

THE BEHAVIOUR OF DOMESTIC AND NON DOMESTIC BANKS IN THE HOUSING CREDIT MARKET: AN ANALYSIS BASED ON MICROECONOMIC DATA*

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ABSTRACT

Non-domestic financial institutions have played an important role in smoothing the process of deleveraging of the Portuguese economy, contributing in particular to a minor slowdown in housing credit. The weight of new loans extended by non-domestic banks increased significantly throughout 2010. In addition, the non-domestic banks have charged lower interest rates on new loans than domestic banks. The difference between the rates for both types of institutions has increased in mid-2010, with the deepening of the sovereign debt crisis. In this paper we use microeconomic data on new loans for house purchase to examine whether the domestic and non-domestic banks behave differently regarding the tightness of their credit standards. The results suggest that domestic banks are more sensitive to the riskiness of borrowers than the non-domestic. This behaviour seems to have been more marked in the period in which the difference between interest rates charged by domestic and non-domestic banks widened.

1. INTRODUCTION

The deleveraging process of the private sector is a crucial aspect of the ongoing adjustment in the Portuguese economy. The sharpening of the sovereign debt crisis in the euro area has made clear that the current debt levels in the various sectors of the economy are unsustainable. Meanwhile, the necessary correction of households' consumption and investment expenditures has started, leading to a slowdown in credit demand. The effects on the supply side have been also contributing to the slowdown of credit in the economy, in a context of increased credit risk of borrowers, the difficulty of the Portuguese banks in the access to the wholesale funding markets and the need for restructuring their balance sheets.

The contraction of credit supply may be the result of different types of banks' behaviour. Banks may impose tighter contractual terms across the board to all debtors, charging, for example, higher interest rates. They can also choose to increase the tightness of contractual terms relatively more in loans to high risk borrowers. Banks may also decide not to grant credit to borrowers with higher probability of default, even if they are willing to pay the respective risk premium.¹ These various types of behaviour have different consequences regarding the average "quality" of banks' new borrowers and, therefore, different implications in terms of financial stability. Therefore trying to identify the type of behaviour followed by domestic banks is a relevant issue in the current context.

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¹ This is the case of credit rationing presented in Stiglitz and Weiss (1981).



The presence of non-domestic institutions in the credit market can be very useful in analyzing this question because their behaviour is, in principle, different from the institutions in which capital comes from domestic sources. Those institutions have the advantage over the Portuguese institutions of having access to funding through their respective parent homes, which are often part of a diversified international financial group with location in markets where the access to funding is relatively easier. In addition, branches in Portugal are neither subject to the more demanding capital requirements imposed to domestic banks nor to the requirements concerning deleveraging implied by the adjustment process ongoing in the Portuguese economy.

Non-domestic financial institutions have played an important role in smoothing the credit cycle in the Portuguese economy, particularly in the case of mortgage loans.² In fact, in recent years, new loans for house purchase extended by domestic banks have shown a downward trend, which, in the case of non-domestic banks, started only in 2011. In this context, the weight of new loans extended by non-domestic banks, which stood at about 20 per cent in 2009, has increased significantly over 2010, reaching, in the mid of the year, a level of about 35 per cent, which is much higher than the market share of these banks in the outstanding amount of housing loans. In addition, non-domestic banks have been charging lower interest rates on new loans than domestic banks. This practice intensified in mid-2010 with the deepening of the sovereign debt crisis. These differences concerning interest rates practices may be due to the fact that the proportion of borrowers with higher risk increased relatively more in domestic institutions (a composition effect) and/or to the fact that domestic banks applied tighter credit standards than the non-domestic. The consequences for financial stability are different in either case. This paper attempts to contribute to clarify this issue.

The analysis presented in this article uses a microeconomic database on new housing loan contracts in order to examine whether the domestic and non-domestic banks have a different behaviour regarding the tightness of credit standards. The study benefited from the availability of a database on housing loans collected by the Banking Conduct Supervision Department (DSC) of Banco de Portugal. This database contains comprehensive information on credit contracts, enabling an analysis of the relationship between the interest rate of a loan and its respective amount, controlling for other characteristics of the contract and certain characteristics of the financial institution extending the loan (such as the origin domestic/non domestic of the capital). A sample of new loans for which it was possible to obtain the initial conditions of the contracts was selected from this database.

A drawback of the database of DSC is that it does not include information on the characteristics of the borrower. Additionally, the sample of new loans selected from this database covers a relatively short time period (from October 2009 to September 2010), including just a few months after the deepening of the sovereign debt crisis that occurred in mid-2010, which led to the request for financial and economic assistance from Portugal in April 2011. With the aim of overcoming these limitations, the database from the Central Credit Register (CRC) of Bank of Portugal was also used in this study. This database contains information on the outstanding amounts of loans extended to individuals by all credit institutions operating in Portugal during the period from April 2009 to June 2011. Several indicators of credit default of borrowers with new loans have been computed using CRC data. These indicators can give a rough idea about the average quality of lending by domestic and non-domestic banks.

The paper is organized as follows: section 2 briefly reviews the literature on the role of non-domestic institutions in the credit supply of the host country; section 3 presents the databases used; section 4 includes a descriptive analysis of the data, which allows to characterize the recent evolution of housing loans extended by domestic and non-domestic banks; section 5 presents the results of the regression analysis, which aimed at examining whether domestic and non domestic banks behave differently with regard to the tightness of credit standards; and finally, section 6 includes the main conclusions.

² See "Box 1.4 *The mitigating role of resident non-domestic financial institutions in the Portuguese leveraging process of Portuguese economy*", Banco de Portugal, *Financial Stability Report*, May 2011.

2. LITERATURE

A part of the recent empirical literature about the effect of entry/presence of non-domestic financial institutions on the economic and financial stability in the host country investigates whether that entry/presence attenuates or amplifies macroeconomic shocks. The theoretical foundations for this literature are in general based on the model developed by Holmstrom, Bengt and Tirole (1997) or on extensions of this model. Their paper focuses on the effects of financial integration and concludes that it tends to amplify the impact of negative shocks that affect the value of collateral because, in the event of such a shock, foreign banks tend to displace themselves. If the shock is mainly on the banking system, the presence of non-domestic banks tends to have a stabilizing effect because these banks can more easily import funds from abroad to finance local projects. Since the two types of shocks often occur simultaneously it is difficult to know in advance what the dominant effect is. According to Clarke *et al.* (2005), if non-domestic banks are predominantly large banks, pursuing a long-term strategy and more committed to the host economy their presence tends to minimize the effects of the first type of shocks and it is more likely that the overall effect is stabilization.

The empirical literature also reflects this duality of positions. Goldberg (2002), for example, concludes that the presence of U.S. banks in emerging markets helps to stabilize the supply of credit in case of fluctuations in interest rates and growth in these markets. However, he also concludes that the markets in host countries are sensitive to fluctuations in the U.S. economy. Morgan and Strahan (2004) address the issue from the perspective of the consequences of financial integration within the U.S., also extending the analysis to the case of a set of countries.

