Are Real Estate Banks More Affected by Real Estate Market Dynamics? Evidence from the Main European Countries[1]

by

Lucia Gibilaro
University of Bergamo
Department of Management, Economics and Quantitative Methods
E-mail lucia.gibilaro@unibg.it
Tel. +39/0352052675
Fax +39/0352052549

and

Gianluca Mattarocci
(corresponding author)
University of Rome 'Tor Vergata'
Department of Economics and Finance
E-mail gianluca.mattarocci@uniroma2.it
Tel. +39 / 0672595931
Fax +39 / 062040219

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Abstract

The economic literature focuses primarily on the effect of changes in property prices on macrovariables and monetary aggregates. Only few studies take into account bank characteristics when considering the effects of real estate market trends on bank lending policies and performance and no studies control for the type of bank or loan purpose. Considering a representative sample of European banks and using the Bank for International Settlements property index for each bank's reference country, we study 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 real estate market trends in explaining changes in bank risk exposure. 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, Banks' specialization

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 change significantly in case of a real estate market collapse or expansion (e.g. Wheaton, 1999). 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 with respect to the pre-crisis period (Ivashina and Scharfstein, 2010) due to the change in the credit market's equilibrium and effects on individuals' wealth.

The effect of real estate market trends on the credit market is affected by the response to 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 exposure due the lower (higher) costs of lending and easier (tighter) access to financing opportunities after the real estate market change, the probability of default of banks will increase (decrease) (Koetter and Poghosyan, 2010). The assumption of stable demand for real estate lending can be considered residual because, according to the lifecycle 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 lifecycle (Hoffman, 2004).

Studies on the main market players in the banking sector demonstrate that real estate banks (REBs) can be riskier than other banks (Blasko and Sinkey, 2006), even if the results change according to the proxy

used to evaluate bank risk change (Giannotti et al., 2011) and the criterion identifying REBs (Eisenbeis et al., 1996). No studies have yet evaluated whether REB risk can be explained by the real estate market trends to which they are prevalently exposed.

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 the REBs, providing empirical evidence on European banking groups over a five-year time horizon. The results demonstrate that REBs are, independent 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 decreases losses, especially in the medium and long term, and this lower 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 lower sensitivity of REBs' 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 studied prevalently 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 banks' shares is affected also 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)

Regarding bank relationship data, the literature studies the main drivers that could explain the relationship between bank performance and real estate market trends. Attention is focused on the relationship between the banks' customers' default risk and market trends, the main driver identified being the difference between current house market value and remaining debt. When the difference is less than zero, the customer is obligated to or can have an incentive 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 higher number of customers exercising 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 analysed 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) the worse (better) the bank fundamentals (e.g. Peek and Rosengren, 1994). The effect can be overstated (understated) if, in the time horizon analysed, a regulatory change affected real estate lending more than other lending solutions (Peek and Rosengren, 1996).

Empirical evidence demonstrates that the bank customers' characteristics and products types can vary on the basis of bank-specific features and, normally, REBs present unique features with respect to other lenders (e.g. Reichert, 1991). Especially if the regulators define different rules for different types of real estate lending solutions, the impact of real estate market changes can differ for banks specialized in housing finance, in commercial real estate lending, or construction lending (Weber and Devaney, 1999).

The analysis of REB performance normally considers the distinctive characteristics of banks more exposed in the real estate sector than other banks in other sectors. Preliminary evidence in the literature demonstrates that REBs could be riskier than other banks (Blasko and Sinkey, 2006) but the results are not always confirmed in the time horizon considered, the risk bank proxy in question (Giannotti et al., 2011), or with different criteria identifying the REBs (Eisenbeis et al. 1996). Only few analyses consider the role of real estate market trends in determining the risks and revenues of banks (Igan and Pinheiro, 2010) and no studies evaluate whether specialized REBs are more or less affected by market trends than all other banks.

3. Empirical analysis

3.1. Sample

We construct a sample of banks based in Europe with data available from the BankScope database for 2004–2011 and we collect for them all the information available from income statements and balance sheets.[2] To distinguish between REBs and other banks, we compute the following measure:

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

Following the approach proposed by Eisenbeis and Kwast (1991), we classify a bank as an REB in year t if the role of real estate lending ($\%\ Real\ Estate_{it}$) is higher than 40%. Summary statistics on the two subsamples (REBs and non-REBs) for each year are provided in Table 1.

[2] 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.

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 smaller than those of other banks (the role of REBS on the basis of total assets varies from 5% to 3%) and in the last years the average size of new REBs has even been decreasing over time.

To study the role of the real estate market in determining the performance and risk of banks, we consider the country of each bank and collect from the Bank for International Settlements' (BIS) website the most representative index available for the residential real estate market (Table 2).

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, 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.

Table 2. Banks classified by country of origin

	Number ° 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)
Netherlands	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)
Switzerland	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.

3.2 Methodology

Following the approach proposed by Blasko and Sinkey (2006), we compute a measure of the default risk for each bank in the sample, using the following formula:

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

where, 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 a higher quality of the banks' assets and revenues and a higher capability to support any (negative) change of the ROA using the current ROA and amount of stable funding (Shares). We compute some summary statistics for REBs and non-REBS and we compute a standard Kolmogorov–Smirnov test for a non-parametric comparison between distributions of the risk measure for the two types of banks.

