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# Cross-Border Banking in the Euro Area Crisis: Implications for Commercial Mortgage Lending<sup>1</sup>

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**Abstract:** We analyze EU banks' rebalancing of commercial real estate loans during the Euro Area debt crisis of 2010-2013, in terms of flight-to-safety, flight-home and risky-lending, using banks' stress test data conducted by the European Banking Authority. The Euro Area crisis amplified CRE loans market segmentation. Banks from the crisis hit EU countries, with low funding costs, rebalanced CRE lending towards their home markets. Banks from safe EU countries followed different strategies: banks with limited funding capacity and low core Tier 1 ratios rebalanced CRE loans towards the crisis hit countries, whereas banks with better funding capacity and high core Tier 1 ratios rebalanced towards the safe region. Banks avoided crisis hit countries with highly levered households.

JEL: F34, G15, G21, R30

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# Cross-Border Banking in the Euro Area Crisis: Implications for Commercial Mortgage Lending

## 1. Introduction

The Euro Area crisis of 2010-2013 is an event of historical proportions. Six years after it began, the economic and social scars are still evident in the most affected countries: Greece, Ireland, Cyprus, Italy, Spain and Portugal, henceforth the “GICIPS” group.<sup>2</sup> The political consequences of the crisis have shaken the very foundations of the European Union.

Much of what has been documented about the crisis refers to problems with government finances and the sharp slump in the private sector, with large number of bankruptcies, rising unemployment and significant loss in personal incomes.<sup>3</sup> However, the Euro Area crisis was also very much a real estate mess, so much so that to many analysts it is still the biggest untold story of the crisis.

Many of the underlying problems originated in real estate excesses. In Spain, for example, construction grew at an average of 6 per cent per year between 2002 and 2007, and investment in housing and commercial real estate accounted for 8 per cent of GDP in 2006. In 2012, crushed by the weight of bad real estate loans, Spanish financial sector received a €100 billion rescue package provided by the European Stability Mechanism. In Ireland, investment in real estate reached a staggering 13 percent of GDP before the crisis. In November 2010, after the property bubble burst, leaving Irish banks with €100 billion in non-performing loans, the country had to ask the European Union and the IMF for a bail-out package. According to the Financial Times, “the pressure from the real estate sector played a huge – and under-appreciated role - in Italy’s banking crisis”, with real estate and construction making up most of the country’s bad debt and over 40 per cent of corporate non-performing loans.<sup>4</sup> Greece, Portugal and Cyprus also had massive amounts of capital and loans tied in the real estate and construction sectors, and banks suffered large losses in collateral and income backed by real estate assets.

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<sup>2</sup> See Lane (2012) for an account of the beginning of the crisis.

<sup>3</sup> See, for example, the works by Shin (2012), Broner et. al. (2014) and Bocola (2015).

<sup>4</sup> “In Charts: Italy’s banking crisis”, Financial Times, July 13, 2016.

At a macroeconomic level, the importance of the real estate sector in the EU is significant. In 2009, the EU average investment in buildings and structures as a fraction of gross fixed capital formation (GFCF) was 29 per cent.<sup>5</sup> Among the GICIPS countries, Portugal had the highest share, 39 per cent, followed by Spain at 33 per cent, and Greece the lowest, 23 percent.<sup>6</sup> The share of jobs in construction and other real estate activities to total employment declined between 2009 and 2013 from 10.4 per cent to 6.5 per cent in Spain, from 8.6 per cent to 5.9 per cent in Ireland, from 9.7 per cent to 6.9 per cent in Portugal, and from 7.8 per cent to 4.6 per cent in Greece. This contrasts with a change from 8.2 per cent to 7.1 per cent in the Euro Area. Using the proportionate value that real estate represents on corporate balance sheets, one study finds that, when buildings are adjusted for inflation, real estate represents about 12 per cent of total corporate assets and 30 per cent of all Plant, Property and Equipment.<sup>7</sup>

In this paper we examine how banks rebalanced their cross-border commercial real estate (CRE) loan exposures during the Euro Area debt crisis. A commercial real estate loan (aka mortgage) is typically used to develop, acquire and refinance a commercial real estate asset. CRE assets refer to buildings used for business purposes, such as industrial compounds, warehouses, retail centers, office complexes, hotels, as well as multi-family residential dwellings, and buy-to-let housing for the express purpose of generating an income.<sup>8</sup>

Looking at the banks' exposures to CRE loans is important for several reasons. First, CRE is tightly linked to prevailing lending conditions, since most CRE projects use a fair amount of leverage. Therefore, CRE markets can be hit particularly hard during a banking crisis. Second, in Europe, unlike in the U.S., commercial banks dominate the CRE lending markets. Third, the share of banks' exposures to CRE loans is economically very significant: according to the European Systemic Risk Board's (ESRB) report of December 2015, EU banks' exposures to CRE loans represented 11 percent of the average EU country's GDP. Although banks' exposure

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<sup>5</sup> See the United Nations System of National Accounts (UNSNA), the National Income and Product Accounts (NIPA) and the European System of Accounts (ESA).

<sup>6</sup> In 2012, the share of gross value added of the broad construction sector in the GDP of Spain was 18.2 per cent, with real estate activities having the largest contribution to the GDP. In Germany, the value added of real estate activities had the largest share in the GDP, 10.1 per cent.

<sup>7</sup> See Campelo and Giambona (2013).

<sup>8</sup> See Shimizu 2014.

to CRE loans in some GICIPS countries was not higher than in the average EU country, banks' non-performing CRE loans in all of the GICIPS countries stood at or above the EU average.<sup>9</sup>

To have an idea of the integration of the CRE markets in Europe, cross-border commercial mortgage lending flows, between 2006 and the first half of 2015, accounted for 42 percent of the total investment in the Euro Area. However, CRE mortgage markets are to a degree heterogeneous across Europe. This feature is important because a negative economic shock in one country may prompt banks to redirect their real estate commercial lending to healthier regions.

There is little empirical analysis comparing risks in domestic and across national European CRE markets. As pointed out in the ESRB's report of December 2015, the problem of lack of CRE reliable data has been a concern for financial stability supervisors. In an attempt to overcome the problem, we construct a novel dataset using unique data of European banks' loan portfolios from the European Banking Authority's (EBA) stress tests. Our data is limited, since it comprises information at two points in time, the end of 2009 and the end of 2013. However, the Euro Area debt crisis took place between the beginning of 2010 and the end of 2012, and therefore our two points in time serve well the purpose of investigating the effect of the Euro Area crisis on the banks' cross-border commercial real estate lending activities. With the available information, a total of 69 European banks are matched from the two stress tests. Our database has information on every bank for these two dates including equity, credit risk, loan losses and loan provisions, as well as information on banks' exposures by loan type and geography.

We estimate changes in CRE mortgage exposures of European banks by geography, and investigate the determinants for these changes. In particular, we are interested in documenting and explaining changes in CRE lending decisions that can be classified as flight-to-safety (FTQ), flight-home (FH) and risky-lending (RL). By flight-to-safety we mean the action of reallocating CRE exposures in the loan portfolio of a bank towards the safer European countries (other than the bank's domestic country if it is regarded as "safe"); by flight-home we mean reallocating CRE exposures in the loan portfolio of a bank towards its domestic market; and by risky-lending

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<sup>9</sup> See EBA 2014 EU-wide stress test. The EU average of non-performing CRE loans by banks was significantly raised by the banks in Ireland, Spain and the UK.

we mean reallocating CRE exposures in the loan portfolio of a bank towards the GICIPS group (other than the bank's domestic country if it part of the GICIPS group).

We find that the estimated squeeze of commercial real estate credit in our sample of 69 European banks was close to €1 trillion between the end-2009 and the end-2013. To understand the magnitude of this figure recall that the 2012 European Central Bank's Long Term Refinancing Operation – portrayed as the “big bazooka” by the press– amounted to €1 trillion. When looking at the tightening of CRE credit by regions, in the GICIPS countries it was €10bn, roughly 6.5 per cent of the combined GDPs of these countries, or the GDP of Ireland in 2013. The CRE credit squeeze was due to the poor economic conditions in the GICIPS countries, and further driven by banks rebalancing their portfolios away from CRE mortgages and towards sovereign debt, a pattern observed in almost every EU country.

We also find that the Euro Area crisis amplified the geographic segmentation in CRE lending. Whereas the percentage of banks doing flight-to-safety in CRE loans was very high and in both the safe European region and the GICIPS region, the intensity of actions related to flight-home and risky-lending differs for banks in these two regions. Specifically, banks from the GICIPS countries were more likely to rebalance their CRE loans towards home, whereas rebalancing of CRE loans towards the GICIPS countries was more specific in banks from safe regions. Interestingly, among the banks from the GICIPS region, those choosing to rebalance towards the safe region were less likely to rebalance towards home or towards other countries in the GICIPS region, and vice versa. This finding suggests a significant increase in segmentation of the CRE loan markets in the European Union.