As far as we know, there are no empirical studies in the literature directly comparable with the analysis presented in this paper. The recent empirical studies that analyze at the micro level the main determinants of interest rates on housing loans and other loans granted to households emphasise the role of borrowers' characteristics. Edelberg (2003, 2006) and Magri and Pico (2011), for example, respectively to the USA and Italy, mainly focus on the effect of credit risk on interest rates.

3. DATA

a. Database on housing loans

This paper uses data on housing loans collected by the Banking Conduct Supervision Department (DSC) of Banco de Portugal with the purpose of monitoring the market for these loans. This database contains information on the main characteristics of all outstanding contracts at 30th September 2010. This includes the identification of the credit institution extending the loan, the starting and ending dates of the contract, the initial amount of the loan, the amount outstanding and the interest rates (the nominal and the effective annual rate) on 30th September 2010. The database also has information on the interest rate regime, the reference rate and the spread, the fixed rate period, the type of repayment regime and the type of loan.³ This database additionally contains information on early repayments and renegotiations of the loans that occurred between the 1st October 2009 and the 30th September 2010.

The information on loan renegotiations was used to build a database on new loans extended each month during the period between October 2009 and September 2010, which are the object of analysis in this study. In particular, data on the renegotiation of loan maturities and spreads that occurred between

³ The interest rate regimes are fixed rate regime, variable rate regime and mixed regime. Under the variable rate regime, the reference interest rate may be the Euribor (3, 6 or 12 months) or another reference rate. Instalments may be constant, progressive or have any other arrangement. The type of contract may be housing credit or credit related. The repayment plan may be classic or a plan in which the principal repayment or the principal and the interest payments are deferred (up to 6 months, 6 months - 1 year, more than 1 year or until the last instalment is due).

the 1st October 2009 and the 30th September 2010 were used to obtain the original interest rate and maturity of each contract.⁴ The data on loans contracted before October 2009 was not used in the analysis, because it is not possible to obtain the initial conditions of the loans extended before that date. The analysis also excludes loans with interest rates indexed to a non-specified reference rate, loans under a mixed interest rate regime, and those where renegotiations involved a change in the interest rate regime. For all these contracts it is not possible to identify the initial interest rate. Finally, data on “other housing-related” credit, and data on loans under specific credit repayment regimes were also not used in the analysis. The exclusion of these data was motivated by the fact that these contracts have very specific arrangements that are difficult to control in a regression analysis. Moreover, it avoids the damage in the quality of the results caused by some inaccuracy in the use of these classifications.

The resulting sample includes data on 68 633 new loans, with starting dates between October 2009 and September 2010. Of these, 15 516 correspond to loans extended by non-domestic banks. The frequency of the data is monthly.

b. Credit Register data

The Central Credit Register (CRC) of Banco de Portugal contains monthly information sent by all the institutions extending credit in the country. For each pair credit institution/borrower, data on credit outstanding amounts are disaggregated by level of responsibility (individual or joint credit), type of financial product (mortgages, consumer credit, etc.), credit situation (regular, overdue, potential, etc.), original and residual maturities and also by the class of credit arrears (in the case of overdue credit). Since early 2009, the availability of information on the type of product allows an unambiguous identification of housing loans. Information on overdue credit enables the computation of credit default indicators and to relate them to the characteristics of credit institutions, borrowers and loans.

The CRC database does not contain information that allows the unambiguous identification of new loans, which are the object of this study. Thus, new loans have been approximated by comparing, for each borrower, the outstanding amount of housing loans with similar characteristics in a credit institution, in three consecutive months. In a given month, a loan was considered a new loan if its outstanding amount was a multiple of 100 euro and if, in that institution, in the previous two months, the borrower had not credit or had only credits with very different characteristics.

Given the approximate nature of these data, the indicators obtained from the CRC should be interpreted with special caution. However, in the comparable period, information on new loans obtained in this way from the CRC database appears to be consistent with the DSC data. The use of these data has the advantage of enabling the extension of the analysis until June 2011. Furthermore, it allows the calculation of credit default indicators, partially offsetting the lack of information at debtors' level in DSC data. A major limitation of the CRC is the lack of information on interest rates associated with each credit amount. Therefore CRC data cannot be used to estimate the model presented in Section 5 to analyze the tightening of lending criteria for domestic and non-domestic credit institutions. In this context, the default indicators are used as a complementary information source. In particular, these indicators give an approximate idea about the level and evolution of the credit “quality” of debtors with new loans extended by domestic and non-domestic institutions.

⁴ The original maturity was obtained by adding/subtracting to the maturity at 30th September 2010 all changes in the loan maturity that occurred since the beginning of the contract. The same procedure was followed to calculate the spread at origination. The nominal interest rate at origination was obtained using the value of the reference rate at that time and the spread calculated as described. In the case of loans under a fixed interest rate regime we assumed that the interest rate at origination is equal to the interest rate at 30th September 2010. This is not a very strong assumption since in the case of fixed interest rate regimes the initial rate fixation periods are in general equal to or greater than 1 year.

4. DESCRIPTIVE ANALYSIS

Chart 1a shows the evolution, between October 2009 and September 2010, of the number of new loans for house purchase obtained from the DSC database. The number of contracts established by domestic banks is higher than that of non-domestic banks however the difference between them declined greatly since the first quarter of 2010. While the number of loans extended by domestic banks recorded a clearly downward trend, from about 5 000 in October 2009 to less than 3 000 in September 2010, the number of contracts of non-domestic banks increased slightly (from about 1200 to about of 1400). The CRC data confirm this trend but indicate that since the beginning of 2011 the number of loans by non-domestic banks has also been declining (Chart 1b).

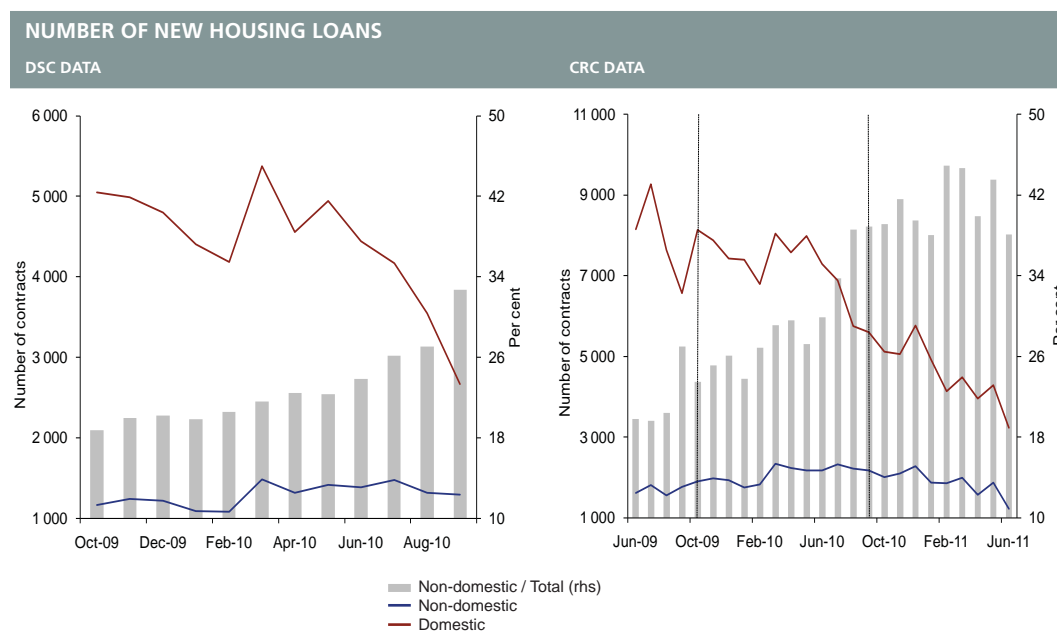
Data on the total amount of credit extended by the two types of institutions, shown in chart 2, confirms that the weight of non-domestic banks in new loans for house purchase has increased significantly from late 2009 to September 2010 and remained relatively stable until June 2011.

