particular pair of countries are broadly at the same level.

In the second step, equation [1] is progressively augmented by including first demand-side regressors (X_{it}) and subsequently supply-side regressors (Z_{it}):

$$r_{it} = \alpha_t^{'} T_{it} + \beta_i^{'} C_{it} + \gamma_g^{'} X_{it} + \delta_h^{'} Z_{it} + \varepsilon_{it} \qquad [2]$$

The Wald tests of the significance of bilateral differences for each pair of countries are then computed as in the case of the first step regression.

Finally, to test for the possible impact of country-specific institutional features that are less likely to change frequently over time (and typically are only available at low data frequencies), we extend the empirical method in the following way.[10] First, we assume that the institutional features should be expected to influence all four types of mortgage rates in more or less the same way. Hence, we carry out a pooled regression including all four types of mortgage rates. Second,

[10] In conceptual terms, this extension is similar to the approach used by Gropp et al (2007) to estimate the impact of structural factors that are difficult to measure over time. An alternative would have been to specify a cross-sectional regression using averages over the entire sample period and pooling the rates for different interest fixation periods, but due to the still limited number of observations available, this alternative approach would not have enabled us to control for the demand and supply variables at the same time.

as we do not have a time series of the institutional factors but typically only one single observation per country, we split the country dummies in equation [2] into two groups with "high" respectively "low" indicator values. Third, we conduct Wald tests of the significance of differences in "high" country dummies and the "low" country dummies.

Thus, in the "institutional" version of the model we estimate the following equation:

$$r_{it} = \alpha_t^{"} T_{it} + \beta_{hi}^{"} C_{hit} + \beta_{lo}^{"} C_{lot} + \gamma_g^{"} X_{it} + \delta_h^{"} Z_{it} + \varepsilon_{it} \qquad [3]$$

where r_{it} is the pooled interest rate for country i in month t. C_{hit} and C_{lot} refer to the "high" country dummies and the "low" country dummies, respectively. Equation [3] is estimated with respect to each of the specific institutional factors.

4.2. Determinants of mortgage interest rates

This section summarises the most important determinants of bank interest rates that have been suggested in the literature.[11] We use these determinants as factors that are likely to explain cross-country differences, and classify them into two groups: (i) demand-side determinants comprise factors that are largely related to the characteristics of the borrower (such as the demand for credit, the evolution of housing markets and the creditworthiness of the borrower); and (ii) supply-side determinants comprise factors that are largely related to the characteristics of the banking system (such as bank balance sheets, funding methods and competition). While not always unambiguous, we nevertheless seek to make a distinction between demand-side and supply-side determinants in an attempt to provide some indication of whether the reasons underlying mortgage interest rate heterogeneity are of a cyclical nature (reflecting differences in national demand conditions), or of a structural nature, reflecting differences in national supply conditions.

In addition to demand-side and supply-side determinants, we also include one factor that controls for measurement issues in the MFI interest rates.

Table 1 and Chart 3 provide an overview of the determinants of mortgage interest rates that will be described in what follows, together with the expected impact on the interest rates and summary statistics. In selecting these determinants, we have focused on those where cross-country differences are relatively pronounced thereby having the largest potential in explaining interest rate heterogeneity. For example, we do not consider the effect of interest rate risk in the loan premium given that money market volatility is uniform across euro area countries during the period considered.

[11] For recent reviews, see for example, Maudos and Fernández de Guevara (2004) or Gropp et al. (2007) and references therein.

Demand-side (borrower-related) variables

A typical indicator for demand in the housing market is real growth in the disposable income of the household sector. A higher demand for housing may in turn lead to a higher **demand for mortgage credit**, given that most households require external financing to purchase a dwelling. Data on households' disposable income for individual euro area countries are, however, only available at annual frequency, so that we take gross domestic product as a proxy for household income.[12] A positive relation between GDP and mortgage rates may also be expected a priori because market interest rates tend to be pro-cyclical in the sense that money market rates rise when the economy is growing rapidly.[13] Moreover, we use GDP growth in nominal terms in order to disentangle the effects of house price dynamics, which we measure by the annual growth rate in nominal **residential property prices**. Developments in house prices are particularly important for mortgage loans given that they are usually secured by the dwelling that the borrower is acquiring. Changes in house prices affect the value of the collateral. The quality of collateral, together with the economic prospects of the borrower, determines the credit risk premium in the loan spread. We expect that higher growth in residential property prices leads to a higher value of the collateral thereby to lower credit risk for the bank and lower interest rates.[14] At the same time, by increasing demand for mortgage loans higher property prices may also exert a positive impact on mortgage rates. Hence, a priori the overall effect of residential property prices on mortgage rates is ambiguous. With regard to the overall creditworthiness of the borrower we include the **ratio of household debt per capita** (due to the lack of a more direct measure) and generally expect a positive relationship with the level of mortgage rates.[15]

Supply-side (bank-related) variables

Liquidity risk is the risk of not having sufficient cash or borrowing capacity to meet deposit withdrawals or new loan demand, thereby forcing banks to borrow emergency funds at potentially higher cost (Angbazo (1997)). As the proportion of funds invested in cash or cash equivalents increases, the liquidity risk of the bank declines, which may reduce the liquidity premium in bank spreads. Similarly, by introducing liquidity risk into the Monti-Klein model of the banking firm (Klein (1971), Monti (1972)) in the form of some randomness in the volume of loans or deposits, Prisman et al. (1986) show that the cost of the bank's resources should increase, as it includes a premium to compensate for the expected cost of a liquidity shortage (see also Freixas and Rochet (1997)). We measure liquidity risk by the ratio of cash and debt securities held divided by short-term deposits and expect a negative relation with the interest rate level.

