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Are Real Estate Banks More Affected by Real Estate Market Dynamics?

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The literature primarily focuses on the effect of changes on property prices in terms of macrovariables and monetary aggregates. Only a few studies have taken into account bank characteristics when considering the effects of real estate market trends on bank lending policies and performance, and there is no study that controls for the type of bank or loan purpose. The paper studies the linkage between property market trends and bank risk exposure. We test for any significant difference of real estate banks with respect to other banks and the different roles of the real estate market trend in explaining changes in bank risk exposure. The empirical evidence demonstrates that real estate banks are not always riskier than other banks, and specialized banks are less sensitive to real estate market trends than other banks.

Keywords

Real Estate Banks, Real Estate Market, Bank Risk, Bank Specialization

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1. Introduction

Real estate market trends can affect the value of direct exposure in both property loans and real estate collateral. Therefore, bank performance and/or risk can significantly change in the case of a real estate market collapse or expansion (e.g. Wheaton, 1999) and banks normally modify their lending strategy more significantly during a crisis with respect to a growing number of loans (Jackson, 2001). During the current financial crisis, the decrease in the average price of real estate assets has led to a strong decrease in both number and amount of loans in comparison to the pre-crisis period (Ivashina and Scharfstein, 2010) due to the changes in the equilibrium of the credit market and effects on the wealth of individuals.

The effect of real estate market trends on the credit market is driven by the response of the demand under the new market conditions. If the demand for real estate financing does not change over time, in a real estate market upturn (downturn), the credit market will experience an increase (decrease) in the collateral value of its lending exposure and bank riskiness will decrease (increase) (Kiyotaki and Moore, 1997). If debtors modify their lending exposure due the lower (higher) costs of lending and easier (tighter) access to financing opportunities after a change in the real estate market, the probability of bank default will increase (decrease) (Koetter and Poghosyan, 2010). The assumption of a stable demand for real estate lending can be considered residual because, according to the life-cycle model of household consumption (Ando and Modigliani, 1963), households may react to an increase (decrease) in property prices by increasing (decreasing) their spending and borrowing to smooth consumption over the life-cycle (Hofman, 2004).

In the literature, the focus is on the different features and behavior of banks with a diversified lending portfolio with respect to those that prevalently offer real estate lending solutions, otherwise known as real estate banks (hereinafter REBs), and normally identified as those that lend more than 40% only to the real estate sector. The results obtained show that REBs can be riskier than other banks (Blasko and Sinkey, 2006), even if the results change according to the proxy used for evaluating bank risk (Giannotti et al., 2011) and the criteria that identify REBs (Eisenbeis et al., 1996). No studies have yet evaluated whether the risk faced by REBs can be more or less sensitive to real estate market trends.

This paper aims to contribute to the existing literature by evaluating the role of real estate market trends in explaining the riskiness and profitability of REBs, thus providing empirical evidence on European banking groups over a five-year time horizon. The results demonstrate that REBs are, independently of the proxy used, less exposed to real estate risk. Generally speaking, the results support the hypothesis presented in the literature (Eisenbeis and Kwast, 1991) that greater lender specialization reduces losses and this lessened

exposure can be partially ascribed to less sensitivity to real estate market dynamics.

The paper is structured as follows: Section 2 presents a detailed review of the role of real estate market trends in the performance of both lending portfolios and banks in general. Section 3 provides empirical evidence in support of the thesis of the reduced sensitivity of REB performance and risk measures to real estate market trends. The last section summarizes the conclusions and main policy implications of the results.

2. Literature Review

The role of real estate market trends on the banking sector has been prevalently studied by considering whether changes in the value of assets owned or the value of credit collateral affects the market value of bank shares. Empirical evidence demonstrates that the market price of bank shares is also affected by the risk related to real estate market trends and market sensitivity can differ based on bank features, such as size (e.g. Allen et al., 1995).

With regard to bank relationship data, the main drivers that could explain the relationship between bank performance and real estate market trends are studied in the literature and it is found that the main driver identified is the difference between current house market value and remaining debt. When the difference is less than zero, the customer has the incentive (or is even obliged) to declare default (Deng et al., 2000). Thus the cost and amount of loans are defined based on the probability that, due to real estate market dynamics, the put option offered to debtors becomes in the money (Koh et al., 2005). A greater number of customers who exercise the put option implies a liquidity shortage for the bank and, under extreme conditions, can cause the bank to default.

Empirical evidence demonstrates that real estate price dynamics affect the amount of loans offered by banks, even if the relationship is more or less significant on the basis of the market analyzed and the time horizon (e.g. Inoguchi, 2011). Moreover, bank characteristics can explain differences in sensitivity to real estate market dynamics, where, normally, the effect is stronger (weaker) with worse (better) bank fundamentals (e.g. Peek and Rosengren, 1994) and the beta can be significantly different on the basis of the primary type of real estate loan offered by the bank (He et al., 1997). The effect can be overstated (understated) if, in the time horizon analyzed, a regulatory change affects real estate lending more than other lending solutions (Peek and Rosengren, 1996).