To verify the robustness of the results achieved using the ZRisk measure, we consider also other measures proposed by the same authors to evaluate the risks and qualities of banks. The following are more detailed measures:[3]

ROE_{it}	Return on equity at time t for bank i,
NII_{it}	Net interest income with respect to overall income at time t for bank i,
$Tier\ 1_{it}$	The tier 1 capital requirement at time t for bank i, defined on the basis of the amount and quality of outstanding debt,
LLP_{it}	Loan loss provisions with respect to overall loans at time t for bank i,
PDL_{it}	Total of credits past due over 90 days with respect to 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,
$RSAL_{it}$	Difference between rate-sensitive assets and rate-sensitive liabilities with respect to total assets at time t for bank i.

The same summary statistics and tests are provided for all these variables for the REB and non-REB subsamples.

To study the relationship between bank default risk and real estate market trends, we perform a panel regression analysis of risk exposure with bank characteristics, including two variables on the role of real estate lending.[4] In formulas, we have

[3] We include all the variables identified by the authors as a possible explanation of banks' default risk but we exclude data about portfolio composition and some aggregate values.
[4] We select the random effect model on the basis of the results of the Hausman specification test.

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

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

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 the 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.

To evaluate if real estate market trends affect REBs more than other banks, we include in equations (3) and (4) a variable related to the real estate market trend of the reference market for each bank and we analyse the role of this variable in explaining the risk of all banks and that of only REBs. In formulas,

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

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

where $Real\ Estate\ Mkt_t$ represent the BIS's index value for all dwellings at time t for the country that hosted 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 bank's risk exposure.

[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 REBS are more or less affected by real estate market dynamics, we perform the same regression, constructing two real estate market variables, one for the REBS and the other for non-REBs. In formulas,

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

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

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

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

In equations (7) and (8), $Dummy\ Not\ Real\ Estate_t$ 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 real estate market dynamics, whereas if the results are the opposite, REBs are more affected by market dynamics than unspecialized bank are. The first set of result supports the hypothesis that a higher level of specialization allows reducing the risk assumed in the real estate sector due to the greater expertise and the larger amount of resources invested in the market analysis (e.g. Eisenbeis and Kwast, 1991), while the second type of result demonstrates that greater exposure to the real estate market always increases its 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, is linearly correlated to the amount of exposure in real estate lending. If φ_{it} is

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

statistically significant and bigger 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, considering 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

Source: BankScope data processed by the authors.

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

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

Table 4. The role of real estate in explaining bank risk

The explained variable is ZRisk, the regression model is a panel random effect, 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:
* t-test significant at 90% level ** t-test significant at 95% level *** t-test significant at 95% level

Source: BankScope data processed by the authors.

The statistical fitness of the model (from 10% to 11%) is coherent with 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 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 decreases significantly once the real estate market trend variable is added to the analysis.

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 modify bank risk. Real estate exposure positively affects bank risk (the relationship with Z-score is negative), supporting the hypothesis demonstrated by some authors (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 (models 4 and 5) is relevant in explaining the value of a bank's

ZRisk. A positive (negative) change in market trend implies a decrease (increase) in the probability of default of the bank and the relationship is statistically significant for the sample analysed.

If we consider separately 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, 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:
* t-test significant at 90% level ** t-test significant at 95% level *** t-test significant at 95% level

Source: BankScope data processed by the authors.

The comparison between models (5) and (7) and models (6) and (8) demonstrates 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 they are statistically significant only for non-REBs. 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 the real estate lending opportunities.

Looking at the interaction term between real estate lending and market trends (model 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

Robustness checks consider both a different definition of REBs and a different index for the real estate market.

Following the approach proposed by Eisenbeis and Kwast (1991), we consider as REBs only banks that are structurally specialized in the real estate sector for the 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 an 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). Using the new real estate proxies, we perform the same analysis presented in Section 3.3 and Table 6 summarizes the results.

The analysis focused only on persistent REBs does not show any significant difference 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 have the status for entire period.

The assumption made in the analysis proposed in Section 3.3 assumes 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 remove the assumption, we consider the average return of the BIS property index for the European area and we perform the same analysis presented in Section 3.3. Table 7 summarizes the results.

If we consider the EU index, the real estate market is never significant in explaining the ZRisk – equations (5a) and (6b) – and the results are also confirmed when we evaluate separately 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 to consider as reference market a wider market index does not fit the best with the data analysed.

[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 the REB definition

The explained variable is ZRisk, the regression model is a panel random effect, 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	
Notes: * t-test significant at 90% level ** t-test significant at 95% level *** t-test significant at 95% level								

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, 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						

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

Source: BankScope data processed by the authors.

4. Conclusions

Real estate market trends are one of the drivers of bank riskiness and, even if some bank features also explain a bank's default risk, any change in the real estate market could cause a significant change in the bank's riskiness. 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 real estate banks are less affected by any positive or negative market dynamics. The results are robust with respect to the definition of REBs but always require considering local real estate indexes instead of global or area indexes.

Looking at the literature on the diversification of bank lending portfolios, we find the evidence supports the hypothesis that a reduction in bank risk is not always just related to the degree of diversification (e.g. Demsetz and Strahan, 1997). Tighter capital constraints for specialized real estate banks are not justified on the higher risk assumed by those banks and specific knowledge available for the management of these banks could be useful in selecting the best debtors to reduce their 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 it is 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 to test if a choice to specialize only on some types of real estate asset can allow to reduce more the sensitivity of bank risk to real estate market trends.

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