The level of **bank capital** may also affect the price-setting behaviour of banks in several ways. First, banks hold capital to insulate themselves against both expected and unexpected credit risk (Saunders and Schumacher (2000)). While capital requirements constitute the minimum level, banks often endogenously choose to hold more capital against unexpected credit losses or market discipline may induce them to hold more capital (Flannery and Rangan (2004)). However, holding equity capital is a more expensive funding source than debt (because of tax and dilution

[12] We do not use the nominal growth rate of MFI loans to households for house purchase as a measure for demand to avoid endogeneity.

[13] The period considered covers the single monetary policy so that the market interest rates in the euro area countries are the same.

[14] House price growth affects the value of collateral for existing mortgages, but not necessarily for new mortgages. Hence, there is not necessarily a negative relation between house prices and mortgage rates.

[15] In periods of credit rationing this relationship may, however, turn negative to the extent that banks regulate supply through volumes rather than through prices.

of control reasons). Thus, banks that have a relatively high capital ratio for regulatory or credit policy reasons can be expected to seek to cover some of the increase in the average cost of capital by operating with higher interest rate spreads. Second, since capital is considered to be the most expensive form of liabilities, holding capital above the regulatory minimum is a credible signal of creditworthiness on the part of the bank (Claeys and Vander Vennet (2003)).[16] We measure bank capital by the ratio of capital and reserves divided by total liabilities. The relationship with the interest rate level is expected to be ambiguous.

A market-based measure of the banks' soundness is the so-called **expected default frequency** (EDF) of banks, which is derived on a monthly basis by Moody's KMV's Credit Monitor model. It expresses the bank's probability of default over the next twelve months and is mainly related to the banks' balance sheet situation. The EDF rests upon the assumption that a bank goes bankrupt and defaults when its liabilities exceed its value (as calculated by the market value of its outstanding shares).[17] Thus, a higher EDF would indicate deteriorating bank soundness and hence should be positively related with the bank lending rate as banks may try to compensate for this weakness by widening their margins.

Stronger **competition** among banks should lead to a more efficient pricing and thereby lead to a lower mortgage rate. However, competition is typically difficult to measure. Two measures are available as a time series at quarterly frequency: the concentration ratio and the Herfindahl index.[18] We choose the latter because, unlike the market share of the five or ten largest banks, the Herfindahl index will reflect changes in the market structure also among smaller banks. We expect a positive relationship between this measure and the level of mortgage interest rates.

We include the **interest rate on deposits** from households as a measure of the banks' funding costs with regard to core deposits. We expect a positive relationship with mortgage interest rates, as higher funding costs should translate into higher loan rates. The extent to which banks take recourse to **market-based funding** may, on the one hand, exert a negative pressure on bank loan rates as banks that are less able to rely on a stable pool of traditional deposits have correspondingly lower market power when pricing their loans. This effect may be particularly strong for mortgage loans with floating rate and short-term rate fixation due to the relatively larger interest risk (compared to long-term fixed-rate loans). On the other hand, since market-based funding is more expensive and risky (in terms of refinancing) than traditional deposit funding banks may compensate by engaging in more expensive loan pricing. Moreover, **loan securitisation** enables mortgage lenders to remove risk from their balance sheet so that the extent of securitisation may affect loan supply and lending rates. We expect a negative relationship between the degree of securitisation and mortgage interest rates, as the securitised assets should augment loan supply and hence lower loan rates.

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[16] Alternatively, holding excess capital may signal a stronger incentive for banks to efficiently monitor their borrowers (in a situation of scarce supply of high quality borrowers), e.g. Allen, Carletti and Marquez (2005).

[17] The derivation of the EDFs thereby assumes that it is the same factors which affect the share price and the probability of default. This is a rather strong assumption since it may be expected that a large number of factors (besides the probability of default) influence share prices.

[18] These two traditional measures of competition are not uncontested in the literature and alternatives such as the Lerner index, the H-statistic or the Boone indicator may provide additional or more valuable information on the degree of competition in the market. For most of the euro area countries these measures are, however, not available as time series. Hence, it would require a different modelling set-up to take into account the effect of competition on mortgage rates according to these more direct measures of bank competition.

Measurement issues

MFI interest rates only measure the interest rate component of the cost to mortgage borrowers. Banks may charge lower interest rates but at the same time demand higher **non-interest rate charges** (fees and commissions) so that we could expect a negative relation between mortgage rates and non-interest income. We measure the latter by the difference in basis points between the annual percentage rate of charge (APRC) and the MFI interest rate on new business (for all periods of initial rate fixation combined).[19] Furthermore, in some cases banks may (for example due to competitive pressures) choose to keep mortgage interest rates constant even if market rates change and instead alter the **maturity structure** of the loans offered. We would generally expect a negative relationship, as for example in a situation of increasing market rates banks may keep mortgage interest rates unchanged while lowering the maturity on new mortgage loans.[20]