Empirical evidence demonstrates that the characteristics of debtors, bank's customers and product type can vary on the basis of bank-specific features (e.g. Reichert, 1991). This is especially if the regulators define different rules

for different types of real estate lending solutions, then the impact of real estate market changes can differ for banks that specialize in housing finance, commercial real estate lending, or construction lending (Weber and Devaney, 1999).

Previous analyses on REBs have focused on the effect of higher exposure in the real estate lending market on the performance and risk of these banks. The preliminary evidence in the literature demonstrates that REBs are riskier than other banks (Blasko and Sinkey, 2006) but the results change if other risk proxies are taken into account (Giannotti et al., 2011), or if we adopt a different criterion for identifying REBs (Eisenbeis et al. 1996). Only a few analyses have considered the role of real estate market trends in determining the risks and revenues of banks (Igan and Pinheiro, 2010) and no studies have evaluated whether specialized REBs are more or less affected by market trends in comparison to all of the other banks.

3. Empirical Analysis

3.1 Sample

The sample includes banks based in Europe with data available from the BankScope database for 2004–2011, and for each bank, the database includes all of the information available from income statements and balance sheets.[1] To distinguish between REBs and other banks, we compute the following measure:

$$\%\ Real\ Estate_{it} = \frac{Real\ Estate\ Loans_{it}}{Total\ Assets_{it}} \quad (1)$$

By following the approach proposed by Eisenbeis and Kwast (1991), an REB is defined as a bank that in year t, has exposure to real estate lending ($\%\ Real\ Estate_{it}$) higher than 40%. Summary statistics on the two subsamples (REBs and non-REBs) for each year are provided in Table 1.

More than 900 banks are considered in each year and the role of REBs is around 20% of the overall sample for the overall time period (from 20% in 2007 to 21% in 2011). The average total assets of REBs are significantly less than those of other banks (the role of REBs on the basis of total assets varies from 5% to 3%) and in the last few years, the average size of new REBs has even been decreasing over time.

The sample is significantly geographically diversified and all main European markets are represented (Table 2).

[1] Data from 2004 to 2006 are used only to construct the left-hand-side variable in the regression analysis.

Table 1 Role of REBs and Non-REBs in the Sample

REBs					
	2007	**2008**	**2009**	**2010**	**2011**
Number	164	170	172	168	172
Total assets	3,254,550.50	3,981,159.20	3,241,582.30	3,479,051.70	4,471,235.10
Average Total Assets	19,844.82	23,418.58	18,846.41	20,708.64	26,147.57
Non-REBs					
	2007	**2008**	**2009**	**2010**	**2011**
Number	819	814	813	820	816
Total assets	56,389,522.21	70,861,665.99	81,591,275.85	96,917,095.76	120,437,430.83
Average Total Assets	67,451.58	85,375.50	98540.19	116,486.89	145,280.37

Source: BankScope data processed by the authors.

Table 2 Banks Classified by Country of Origin

	Number of banks					Total assets (000 bln €)				
	2007	**2008**	**2009**	**2010**	**2011**	**2007**	**2008**	**2009**	**2010**	**2011**
Austria	7 (0)	7 (0)	7 (0)	7 (0)	7 (0)	261 (0)	276 (0)	281 (0)	278 (0)	294 (0)
Belgium	12 (1)	12 (1)	12 (1)	12 (2)	12 (2)	1612 (21)	1433 (23)	1214 (26)	1128 (308)	1121 (283)
Cyprus	1 (0)	1 (1)	1 (1)	1 (1)	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Denmark	4 (2)	4 (2)	4 (2)	4 (2)	4 (2)	253 (241)	274 (259)	289 (273)	276 (231)	260 (221)
Finland	8 (2)	8 (2)	8 (2)	8 (2)	8 (2)	220 (150)	305 (222)	313 (223)	382 (288)	507 (403)
France	61 (4)	61 (6)	61 (5)	61 (5)	61 (5)	2248 (798)	2451 (459)	2391 (442)	2408 (464)	2518 (471)
Germany	145 (8)	145 (123)	145 (127)	145 (125)	145 (128)	654 (193)	673 (200)	625 (200)	571 (109)	549 (208)
Great Britain	75 (12)	75 (14)	75 (15)	75 (14)	75 (15)	2592 (865)	3381 (920)	3017 (902)	3055 (794)	3298 (769)
Greece	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	5 (0)	4 (0)	3 (0)
Ireland	10 (2)	10 (1)	10 (1)	10 (1)	10 (1)	713 (154)	1152 (101)	887 (85)	807 (72)	879 (56)
Italy	520 (4)	520 (3)	520 (3)	520 (3)	520 (4)	2951 (0)	3212 (0)	3168 (0)	3265 (0)	3360 (0)
Luxembourg	6 (0)	6 (1)	6 (1)	6 (1)	6 (1)	239 (0)	225 (78)	205 (85)	196 (87)	166 (84)
Malta	1 (0)	1 (0)	1 (0)	1 (0)	1 (0)	3 (0)	5 (0)	3 (0)	3 (0)	3 (0)
Nether-lands	10 (4)	10 (3)	10 (3)	10 (3)	10 (3)	208 (161)	235 (55)	218 (56)	218 (54)	225 (54)
Norway	43 (0)	43 (0)	43 (0)	43 (0)	43 (0)	103 (0)	120 (0)	137 (0)	151 (0)	164 (0)
Portugal	15 (4)	15 (4)	15 (3)	15 (4)	15 (4)	821 (97)	884 (212)	1030 (187)	1230 (238)	1119 (1011)
Spain	59 (3)	52 (2)	59 (2)	59 (1)	59 (2)	106 (33)	114 (33)	112 (35)	113 (34)	115 (29)
Sweden	8 (2)	8 (3)	8 (2)	8 (1)	8 (1)	1203 (541)	1444 (1416)	1536 (723)	1573 (797)	1690 (880)
Switzer-land	8 (3)	8 (3)	8 (3)	8 (3)	8 (3)	164 (2)	157 (2)	152 (2)	138 (2)	139 (3)
Turkey	9 (0)	9 (1)	9 (1)	9 (1)	9 (1)	45289 (0)	58498 (0)	69248 (0)	84601 (0)	108497 (0)