We then examine the determinants of the flight-to-safety, flight home and risky-lending behaviors in CRE lending to try to understand segmentation in CRE loan markets by geography, as well as by bank. Our results indicate that banks from the GICIPS with lower funding costs reoriented their CRE lending towards the domestic markets. The flight-home lending behavior is discussed by Claessens (2006), who highlights the role of foreign banks in promoting access to local financial services, enhancing financial and economic performance of local borrowers, and improving financial stability. De Haas and Van Horen (2012) and Giannetti and Laeven (2012) find that cross-border lending shrank rapidly during the 2008–2009 U.S. financial crisis, when

financial constraints forced banks to reduce their foreign lending.<sup>10</sup> In particular, Giannetti and Laeven (2012) find that binding capital requirements explain banks' flight home episodes in the corporate loan market. In our case, many banks, especially from crisis hit countries, reoriented their CRE lending towards the home market. However, we do not find enough evidence that core Tier 1 capital ratios, widely regarded as a proxy for binding capital requirements, played a significant role in the rebalancing of CRE lending toward the home country.

We also observe that among the group of banks from the safe region, banks with low funding costs and well capitalized (high core Tier 1 ratios) were more likely to rebalance their CRE loan exposures towards the safe region. This is in contrast with our result that the rebalancing of CRE loans towards the GICIPS region was more likely for undercapitalized banks and facing higher funding costs, which suggests that both the core Tier 1 ratio and the bank's access to and cost of funding appear to be important determinants of the strategy to rebalance CRE lending towards the safer or the riskier EU region.<sup>11</sup>

It is possible that the rebalancing of CRE loans towards the GICIPS region is akin to a strategy of risk-shifting by financially fragile banks from the safe region. However, careful analysis shows that such behavior applies to geography but not to the type of assets. In other words, it is not possible to assert that banks following this strategy redirected their lending towards riskier borrowers. The fact is that many of these banks were already exposed to the government debt from GICIPS countries, and despite their fragile financial condition, they chose to increase their commercial mortgage exposures in GICIPS countries. Since these banks from the safe region were undercapitalized and had relatively higher funding costs, they might have experienced trouble competing for business in the safe region, and rationally decided to rebalance towards the CRE markets in GICIPS, where the chances of achieving higher absolute returns were higher.

Acharya and Steffen (2015) also found evidence of risk-shifting in the case of sovereign debt. The asset substitution hypothesis pioneered by Jensen and Meckling (1976) and Myers (1977) suggests that managers of companies can increase the value of shareholders' equity by raising

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<sup>10</sup> De Haas and Van Horen (2013) examined the cross border syndicated lending after the collapse of Lehman Brothers and find that banks reduced their credit by less to markets which were geographically close.

<sup>11</sup> Several papers have examined cross-border lending during the sovereign crisis and how it related to funding costs. For example, Bocola (2015), De Marco (2014) and Acharya et al. (2015) find that the credit squeeze of the corporate sector was in part motivated by poor funding capacity of the banks with large exposures to European countries' risky sovereign bonds.

the risk of the firm's assets, especially when there is a meaningful probability of default. Such behavior cannot be disconfirmed by more financially fragile banks (less regulatory capital) during the Euro Area crisis.<sup>12</sup>

Lastly, we observe that households' leverage in the GICIPS countries appears to have played an important role in the tightening of credit in CRE. However, such negative effect seems specific to the GICIPS countries, and not safer Euro Area countries. In the latter case, the more levered the households were, the less the banks performed risky lending and the more the banks engaged in flight-to-safety, a substitution effect consistent with risk management.

The rest of this paper is organized as follows: In Section 2, we first describe the European CRE markets, and introduce the data used in the paper, together with a brief description of the evolution of cross-border CRE lending at the heart of the Euro Area crisis. Section 3 provides the metrics characterizing the different rebalancing strategies of a bank: flight-to-safety (FTQ), flight-home (FH) and risky-lending (RL), and provides estimates for the intensities and correlations of such behaviors across the different European regions. Section 4 focuses on the determinants of flight-to-safety (FTQ), flight-home (FH) and risky-lending (RL), and relates the findings to existing results in the literature. Section 5 concludes.

## **2. European CRE Markets and the Sovereign Crisis**

We start by highlighting three important facts that motivate our analysis. First, CRE markets in European Union (EU) countries depend, to a large extent, on foreign investment, both from other EU countries – henceforth “EU-member” – and from outside the EU – henceforth “non-EU-member”. According to the European Systemic Risk Board's (ESRB) report of December 2015, in Portugal, combined investment by foreign EU-member and non-EU-member countries accounted for 60 per cent of the total between 2006 and 2015. In Spain that figure was 50 per cent, and in countries such as Germany, France, Italy, Austria, and The Netherlands, the figure was between 40 and 46 per cent. The share of foreign investors from the EU was lower in

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<sup>12</sup> The risk-shifting incentive occurs when firms' debt is underwater in some states. Risky investments that increase the volatility of the assets' cash flows also increase the value of the equity, which is a call option on the assets of the firm. The evidence of risk shifting is weak. For example, Andrade and Kaplan (1998) find no evidence that financially troubled firms engage in risk shifting. Kroszner and Strahan (1996) find that insolvent savings and loan institutions have increased dividends to their shareholders, but the payouts are positively correlated with the financial condition of the institution.

Ireland, around 30 per cent. In Eastern EU countries, that share of foreign investors from the EU was significantly larger, ranging from 70 per cent in Estonia, to approximately 90 percent in Poland, Romania and Hungary. These figures show the importance of cross-border lending in CRE.

European CRE markets, unlike in the United States, are dominated by commercial banks.<sup>13</sup> Also, CRE markets seem to have different narratives across European countries. For example, outstanding CRE loans in Spain dropped from more than €400 million at the beginning of 2010 to €160 million at the end of 2013, a number last seen in 2003, while in Germany, during the same period, outstanding CRE loans barely changed from €250, a level not different from that in 2003.<sup>14</sup> In Italy, on the other hand, the crisis does not seem to have changed the upward trend in outstanding CRE loans, which grew from €71million in 2009 to €87 in 2013.<sup>15</sup> Shrieves, Dahl and Spivey (2010) attribute the differences to national institutions – cultural, legal and regulatory – which seem to impact domestic banks’ capitalization and lending.

These facts – that European CRE markets have a large presence of foreign investors and are primarily financed by banks, and that these markets tell very different stories, combined with the importance that investment in commercial real estate has on national spending, make the Euro Area sovereign debt crisis an episode worth analyzing. We wish to understand how European banks rebalanced their CRE loan portfolios across Europe using information gathered from European banks’ stress tests realized at the end of 2009 and end of 2013, right before and after the worst period of the Euro Area debt crisis of 2010-2013, characterized by severe economic recession and weak public finances, especially in GICIPS. This can be seen by looking at Figure 1, which illustrates the evolution of the 10-year government bond interest rates for the five GICIPS countries.

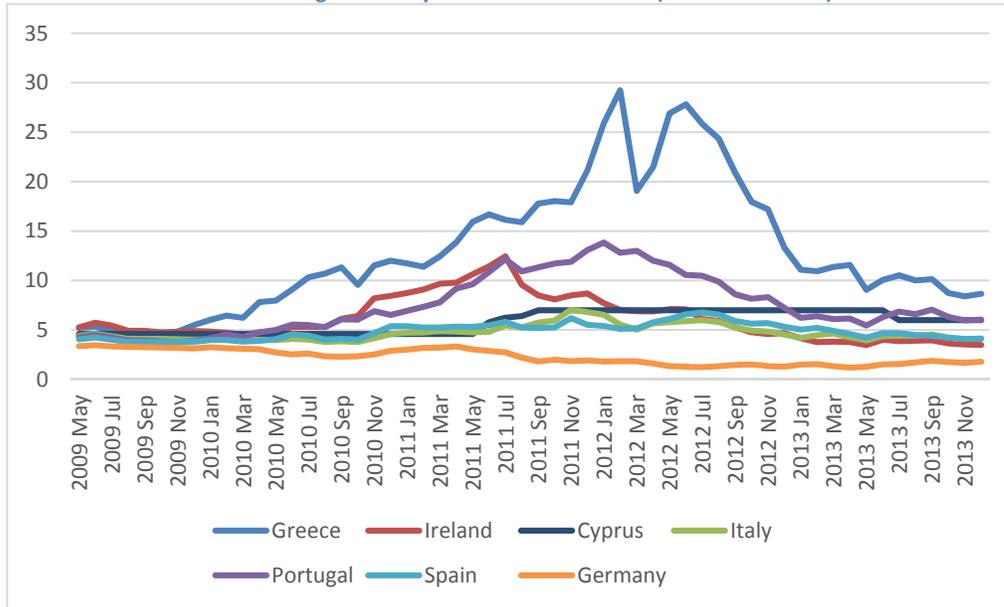
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<sup>13</sup> See ESRB, based on EBA 2014 EU-wide stress test, EIOPA, ECB and CRE questionnaire.

<sup>14</sup> Evidence gathered from the commercial real estate rental markets confirms this finding. During the crisis, funds for real estate investment flowed from GICIPS countries, such as Spain, to safe countries such as Germany. For example, between 2008 and 2013 the office prime market rents in Madrid, Spain, dropped by 40 per cent, whereas in Munich, Germany, these rents went up by 11.6 per cent.