Table 1: Determinants of mortgage rates and descriptive statistics

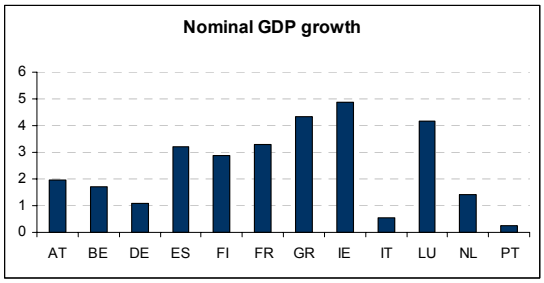
Variable (expected sign in brackets)	**Description**	**mean**	**s.d.**	**min**	**max**	**n**
Nominal gross domestic product (+)	Annual percentage changes; source: Eurostat.	2.44	1.83	-2.19	7.99	480
Residential property prices (-)	Annual percentage changes; source: national sources.	7.86	5.98	-7.74	18.75	480
Household debt per capita (+)	Total outstanding MFI loans divided by total population; source: ECB and Eurostat.	10.72	3.98	4.86	28.41	480
Bank capital (+/-)	Capital and reserves as a ratio of total liabilities; source: ECB.	0.06	0.02	0.03	0.10	480
Bank liquidity (-)	Cash and debt securities held by MFIs as a ratio of short-term deposits; source: ECB.	0.89	0.55	0.17	2.17	480
Bank's expected default frequency (+)	Expected probability of default one year ahead; source: Moody's KMV.	0.24	0.35	0.00	3.44	480
Market-based funding (+/-)	Debt securities with an original maturity over 1 year issued by MFIs as a ratio of non-MFI deposits; source: ECB.	0.30	0.20	0.00	0.70	480
Competition (+)	Herfindahl index; source: ECB.	0.10	0.08	0.02	0.27	480
Non-interest charges (-)	Difference in basis points between the annual percentage rate of change and the MFI interest rate (all periods of initial rate fixation combined); source: ECB.	0.27	0.26	-0.02	1.01	480
Deposit funding (+)	Bank interest rate on deposits from households (excluding overdrafts; new business weights); source: ECB.	1.84	0.57	0.45	3.04	480
Maturity structure (-)	The share of mortgage loans with original maturity over 5 years to total mortgage loans (outstanding amounts); source: ECB.	0.96	0.04	0.84	0.99	480
Securitisation (-)	Securitised issues placed in Europe as fraction of GDP (by country of collateral; excluding Pfandbriefe); source: European Securitisation Forum.	1.84	2.11	0.00	8.04	480

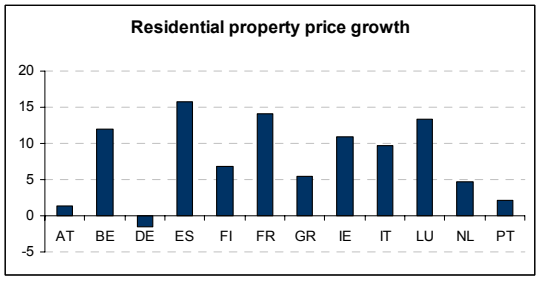
[19] This calculation implicitly assumes identical non-interest charges across the different fixation bands.

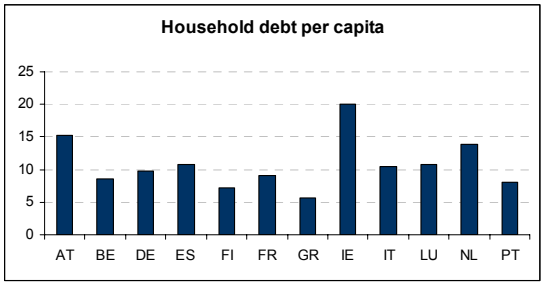
[20] For example, in Belgium, the so-called "accordion option" on floating-rate mortgages gives the borrower the opportunity on the interest rate reset date to choose between adjusting the amortization or adjusting the duration of the loan while keeping the present amortization, without exceeding a total duration of 30 years (see also Banque Nationale de Belgique (2006)).

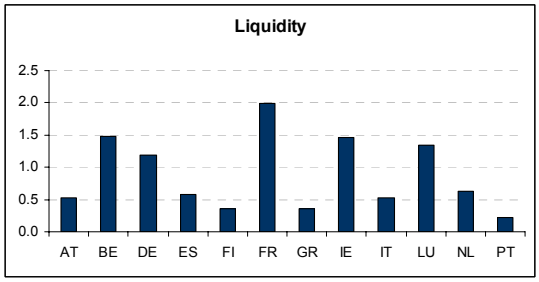
Chart 3: Explanatory variables

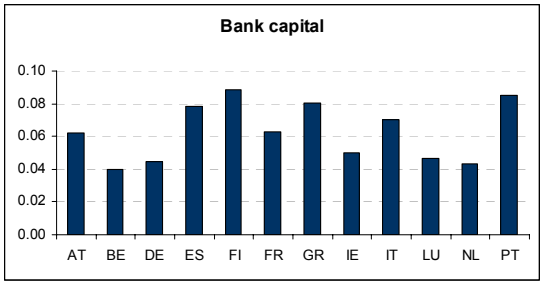
(average January 2003 to April 2006)