Regarding the characteristics of the contracts, the average amount per contract is always higher for non-domestic institutions (the monthly average is 94 thousand euro in the case of domestic banks and 117 thousand euro in the case of non-domestic banks, according to the data from DSC). It remained relatively stable over the period under review (Table 3).

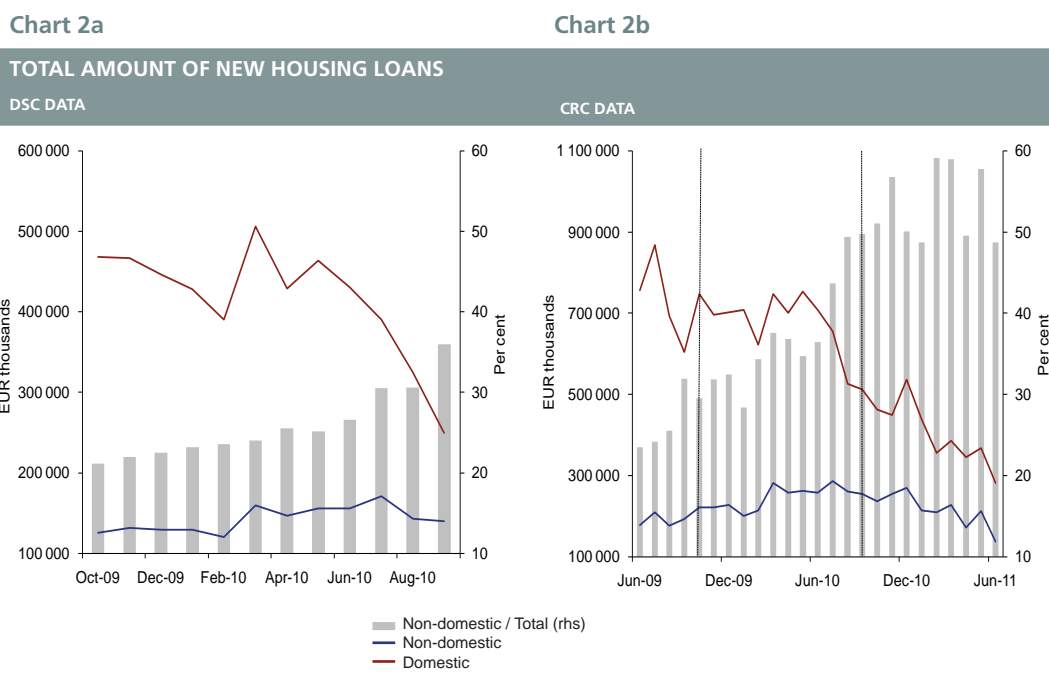
The maturity structure of new loans from the two types of banks shows some changes during the period (Chart 4). According to DSC data, in domestic institutions the weight of loans with longer maturities clearly decreased. This is shown by the evolution of the weight of loans with a 45 years maturity (Chart 4a). In turn, in non-domestic institutions the importance of the 25-30 years maturities seems to have declined and the weight of the longer maturities seems to have increased (Chart 4b). Between October 2009 and September 2010, the average maturity of new loans increased by about two years in non-domestic banks and fell about one year in the domestic ones. CRC data provides the maturities of the loans in ranges, what limits the comparability with the data from DSC, especially because there is no breakdown for the maturities longer than 30 years, which accounts for the loans where the major changes occurred. The CRC data suggest that in both domestic and non-domestic institutions, the weight of the maturities

Chart 1a

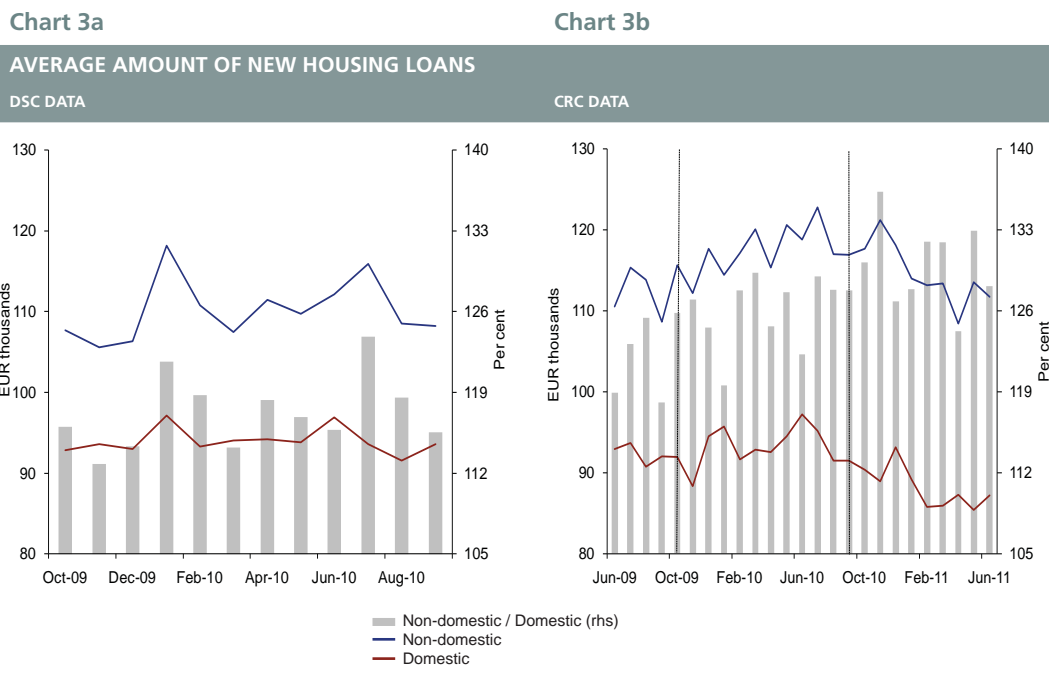
Chart 1b



Source: Banco de Portugal.