Note: REB values in brackets.
Source: BankScope data processed by the authors.

The most represented countries in the sample are Italy, Germany, Great Britain, Spain, and France, and only very small countries (e.g. Cyprus and Malta) are represented by only one bank. The sample composition is quite coherent with the overall market statistics on the number of intermediaries in Europe, even if the size and total assets of the banks in each country are not comparable and the main countries represented are Great Britain, Italy, France, and Belgium.

To study the role of the real estate market in determining the performance and risk of banks, the index of the Bank for International Settlements (BIS) (the most representative index available for the residential real estate market) is used in this paper. For each bank in the sample, the analysis considers the national BIS index for the country in which the bank is legally based.

3.2 Methodology

In following the approach proposed by Blasko and Sinkey (2006), the proxy used in the paper for the default risk of each bank in the sample is Z-Risk, per the following equation:

$$ZRisk_t = \frac{Average\ ROA_{t-3,t} + CAP_t}{\sigma ROA_{t-3,t}} \tag{2}$$

where, in following the approach proposed by Hannan and Hanweck (1988), the $Average\ ROA_{t-3,t}$ and $\sigma ROA_{t-3,t}$ are, respectively, the mean and standard deviation of the return on assets (ROA) in the last four years, while the capitalization rate (CAP_t) is the ratio between equity capital and overall capital. A higher value of the index signals higher quality of the bank assets and revenues, and a higher capability to support any (negative) changes of the ROA by using the current ROA and amount of stable funding (shares).

A preliminary analysis of the data presents the summary statistics for REBs and non-REBs, and computes a standard Kolmogorov–Smirnov test for a non-parametric comparison between distributions of the risk measure for the two types of banks. The comparison between REBs and non-REBs also considers other indexes proposed by the same authors for evaluating the difference in the features of the banks and the risks. The other indexes considered are:[3]

ROE_{it} Return on equity at time t for bank i defined as the ratio of the net return to shareholders with respect to the shareholder capital,

NII_{it} Net interest income at time t for bank i computed as the percentage of current income related to the difference of active and passive interest rate payments,

[3] We include all of the variables identified by the authors as a possible explanation of the default risk of banks, but we exclude data on portfolio composition and some of the aggregate values.

$Tier\ 1_{it}$ Tier 1 capital requirement at time t for bank i, defined as the ratio between core capital (common shares and retained earnings) with respect to the overall capital,

LLP_{it} The ratio of loan loss provisions with respect to overall loans at time t for bank i,

PDL_{it} The ratio between the amount of credits that are classified as past due over 90 days and the overall loans at time t for bank i,

IRD_{it} Amount of derivative exposure with respect to total assets at time t for bank i, and

$RSAL_{it}$ Difference between the value of interest rate-sensitive asset liabilities with respect to total assets at time t for bank i.