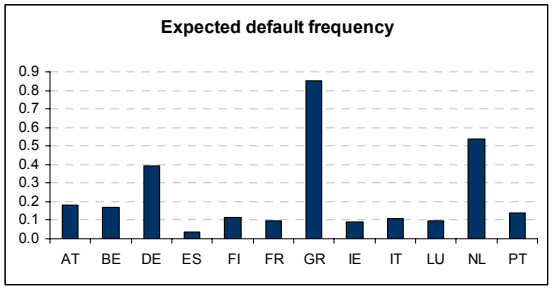


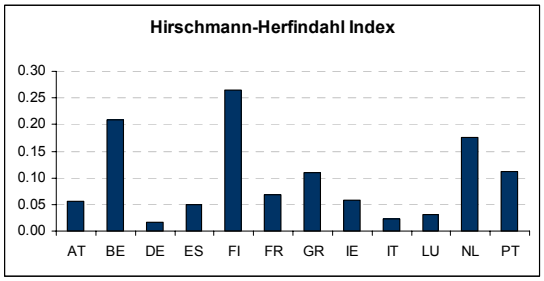


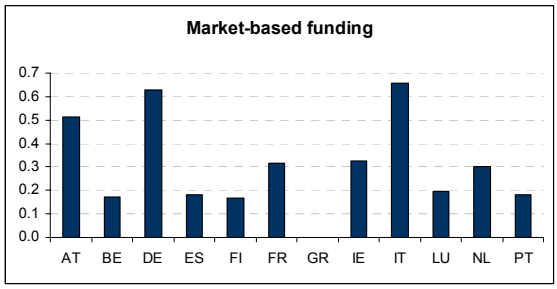


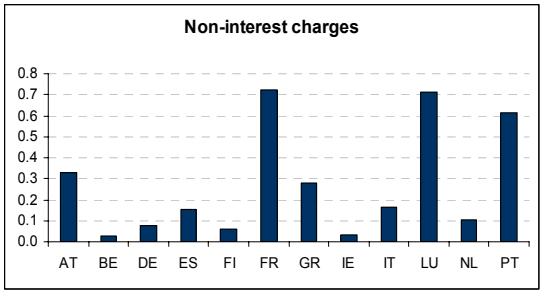


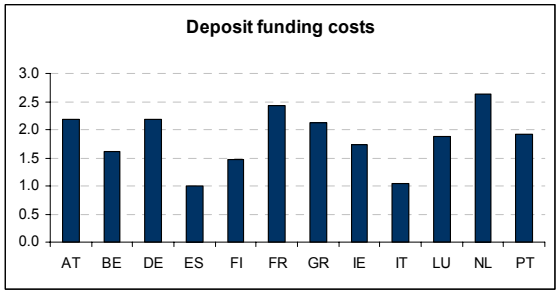


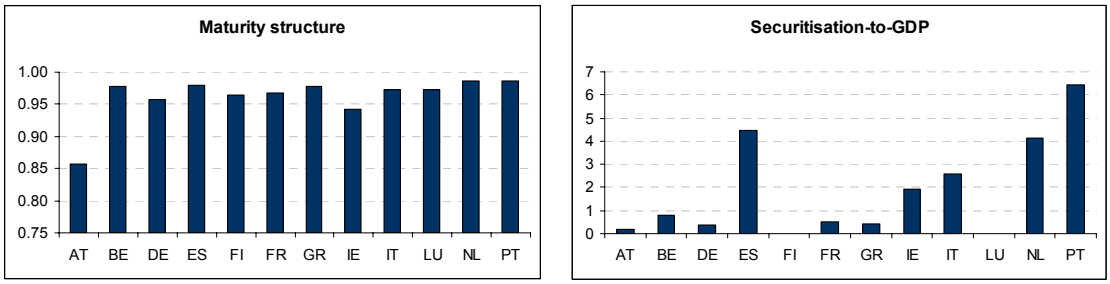










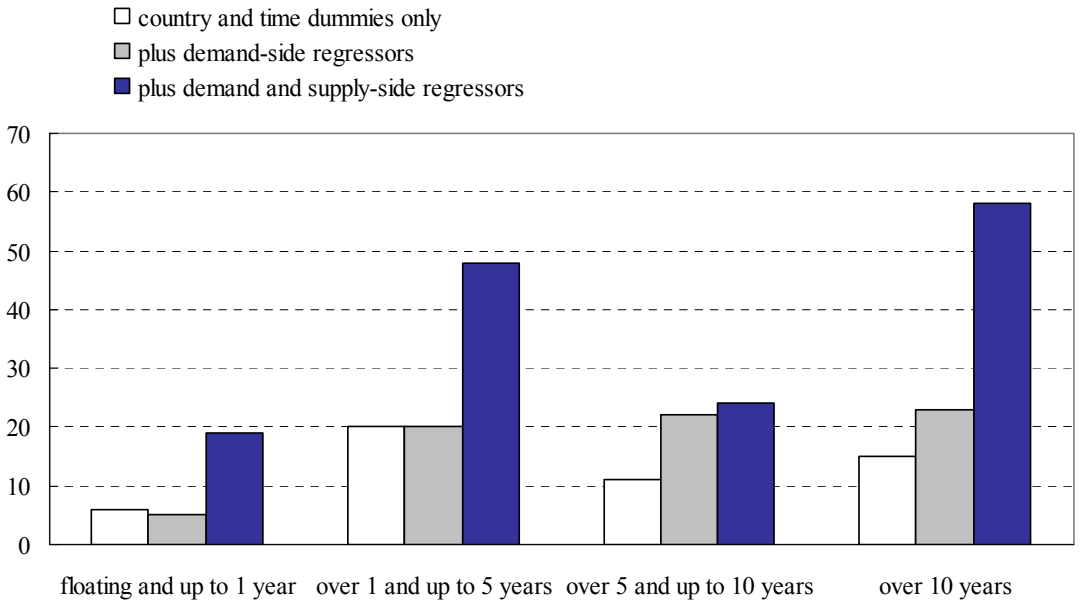


Sources: ECB, Eurostat, European Securitisation Forum, Moody's KMV and national sources.

5. RESULTS

Equations [1] and [2] have been estimated by ordinary least squares. The main results of the subsequent Wald tests of coefficient equality are summarised in Chart 4 for each of the four instrument categories.[21] As can be seen, the percentage of statistically similar bilateral differences tends to increase as demand-side and supply-side determinants are added to the regression. This suggests that the observed interest rate dispersion is considerably reduced once account is taken of the different demand and supply conditions in the mortgage markets across euro area countries.