Source: Banco de Portugal.



Source: Banco de Portugal.

longer than 30 years have declined (Charts 4c and 4d). In exchange, the domestic banks have increased the share of loans with shorter maturities (less than 10 years) and in the non-domestic, the weight of the intermediate maturities (10-25 years) seems to have increased.

Chart 4a

MATURITY STRUCTURE OF NEW HOUSING LOANS

DSC DATA – DOMESTIC BANKS

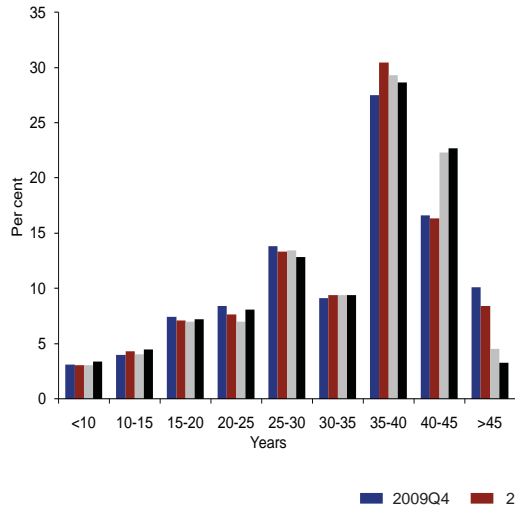


Chart 4b

MATURITY STRUCTURE OF NEW HOUSING LOANS

DSC DATA – NON-DOMESTIC BANKS

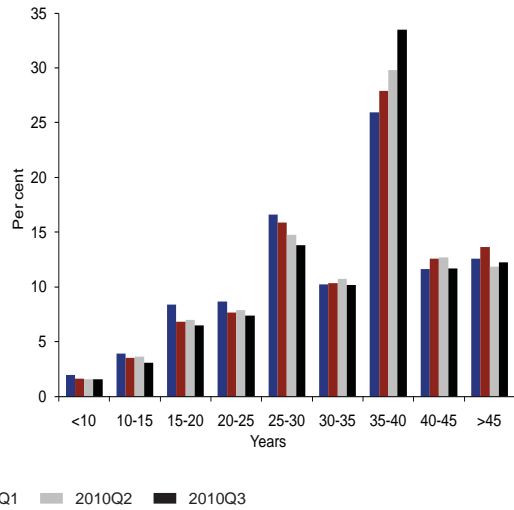


Chart 4c

MATURITY STRUCTURE OF NEW HOUSING LOANS

CRC DATA – DOMESTIC BANKS

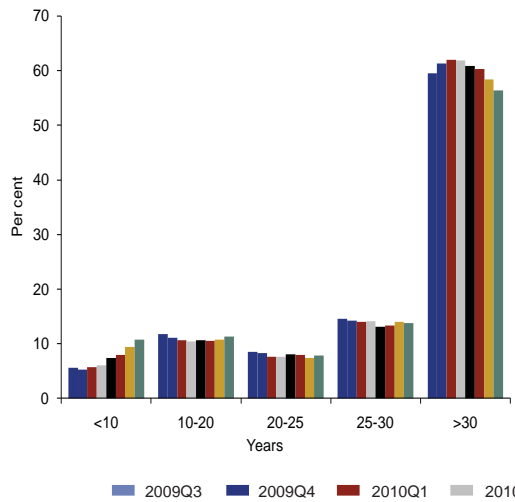
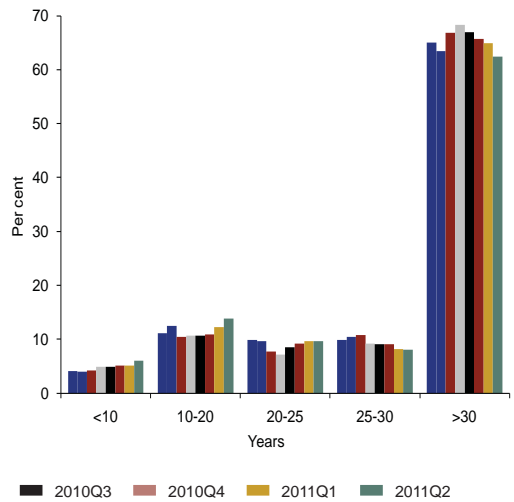


Chart 4d

MATURITY STRUCTURE OF NEW HOUSING LOANS

CRC DATA – NON-DOMESTIC BANKS



Source: Banco de Portugal.

The average interest rates in the DSC data are always lower in the case of loans granted by non-domestic institutions. Since the first quarter of 2010, interest rates of both the domestic and non-domestic banks have been showing a rising trend (Chart 5a), in a context of expectations of higher interest rates by the ECB. The difference between the interest rates of domestic and non-domestic banks widened significantly during the second and third quarters of 2010. Data from the Monetary and Financial Statistics of Banco de Portugal, point out that more recently there has been a reduction of the spread between interest rates of the two types of banks. However, the interest rates of non-domestic banks are still lower (Chart 5b).

Finally, chart 6 shows two indicators of default calculated with data from the CRC for borrowers with new loans for house purchase for the two types of institution. The first indicator corresponds to the ratio between the number of borrowers with new loans for house purchase who have overdue credit in the banking system and the total number of borrowers with new loans for house purchase (Chart 6a). The

Chart 5a

AVERAGE INTEREST RATE OF NEW HOUSING LOANS

DSC DATA

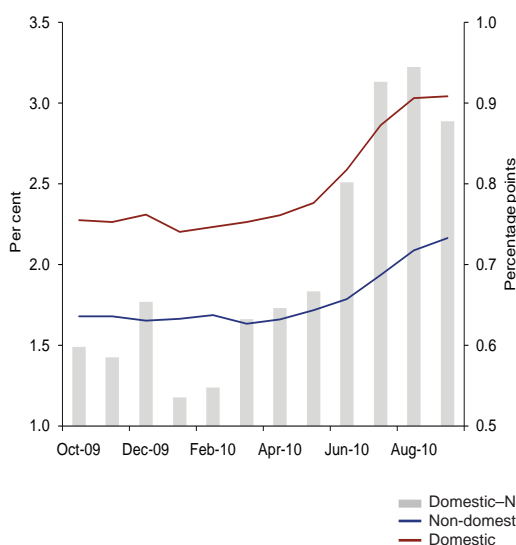
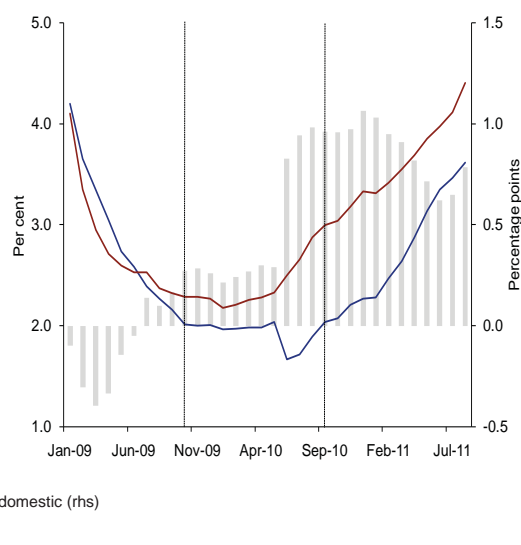


Chart 5b

MONETARY AND FINANCIAL STATISTICS



Source: Banco de Portugal.