To study the relationship between bank default risk and real estate market trends, a panel regression analysis of risk exposure with bank characteristics is used in this paper, including two variables on the role of real estate lending.[4] This is shown in the following two equations:

$$ZRisk_{it} = \alpha_{it} + \sum_{k=1}^{n} \beta^k Bank\ Feature_{it}^k + \sum_{l=1}^{m} \beta^k Country\ Dummy_{it}^l + \gamma_{it} \%\ Real\ Estate_{it} + \varepsilon_{it} \quad (3)$$

$$ZRisk_{it} = \alpha_{it} + \sum_{k=1}^{n} \beta^k Bank\ Feature_{it}^k + \sum_{l=1}^{m} \beta^k Country\ Dummy_{it}^l + \gamma_{it} Dummy\ Real\ Estate_{it} + \varepsilon_{it} \quad (4)$$

where the n bank features considered for each firm are coherent with the empirical evidence provided by Blasko and Sinkey (2006). The m country dummies assume a value of one for bank i if the hosting country is country l and zero otherwise.[5]

The real estate variables used for the analysis are $\%\ Real\ Estate_{it}$ and $Dummy\ Real\ Estate_{it}$. The first measure is the ratio between real estate loans and overall loans for bank i at time t, while the latter is a dummy variable that assumes a value of one if the role of real estate loans on the overall portfolio is greater than 40% for bank i at time t.

[4] We select the random effect model on the basis of the results of the Hausman specification test.

[5] In the sample selected, the reference countries are Austria, Belgium Switzerland, Cyprus, Germany, Denmark, Spain, Finland, France, Great Britain, Greece, Ireland, Italy, Luxembourg, Malta, the Netherlands, Norway, Portugal, Sweden, San Marino, and Turkey.

To evaluate if real estate market trends affect REBs more than other banks, a variable related to the real estate market trend of the reference market for each bank is added to Equations (5) and (6), and the role of this variable in explaining the risk of a bank is analyzed in the equations as follows:

$$ZRisk_{it} = \alpha_{it} + \sum_{k=1}^{n} \beta^k Bank\ Feature_{it}^k + \sum_{l=1}^{m} \beta^k Country\ Dummy_{it}^l + \gamma_{it} Dummy\ Real\ Estate_{it} + \tau_{it} Real\ Estate\ Mkt_t + \varepsilon_{it} \quad (5)$$

$$ZRisk_{it} = \alpha_{it} + \sum_{k=1}^{n} \beta^k Bank\ Feature_{it}^k + \sum_{l=1}^{m} \beta^k Country\ Dummy_{it}^l + \gamma_{it} \%\ Real\ Estate_{it} + \tau_{it} Real\ Estate\ Mkt_t + \varepsilon_{it} \quad (6)$$

where $Real\ Estate\ Mkt_t$ represents the index value of the BIS for all dwellings at time t for the country that hosts the headquarters of the bank.[6] If τ_{it} is significant, the model demonstrates that the increasing performance of the real estate market modifies the risk exposure of the bank.

To evaluate if REBs are more or less affected by real estate market dynamics, Equations (7) to (10) perform the same panel regression by adding two different real estate market variables, one for the REBs and the other for non-REBs as follows:

$$ZRisk_{it} = \alpha_{it} + \sum_{k=1}^{n} \beta^k Bank\ Feature_{it}^k + \sum_{l=1}^{m} \beta^k Country\ Dummy_{it}^l + \gamma_{it} Dummy\ Real\ Estate_{it} + \partial_{it}(Dummy\ Not\ Real\ Estate_{it} \times Real\ Estate\ Mkt_t) + \theta_{it}(Dummy\ Real\ Estate_{it} \times Real\ Estate\ Mkt_t) + \varepsilon_{it} \quad (7)$$

[6] The BIS property index is constructed with the assistance of the central banks of EU members, and describes the price trend of residential real estate assets in each European country. For further details, see http://www.bis.org/statistics/pp.htm.

$$ZRisk_{it} = \alpha_{it} + \sum_{k=1}^{n} \beta^k Bank\ Feature_{it}^k + \sum_{l=1}^{m} \beta^k Country\ Dummy_{it}^l + \gamma_{it} \%\ Real\ Estate_{it} + Dummy\ Not\ Real\ Estate_{it} \times \partial_{it} Real\ Estate\ Mkt_t + Dummy\ Real\ Estate_{it} \times \theta_{it}\ Real\ Estate\ Mkt_t + \varepsilon_{it} \quad (8)$$

$$ZRisk_{it} = \alpha_{it} + \sum_{k=1}^{n} \beta^k Bank\ Feature_{it}^k + \sum_{l=1}^{m} \beta^k Country\ Dummy_{it}^l + \gamma_{it} Dummy\ Real\ Estate_{it} + \varphi_{it}(\%\ Real\ Estate_{it} \times Real\ Estate\ Mkt_t) + \varepsilon_{it} \quad (9)$$

$$ZRisk_{it} = \alpha_{it} + \sum_{k=1}^{n} \beta^k Bank\ Feature_{it}^k + \sum_{l=1}^{m} \beta^k Country\ Dummy_{it}^l + \gamma_{it} \%\ Real\ Estate_{it} + \varphi_{it}(Real\ Estate\ Mkt_t \times \%\ Real\ Estate_{it}) + \varepsilon_{it} \quad (10)$$