Chart 4: Percentage of statistically-similar bilateral interest rate differences



A closer look at the estimation results concerning the control variables, reported in Table 2, provide some further indication about the forces at work and the reasons for the cross-country differences in the mortgage rates. Starting with the demand-side determinants, we find that

[21] The full results are reported in the Table of the annex.

nominal GDP growth (as a proxy of household disposable income) exhibits the expected positive sign and significantly so in the case of "floating and up to 1 year" – and also in the case of "over 10 years" when supply-side variables are added. Residential property price growth is found to exert a negative influence on mortgage rates but is only significant in the category "floating and up to 1 year". This may partly reflect that the countries with strong house price dynamics are also those where mortgages are granted at a variable rate. When supply-side variables are added differences in house price developments also affect longer term rates ("over 5 and up to 10 years") – though in a positive way. Household debt per capita, as expected, is significantly and positively related to mortgage rates at "floating and up to 1 year" and "over 1 and up to 5 years". This may reflect that credit risk considerations are more of an issue with respect to loans as short-term fixation where interest rate risk, and hence repayment risk, is more pronounced. This may suggest that over the period considered banks have tended to charge a credit risk premium by raising interest rates when household indebtedness increased.

With respect to the supply-side determinants, bank liquidity exhibits the expected negative sign in all but one regressions and turns out strongly significant in the categories "floating and up to 1 year" and "over 5 and up to 10 years". In contrast, according to our model specification, bank capital does not seem to have a significant effect on mortgage rates. The result for the bank EDFs is somewhat mixed. While we do find the expected positive sign in the case of "over 1 and up to 5 years" and "over 5 and up to 10 years", the sign is significantly negative for "floating and up to one year".

Deposit funding costs are found to exert the expected (and significant) positive influence on mortgage interest rates – in the categories "over 1 and up to 5 years" and "over 10 years". The effect of market-based funding is negative in the cases of "floating and up to 1 year" and "over 1 and up to 5 years" and positive in the two long-term instrument categories: "over 5 and up to 10 years" and "over 10 years". These results are in line with the ambiguous theoretical predictions. At the same time, the estimated coefficient is significant for all four instrument categories, so that it does appear that cross-country differences in mortgage funding practices matter. The results regarding securitisation are less convincing, although we do find a weakly significant (expected) negative effect in the case of "over 5 and up to 10 years".

The Herfindahl index exerts a positive effect on interest rates in all four regressions. Although the coefficient is not significant at conventional levels, this result may nevertheless suggest that a lower concentration in the banking sector may have a tendency to exert a downward pressure on mortgage rates.[22]

[22] As a cross-check, we also investigated the effect of competition using the results of the Eurosystem's bank lending survey in which banks report the extent to which competition from "other banks" or "non-banks" affect bank credit standards on mortgage loans. The results were similar to those found applying the more traditional concentration index. Also competition from non-banks seems to exert an influence. Although useful as a cross-check, interpretations of the competition indicator derived from the bank lending survey should be taken with a note of caution for two main reasons. First, this indicator is not a direct measure of competition but simply one of several contributing factors affecting changes in credit standards from one quarter to the next. Second, the BLS indicator is qualitative and reflects the banks (or more precisely the senior loan officers) perception of their present situation.

Table 2: Coefficient estimates

	Demand				Demand and Supply			
	floating and up to 1 year	over 1 and up to 5 years	over 5 and up to 10 years	over 10 years	floating and up to 1 year	over 1 and up to 5 years	over 5 and up to 10 years	over 10 years
Nominal GDP growth	0.02 **	0.02	0.01	0.02	0.02 ***	0.01	0.04	0.04 *
	(0.01)	(0.03)	(0.03)	(0.02)	(0.01)	(0.03)	(0.03)	(0.02)
Residential property prices growth	-0.02 ***	0.00	-0.01	-0.01	-0.02 ***	-0.01	0.03 **	0.01
	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)
Household debt per capita	0.01 *	0.05 *	0.04	-0.01	0.02 ***	0.09 **	-0.01	-0.04
	(0.01)	(0.03)	(0.03)	(0.02)	(0.01)	(0.04)	(0.04)	(0.03)
Bank capital					-1.17	7.90	0.33	7.59
					(1.90)	(9.58)	(9.48)	(6.98)
Liquidity					-0.31 ***	-0.34	-3.29 ***	0.82 *
					(0.12)	(0.62)	(0.61)	(0.45)
Expected default frequency					-0.07 ***	0.07	0.16	-0.11
					(0.03)	(0.13)	(0.13)	(0.10)
Bonds/deposits					-0.51 **	-4.27 ***	9.52 ***	2.49 **
					(0.27)	(1.40)	(1.39)	(1.03)
Herfindahl index					2.02	7.49	2.28	5.05
					(1.32)	(6.75)	(6.63)	(4.87)
Non-interest charges					-0.14 *	-0.21	-0.71 *	-0.88 ***
					(0.08)	(0.43)	(0.41)	(0.29)
Deposit funding costs					0.01	0.32 **	-0.02	0.28 ***
					(0.03)	(0.14)	(0.14)	(0.10)
Maturity structure					0.02	3.96	-11.94 ***	-4.73 **
					(0.63)	(3.17)	(3.13)	(2.30)
Securitisation					-0.01	0.16	-0.18 *	0.09
					(0.02)	(0.10)	(0.10)	(0.08)
R-squared	0.999	0.985	0.989	0.992	0.999	0.986	0.991	0.993

Note: Equations were estimated using ordinary-least squares; standard errors in parenthesis; *, **, *** indicates significance at the 10%, 5% and 1% level, respectively; country and time dummies are not reported.