Chart 6a

DEFAULT INDICATORS OF THE BORROWERS WITH NEW HOUSING LOANS

PERCENTAGE OF NEW BORROWERS WITH DEFAULT SITUATIONS IN THE BANKING SYSTEM^(a)

CRC DATA

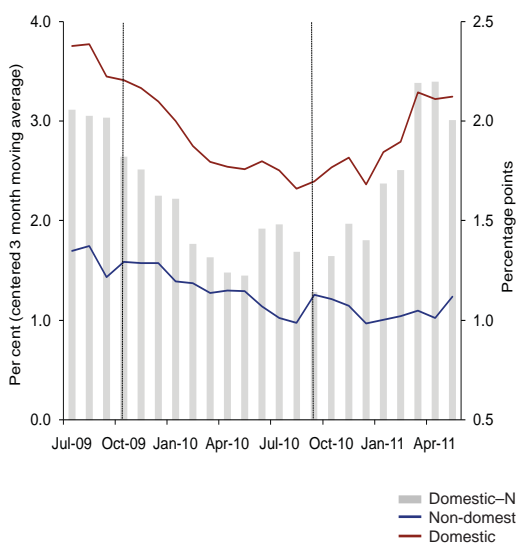
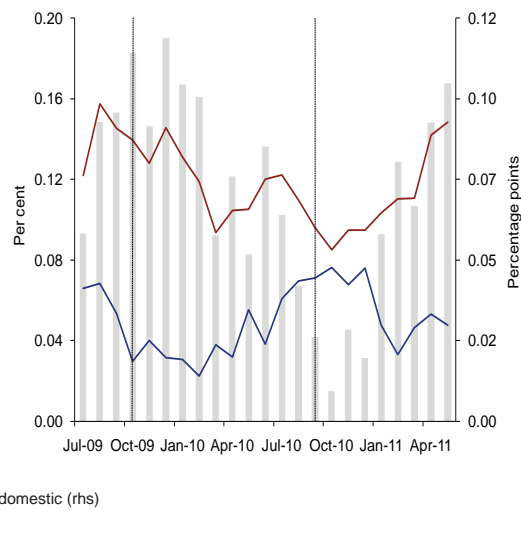


Chart 6b

CREDIT IN DEFAULT AS A PERCENTAGE OF TOTAL CREDIT – WEIGHTED AVERAGE OF INDIVIDUAL BORROWERS RATIOS^(b)

CRC DATA



Source: Banco de Portugal.

Notes: (a) Number of borrowers with new housing loans extended by domestic (non-domestic) banks who have overdue credit in the banking system as a percentage of, the total number of borrowers with new housing loans on domestic (non-domestic) banks. (b) Weighted average of credit default ratios for the borrowers of the domestic (non-domestic) banks. The individual borrowers' ratios of credit default are calculated as the borrower's overdue credit in the banking system as a percentage of total credit for that borrower. The weights correspond to the proportion of credit extended by the domestic (non-domestic) banks to the borrower in the total credit extended by the domestic (non-domestic) banks.

second indicator refers to a weighted average of the ratio between overdue credit and total credit in the banking system for the borrowers with new loans for house purchase (Chart 6b). The weights are the shares of the new loans extended to each borrower in the whole new credit extended by each type of bank (domestic or non-domestic). The two indicators are always higher for domestic banks, suggesting that the average quality of their borrowers with new loans is lower than in the case of the non-domestic banks. Until the third quarter of 2010, the quality of the credit extended by the two types of banks seems to have become more similar, mainly reflecting the reduction in the default ratios in the case of domestic banks. This trend has however been reversed in the most recent period.

To sum up, in the period under analysis, these data indicate that the non-domestic banks extended on average housing credit to borrowers of higher quality. This is suggested by the higher average level of loan amounts, as well as by the indicators of default.⁵ This may, at least in part, explain why the level of interest rates is lower in non-domestic banks. During most of the period there was a significant increase in the market share of non-domestic banks, together with an increase in the positive differential in interest rates of domestic banks compared with those of the non-domestic. There is no evidence that the evolution of interest rates is justified by a composition effect, *i.e.*, by a relative improvement of the quality of the borrowers of non-domestic banks *vis-à-vis* the domestic. In fact, the widening of the differential in interest rates did not go together with significant changes in the average loan amounts or in the indicators of default. In this context, a possible explanation for the different evolution of interest rates may be the difference in the level of tightness in the lending criteria applied to the same type of borrowers. This hypothesis will be analyzed in the next section.

Note also that the available data for the end of 2010 and the first half of 2011 point to an interruption of the increasing trend in the weight of non-domestic banks in new loans for house purchase and a convergence of the interest rates, suggesting some rapprochement of the behaviour of the two types of banks.

5. REGRESSION ANALYSIS

a. Method and variables

The purpose of this section is to identify the main factors that explain the level of interest rates charged for housing credit by domestic and non domestic credit institutions. A central aspect of the analysis is to test for differences in the behaviour of the two types of institutions as well as the existence of any changes in their behaviour over time.

It is expected that interest rates are related to the characteristics of the institutions (in particular the country of origin of the capital), the characteristics of borrowers (in particular their degree of risk), the loan characteristics (in particular the maturity) and even with the macroeconomic conditions and financial environment that affect similarly all institutions operating in a country. In order to analyse these issues the following model was estimated:

$$TAN_i = \beta_0 + \beta_1 NDom_i + \beta_2 DReemb_i + \beta_3 \ln Mont_i + \beta_4 Prazo_i + \beta_5 DIsol_i + \sum_k \beta_6^k DIndex_i^k + \sum_n \beta_7^n DTime_i^n + \varepsilon_i \quad (1)$$

In this model, the variable to be explained is the nominal interest rate TAN_i applied to loan i at the origination of the credit contract. The set of explanatory variables includes variables that capture the

⁵ The initial amount of housing loans is strongly correlated with the value of collateral. Therefore, it has, in general, a positive relationship with the credit quality of the debtor, as shown by the analysis in section 5.

characteristics of the credit institution extending the loan and that are considered relevant to explain differences in interest rates. In particular, the model includes a *dummy* variable indicating whether the source of the capital of credit institution extending the loan is domestic or non-domestic ($NDom_i$). This variable takes the value 1 if the institution is non-domestic and 0 otherwise. In addition, the model additionally includes a *dummy* variable that takes the value 1 in cases where the institution does not belong to a banking group ($DIsoI_i$), what happens only for some domestic institutions.⁶

The variable $DReemb_i$ is a *dummy* variable that takes the value 1 if, during the period under analysis, there was any early repayment of the loan and the value 0 in the opposite case. This indicator intends to capture the effect of credit quality of the borrower. The inclusion of this variable assumes that early repayments are typically made by individuals in a better financial situation and, therefore, with a lower credit risk.