<sup>15</sup> See Hypostat (2014), based on European Mortgage Federation National Experts, National Central Banks, and Federal Reserve. Amounts are in EUR millions.

Figure 1. 10-year bond interest rate (GICIPS countries)



Source: ECB. This figure illustrates the 10-years (long) term interest rates (in basis points) of Greek, Irish, Cypriot, Italian, Portuguese, Spanish and German sovereign bonds.

## 2.1. Granular Data on EU Banks’ Balance Sheets from the EBA’s Stress Tests

The 2015 European Systemic Risk Board’s (ESRB) report on Commercial Real Estate recognized that the lack of data was a serious problem to perform a reliable analysis of European CRE markets. Gaps include missing data on prices and volume, both for physical stocks and investment/divestment flows in CRE, exposures by financial institutions and investors, the type and level of risk of the financing provided by financial institutions and investors (lending standards, investment strategy, risk appetite, etc.), as well as the financial condition of “property borrowers” (leverage, etc.). Data gathered by private data providers<sup>16</sup> offers a very incomplete picture of just a few segments of the national markets and no reliable data on international investments. The 2015 ESRB report concludes that better data is needed in order to have a good assessment of the financial system’s exposure to CRE loans.

The European Banking Authority’s (EBA) stress tests offer a rare opportunity to take a closer examination of the European bank’s exposures, despite the fact that by being less frequent, stress tests cannot provide intense and timely monitoring by banks’ supervisory authorities.

<sup>16</sup> For example, Private providers such as Morgan Stanley Capital International (MSCI, which acquired Investment Property Databank (IPD)), Jones Lang LaSalle (JLL), Cushman & Wakefield (formerly DTZ) and CBRE.

To ensure transparency, the stress tests include full disclosure of all the capital components under baseline and adverse scenarios. For our study, we are only interested in the real baseline data, not in data generated from hypothetical simulations. We use the banks' names as identifiers to match the information in 2009 and in 2013. The stress tests were conducted at the consolidated level (bank group level), so they do not treat subsidiaries of banks in the European Economic Area as separate banks. We believe that if local bank subsidiaries were treated separately, our estimates of the credit squeeze would be significantly bigger, since, as pointed out by De Hass and Van Lelyveld (2014), in a crisis, multinational bank subsidiaries slow down credit growth almost three times more than domestic banks.

Our 69 banks are located in 21 European countries: Austria, Belgium, Cyprus, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Hungary, Ireland, Italy, Luxemburg, Malta, the Netherlands, Norway, Poland, Portugal, Sweden, and Slovenia. These banks do business in their own markets as well as abroad, and the data includes 32 foreign countries.

Of these 69 banks, 5 were rescued and nationalized between 2010 and 2013. We have decided to remove them from our analysis because their change of status occurred between the two dates that we use to contrast banks' exposures. On the other hand, banks nationalized prior to the end of 2009 and which were kept under government control between end-2009 and end-2013, such as Allied Irish Bank, Bank of Ireland, ABN Amro, Royal Bank of Scotland and Lloyds, were included in the analysis.

Our database has information about individual bank's finances, such as equity, debt, deposits, credit risk, loan losses, and loan provisions, as well as information on banks' exposures by loan type and geography. Information on banks' exposures in their domestic market, allows us to examine whether banks have taken the action labeled "flight-home" or not, and how banks with their main headquarters in an EU crisis country (GICIPS) reacted in contrast to banks with their headquarters in countries which survived the EU crisis. In total, our data has 146,944 observations, including banks, markets, types of loans for the two relevant dates, end-2009 and end-2013.

In addition, we augmented the database with fundamental macroeconomic variables, such as the difference in GDP growth rates between the bank’s home country and a foreign country. In Section 4 we detail how we generated these variables.

## 2.2. European risky and safe countries

Since our banks come from and do business in countries with very different situations, we sorted these countries/markets into six groups. Sorting and aggregating help reduce noise and also yield results in a more concise way. Table 1 sorts countries in 6 groups: A, B1, B2, C1, C2, D. The stress tests cover banks from regions A to C2. Region D is important as a destination of loans from banks homed in regions A to C2. For the sake of exposition, most of our discussion will focus on groups A (Euro Area safe countries) and B1 (GICIPS), which in our view are the more relevant groups both in terms of EU financial implications and in terms of cross-border bank lending behavior within the European monetary union. The main differences between groups A and B1 are in economic performance and public finances.

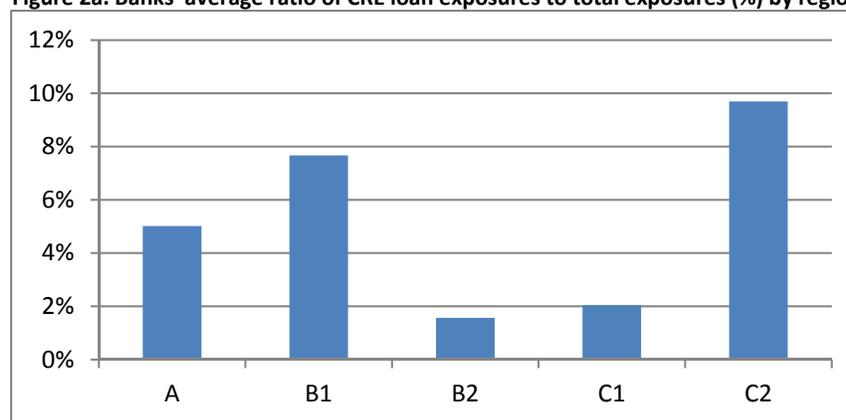
**Table 1 – Regions (Origin and Destination)**

<b>Group A</b>	<b>Group B1</b>	<b>Group B2</b>	<b>Group C1</b>	<b>Group C2</b>	<b>Group D</b>
Euro Area safe countries	(GICIPS) Euro Area crisis-hit countries	Euro Area Eastern European countries	Non-Euro Area Eastern European small countries	Non-Euro Area Western European countries	Non-European countries
Austria Belgium France Germany Netherlands Finland Luxemburg	Greece Ireland Cyprus Italy Portugal Spain	Estonia Latvia Lithuania Slovakia Slovenia	Bulgaria Czech Republic Hungary Poland Romania	Denmark Iceland Liechtenstein Norway Sweden United Kingdom	Japan United States

### 2.3. European banks' exposures to CRE during the EU crisis

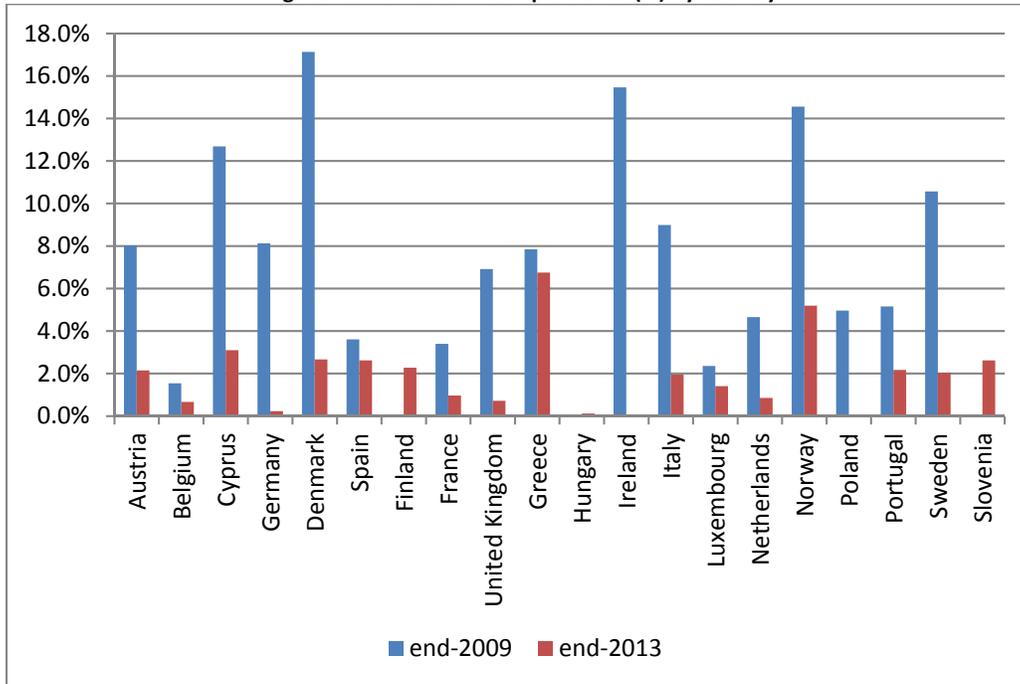
Figure 2a shows that the average ratio of CRE loan exposures to total exposures is higher for B1-banks than for A-banks (7.6% and 5%, respectively). B1-banks' CRE loan exposures were between 0.9% and 19% of the total exposures at the end of 2009, whereas for A-banks these percentages were between 0.7% and 19.5%. Figure 2b reveals that, with the exception of Finish, Hungarian and Slovenian banks, banks in all other European countries have rebalanced their portfolio loan exposures away from CRE mortgages between end-2009 and end-2013. Banks in Denmark, Norway, Sweden, Ireland and Cyprus had in 2009 CRE loan exposures to total exposures above 10%. Although the banks from all these countries reduced their exposures significantly between 2009 and 2013, none did it so drastically as Irish banks.<sup>17</sup> Surprisingly, banks from Greece and Spain reduced their CRE exposures much less than the majority of the banks from the safe A-countries.