Fees exhibit the expected negative sign in all four regressions and significantly so in the categories "floating and up to 1 year", "over 5 and up to 10 years" and "over 10 years". These results seem to indicate that part of the cross-country heterogeneity may be due to measurement issues in the sense that the MFI interest rate statistics do not include fees and other non-interest related costs that households incur when taking out a loan. Finally, differences in maturity structure seem to exert a significant (and expected) negative influence on mortgage interest rates for the "over 5 and up to 10 years" and "over 10 years" categories. That is, the loan categories where changes in maturity may be expected to matter most in terms of the overall borrowing costs.

6. COUNTRY-SPECIFIC INSTITUTIONAL FACTORS

All in all, the econometric results provide some insights into why mortgage interest rates differ across countries, yet a good deal of this heterogeneity remains unexplained, suggesting that other country-specific factors such as institutional differences that are difficult to measure over time play an important role. Commonly cited examples include *inter alia* differences in enforcement procedures, loan-to-value ratios and fiscal systems (e.g. Low et al (2003), London Economics (2005), European Central Bank (2006b)).

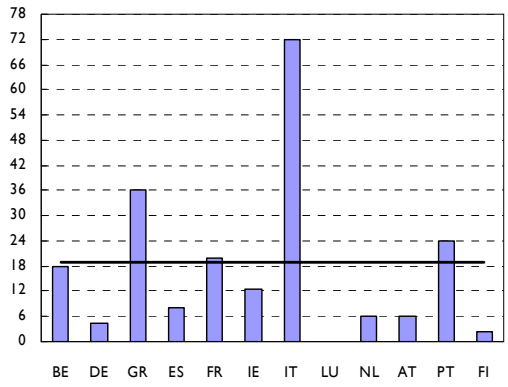
Enforcement procedure. The expected cost of anticipated losses depends not only on the probability of the default but also on the cost of the event itself. While the probability of default is influenced by many factors (position in the business cycle, income prospects, etc.), the cost of the event itself is also determined by the national legal framework and, in particular, by the cost and

duration of the procedure to enforce the collateral. When some of these costs (time and resources spent) are borne by the creditor, banks may include them ex ante into their lending rates. As the cost and duration of collateral enforcement varies considerably across countries (see Chart 5), it cannot be excluded that these differences also exert an influence on MFI interest rates.

Loan-to-value ratios. The credit risk premium also depends on the value of the collateral provided by the borrower in relation to the value of the loan. Chart 6 illustrates the large differences in the "average" loan-to-value (LTV) ratio. These LTV ratios in some of the largest euro area countries where mortgage loans are offered predominantly at variable rate are generally somewhat lower. It has been argued, for example, that the low LTV ratio in Italy (55%) reflects the difficulty for the lender to enforce repossession in case of default of the borrower due to slow and costly judicial proceedings (e.g. MacLennan et al (1998) and Ahearne et al (2005)).[23]

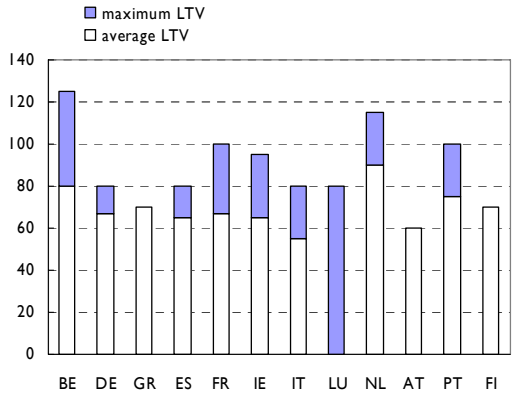
Fiscal factors are measured by the tax wedge computed by van den Noord (2003). The wedge measures the difference between after-tax and pre-tax mortgage interest rates, taking into account deductibility of mortgage interest payments from taxable income, tax credits, and taxation of imputed income from owner-occupied housing (Chart 7). A negative tax wedge indicates that the tax system provides a subsidy (see also Wolswijk (2005)). While the tax wedges are calculated on tax parameters prevailing in 1999, they may nevertheless provide a broad cross-country indication of tax incentives for house ownership.[24]

Chart 5: "Typical" duration of enforcement procedure (in months)



Source: European Mortgage Federation (2002), national sources.
Note: The horizontal line is the euro area average.

Chart 6: Loan-to-value ratios

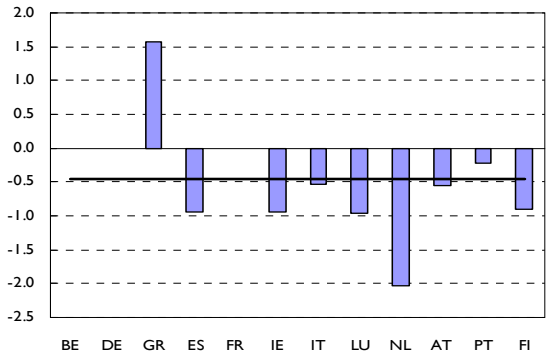


Source: Low et al. (2003), London Economics (2005) and national sources.

[23] The simple correlation coefficient between the duration of the enforcement procedure (in Chart 5) and the average LTV ratio (in Chart 6) is indeed negative (ρ=-0.40).

[24] The highly negative tax wedge in the NL reflects that interest expenses are fully deductible against total income. Moreover, it should be mentioned that the Nationale Hypotheek Garantie (NHG) - which is a government fund - guarantees loan for the purchase and/or refurbishment of a dwelling up to a certain amount.