The model also includes as explanatory variables the main features of the loan at origination: loan amount – $\ln Mont_i$ – and loan maturity – $Prazo_i$. The amount is measured by the logarithm of the initial loan amount in thousands euro, and maturity is measured in years. In principle, for borrowers with an equal degree of risk, it is expected a positive relationship between the loan amount and the interest rate, given that the higher the amount borrowed the higher is the amount of loss given default for the credit institution. However, it is also expected that the amount of the loan, in the case of housing credit, is strongly correlated with the value of the collateral. Therefore the amount of the loan can also capture the creditworthiness of the borrower. Thus, the coefficient associated with the variable amount should be interpreted taking into account these two possible effects. Note that, for example, Magri and Pico (2011) and Edelberg (2003) obtain a negative and significant effect of the loan amount on the interest rate on housing loans in regressions that also include a variable designed to measure specifically the risk of the borrower (a credit score).

Concerning the effect of the variable loan maturity, it is expected that, controlling the credit risk of the borrower, longer maturities will be associated to higher rates, reflecting the term premium that compensates for the greater uncertainty associated with longer maturities.

The model also includes four *dummy* variables – $DIndex_i^k$ – that control for the interest rate regime. Three of these variables refer to the cases where the reference rate is the Euribor 3, 6 or 12 months and the fourth variable refers to the case of loans with fixed interest rate. In principle, the longer the initial rate fixation period the higher is the risk to the credit institution and therefore the higher the rate applied to the loan.

Finally, the model includes monthly *dummies* $DTime_i^n$, which capture the effect of the change over time of the conditions that affect similarly all institutions and all borrowers. Although the time dimension of the sample is limited, the data cover a period of financial instability associated with the deepening of the sovereign debt crisis in the euro area, which justifies the inclusion of these *dummies*.

The model given by equation (1) imposes that the estimated coefficients associated with the loan characteristics are identical for different credit institutions, particularly for the domestic and the non-domestic. However, the focus of the analysis presented in this paper is to investigate whether, in a loan of similar characteristics, non-domestic and domestic institutions charge or not a similar rate. Thus, departing from the base specification, we estimated a model that admits the possibility that the estimated coefficients associated with the most relevant explanatory variables ($\ln Mont_i, Prazo_i, DReemb_i$) can be different in the case of loans granted by domestic and non-domestic banks, which corresponds to the following equation:

⁶ We tried to include in the model other variables that captured the characteristics of the credit institutions which seemed relevant to explain differences in interest rates, such as the size of the institutions and indicators of profitability, solvency or liquidity. However, these indicators are not available for the group where non-domestic subsidiaries and branches belong, but only for the individual institutions operating in Portugal, which bias the regression results. However, note that the inclusion of these variables did not significantly change the estimated effects for the other variables.

$$TAN_i = \beta_{11}NDom_i + \beta_{12}(1 - NDom_i) + \beta_{21}NDom_iDReemb_i + \beta_{22}(1 - NDom_i)DReemb_i + \beta_{31}NDom_i \ln Mont_i + \beta_{32}(1 - NDom_i) \ln Mont_i + \beta_{41}NDom_i Prazo_i + \beta_{42}(1 - NDom_i) Prazo_i + \beta_5 DIsoI_i + \sum_k \beta_6^k DIndex_i^k + \sum_n \beta_7^n DTime_i^n + \varepsilon_i \quad (2)$$

The estimation of the following specification, obtained from a reparametrization of the model given by equation (2):

$$TAN_i = \beta_{12} + (\beta_{11} - \beta_{12})NDom_i + \beta_{22}DReemb_i + \beta_{32} \ln Mont_i + \beta_{42} Prazo_i + (\beta_{21} - \beta_{22})NDom_i DReemb_i + (\beta_{31} - \beta_{32})NDom_i \ln Mont_i + (\beta_{41} - \beta_{42})NDom_i Prazo_i + \beta_5 DIsoI_i + \sum_k \beta_6^k DIndex_i^k + \sum_n \beta_7^n DTime_i^n + \varepsilon_i \quad (2')$$

allows the test of whether the effects of variables $\ln Mont_i, Prazo_i, DReemb_i$ on interest rates are significantly different in the case of loans extended by domestic and by non-domestic credit institutions.⁷

Finally, in order to test the possible changes over time in the behaviour of the two types of institutions, it was estimated an even more general specification allowing for the possibility that the coefficients associated with the amount, maturity and early repayments may be different not only across different types of banks but also between the first and the second half of the sample period. In fact, according to the analysis of the previous section, the increase in the market share of non-domestic institutions was more pronounced in the second half of the sample period. During this period there was also an increase in the interest rate differential between the two types of institutions. These developments could be justified by a change in banks' behaviour, in a context of a deepening of the sovereign debt crisis, which increased the difficulties of domestic banks in their access to the wholesale funding markets.

Thus, we also estimated the following model:

$$TAN_i = \gamma_{11}NDom_i DAntes + \gamma_{12}NDom_i DDepois + \gamma_{13}(1 - NDom_i) DAntes + \gamma_{14}(1 - NDom_i) DDepois + \gamma_{21}NDom_i DReemb_i DAntes + \gamma_{22}NDom_i DReemb_i DDepois + \gamma_{23}(1 - NDom_i) DReemb_i DAntes + \gamma_{24}(1 - NDom_i) DReemb_i DDepois + \gamma_{31}NDom_i \ln Mont_i DAntes + \gamma_{32}NDom_i \ln Mont_i DDepois + \gamma_{33}(1 - NDom_i) \ln Mont_i DAntes + \gamma_{34}(1 - NDom_i) \ln Mont_i DDepois + \gamma_{41}NDom_i Prazo_i DAntes + \gamma_{42}NDom_i Prazo_i DDepois + \gamma_{43}(1 - NDom_i) Prazo_i DAntes + \gamma_{44}(1 - NDom_i) Prazo_i DDepois + \gamma_5 DIsoI_i + \sum_k \gamma_6^k DIndex_i^k + \sum_n \gamma_7^n DTime_i^n + \varepsilon_i \quad (3)$$

In this specification $DAntes$ and $DDepois$ are *dummy* variables that take the value 1 for observations before and after April 2010, respectively. The estimation of adequate reparametrizations of this model

7 Note that testing the statistical significance of the coefficients associated with the interactive variables $NDom_i DReemb_i, NDom_i \ln Mont_i$ and $NDom_i Prazo_i$ is equivalent to test whether the differences between the coefficients associated with the *dummy* for early repayment, the loan amount and the loan maturity in the two sub-samples (of domestic and non-domestic banks) are statistically significant.

allows testing whether the differences in the effects of the variables “dummy for early repayments”, “loan amount” and “loan maturity” are statistically different for the domestic and the non-domestic banks in each of the time periods and also if the estimated coefficients are statistically different for each type of banks (domestic or non-domestic) in the first and second half of the sample period.