Figure 2a. Banks' average ratio of CRE loan exposures to total exposures (%) by region



<sup>17</sup> The three Nordic European countries are not part of the Euro Area.

Figure 2b. Banks' CRE loan portfolios (%) by country



Looking at the average of total exposures to B1-sovereign debt in absolute terms (million EUR), Figure 3a shows that B1-banks were far more exposed (in absolute terms) than A-banks by the end of 2009. Figure 3b reveals that the share of sovereign debt in banks' portfolios in all countries increased during the crisis, a fact already pointed out before. For example, German banks' sovereign debt exposures increased from 19% to 69% of the total banks' loan portfolios, and Spanish banks increased from 12% to 51%.

Figure 3a. Sovereign exposures to B1-countries by bank's origin in million EUR

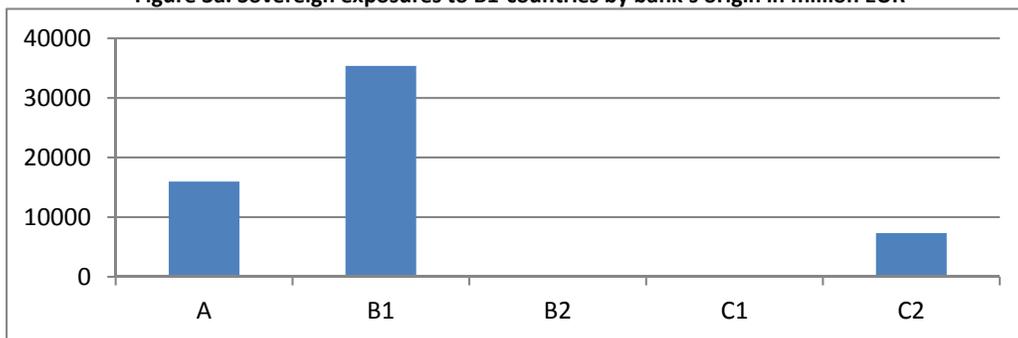
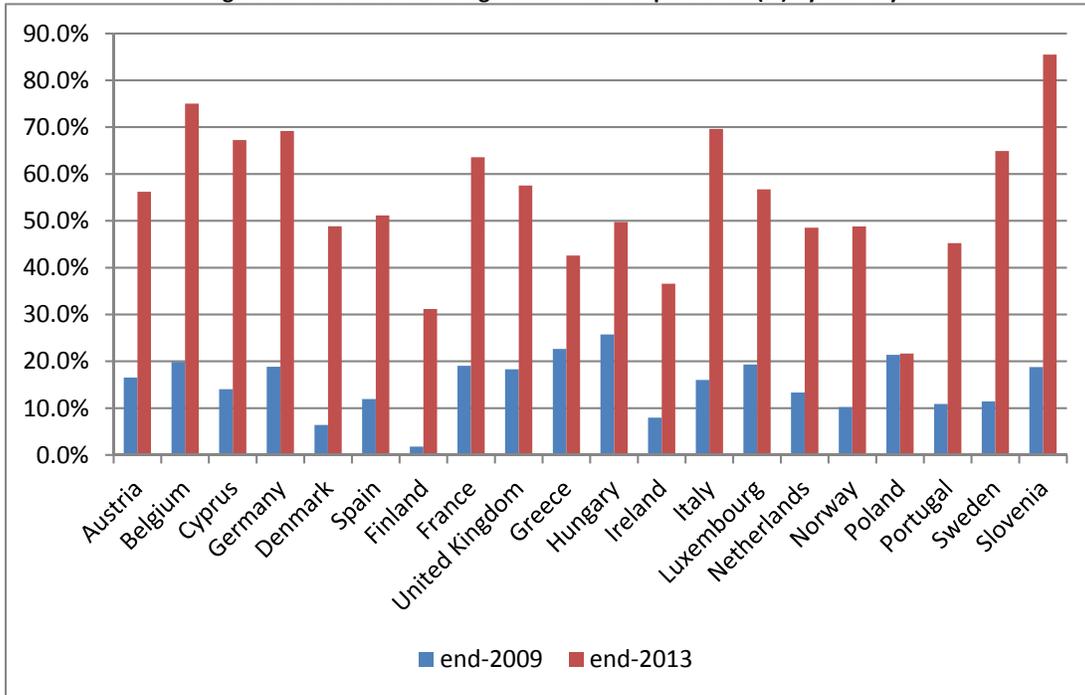
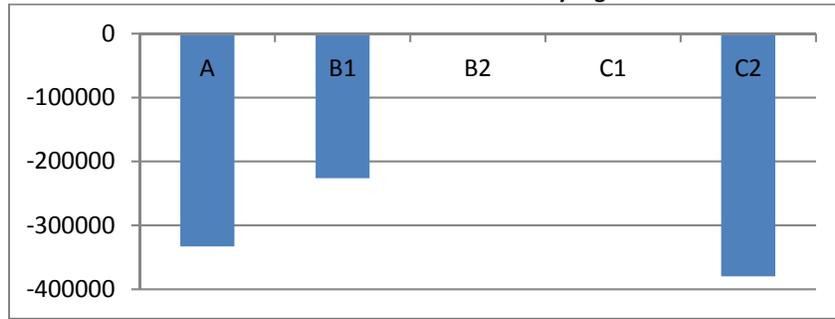


Figure 3b. Shares of sovereign debt in banks' portfolios (%) by country



We also find that banks' portfolio rebalancing occurred in a context of a generalized credit squeeze that affected all types of loans. The total credit squeeze was close to €1 trillion. The credit squeeze in cross-border CRE lending was more than €0.94 trillion, as illustrated in Figure 4. B1 banks' CRE exposures in the B1 region decreased more than €69bn. On the other hand, banks from countries other than the B1 region reduced their CRE exposures in the B1 region by more than €42bn. Thus, the credit squeeze in CRE lending in the B1 region was bigger than €10bn. This contrasts with a decrease of all banks' CRE exposures in the A region of €280bn, an amount significantly higher than the CRE credit squeeze in the economically smaller B1 region. Finally, it is interesting to see that the decline in B1 banks' exposures to all regions was smaller than the decline in A banks' exposures, being these reductions €26 bn and €33bn, respectively. Since the size of the different regions varies, we will report the results on portfolio rebalancing by shares rather than in euro amounts.

Figure 4. Change in banks portfolio CRE exposures (EUR million) between end-2009 and end-2013 by regions



### 3. Banks' rebalancing strategies: Flight-to-quality, flight-home and risky-lending

Banks make numerous portfolio decisions that are complex and often hard to discern. As mainstream financial intermediaries, banks operate in many different markets, transact in an array of products and deal with many counterparties. However, the need for a simple taxonomy is necessary to make sense of bank's choices. In this paper we focus on bank's portfolio allocation strategies that broadly fall into three different categories: Flight-to-quality (henceforth FTQ), flight home (henceforth FH) and risky lending (henceforth RL). Since we are interested in comparing the behavior of different banks in cross-border CRE lending, we restrict our analysis to actions pertaining to different geographical areas. This choice is obviously subjective and simplistic. For example, a bank can increase its risky lending in a safer region; and, conversely, another bank can reduce its exposure in a region under pressure by cutting off loans to the riskier debtors and investing in Treasuries. We chose this approach because it highlights the effects of the Euro Area crisis of 2010-2013 on regions that were deemed to be part of a currency union, in a single and supposedly unified market, where people, goods and capital flow without barriers. What the crisis has most patently shown is that CRE markets remain very fragmented and banks continue to be mostly national (i.e., regional).

In order to define what we mean by flight-to-quality (FTQ), flight-home (FH) and risky lending (RL), let us denote by  $L_{i,CRE}^j$  as the outstanding gross exposure in CRE loans that bank  $j$  has in country  $i$ . As argued before, we will focus our analysis on portfolio shares, rather than euro amounts, so it is convenient to define bank  $j$ 's share of CRE loans in country  $i$  with respect to its total loan portfolio. In our database, the total portfolio, which consists of different investments  $\theta$ ,

includes Treasury bills and bonds, residential mortgages, commercial real estate mortgages, loans to companies, and loans to other financial institutions.<sup>18</sup>

For a given time  $t$ , the metric we use is written as follows:

$$\pi_{i,CRE,t}^j = \frac{L_{i,CRE,t}^j}{\sum_{\theta} \sum_i L_{i,\theta,t}^j}$$

We denote by  $FTQ_{i,CRE}^j$  the FTQ dummy variable that equals 1 when  $\pi_{i,CRE,t+1}^j > \pi_{i,CRE,t}^j$ , where  $i \in \{A \cup C2 \cup D\}$ . Time  $t$  equals the end-of 2009, and time  $t+1$  to the end of 2013. These two dates correspond to the dates of the stress tests' baseline data, which involved 64 banks. For FTQ, the letter  $i$  includes the group of A countries {Austria, Belgium, France, Germany, Netherlands, Finland and Luxembourg}, the group C2 of countries {Denmark, Iceland, Liechtenstein, Norway, Sweden and the United Kingdom}, and the group of D countries {USA and Japan}. Recall that during 2010-2013 these countries were not involved in the Euro Area crisis.<sup>19</sup> The USA has had its financial crisis in 2008-2009, but by 2010 the worst had been over.