In Equations (7) and (8), $Dummy\ Not\ Real\ Estate_{\mathrm{t}}$ assumes a value of one if the role of real estate loans on the overall portfolio is less than 40% for bank i at time t. If ∂_{it} is less significant with respect to θ_{it}, non-REBs are more affected by the real estate market dynamics, whereas if the results are the opposite, REBs are more affected by the market dynamics than the non-REBs. The first set of results supports the hypothesis that a higher level of specialization allows a reduction in the risk assumed in the real estate sector due to the greater expertise and larger amount of resources invested into market analysis (e.g. Eisenbeis and Kwast, 1991), while the second set of results demonstrates that greater exposure to the real estate market always increases sensitivity to market dynamics due to disaster myopia (e.g. Herring and Watcher, 2003).

Equations (9) and (10) evaluate whether the sensitivity to market trends is not related to bank specialization but, rather, linearly correlated to the amount of exposure in real estate lending. If φ_{it} is statistically significant and greater than the τ_{it} computed in Equations (5) and (6), any increase in real estate lending will impact the bank risk of default in the event of a real estate market crisis.

3.3 Results

A preliminary analysis of the differences between REBs and non-REBs is realized, which considers some summary statistics for the two subsamples (Table 3).

Table 3 Summary Statistics and Kolmogorov–Smirnov Test Comparison between REBs and Non-REBs

	REBs			Non-REBs			Kolmogorov–Smirnov test	
	Mean	Median	Dev.St.	Mean	Median	Dev.St.	Value	Test
$ZRisk_{it}$	15.05	3.52	34.84	6.53	3.10	20.48	0.17	0.00
$Tier\ 1_{it}$	0.11	0.10	0.09	0.16	0.14	0.12	0.29	0.00
ROE_{it}	0.03	0.03	0.21	0.05	0.05	0.22	0.17	0.00
NII_{it}	0.02	0.01	0.05	0.02	0.03	0.09	0.14	0.00
LLP_{it}	0.02	0.01	0.05	0.03	0.02	0.04	0.32	0.00
PDL_{it}	0.00	0.00	0.04	0.00	0.00	0.01	0.01	1.00
IRD_{it}	0.01	0.00	0.03	0.03	0.00	0.77	0.28	0.00
$RSAL_{it}$	-0.10	-0.06	0.18	-0.02	0.00	1.99	0.49	0.00

Notes: In this table, $ZRisk_{it}$ is the risk proxy of the bank, $Tier\ 1_{it}$ is the core capital ratio, ROE_{it} is the return on equity, NII_{it} is the net interest income ratio, LLP_{it} is the incidence of loan loss provision, PDL_{it} is the incidence of past due loans, IRD_{it} is the relevance of interest rate derivatives and $RSAL_{it}$ is the gap between interest rate sensitive assets and liabilities

Source: BankScope data processed by the authors.

Even if some differences can be pointed out between the REBs and non-REBs, they are not statistically significant on the basis of the Kolmogorov–Smirnov test. Only for past due exposures (PDL), REBs could be considered riskier than other banks due to the fact that they are significantly more variable over time.

The analysis of the relationship between bank features and real estate market dynamics provides results that are coherent with the literature on the main drivers of bank risk (Table 4).

The low statistical fitness of the model (from 10% to 11%) is coherent with the results obtained by Blasko and Sinkey (2006) who, in their best model, are able to obtain a fit of less than 15%. The results are not surprising, because the explained variable is significantly volatile due to the relevant changes registered in the ROA during the time horizon considered.

Looking at the bank risk determinants, we represent the main driver by the net interest income, which represents the only variable that is statistically significant in all of the models considered. The relationship is positive because, as expected, an increase in the income related to the core business of

the bank reduces its risk (as does an increase of ZRisk). Another driver of bank risk could be identified in the return on equity measure that is positively related to bank safety, but its relevance significantly decreases once the real estate market trend variable is added to the analysis.

Table 4 The Role of Real Estate in Explaining Bank Risk

The explained variable is ZRisk, the regression model is a panel random effect model, and the explained variables are both banking features and real estate market trends. The regression includes a set of country dummy variables to consider the specific characteristics of the country of origin of each bank.