Note also that, in order to better interpret the effect of the nationality of the banks’ capital on the interest rates that they charge, we also estimated for each model a specification that includes as an additional explanatory variable the 10-year government bond yield in the country of origin of the capital, measured as a monthly average. In the context of the current crisis, interest rates on bank liabilities are strongly correlated with sovereign bond yields. Therefore, the inclusion of this variable aims at identifying, more accurately, the impact of banks’ funding difficulties and the need for deleveraging their balance sheets, on the interest rates that they charge to their borrowers.

b. Regression results

Basic specification

The first column of Table 1 presents the estimation results of the model given by equation (1) that corresponds to the basic specification. Regarding the effect of the characteristics of credit institutions, it is observed that the estimated coefficient associated with the *dummy* that takes the value 1 for loans extended by non-domestic banks ($NDom_i$) is negative and significant, suggesting that the loans extended by these institutions have, on average, lower interest rates, even when they have identical characteristics. The results also suggest that the domestic institutions not belonging to a group charge on average interest rates significantly higher. This may reflect the fact that these institutions do not benefit from the advantages of economies of scale and access to information that are expected to be associated with the behaviour of institutions belonging to a group.

The coefficient of the *dummy* that takes value 1 in case early repayments have occurred ($DReemb_i$) is negative and significant, suggesting that, as intended, this variable is capturing the quality of the borrowers in terms of credit risk. In fact, it is expected that borrowers with a stronger financial position have a greater propensity to make early repayments of their loans. Thus, the negative coefficient obtained in the estimation suggests, as expected, that borrowers with lower credit risk get lower interest rates on average.

Regarding the effect of the characteristics of the contracts, it should be noted that the amount of the loan ($\ln Mont_i$) presents a negative and significant coefficient. This suggests that this variable largely captures the “quality” of the debtor, that is, in general larger loans are extended to borrowers with a higher income/wealth level, which have lower credit risk. The coefficient associated with the loan maturity ($Prazo_i$) has a positive sign and is significant, as expected, what reflects the risk premium that is due to the greater uncertainty associated with longer maturities. The coefficients associated with the interest rate regime suggest that interest rates on variable-rate loans increase with the maturity of the reference rate. Additionally, fixed interest rate loans have on average higher interest rates than variable-rate loans. These effects are consistent with the absence of expectations of interest rate cuts by the ECB during the period of analysis.

The second column of Table 1 presents the results of the estimation of a model identical to the previous one, which also includes as an explanatory variable the interest rate on 10-year bonds of the country of origin of the capital of the credit institution. The estimated coefficient associated with this variable is positive and significant as expected. When comparing the results of the first two columns of Table 1 we conclude that the main impact of the inclusion of government bond yields is a reduction of the effect, in terms of magnitude and statistical significance, associated with the dummy that indicates whether the

institution is domestic or non-domestic. This suggests that the higher level of interest rates on housing loans in the case of domestic institutions is largely due to their greater difficulties in funding resulting from the sovereign debt crisis.

Different effects according to the type of institution (domestic/non domestic)

The last three columns of Table 1 present the estimation results of equation (2), *i.e.*, the specification that considers that the loan amount, the loan maturity and the dummy indicating the occurrence of early repayments have different coefficients for domestic and non-domestic banks. The first two columns show the estimated coefficients and corresponding t-ratios in case of domestic and non-domestic banks, respectively. The third column shows the differences between the estimated coefficients for domestic and non-domestic banks and the t-ratios associated with the test of equality between these coefficients obtained from the estimation of equation (2').

The estimated coefficients associated with the amount and with the dummy for early repayments are negative and significant. The magnitude of these coefficients is significantly lower in the case of non-domestic banks than in the domestic ones. In the sense that these variables seem to capture the credit risk of the borrower, those differences between the coefficients can be interpreted as evidence that the interest rates applied by domestic banks have been in this period, more sensitive to the riskiness of borrowers. For the case of the loan maturity there is no evidence of differences in the behaviour of the two types of institutions.

Different effects according to the type of institution and the time period (before/after April 2010)

Table 2 shows the estimation results of the regressions where the coefficients associated with the amount, the maturity, the dummy indicating the occurrence of early repayments and the dummy indicating whether the loan was extended by a domestic or non-domestic bank are allowed to be different in the first and the second half of the sample period (October 2009 to March 2010 and April 2010 to September 2010). The first part of the table corresponds to the results of the estimation of the model given by equation (3). The first four columns present the estimated coefficients and corresponding t-ratios in the case of domestic banks and non-domestic before and after April 2010. The following four columns show the differences between the coefficients and the t-ratios associated with the test of equality between the coefficients.⁸

The differences in the constant of the model capture the fact that interest rates have risen, both in the case of domestic and non-domestic banks, from the first to the second part of the sample period, but more sharply in the case of domestic banks. The dummy concerning early repayments presents, as in the previous model, a negative sign, which has a greater magnitude in the case of domestic institutions. These effects do not show significant changes between the first and the second part of the sample period. The interpretation of the differences between the two sub-periods in the effect of this variable must be made with caution. Since we only have data on the repayments occurred until September 2010, loans contracted at a close date naturally have a smaller number of occurrences. In the case of the loan amount, the (absolute value) of the negative coefficient increases between the two sub-periods in the case of domestic institutions and does not change significantly in the case of the non-domestic. This may suggest that the greater differentiation of credit risk made by domestic institutions has slightly intensified over time. Finally, the results for the loan maturity indicate that, in the first part of the sample period, non-domestic banks may have been imposing lower premiums in interest rates when the maturity of the contract increases than the domestic banks. This may suggest that the non-domestic institutions

⁸ We tested the equality between the coefficients for domestic and non-domestic banks in each of the sub-periods and the equality between the coefficients in the two sub-periods for each type of banks.