More succinctly, for a (bank  $j$ , country  $i$ )–pair with {bank  $j$ 's home country  $\neq i$ },  $FTQ_{i,CRE}^j = 1$  if  $\pi_{i,CRE,t+1}^j > \pi_{i,CRE,t}^j$  and  $i \in \{A \cup C2 \cup D\}$ . In other words, FTQ means simply that a bank rebalanced its CRE loan portfolio towards a “safe” country (other than its home market, if the bank's home country is “safe”).

Similarly, we write the corresponding definition for risky lending, RL, as follows: for a (bank  $j$ , country  $i$ )–pair with {bank  $j$ 's home country  $\neq i$ },  $RL_{i,CRE}^j = 1$  if  $\pi_{i,CRE,t+1}^j > \pi_{i,CRE,t}^j$  and  $i \in \{B1\}$ . In this case,  $i$  includes the group of the so called GICIPS countries {Greece, Ireland, Cyprus, Italy, Portugal and Spain}.

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<sup>18</sup> Unfortunately, our database does not contain information about consumer loans.

<sup>19</sup> We did not include B2-countries and C1-countries in our definition of “safe” region because some of their members had episodes characteristic of a banking crisis and their markets were perceived by investors as emerging. For example, Hungary suffered a sovereign debt crisis in June 2010 (the credit default swaps on Hungarian debt jumped 83 basis points to 393bp; by way of comparison, Portugal and Greece were around 376 and 787 at that time).

And for flight home, FH, we write the corresponding definition as follows: for a (bank  $j$ , country  $j$ )–pair with {bank  $j$ 's home country= $j$ },  $FH_{i,CRE}^j = 1$  if  $\pi_{i,CRE,t+1}^j > \pi_{i,CRE,t}^j$ . FH in CRE loans means that the bank rebalanced its CRE loan portfolio towards its home market.

Using the rebalancing strategies FTQ, FH and RL, Figure 5 illustrates the percentage of banks that rebalanced their CRE exposures between 2009 and 2013. For example, for FTQ by banks from the A region, we count the number of pairs  $(j,i)$  with  $FTQ_{i,CRE}^j = 1$  and  $i \in A$ , and then divide the resulting sum by the total number of banks from region A. The number of banks with headquarters in regions A and B1 are 22 and 24, respectively, after excluding banks which were nationalized.

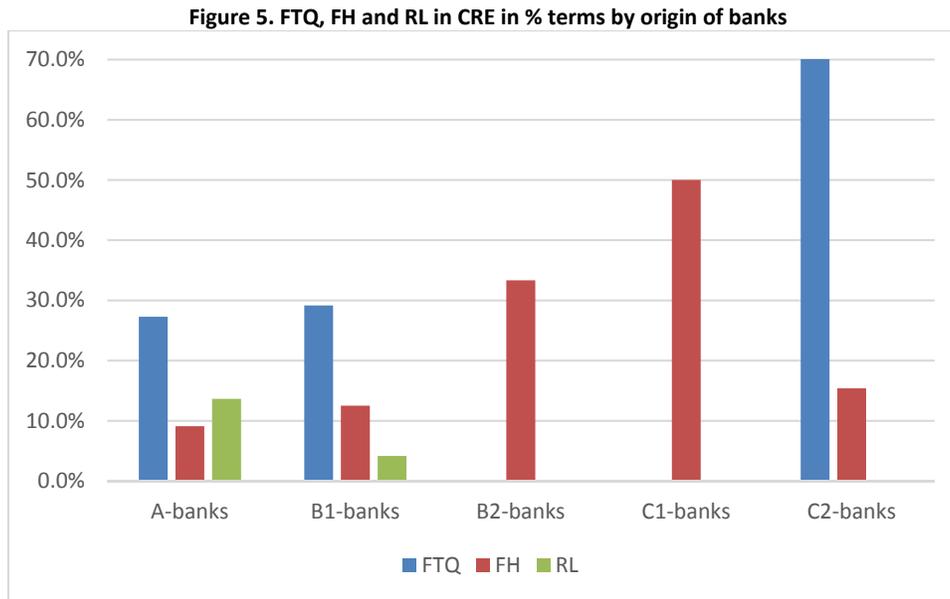


Figure 5 shows that the percentages of banks in regions A and B1 doing FTQ in CRE lending were substantially higher than the percentages corresponding to FH and RL. While the percentages of banks doing FTQ in CRE lending were quite similar in regions A and B1 (around 28% of banks in each of the two regions), the percentages in FH and RL were substantially different between these two regions. In particular, in FH there is a slightly higher percentage of banks doing FH in CRE loans in the B1 region than in the A region (12.5% versus 9%). However, it is hard to draw firm conclusions just by counts of banks. Finally, we also see more RL in CRE loans for A-banks than for B1-banks. On average, 13.6% of A-banks rebalanced their

CRE loan portfolios towards the risky GICIPS region, whereas only 4.2% of B1-banks behaved similarly.

We also considered alternative measures for FTQ, FH and RL, such as net exposures within a region instead of gross exposures. The bank's share of CRE loans in its portfolio is adjusted by offsetting CRE loans within a particular region. To see the impact of the change from gross to net exposures, consider, for example, that French banks in 2009 had 8% of their total loan portfolio in CRE loans in Germany and 5% in Austria - both countries from the A group - and in 2013 the same French banks had 5% in Germany and 8% in Austria. Using the gross measure above we count 1 for Austria and 0 for Germany, since only Austria registered an increase. In the alternative net exposure measure, we would register a 0, because the aggregate change in CRE exposure in region A would be 0.

Under the net exposure definition, we obtain similar conclusions to the definition in gross terms. In particular, we find that, on average, A-banks did less FTQ than B1-banks – being the percentages of banks in each region 4.5% and 8.7%, respectively -, which suggests that some A-banks rebalanced their CRE loans portfolio from one A-country to another A-country (different than the home country), with offsetting positions. For the other two lending strategies, RL and FH, the comparison between A banks and B1-banks in net exposures terms gives similar results as in gross exposures.

Banks can follow different rebalancing strategies across different loan types. For example, it is possible that a bank could reduce its exposure to firms in GICIPS while increasing its exposure to government bonds in that region. Although this appears to be consistent with risk reduction, in terms of the geography of the crisis it is not considered FTQ. To take into account this possibility, we correlated rebalancing in CRE loans across regions with other types of loans such as residential mortgages, loans to financial institutions, loans to firms and sovereign debt. The results, reported in Table 2, show that RL and FH in all other loans have little or negative correlation with CRE loans. However, FTQ in CRE lending is highly correlated with FTQ in other loan types, with a correlation coefficient of 0.74 between FTQ in CRE loans and loans to financial institutions, 0.57 between FTQ in CRE loans and corporate loans, and 0.54 between FTQ in CRE loans and residential mortgages. Also, FTQ in CRE lending seems to be negatively correlated with FH and RL for other loan types, with the highest and lowest correlation

coefficients being 0.21 (for the pair FTQ in CRE lending - FH in CRE lending) and -0.15 (for several pairs of lending behaviors).

**Table 2. FTQ, FH and RL correlations among loan types**

	<b>FTQ Commercial Mortgages</b>	<b>FH Commercial Mortgages</b>	<b>RL Commercial Mortgages</b>
<b>FTQ Financial Institutions</b>	0.74	0.06	-0.06
<b>FTQ Corporations</b>	0.57	0.08	-0.05
<b>FTQ Residential Mortgages</b>	0.54	0.02	0.02
<b>FTQ Commercial Mortgages</b>	1.00	0.21	0.04
<b>FTQ Sovereigns</b>	0.03	-0.25	-0.01
<b>RL Financial Institutions</b>	-0.15	-0.17	0.02
<b>RL Corporations</b>	-0.14	-0.13	-0.08
<b>RL Residential Mortgages</b>	-0.14	-0.16	0.13
<b>RL Commercial Mortgages</b>	0.04	0.08	1.00
<b>RL Sovereigns</b>	-0.15	-0.24	0.10
<b>FH Financial Institutions</b>	-0.03	-0.03	-0.15
<b>FH Corporations</b>	-0.06	-0.05	-0.03
<b>FH Residential Mortgages</b>	-0.15	0.15	0.13
<b>FH Commercial Mortgages</b>	0.21	1.00	0.08
<b>FH Sovereigns</b>	0.14	-0.02	0.08

It is possible that the aggregate correlation coefficients reported in Table 2 differ significantly for banks with headquarters in A and B1 regions. When we disaggregated the sample and separated the banks by their home markets (A and B1), we found that for the subset of A-banks, FH in CRE lending was highly correlated with FTQ in all loan types, except for government debt, with coefficients ranging from 0.45 to 0.82. Also, for A-banks, we found that the correlation between FTQ in CRE lending and FH in CRE lending was quite high, 0.82. This is not surprising if one accepts that for a bank from the A region rebalancing towards another safe country is considered as safe as rebalancing towards home. With respect to the subset of B1 banks, we noticed that the correlation between FH in CRE lending and FH in lending to financial institutions was positive and equal to 0.26.