Chart 7: Tax wedge



Source: Van den Noord (2003).
Note: A low value indicates a high degree of tax subsidies. The value of the tax wedge for BE, DE and FR is neutral (amounting to nil). The horizontal line is the euro area average.

In order to provide some insight into the possible effects of these institutional factors, we estimate equation [3] separately for country-specific enforcement procedures, taxation and LTV ratios, respectively. The results are reported in Table 3 and suggest that differences in the institutional set-up across national mortgage markets do have an effect on national mortgage rates. First, banks seem to compensate longer (and more costly) enforcement procedures by demanding higher mortgage rates. Second, mortgage rates are found to be lower in countries where the tax system contains generous incentives for house ownership. The lower mortgage rates in these countries may reflect the perceived lower credit risk in light of the explicit, or implicit, government involvement in the housing market. Third, as expected, a higher LTV ratio is found to imply higher mortgage rates possibly reflecting the larger degree of credit risk.[25] Finally, we conducted Wald tests of parameter equality between the "high" and "low" indicator values and found that the differences between the two groups were statistically significant in all cases.

Table 3. The effect of institutional factors

	Enforcement procedure			Tax wedge			LTV ratio (average)		
	high	low	ratio	high	low	ratio	high	low	ratio
r_{it}	9.37	8.73	7.25%	7.86	6.99	12.39%	9.24	8.71	6.05%
Wald test	0.00			0.00			0.00		

Note: The figures in the "high" and "low" columns refer to the parameter estimates on the two groups of country dummies. "Ratio" indicates the ratio of "high" to "low" parameter estimates (in percentages). A "high" tax wedge indicates a low degree of subsidies. "Wald test" indicates the p-value of the Wald tests of parameter equality. The parameter estimates for time dummies and control variables are not shown.

[25] We estimated the effect on mortgage rates of both average LTV ratios and maximum LTV ratios (not shown in Table 3) and found similar results.

7. CONCLUSION

A simple analysis of the harmonised MFI interest rate statistics published by the Eurosystem suggests that mortgage rates are rather heterogeneous across euro area countries, both in terms of levels and changes. Part of these differences may be due to measurement problems in the sense that the MFI interest rate statistics do not include fees and other non-interest related costs that households incur when taking out a loan. As a result, we are able only to measure a part (the interest rate component) of the elements constituting the pricing of loans. This notwithstanding, by applying the methodology proposed by Affinito and Farabullini (2006) to the mortgage market, we find that some of the observed mortgage rate heterogeneity disappears once account is taken of differences in national demand and supply conditions. Moreover, supply-side factors appear to exert a more significant influence. At the same time, a considerable part of the heterogeneity remains unexplained by the demand and supply conditions. Hence, we test and find that additional country-specific institutional aspects (such as enforcement procedures, loan-to-value ratios and fiscal arrangements) also contribute to the observed heterogeneity. All in all, by applying the Affinito-Farabullini approach to explaining interest rate dispersion to one specific banking market, namely the market for mortgage loans, we are able to make a clearer identification of the role of the various factors determining banks' pricing behaviour in this market.

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ANNEX

Table: Significance of bilateral differences

(p-values greater than 0.05; the row "count" reports for each country the total number of cases where the p-value is greater than 0.05 (horizontally and vertically))

(i) floating and up to 1 year

(a) only time and country dummies

	BE	DE	GR	ES	FR	IE	IT	LU	NL	AT	PT	FI
BE	.											
DE		.										
GR			.									
ES				.								
FR					.							
IE	0.32					.						
IT					0.24		.					
LU								.				
NL	0.32								.			
AT			0.60							.		
PT						0.11		0.10			.	
FI												.
Count	**2**	**0**	**1**	**0**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**0**

(b) plus demand-side regressors

	BE	DE	GR	ES	FR	IE	IT	LU	NL	AT	PT	FI
BE	.											
DE		.										
GR			.									
ES				.								
FR					.							
IE				0.46		.						
IT							.					
LU								.				
NL						0.43			.			
AT										.		
PT	0.23			0.31		0.28					.	
FI												.
Count	**1**	**0**	**0**	**2**	**0**	**3**	**0**	**0**	**1**	**0**	**3**	**0**

(c) plus demand-side and supply-side regressors

	BE	DE	GR	ES	FR	IE	IT	LU	NL	AT	PT	FI
BE	.											
DE		.										
GR			.									
ES	0.98			.								
FR			0.27		.							
IE	0.72			0.63		.						
IT	0.08		0.83		0.20		.					
LU	0.05		0.60				0.72	.				
NL						0.06			.			
AT			0.64		0.46		0.14	0.18		.		
PT	0.84			0.70		0.62		0.06			.	
FI												.
Count	**5**	**0**	**4**	**3**	**3**	**4**	**5**	**5**	**1**	**4**	**4**	**0**

(ii) over 1 and up to 5 years

(a) only time and country dummies

	BE	DE	GR	ES	FR	IE	IT	LU	NL	AT	PT	FI
BE	.											
DE	0.21	.										
GR			.									
ES				.								
FR	0.06				.							
IE				0.27	0.11	.						
IT				0.15	0.21	0.74	.					
LU				0.76		0.18	0.10	.				
NL	0.55	0.06			0.19				.			
AT				0.17				0.34		.		
PT											.	
FI				0.31	0.09	0.93	0.67	0.21				.
Count	**3**	**2**	**0**	**5**	**5**	**5**	**5**	**5**	**3**	**2**	**0**	**5**