Table 1

REGRESSION RESULTS WITHOUT DISTINGUISHING THE TWO PARTS OF THE SAMPLE PERIOD ^(a)					
	Not distinguishing domestic and non-domestic banks		Distinguishing domestic and non-domestic banks ^(b)		
	(1)	(1b)	Domestic banks (2a)	Non-domestic banks (2b)	Difference (2b)-(2a)
<i>Constant</i>	4.34 (82.6)	3.72 (65.65)	4.79 (71.46)	2.25 (38.37)	-2.55 (-28.69)
<i>Dummy non-domestic bank</i>	-0.78 (-155.14)	-0.62 (-85.28)			
<i>Government bond yield</i>		0.16 (31.47)			
<i>Dummy isolated bank</i>	0.72 (8.49)	0.72 (8.51)		0.70 (8.36)	
<i>Logarithm of the amount</i>	-0.20 (-43.79)	-0.20 (-44.15)	-0.25 (-40.85)	-0.09 (-17.12)	0.16 (19.77)
<i>Maturity (years)</i>	0.005 (19.07)	0.005 (18.78)	0.006 (17.06)	0.005 (13.29)	-0.001 (-1.44)
<i>Dummy occurrence of early repayments</i>	-0.21 (-10.30)	-0.20 (-10.09)	-0.23 (-9.99)	-0.06 (-1.92)	0.173 (4.56)
<i>Dummy reference rate: euribor 6 month</i>	0.36 (64.39)	0.33 (53.75)		0.37 (64.92)	
<i>Dummy reference rate: euribor 12 month</i>	0.40 (8.08)	0.39 (7.9)		0.39 (7.74)	
<i>Dummy fixed interest rate</i>	0.45 (8.96)	0.42 (8.29)		0.44 (8.78)	
Number of observations	68633	68633		68633	
Root MSE	0.6603	0.6575		0.6588	

Source: Banco de Portugal.

Notes: (a) t-ratios in parentheses. (b) The coefficients of the variables for which cross-effects were not estimated are the same in all models.

have facilitated the extension of maturities by imposing a less strong penalty in terms of interest rate to keep the possibility of relieving instalments. The domestic credit institutions in the present context have more difficulties in pursuing with this practice. This behaviour is consistent with the trend observed in the data analyzed in the previous section. The difference between the behaviour of the two types of banks is likely to have weakened in the second part of the sample period.

The second part of table 2 presents the results of a regression which is identical to the previous, but that includes the 10-year government bond yield of the country of origin of the bank as an explanatory variable. As expected, the government bond yields have a significantly higher effect on housing loans interest rates in the second half of the sample, reflecting the deepening of the sovereign debt crisis. With the introduction of this variable the average levels of interest rates charged by banks (given by the "constant") do not significantly increase from the first to the second part of the sample period. This suggests that the increase in interest rates between April and September 2010 that is not related to the evolution of borrowers' credit quality or the characteristics of the contracts, is likely to be largely

Table 2

REGRESSION RESULTS DISTINGUISHING THE TWO PARTS OF THE SAMPLE PERIOD^(a)

	First part of the sample period ^(b)		Second part of the sample period ^(b)		Differences		Differences									
	Domestic banks (1a)	Non-domestic banks (1b)	Domestic banks (2a)	Non-domestic banks (2b)	Domestic banks (3a)	Non-domestic banks (3b)	Domestic banks (4a)	Non-domestic banks (4b)								
Constant	4.66 (53.73)	2.44 (29.37)	5.59 (53.59)	2.71 (34.19)	-2.22 (-18.49)	-2.88 (-22.17)	0.93 (6.88)	0.27 (2.37)	4.21 (40.37)	2.03 (21.41)	4.42 (40.52)	1.87 (25.58)	-2.17 (-18.07)	-2.55 (-20.25)	0.21 (1.42)	-0.16 (-1.38)
Government bond yield									0.12 (8.41)		0.21 (33.51)				0.09 (6.18)	
Dummy isolated bank			0.70 (8.33)									0.71 (8.39)				
Logarithm of the amount	-0.23 (-30.01)	-0.10 (-13.03)	-0.26 (-27.88)	-0.08 (-11.78)	0.14 (12.69)	0.18 (15.34)	-0.03 (-2.27)	0.01 (1.45)	-0.23 (-30.01)	-0.10 (-13.00)	-0.26 (-27.92)	-0.08 (-12.83)	0.14 (12.77)	0.18 (16.15)	-0.03 (-2.31)	0.02 (1.69)
Maturity (years)	0.0054 (12.45)	0.0040 (6.89)	0.0065 (11.52)	0.0064 (13.00)	-0.0013 (-1.84)	-0.0003 (-0.04)	0.0011 (1.51)	0.0024 (3.11)	0.0053 (12.19)	0.0038 (6.49)	0.0064 (11.43)	0.0059 (12.75)	-0.0014 (-1.96)	-0.0005 (-0.72)	0.0011 (1.60)	0.0021 (2.74)
Dummy occurrence of early repayments	-0.21 (-8.26)	-0.08 (-2.45)	-0.27 (-5.22)	-0.12 (-2.00)	0.13 (3.01)	0.16 (2.02)	-0.06 (-1.02)	-0.03 (-0.47)	-0.2108 (-8.16)	-0.0873 (-2.51)	-0.2514 (-4.83)	-0.1741 (-3.16)	0.12 (2.86)	0.08 (1.02)	-0.04 (-0.70)	-0.09 (-1.33)
Dummy indexante euribor 6 meses			0.36 (63.57)								0.32 (52.15)					
Dummy reference rate: euribor 12 month			0.38 (7.70)								0.37 (7.49)					
Dummy fixed interest rate			0.44 (8.55)								0.42 (8.14)					
Number of observations													68633			
Root MSE													0.65581			

Source: Banco de Portugal.

Notes: (a) t-ratios in parentheses. (b) The coefficients of the variables for which cross-effects were not estimated are the same in all models.

explained by the differences in terms of the need to deleverage banks balance sheets. The remaining results are unchanged compared to the regression that does not include the government bond yields.

6. CONCLUSIONS

Between late 2009 and the third quarter of 2010 non-domestic banks increased their market share in the Portuguese mortgage market. The increase in the funding difficulties faced by Portuguese banks as well as their need to deleverage, in the context of the adjustment process of the Portuguese economy, have largely contributed to this situation. During the second and third quarters of 2010, the increase in the market share of non-domestic banks has occurred simultaneously with an increase in the positive differential between interest rates charged on new housing loans by the domestic and the non-domestic banks.

The results of the regression analysis using data at the microeconomic level for a sample of new loans for house purchase in the period from October 2009 to September 2010 show that the domestic banks are more sensitive to the riskiness of borrowers than the non-domestic. This behaviour has been more marked when the difference between the interest rates charged by domestic and non-domestic banks widened. In this period, the domestic banks used the interest rates more intensively to differentiate borrowers with different credit qualities. The results also suggest that the non-domestic banks might have been demanding a lower premium to compensate for longer maturities than the domestic banks.

According to the indicators of default calculated for new borrowers, the non-domestic banks extend credit to borrowers with lower credit risk, on average terms. Nevertheless, in the period of widening of the interest rate differential, the quality of the borrowers with new loans in the non-domestic banks has not improved *vis-à-vis* the domestic banks. In this context, the reduction of interest rates of the non-domestic banks relative to the domestic has not occurred simultaneously with a change in the relative quality of borrowers in the two types of banks.

The macro level data available for the end of 2010 and the first half of 2011 point to an interruption of the increasing trend on the weight of non-domestic banks in lending for house purchase and a convergence in the interest rates charged. This suggests a rapprochement of the behaviour of non-domestic and domestic banks. The analysis of the mechanisms underlying these developments will only be possible when there microeconomic data is available for this period.

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