An important finding from the disaggregation of the sample of banks is that the A banks and the B1 banks behaved very differently in their rebalancing strategies of CRE loans. Table 3 shows that the pairs (FTQ, FH), (FTQ, RL) and (FH, RL), all in terms of CRE lending, have a positive correlation coefficient for the group of A banks (0.82, 0.18 and 0.34, respectively), whereas the corresponding coefficients are negative for the group of B1 banks (-0.18, -0.10 and -0.08, respectively). This result says that B1 banks that rebalanced towards the safe region were less likely to rebalance towards home or the GICIPS region, and A banks that rebalanced towards the GICIPS region were more likely to rebalance towards home or the safe region. In the next section, we will complement this result with the identification of the characteristics of those banks that increased their likelihood of doing FTQ, FH and RL.

**Table 3. Correlations between FTQ, FH and RL pairs for CRE loan type**

	All banks (64)	Only A banks (22)	Only B1 banks (24)
Correlation( $FTQ_{i,CRE}^j, FH_{i,CRE}^j$ )	0.21	0.82	-0.18
Correlation ( $FTQ_{i,CRE}^j, RL_{i,CRE}^j$ )	0.04	0.18	-0.10
Correlation ( $RL_{i,CRE}^j, FH_{i,CRE}^j$ )	0.28	0.34	-0.08

In sum, the results of this section seem to indicate that there was an important fragmentation of the market of CRE cross-border loans during the Euro Area crisis. This fragmentation is visible from A banks rebalancing towards RL in CRE, and B1-banks rebalancing towards FH. In addition, both the A and B1 regions exhibited similar high levels of FTQ, contributing to amplify the funding gap between the A region (Safe) and the B1 region (GICIPS). Also, within the B1 region we observe even further segmentation, with banks that rebalanced towards FTQ being less likely to rebalance towards RL or FH, respectively.

#### **4. Determinants of Banks' CRE Loan Portfolio Rebalancing**

In this section we estimate the determinants of banks' rebalancing their CRE mortgage loans, whether towards safer regions (flight-to-quality), towards their domestic markets (flight-home) or towards GICIPS (risk-lending). We begin our analysis by shedding some light on the importance of two variables to banks' lending decisions: Funding costs and Core Tier 1 ratios. We then describe the covariates used in the regressions. After reporting the coefficients and

statistical significance, we attempt to interpret the findings by resorting to existing theoretical hypotheses.

#### 4.1. Funding cost and Core Tier 1 ratio

Banks access funds at a cost to invest in securities. In periods of financial stress, banks' funding costs go up as reflected by the TED spread, the difference between the interest rates on interbank loans and on short-term government debt. The cost and the ability to access liquidity by banks are important determinants of banks' portfolio strategies and in extreme cases ascertain whether they are able to weather the storm.<sup>20</sup> For our sample of banks, we obtain information on funding cost at the bank level from the EBA's end-2009 stress test. We construct a dummy variable ( $\mathbb{1}_{funding\_cost}$ ) that takes a value equal to 1 if the bank's funding cost is above the average funding cost of our sample of banks, and 0 otherwise. When  $\mathbb{1}_{funding\_cost} = 0$ , we consider that a bank has (in relative terms) low funding cost.

For each lending strategy, we then look at the percentage of banks with low funding cost with  $FTQ_{i,CRE}^j = 1$ ,  $FH_{i,CRE}^j = 1$  and  $RL_{i,CRE}^j = 1$ . Table 4 shows that the majority of banks that engaged in  $FTQ_{i,CRE}^j$  were banks from the A and B1 regions with low funding costs. The majority of banks that engaged in  $FH_{i,CRE}^j$  were from the B1 region. Interestingly, banks that engaged in  $RL_{i,CRE}^j$  had low funding costs when they were from the B1 region, but high funding costs if they were from the A region.

The EBA's stress tests also provide baseline information on banks' core Tier 1 capital ratios at the end of 2009. This measure captures a bank's financial strength from the regulators' point of view.<sup>21</sup> This variable is commonly used in the literature that looks at carry trade incentives during the EU crisis.<sup>22</sup> We construct a dummy variable ( $\mathbb{1}_{core\_Tier\_1}$ ) that takes the value 1 if the bank has a core Tier 1 ratio above the average of core Tier 1 ratios of the banks in our sample, and 0 otherwise. When  $\mathbb{1}_{core\_Tier\_1}=0$ , we consider that the bank is undercapitalized. In Table 4 we report the percentages of undercapitalized banks in regions A and B1 for each

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<sup>20</sup> See Brunnermeier and Pedersen (2009), and Liu and Mello (2016).

<sup>21</sup> The Tier 1 capital is composed of common stock and non-redeemable preferred stock. Tier 1 capital ratio compares Tier 1 capital to the bank's risk weighed assets.

<sup>22</sup> See Acharya and Steffen (2015).

lending strategy. For example, the second number in the third column of Table 4 reads as follows: among the banks from the B1 region that did  $FTQ_{i,CRE}^j$ , 86 percent had low funding costs. The results in Table 4 are the following: All banks from the B1 region which did  $FTQ_{i,CRE}^j$  were undercapitalized, whereas the majority of banks from the A region which did  $FTQ_{i,CRE}^j$  (83 per cent) were well capitalized (as shown in Table 4, only 17 per cent of A banks which did  $FTQ_{i,CRE}^j$  were undercapitalized). Among the banks that did  $FH_{i,CRE}^j$ , a significant majority of undercapitalized banks were from region B1. And a majority of banks that did  $RL_{i,CRE}^j$  were undercapitalized, regardless of their origin.

**Table 4**

		Banks with low funding cost	Undercapitalized banks
$FTQ_{i,CRE}^j = 1$	A-region	67%	17%
	B1-region	86%	100%
$FH_{i,CRE}^j = 1$	A-region	50%	50%
	B1-region	67%	67%
$RL_{i,CRE}^j = 1$	A-region	33%	67%
	B1-region	100%	100%

We now proceed to consider additional explanatory variables in order to understand the forces behind banks' lending strategies.

#### **4.2. Regression analysis**

The EBA's stress tests provide unique granular data on European banks' characteristics, including exposures by loan type and geography, total defaulted loans (D), core Tier 1 capital ratio, funding costs, loan provisions and loan losses (also known as non-performing loans), as well as the coverage ratio, or the ratio of a bank borrowers' net operating income to gross debt (the inverse of the debt to EBITDA ratio), which measures borrowers' ability to meet its financial obligations to the bank. We use all these variables as covariates, and transform them into percentages or dummies whenever the original information was given in Euro amounts. For example, we divided both a bank's total defaulted loans and its exposures to GICIPs (Group B1) sovereign debt by the bank's total exposures (the sum of all different loan types), and refer to

these two variables as “Defaulted loans to total exposures” and “B1-sovereign exposures to total exposures”, respectively. Similarly, we divided provisions of a given loan type by the bank’s amount of exposures in this type of loans.

In addition to the bank data, we gathered information about GDP growth rates and 10-year yields on government bonds. We then constructed variables with the difference in GDP growth rates of the bank’s domestic country and a foreign country where the bank had CRE loan exposures – referred to as “Domestic - Foreign GDP growth difference”, and the difference in government bond yields of the bank’s domestic country and the specific foreign country, and refer to this variable as “Domestic - Foreign int-rate difference”.

Residential mortgage loans are the most important debt of households and a significant component of bank assets. To incorporate a proxy measure of household indebtedness, we include data on banks’ residential loan-to-value (LTV) ratio from the EBA’s stress tests. However, since a bank’s LTV ratio varies across European countries, we constructed an index of household indebtedness, by taking the bank’s average of LTV ratios in each region. We labeled this variable as “LTV Region Group”. Many studies have shown a positive correlation between default risk of residential mortgage loans and loan-to-value ratios.<sup>23</sup>

We chose all the above covariates by using end-2009 data. Recall that we computed our dependent variables  $FTQ_{i,CRE}^j$ ,  $FH_{i,CRE}^j$  and  $RL_{i,CRE}^j$  using the data from the stress tests done by the EBA at end-2009 and end-2013. Because the Euro Area crisis got in motion during the first quarter of 2010 (see Figure 1),<sup>24</sup> there is no reason to suggest endogeneity in our tests.

We ran separate logistic econometric models by regressing our categorical dependent variables  $FTQ_{i,CRE}^j$ ,  $FH_{i,CRE}^j$  and  $RL_{i,CRE}^j$  on the independent variables described above (either in percentage or as dummies).<sup>25</sup> We use the logistic distribution because it has larger tails than a normal distribution, and gives a more robust estimation in the case of our volatile data. We report the results from our regressions in Table 5. For the three regressions the standard error is

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<sup>23</sup> See Wong et. al. (2004).