	(3)	(4)	(5)	(6)
$Tier\ 1_{it}$	0.01	0.01	0.01	0.01
ROE_{it}	0.13***	0.13***	0.11**	0.11***
NII_{it}	2.40***	2.38***	2.17***	2.17***
LLP_{it}	-0.20	-0.19	-0.18	-0.18
PDL_{it}	-0.50	-0.51	-0.42	-0.42
IRD_{it}	-0.01	-0.01	-0.01	-0.01
$RSAL_{it}$	-0.01	-0.01	-0.01	-0.01
$Dummy\ Real\ Estate_{it}$	0.02	-	0.01	-
$\%\ Real\ Estate_{it}$	-	-0.07	-	-0.01
$Real\ Estate\ Mkt_t$	-	-	0.29***	0.29***
α_{it}	-0.06	-0.06	-0.06	-0.06
Country Dummies	Yes	Yes	Yes	Yes
Observations	2798	2798	2798	2798
Groups	634	634	634	634
R^2	0.10	0.10	0.11	0.11

Notes: 1. * t-test significant at 90% level ** t-test significant at 95% level *** t-test significant at 95% level

2. In this table, $ZRisk_{it}$ is the risk proxy of the bank, $Tier\ 1_{it}$ is the core capital ratio, ROE_{it} is the return on equity, NII_{it} is the net interest income ratio, LLP_{it} is the incidence of loan loss provision, PDL_{it} is the incidence of past due loans, IRD_{it} is the relevance of interest rate derivatives, $RSAL_{it}$ is the gap between interest rate sensitive assets and liabilities, $Dummy\ Real\ Estate_{it}$ is a dummy that assumes a value of one for REBs, $\%\ Real\ Estate_{it}$ is the percentage of exposure to real estate lending, and $Real\ Estate\ Mkt_t$ is the BIS property index.

Source: BankScope data processed by the authors.

In looking at the difference between REBs and non-REBs, we find the dummy variable to be more significant with respect to the percentage of real estate lending because, below a given threshold, the incidence of any real estate lending policy is not sufficient to change bank risk. Real estate exposure positively affects bank risk (the relationship with Z-score is negative), thus supporting the hypothesis demonstrated by some of the authors in the literature (e.g. Blasko and Sinkey, 2006) that REBs are normally riskier than other banks.

Even if it does not imply a significant change in the statistical fitness of the model, the choice to include the real estate market variable (modeled in Tables 4 and 5) is relevant in explaining the value of the ZRisk of a bank. A positive (negative) change in market trend implies a decrease (increase) in the probability of bank default and the relationship is statistically significant for the sample analyzed.

By separately considering the role of real estate market trends for REBs and non-REBs, some interesting results could be pointed out on the different roles of real estate market trends in explaining bank risk (Table 5).

Table 5 The Role of Real Estate in Explaining Bank Risk for REBs and Non-REBs

The explained variable is ZRisk, the regression model is a panel random effect model, and the explained variables are both banking features and real estate market trend. The regression includes a set of country dummy variables to consider the specific characteristics of the country of origin of each bank.

	(7)	**(8)**	**(9)**	**(10)**
$Tier\ 1_{it}$	0.01	0.01	0.01	0.01
ROE_{it}	0.11^{***}	0.11^{***}	0.13^{***}	0.13^{***}
NII_{it}	2.19^{***}	2.18^{***}	2.38^{***}	2.37^{***}
LLP_{it}	-0.18	-0.19	-0.20	-0.20
PDL_{it}	-0.42	-0.44	-0.48	-0.50
IRD_{it}	-0.01	-0.01	-0.01	-0.01
$RSAL_{it}$	-0.01	-0.01	-0.01	-0.01
$Dummy\ Real\ Estate_{it}$	0.01	-	0.01	-
$\%\ Real\ Estate_{it}$	-	-0.01	-	-0.01
$Dummy\ Real\ Estate_{it} \times Real\ Estate\ Mkt_t$	0.55	0.55	-	-
$Dummy\ Not\ Real\ Estate_{it} \times Real\ Estate\ Mkt_t$	0.26^{**}	0.25^{**}	-	-
$\%\ Real\ Estate_{it} \times Real\ Estate\ Mkt_t$			0.42	0.43
α_{it}	-0.14	-0.63	-0.06	-0.14
Country Dummies	Yes	Yes	Yes	Yes
Observations	2798	2798	2798	2798
Groups	634	634	634	634
R^2	0.11	0.11	0.10	0.10

Notes: 1. * t-test significant at 90% level ** t-test significant at 95% level *** t-test significant at 95% level

2. In this table, $ZRisk_{it}$ is the risk proxy of the bank, $Tier\ 1_{it}$ is the core capital ratio, ROE_{it} is the return on equity, NII_{it} is the net interest income ratio, LLP_{it} is the incidence of loan loss provision, PDL_{it} is the incidence of past due loans, IRD_{it} is the relevance of interest rate derivatives, $RSAL_{it}$ is the gap between interest rate sensitive assets and liabilities, $Dummy\ Real\ Estate_{it}$ is a dummy that assumes a value of one for REBs, $\%\ Real\ Estate_{it}$ is the percentage of exposure to real estate lending, $Real\ Estate\ Mkt_t$ is the BIS property index.

Source: BankScope data processed by the authors.