(b) plus demand-side regressors

	BE	DE	GR	ES	FR	IE	IT	LU	NL	AT	PT	FI
BE	.											
DE	0.60	.										
GR			.									
ES				.								
FR		0.09			.							
IE				0.18		.						
IT				0.18	0.28	0.07	.					
LU				0.68		0.28	0.10	.				
NL					0.81		0.38		.			
AT				0.06		0.86		0.10		.		
PT											.	
FI				0.17	0.51	0.10	0.74	0.09	0.73			.
Count	**1**	**2**	**0**	**5**	**4**	**5**	**6**	**5**	**3**	**3**	**0**	**6**

(c) plus demand-side and supply-side regressors

	BE	DE	GR	ES	FR	IE	IT	LU	NL	AT	PT	FI
BE	.											
DE		.										
GR	0.11	0.17	.									
ES	0.91			.								
FR	0.35		0.74	0.44	.							
IE	0.93		0.21	0.96	0.20	.						
IT	0.06	0.52	0.20		0.13		.					
LU	0.51		0.59	0.44	0.73	0.21		.				
NL	0.48			0.45	0.25	0.60		0.31	.			
AT	0.21		0.80	0.09	0.53			0.30	0.07	.		
PT	0.07	0.44	0.30		0.46	0.11	0.52	0.36		0.77	.	
FI	0.58	0.07	0.07	0.65	0.41	0.71	0.07	0.48	0.92	0.21		.
Count	**10**	**4**	**9**	**7**	**10**	**8**	**6**	**9**	**7**	**8**	**8**	**10**

(iii) over 5 and up to 10 years

(a) only time and country dummies

	BE	DE	GR	ES	FR	IE	IT	LU	NL	AT	PT	FI
BE	.											
DE		.										
GR			.									
ES				.								
FR					.							
IE		0.73				.						
IT		0.87				0.86	.					
LU								.				
NL	0.15	0.30				0.17	0.23		.			
AT		0.32				0.52	0.41			.		
PT											.	
FI					0.34							.
Count	**1**	**4**	**0**	**0**	**1**	**4**	**4**	**0**	**4**	**3**	**0**	**1**

(b) plus demand-side regressors

	BE	DE	GR	ES	FR	IE	IT	LU	NL	AT	PT	FI
BE	.											
DE	0.45	.										
GR			.									
ES			0.28	.								
FR					.							
IE	0.89	0.63			0.22	.						
IT	0.06	0.57				0.33	.					
LU								.				
NL	0.72	0.31			0.06	0.95			.			
AT	0.56	0.87				0.54	0.40		0.18	.		
PT											.	
FI	0.07				0.51	0.53			0.29	0.07		.
Count	**6**	**5**	**1**	**1**	**3**	**7**	**4**	**0**	**6**	**6**	**0**	**5**

(c) plus demand-side and supply-side regressors

	BE	DE	GR	ES	FR	IE	IT	LU	NL	AT	PT	FI
BE	.											
DE		.										
GR	0.98		.									
ES	0.95		0.88	.								
FR	0.69		0.71	0.75	.							
IE	0.34		0.33	0.14		.						
IT							.					
LU	0.47		0.43	0.29		0.78		.				
NL		0.28				0.10		0.13	.			
AT							0.87			.		
PT					0.07						.	
FI		0.94				0.08	0.24	0.09	0.12	0.20		.
Count	**5**	**2**	**5**	**5**	**4**	**6**	**2**	**6**	**4**	**2**	**1**	**6**

(iv) over 10 years

(a) only time and country dummies

	BE	DE	GR	ES	FR	IE	IT	LU	NL	AT	PT	FI
BE	.											
DE		.										
GR		0.38	.									
ES				.								
FR					.							
IE					0.39	.						
IT							.					
LU								.				
NL		0.13	0.53				0.14		.			
AT		0.20	0.68				0.09		0.83	.		
PT		0.52	0.85						0.43	0.55	.	
FI				0.38				0.13				.
Count	**0**	**4**	**4**	**1**	**1**	**1**	**2**	**1**	**5**	**5**	**4**	**2**

(b) plus demand-side regressors

	BE	DE	GR	ES	FR	IE	IT	LU	NL	AT	PT	FI
BE	.											
DE	0.28	.										
GR	0.22	0.86	.									
ES				.								
FR					.							
IE	0.42	0.24	0.23		0.57	.						
IT			0.05				.					
LU								.				
NL		0.18	0.35				0.17		.			
AT		0.28	0.48				0.13		0.69	.		
PT	0.09	0.45	0.70			0.17			0.44	0.61	.	
FI				0.33				0.54				.
Count	**4**	**6**	**7**	**1**	**1**	**5**	**3**	**1**	**5**	**5**	**6**	**2**

(c) plus demand-side and supply-side regressors

	BE	DE	GR	ES	FR	IE	IT	LU	NL	AT	PT	FI
BE	.											
DE	0.78	.										
GR		0.12	.									
ES	0.69	0.95		.								
FR	0.74	0.43		0.47	.							
IE	0.86	0.81		0.71	0.45	.						
IT	0.36	0.14	0.33	0.27	0.17	0.23	.					
LU	0.68	0.89	0.06	0.98	0.10	0.60	0.36	.				
NL	0.15	0.68		0.49	0.29	0.44	0.77	0.68	.			
AT	0.40	0.28	0.21	0.48	0.18	0.23	0.64	0.45	0.93	.		
PT	0.06	0.27	0.58		0.09	0.12	0.54	0.23	0.06	0.44	.	
FI	0.43	0.57		0.41	0.81	0.58	0.25	0.50	0.07	0.28		.
Count	**10**	**11**	**5**	**9**	**10**	**10**	**11**	**11**	**10**	**11**	**9**	**9**

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