<sup>24</sup> By end-2009, Greece was put on a “negative watch” by rating agencies Fitch and Moody’s, but the country was still Investment Grade. After the rating agencies announcements, the spread on the 10-year Greek government debt, relative to German 10-year government debt, barely blipped, according to Papaconstantinou (2016, page 41).

<sup>25</sup> In the case of the  $FH_{i,CRE}^j$  regression, covariates “Domestic - Foreign GDP growth difference” and “Domestic - Foreign GDP int-rate difference” do not apply because there is no foreign country.

adjusted for 59 clusters. Each regression has 952 observations. We achieve a quite high goodness of fit (pseudo  $R^2$ ) for a logistic model:  $R^2 = 29.88\%$  for the  $FTQ_{i,CRE}^j$  regression,  $R^2 = 17.80\%$  for the  $FH_{i,CRE}^j$  regression and  $R^2 = 41.61\%$  for the  $RL_{i,CRE}^j$  regression. The Wald Chi-Square test's p-values for each of these three regressions confirm that, at an alpha level of 0.01, we reject the null hypothesis that regression coefficients are zero given the rest of the predictors in the model. Thus, we conclude that the regression coefficients are statistically different from zero. In addition, we performed the Hosmer–Lemeshow goodness-of-fit test with 10 groups. For each of the three regressions this test indicates that the multivariate model is a good fit at the standard 0.05 alpha level. The results allow to conclude that the predicted frequency and the observed frequency match closely.

The regression results in Table 5 show that flight home in banks' CRE lending,  $FH_{i,CRE}^j$ , was more likely for banks from the GICIPS countries (B1 region) with relatively lower funding costs (consistent with the results in Section 4.1) and a higher level of provisions for defaulted CRE loans. Flight home in lending by banks is well-documented in the literature. For example, Giannetti and Laeven (2012a, 2012b), studied the global market for syndicated loans, and found that during financial crises banks tend to curtail their activities and prioritize domestic borrowers.<sup>26</sup> These authors find that binding capital requirements explain banks' flight home episodes in the corporate loan market. In our case, we noticed that banks from different regions reoriented their CRE lending towards the home market. However, in our regression we do not find statistical significant evidence that core Tier 1 capital ratios, widely regarded as a proxy for binding capital requirements, played a significant role in the rebalancing of CRE lending toward the home country.<sup>27</sup> According to the findings in Section 4.1 such considerations would apply to banks from the B1 region only.

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<sup>26</sup> Worried about the effect of credit squeezes on unemployment and defaults, domestic governments exert moral suasion and are more willing to provide assistance to local banks, directly supervised by the local Central Bank (whereas local subsidiaries of foreign banks are supervised by the central banks of the origin country), perhaps because local banks have informational advantages with respect to domestic investors, as Van Nieuwerburgh and Veldkamp (2009) claim, or could have strong biases arising from closeness, as pointed out by Grinblatt and Keloharju (2000) and Seasholes and Zhu (2010)).

<sup>27</sup> We find some evidence of in favor of Giannetti and Laeven's hypothesis when looking at the subset of B1-banks, which from our previous analysis we know they engaged in substantially more flight home than A-banks. For this subset of banks, we find that 66% of these banks doing FH had a core Tier 1 ratio below average (undercapitalized). However, this result is only specific to a subset of banks and cannot be regarded as conclusive.

Table 5

Variable	Flight-to-Quality			Flight Home			Risky Lending		
	Coef.	P>z	Robust Std. Err.	Coef.	P>z	Robust Std. Err.	Coef.	P>z	Robust Std. Err.
<b>BANK'S EXPOSURES, CREDIT RISK, P&amp;L</b>									
Core Tier 1 ratio	-0.330	*	0.176	0.190		0.126	-0.587	***	0.090
Funding costs	-1.256	**	0.520	-2.379	***	0.010	3.076	***	1.092
Defaulted loans to total exposures	-0.036		0.417	0.225		0.471	-2.359	***	0.607
B1-bond exposures to total exposures	-0.235		0.187	0.027		0.819	0.699	***	0.130
Coverage ratio CRE loans	0.136	***	0.033	-0.037		0.297	-0.074	**	0.037
Provisions non-defaulted CRE loans	0.104		0.690	0.349		0.288	0.232		0.569
Provisions defaulted CRE loans	-1.288	***	0.442	0.144	***	0.002	0.159	*	0.085
Losses residential CRE	0.644		0.871	-0.241		0.415	-9.755	***	1.216
<b>DUMMIES</b>									
Region A	-0.736		0.709	0.842		0.301	5.556	***	0.969
Region B1	3.702		2.410	5.373	*	0.083	-1.265		2.185
LTV Region A	0.042	**	0.018	0.012		0.284	-0.043	***	0.015
LTV Region B1	-0.057	***	0.020	-0.103	*	0.060	-0.067	***	0.025
<b>HOUSING MACRO FUNDAMENTALS</b>									
Dom-Foreign GDP growth difference	-0.269		0.179	n.a.	n.a.	n.a.	0.238		0.173
Dom-Foreign int rate difference	2.128	***	0.628	n.a.	n.a.	n.a.	0.143	***	0.047
Constant	0.273		2.202	-4.887	**	0.045	-6.817	***	1.648
Coefficients from logistic regression: D means "defaulted exposures", T means "total exposures", GDP means Gross Domestic Product, and LTV means Loan-to-Value. *** Significant at the 1 percent level; ** Significant at the 5 percent level; * Significant at the 10 percent level. Standard error adjusted for 58 clusters in bank.									

Our regression for  $FTQ_{i,CRE}^j$  shows that undercapitalized banks with low funding costs were more likely to rebalance CRE lending towards the safe region. These banks had access to funds at relatively low cost, although they had low Tier 1 capital ratios. These results confirm those in Table 4, except in the case of banks from region A which engaged in  $FTQ_{i,CRE}^j$ , where the majority had Tier 1 capital ratio above average. Because the coefficient of the dummy variable “Region A” is positive and statistically significant in the  $FTQ_{i,CRE}^j$  regression, we can reasonably

conclude that low funding costs, and not low capital ratios, played a determinant role in banks' strategies to rebalance their CRE loan portfolios towards the safe region.

Banks with higher CRE debt coverage ratio more likely rebalanced towards the safe region (i.e.,  $FTQ_{i,CRE}^j$ ), suggesting that the CRE mortgage borrowers of these banks had higher levels of income to service their bank debts. The regression also shows that cross border CRE lending was more likely towards countries exhibiting lower interest rates. We performed an additional test to check whether banks from the A region were more likely to do  $FTQ_{i,CRE}^j$  towards A countries with lower interest rate than their own home interest rate, and found strong support for this hypothesis.

Recall that bank's risky lending in CRE (i.e.,  $RL_{i,CRE}^j$ ) is associated with rebalancing of the portfolio of CRE mortgage towards the GICIPS group. First, the banks engaging in such a lending strategy were also more exposed to sovereign debt from the GICIPS group. Table 2 in Section 3 confirms this regression result, given the positive correlation between  $RL_{i,sovereigns}^j$  and  $RL_{i,CRE}^j$ , and the negative correlation between  $RL_{i,sovereigns}^j$  and  $FTQ_{i,CRE}^j$ . Also, it appears that  $RL_{i,CRE}^j$  behavior is more prevalent among banks in the A region with low regulatory core Tier 1 capital ratios (undercapitalized) and high funding costs (consistent with Table 4). These banks were likely to be viewed as financially weak by the regulators and the interbank markets. Finally, we find that the banks more likely to rebalance their CRE lending towards the GICIPS had: (i) small losses and less defaults in CRE mortgage portfolios, but (ii) low coverage ratios in performing CRE loans, an indicator that their CRE mortgage borrowers had low levels of income to interest expenses.

Interestingly, the result that banks from the safer A-region are likely to engage more in  $RL_{j,CRE}^i$  than banks from the GICIPS group (see coefficients of dummy variables "Region A " and "Region B1") is also consistent with our previous finding in Section 3 that A banks engaged more in CRE loan rebalancing towards GICIPS than B1 banks. To see better what this means, think about a GICIPS country, say Spain. Then the results show that banks from Austria, Belgium, France, Germany, The Netherlands, Finland and Luxemburg (A-region), rebalanced their portfolios (in shares) more towards Spain ( $RL_{Spain,CRE}^j$ ) than banks from Greece, Italy,

Ireland and Portugal. Note that Spain is not part of  $RL_{Spain,CRE}^j$ , because the rebalancing towards Spain by Spanish banks is captured in  $FH_{Spain,CRE}^{Spanish\ banks}$ .

What could possibly explain the relatively more aggressive rebalancing of banks from the A group? Table 6 shows that banks from the A region had, on average, higher funding costs than banks from the GICIPS group, at the end of 2009, right before the Eurozone crisis got into motion. Table 7 shows that banks from the A region had, on average, higher core Tier 1 ratios than banks from the GICIPS group. However, the standard deviation for this variable is higher in region A (4.5%) than in the GICIPS (1.92%), suggesting a higher variation in regulatory capital within the A region.