The comparisons between the models in Tables (5) and (7) and those in Tables (6) and (8) demonstrate that the market trend is more relevant for non-REBs with respect to REBs because the ZRisk values of banks are always positively related with real estate market dynamics, but only statistically significant for non-REBs. The evidence supports the hypothesis that the effect of a real estate market trend is more relevant for non-REBs because REBs are probably better at evaluating real estate loans to overcome potential losses related to real estate lending opportunities.

When looking at the interaction term between real estate lending and market trends (modeled in Tables 9 and 10), we find no linear relationship between exposure and sensitivity to market trends. The greater or lesser relevance of the real estate market is related more to bank specialization (REBs vs. non-REBs) than to the amount of real estate lending offered.

3.4 Robustness Test

In the robustness checks, both a different definition of REBs and a different index for the real estate market were taken into consideration.

In following the approach proposed by Eisenbeis and Kwast (1991), banks can be classified as REBs only if they are structurally specialized in the real estate sector for all the years considered. The new explanatory variables constructed are a dummy ($Dummy\ Real\ Estate\ All_{it}$) that assumes a value of one for bank i at time t only if the $\%\ Real\ Estate_{it}\ is$ greater than 40% for all five years considered (2007–2011)[7] and the average real estate exposure ($\%\ Real\ Estate\ All_{it}$), that is, the mean of the role of real estate lending for bank i for the overall time horizon (2007–2011). By using the new real estate proxies, the result presented in Section 3.3 is tested to determine whether it is affected by the definition of the REBs, and Table 6 summarizes the results.

The analysis that focused only on persistent REBs does not show any significant differences with respect to the analysis based on REBs identified on the basis of year-by-year exposure due to the fact that around 85% of the REBs in our sample maintain the status for the entire period of time.

In the assumption made in the analysis proposed in Section 3.3, it is assumed that real estate lending exposure is driven by national market dynamics due to the fact that a significant share of real estate lending is offered by local banks to their local customers (Peek and Rosengren, 1995). To eliminate this assumption, the average return of the BIS property index for the European area is used in this paper and the same analysis presented in Section 3.3 is performed. Table 7 summarizes the results.

[7] The number of banks classified as REBs for all five years is 141, which represents around 14% of the overall sample.

Table 6 Robustness Test for Definition of REB

The explained variable is ZRisk, the regression model is a panel random effect model, and the explained variables are both banking features and real estate market trends. The regression includes a set of country dummy variables to consider the specific characteristics of the country of origin of each bank.

	(3a)	(4a)	(5a)	(6a)	(7a)	(8a)	(9a)	(10a)
$Tier\ 1_{it}$	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ROE_{it}	0.13***	0.13***	0.11***	0.11***	0.13***	0.13***	0.13***	0.13***
NII_{it}	2.38***	2.39***	2.16***	2.17***	2.42***	2.42***	2.38***	2.38***
LLP_{it}	-0.19	-0.20	-0.18	-0.18	-0.20	-0.20	-0.20	-0.20
PDL_{it}	-0.49	-0.50	-0.41	-0.42	-0.51	-0.52	-0.50	-0.50
IRD_{it}	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
$RSAL_{it}$	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
$Dummy\ Real\ Estate\ All_i$	-0.01	-	-0.01	-	-0.01	-	0.01	-
$\%\ Real\ Estate\ All_i$	-	0.01	-	0.01	-	0.01	-	0.01
$Real\ Estate\ Mkt_t$	-	-	0.29***	0.29***	-	-	-	-
$Dummy\ Real\ Estate\ All_i \times Real\ Estate\ Mkt_t$	-	-	-	-	-0.08	-0.11	-	-
$Dummy\ Not\ Real\ Estate\ All_i \times Real\ Estate\ Mkt_t$	-	-	-	-	0.16**	0.17**	-	-
$\%\ Real\ Estate\ All_i \times Real\ Estate\ Mkt_t$	-	-	-	-	-	-	0.02	0.01
α_{it}	0.14	0.14	-0.06	0.14	0.15	0.15	0.14	0.14
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2798	2798	2798	2798	2798	2798	2798	2798
Groups	634	634	634	634	634	634	634	634
R^2	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

Notes: 1. * t-test significant at 90% level ** t-test significant at 95% level *** t-test significant at 95% level

2. In this table, $ZRisk_{it}$ is the risk proxy of the bank, $Tier\ 1_{it}$ is the core capital ratio, ROE_{it} is the return on equity, NII_{it} is the net interest income ratio, LLP_{it} is the incidence of loan loss provision, PDL_{it} is the incidence of past due loans, IRD_{it} is the relevance of interest rate derivatives, $RSAL_{it}$ is the gap between interest rate sensitive assets and liabilities, Dummy Real $Estate_{it}$ is a dummy that assumes a value of one for REBs, % Real $Estate_{it}$ is the percentage of exposure to real estate lending, Real Estate Mkt_t is the BIS property index.