**Table 6**

<b>Summary of bank funding cost (bps) in end-2009</b>		
<b>Region</b>	<b>Mean</b>	<b>Std. Dev.</b>
<b>A</b>	212	58
<b>B1</b>	169	42
<b>B2</b>	191	46
<b>C1</b>	320	50
<b>C2</b>	149	54

**Table 7**

<b>Summary of Tier 1 ratio (%) in end-2009</b>		
<b>Region</b>	<b>Mean</b>	<b>Std. Dev.</b>
<b>A</b>	10.19%	4.49%
<b>B1</b>	7.85%	1.92%
<b>B2</b>	7.50%	2.28%
<b>C1</b>	12.07%	0.25%
<b>C2</b>	9.95%	1.32%

Tables 6 and 7 complement Table 4, and together suggest that at the end of 2009 there were banks from the A region with higher funding cost and lower core Tier 1 ratios than banks in the B1 region. These banks had a higher likelihood of engaging in  $RL_{j,CRE}^i$ . The additional piece of evidence, together with the result from the regression, supports the view that financially fragile banks, defined by a low core Tier 1 capital ratio, high funding costs, high exposures to GICIPS sovereign debt and a low coverage ratio in CRE loans, mostly from the safe region A, were more

likely rebalanced their CRE lending towards the GICIPS group. We conjecture that these banks experienced difficulty in competing in the safer A region and therefore decided to generate business with better returns in the GICIPS region.

In Europe, the largest debt of many families is a home mortgage, and banks are the major lenders to home buyers. Many studies have found a positive correlation between default risk of residential mortgage loans and loan-to-value ratios. To account for household indebtedness, we use data on bank's residential loan-to-value (LTV) ratio from the EBA's stress tests. The results from the regressions show that a bank is more likely to do both  $FTQ_{j,CRE}^i$  and  $RL_{j,CRE}^i$  the lower is its LTV in the B1 region, a fact that seems consistent with the view that banks engage in more cross-border lending the less expose they were to the risky region.

We also find that a bank does more  $FTQ_{j,CRE}^i$  and less  $RL_{j,CRE}^i$  when its LTV in the A region is high. Perhaps this is because of a greater borrowing capacity by households in the A region, and a substitution in the rebalancing of  $RL_{j,CRE}^i$  for  $FTQ_{j,CRE}^i$ . Such substitution effect is indistinguishable from active risk management on the part of the banks, given the risk associated with the GICIPS countries. The result reinforces the argument of a significant credit squeeze in CRE lending in the GICIPS.

## 5. Conclusions

This paper looks at a widely perceived but rarely researched segment of the 2010-2013 Euro Area debt crisis, the market for Commercial Real Estate (CRE) loans. Its main focus is the behavior of European banks. Specifically, how banks rebalanced CRE lending during the crisis. We use data from various sources, with the most important the results of the stress tests conducted at the end of 2009 and end of 2013 by the European Banking Authority (EBA). The tests included the most important banks in every country of the European Union.

We have characterized the banks' behavior in three different categories: CRE lending decisions that are classified as flight-to-safety (FTQ), flight-home (FH) and risky-lending (RL). We contrast the behavior of banks from Euro Area countries not hit by the crisis and Euro Area countries that received assistance by the IMF-ECB-EC (Greece, Ireland, Cyprus, Spain and Portugal) or, alternatively, faced severe financial difficulties (Italy). This group in our study is

denoted as the GICIPS countries. Banks from the GICIPS had higher non-performing CRE loans than the EU average.

The estimated CRE credit squeeze in the Euro Area was almost €1 trillion between end-2009 and end-2013. The Euro Area crisis severely amplified market segmentation of CRE loans. Banks with good funding liquidity from the GICIPS countries mostly rebalanced their CRE loans towards their home markets. Banks from the safe region followed different strategies: undercapitalized banks and with higher funding costs rebalanced their CRE loans towards the GICIPS countries, whereas banks with high core Tier 1 ratios and good funding capacity rebalanced their CRE loans towards the safe region, be that their domestic market or other EU safe countries. When these banks conducted CRE lending abroad, they preferred countries with lower interest rates than their domestic interest rate. These results appears to suggest that the core Tier 1 ratio and funding cost were important determinants in banks choices of CRE exposures.

Our study helps to explain cross-border bank lending during financial crisis in a market poorly understood and scarcely researched. This is all the more astonishing, since the share of the Real Estate industry on the GDP of major countries of the euro is close to 12 per cent. However, our study is still preliminary and rather incomplete. Further research requires that progress is made on filling data gaps, a point stressed in the 2015 European Systemic Risk Board ESRB: “In the medium term, granular and consistent data should be made available to central banks and supervisors to allow a more precise assessment of the financial system’s exposure to CRE and associated risks; similarly, statistical agencies should build a strong data framework to capture broader developments in real estate markets.”

## References

- Acharya, V., Eisert, T., Eufinger, C. and Hirsch, C. (2015), “Real effects of the sovereign debt crises in Europe: evidence from syndicated loans”, unpublished working paper.
- Acharya, V. and Steffen, S. (2015), “The greatest carry trade ever? Understanding Eurozone bank risks”, *Journal of Financial Economics* 115, 215-236.
- Andrade, G. and S.N. Kaplan, (1998), “How costly is financial (not economic) distress? Evidence from highly leveraged transactions that became distressed”, *Journal of Finance* 53, 1443-1493.
- Bocola, L., (2015), “The pass-through of sovereign risk”, *Journal of Political Economy* forthcoming.
- Broner, F., Erce, A., Martin, A. and Ventura, J. (2014), “Sovereign debt markets in turbulent times: creditor discrimination and crowding-out effects”, *Journal of Monetary Economics* 61, 114-142.
- Brunnermeier, M. and L. Pedersen (2009), “Market Liquidity and Funding Liquidity”, *Review of Financial Studies* 22, 2201-2238.
- Campelo, M., and Giambona, E., (2013), “Real assets and capital structure”, *Journal of Financial and Quantitative Analysis* 5, 1333-70.
- Chen, J, Parlour C., and Rajan, U., (2016), “Banks Behaving Badly”, mimeo
- Claessens, S. (2006), “Competitive implications of cross-border banking”, in: Caprio, G., Evanoff,
- De Marco, F. (2014), “Bank lending and the sovereign debt crisis”, unpublished working paper, [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2673967](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2673967)
- De Hass, R. and Van Lelyveld, I. (2014), “Multinational Banks and the Global Financial Crisis: Weathering the Perfect Storm?”, *Journal of Money, Credit and Banking* 46, 333-364.
- De Haas, R. and Van Horen, N. (2013), “Running for the exit? International bank lending during a financial crisis”, *Review of Financial Studies* 26, 244-285.
- European Systemic Risk Board, “Report on commercial real estate and financial stability in the EU”, December (2015)
- Giannetti, M. and Laeven, L. (2012), “The flight home effect: evidence from the syndicated loan market during financial crises”, *Journal of Financial Economics* 104, 23-43.

Grinblatt, M. and Keloharju, M. (2000), “The investment behavior and performance of various investor types: a study of Finland’s unique data set”, *Journal of Financial Economics* 55, 43-67.

Ivashina, V. and Scharfstein, D. (2010), “Bank lending during the financial crisis of 2008”, *Journal of Financial Economics* 97, 319-338.

Jensen, M. C. and W. H. Meckling (1976), “Theory of the firm: Managerial behavior, agency costs and ownership structure”, *Journal of Financial Economics* 3, 305-360.

Kroszner, R. S. and P. E. Strahan (1996), “Regulatory Incentives and the Thrift Crisis: Dividends, Mutual-to-Stock Conversions, and Financial Distress”, *Journal of Finance* 51, 1285-1320.

Liu, X., and A. Mello (2016), “The Creditor Channel of Liquidity Crises”, forthcoming in *Journal of Money, Credit and Banking*.

Myers, S.C. (1977), “Determinants of corporate borrowing”, *Journal of Financial Economics* 5, 147–175.

Nelson, T., Potter. T. and Wilde, H., (2000), "Real estate assets on corporate balance sheets", *Journal of Corporate Real Estate*. 2, 29 – 40.

Papaconstantinou, G. (2016), “Game over: The inside story of the Greek crisis”, Lexington, KY.

Seasholes, M. and Zhu, N. (2010), “Individual investors and local bias”, *Journal of Finance* 65, 1987-2010.

Shimizu, C., “What is commercial property? Concepts and classifications”, Workshop on the Handbook on Commercial Property Price Indicators, Frankfurt, September 2014.

Shin, H. S. (2012), “The Euro crisis through the lens of capital flow reversals”, unpublished lecture, Boston College, December 4, 2012.

Shrieves, R. E., Dahl, D. and Spivey, M. F. (2010), “Capital Market Regimes and Bank Structure in Europe”, *Journal of Money, Credit and Banking* 42, 1073–1092.

Van Nieuwerburgh, S. and Veldkamp, L. (2009), “Information immobility and the home bias puzzle”, *Journal of Finance* 64, 1187–1215.

Wong, J., Fung, L., Fong, T. and Sze, A., (2004), “Residential mortgage default risk and the loan-to-value ratio”, *Hong Kong Monetary Authority Quarterly Bulletin*, 35-45.