Source: BankScope data processed by the authors.

Table 7 Robustness Test for the Real Estate Market Index

The explained variable is ZRisk, the regression model is a panel random effect model, and the explained variables are both banking features and real estate market trends. The regression includes a set of country dummy variables to consider the specific characteristics of the country of origin of each bank.

	(3)	(4)	(5b)	(6b)	(7b)	(8b)	(9b)	(10b)
$Tier\ 1_{it}$	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ROE_{it}	0.13***	0.13***	0.13***	0.13***	0.13***	0.13***	0.13***	0.13***
NII_{it}	2.40***	2.38***	2.39***	2.38***	2.40***	2.40***	2.39***	2.39***
LLP_{it}	-0.20	-0.19	-0.19	-0.20	-0.20	-0.21	-0.20	-0.20
PDL_{it}	-0.50	-0.51	-0.50	-0.51	-0.50	-0.51	-0.50	-0.51
IRD_{it}	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
$RSAL_{it}$	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
$Dummy\ Real\ Estate_{it}$	0.02	-	0.01	-	-0.01	-	-0.01	-
$\%\ Real\ Estate_{it}$	-	-0.07	-	-0.01	-	-0.01	-	-0.01
$Real\ Estate\ Mkt_t$	-	-	0.14	0.14	-	-	-	-
$Dummy\ Real\ Estate_{it} \times Real\ Estate\ Mkt\ EU_t$	-	-	-	-	-0.46	-0.45	-	-
$Dummy\ Not\ Real\ Estate_{it} \times Real\ Estate\ Mkt\ EU_t$	-	-	-	-	-0.20	-0.20	-	-
$\%\ Real\ Estate_{it} \times Real\ Estate\ Mkt\ EU_t$	-	-	-	-	-	-	0.21	0.21
α_{it}	-0.06	-0.06	0.14	-0.06	-0.06	-0.06	0.14	-0.06
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2798	2798	2798	2798	2798	2798	2798	2798
Groups	634	634	634	634	634	634	634	634
R^2	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

Notes: 1. * t-test significant at 90% level ** t-test significant at 95% level *** t-test significant at 95% level

2. In this table, $ZRisk_{it}$ is the risk proxy of the bank, $Tier\ 1_{it}$ is the core capital ratio, ROE_{it} is the return on equity, NII_{it} is the net interest income ratio, LLP_{it} is the incidence of loan loss provision, PDL_{it} is the incidence of past due loans, IRD_{it} is the relevance of interest rate derivatives, $RSAL_{it}$ is the gap between interest rate sensitive assets and liabilities, $Dummy\ Real\ Estate_{it}$ is a dummy that assumes a value of one for REBs, $\%\ Real\ Estate_{it}$ is the percentage of exposure to real estate lending, $Real\ Estate\ Mkt_t$ is the BIS property index.

Source: BankScope data processed by the authors.

When the EU index is used, the real estate market is never significant in explaining the ZRisk – Equations (5a) and (6b) – and the results are also confirmed when we separately evaluate the contributions for REBs and non-REBs – Equations (7b) and (8b) – or the percentage of REB lending – Equations (9b) and (10b). The results support the hypothesis that, in order to evaluate bank risk, it is necessary to focus on the reference home country real estate market and the choice of reference market because a wider market index does not fit well with the data analyzed.

4. Conclusions

Real estate market trends are one of the drivers of bank riskiness and, even if some bank features also explain the default risk of a bank, any changes in the real estate market could cause a significant change in the riskiness faced by a bank. The role of market trends is not independent of bank specialization in the real estate sector and, due to the greater expertise in the sector, normally REBs are less affected by any positive or negative market dynamics. The results are robust with respect to the definition of REBs but always require the considering of local real estate indexes instead of global or area indexes.

The literature shows that bank risk cannot be explained only on the basis of the degree of diversification of the lending portfolio (e.g. Demsetz and Strahan, 1997). Tighter capital constraints for specialized real estate banks are not justified on the assumed higher risk of those banks because specific knowledge and skills available could allow them to select only the best debtors so as to reduce their overall risk exposure.

Due to the high heterogeneity of lending contracts in the real estate sector, a more detailed analysis of contract characteristics could be useful to better understand whether the lower risk of REBs is related only to management procedures and skills not available to other banks or simply related to contract features that could also be used and applied by other banks to reduce the sensitivity of non-REBs to real estate market trends. Moreover, the literature demonstrates significant differences in the market trends of different real estate investments (e.g. Davis and Zhu, 2004) and a more detailed analysis of the types of real estate lending (residential vs. industrial/commercial) offered by each bank could allow testing to determine if the choice to specialize in only some types of real estate assets can allow, more or less, a reduction in the sensitivity of bank risk to real estate market trends.

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