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I thank the associate editor Armin Schwienbacher and an anonymous referee for their very helpful remarks. I would also like to thank Daniel Goyeau for his very helpful comments on previous versions of this article. However, any remaining errors or omissions are mine. I would also like to thank Research Center for Economic and Financial Integration (C.R.I.E.F) and the Nouvelle Aquitaine region in France for their financial support. This research was conducted within a framework of the "Banking Governance, Financial Stability and Macroeconomic Performance" program supported by the Nouvelle-Aquitaine region.
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Abstract

In a context where the authorities of the European Banking Union are showing a keen interest in mergers among banks with a view to consolidating the European banking industry, this paper analyses how the effects of the banks' trading activities on their systemic risk exposure differ according to banking industry concentration. I find that trading activities increased the systemic risk exposure of the banks only in a concentrated banking industry. This paper therefore does not support the encouragement by the European Banking Union authorities for mergers between banks.

Acknowledgments: I would like to thank Daniel Goyeau for his very helpful comments on previous versions of this article. However, any remaining errors or omissions are mine. I would also like to thank Research Center for Economic and Financial Integration (C.R.I.E.F) and the Nouvelle Aquitaine region in France for their financial support. This research was conducted within a framework of the "Banking Governance, Financial Stability and Macroeconomic Performance" program supported by the Nouvelle-Aquitaine region.
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1 - Introduction

Deregulation, technological progress and financial innovation led to a profound restructuring in the western banking systems which were characterized by the development of multi-specialized banks. In this new paradigm, banks were supposed to be more efficient, more profitable, and less risky. If this structural transformation improved the efficiency of banks, it coincided, however, with an increase of banks' systemic risk exposure whose striking fact was the 2007/2008 crisis. In this context, several economists have questioned the effects of non-traditional banking activities (diversification activities of banks) on banks' systemic risk. This question led, for example, to the papers of De Jonghe (2010), Brunnermeier et *al.* (2012), Moshirian et *al.* (2011), De Jonghe et *al.* (2015), Fina Kamani (2015) or Engle *et al.* (2014), to quote only the empirically contributions.

To contribute to this literature which empirically gauges the relationship between non-traditional banking activities and banks' systemic risk exposure, I explore the specific and joint impacts of the trading activities of European deposits-taking banks' and banking sector concentration on banks' exposure to systemic risk. In other words, I analyse how the effects of the trading activities of deposits-taking banks' on their systemic risk exposure differ according to concentration of banking sector in the European countries.

This study is important because if diversification offers opportunities for risk reduction, within financial institutions (Dewatripont and Mitchell (2005)), and also risk-sharing in the financial system (Van Oordt (2014)), and therefore a reduction in banks' exposure to systemic risk, there are at least two reasons which could explain that banking industry concentration might alter the relationship between diversification and banks' systemic risk exposure. Firstly, in a concentrated banking system, *too big to fail* (TBTF) policies encourage banks' risk-taking and therefore an increase of banks' risk exposure, especially banks' systemic risk exposure (Mishkin (1999)). Secondly, banks are generally engaged in multiple activities in a concentrated banking sector and, therefore, according to the *too complex to fail hypothesis*, are more complex and opaque, less transparent and as consequence more likely to engage in riskier activities, which increase their exposure to systemic risk.

Furthermore, notwithstanding these arguments which explain that banking industry concentration might alter the relationship between non-traditional banking activities and banks' systemic risk exposure, empirical papers that test the specific and joint impacts of activity diversification by banks and banking industry concentration on banks' systemic risk exposure are surprisingly scarce. Indeed, most of the previous papers focused either on the effects of activity diversification by banks on systemic risk (see, for example, the papers of Wagner (2008; 2010), De Jonghe (2010), Brunnermeier *et al.* (2012), Duport *et al.* (2018)), or on the effects of banking industry concentration on systemic risk (see, for example, the papers of Boot and Thakor (2000), De Nicolo *et al.* (2004), Kane (2000), Beck *et al.* (2006), Uhde and Heimeshoff. (2009), Weiß *et al.* (2014)).

To the best of my knowledge, only Engle *et al.* (2014) and Moshirian *et al.* (2011) addressed the role of concentration in banking sector on the relationship between banks' diversification activities and banks' exposure to systemic risk. Their papers are therefore closest to mine, but my paper differs from their studies in five points.

Firstly, I focused on the effects of banks' trading activities on their systemic risk exposure. This choice is explained by the fact that at the end of the 2007/2008 crisis, the debate on the separation of banks' activities was about the separation between retail banking and trading activities.

Secondly, I took into account the time persistence of bank systemic risk exposure, and avoided bias due to omissions of explanatory variables in my econometric specification by using the generalized-method-of-moments (GMM).

Thirdly, I performed a cross-sectional dependence test, developed by Pesaran (2015), to take into consideration common factors among the banks from my sample. This analysis is important because any estimate with significant unobservable common factors among individuals in panel data is likely to provide inconsistent results (Chudik and Pesaran (2015)). Additionally, national competition encourages banks' to develop activities beyond national borders which are likely to create common factors between banks.

Fourthly, my measure of banks' exposure to systemic risk is *SRISK* proposed by Acharya *et al*. (2012) and Brownlees and Engle (2017).[1] I prefer *SRISK* because it requires market and banks' accounts data. It therefore reflects market conditions as well as the banks' managerial strategies. Additionally, its definition is conceptually similar to the methodology followed in the European banking stress tests (Acharya *et al*. (2016)).

Finally, I focused on the European Banking Union industry. Focusing on European Banking Union industry is important because the European Banking Union authorities have shown a keen interest in banks mergers in the European banking industry for the past three years.[2] These mergers could give rise to increasingly diversified banking groups and could also result in concentration of the countries' banking industries. Yet, trading banks' activities were at the core of the 2007/2008 crisis, and the evidence on the ongoing debate of the banking industry concentration and systemic risk relationship is inconclusive. Indeed, while Allen and Gale (2000; 2004), for example, cite arguments in support of the so-called "concentration-stability", Weiß *et al.* (2014) cite arguments in support of the so-called "concentration-fragility". Furthermore, understand how the effects of the trading activities of European banks on systemic risk differ according to banking concentration is important since the European Banking Union, established after the European debt crisis, has among these objectives to standardize the banking regulations between countries of the Union. In fact, the European banking Union is characterized by heterogeneity between banking concentration of the countries and figure A1 (in appendices) shows that European banks in a concentrated market have higher trading revenues than those in a less concentrated banking sector.

The remainder of the paper is organized as follows: section 2 presents the empirical framework; section 3 shows the results; section 4 outlines the robustness checks; section 5 concludes.

2 - Empirical framework

2. 1 - Variables

The aim of this paper is to assess the relationship between banks' trading activities, banking industry concentration and bank's systemic risk exposure. The dependent variable is a bank's systemic risk exposure. It is measured by SRISK[3] proposed by Acharya *et al.* (2012) and Brownlees and Engle (2017). Mathematically, for a bank i at time t , it is given by the following formula:

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[1] Engle *et al.* (2014) and Moshirian *et al.* (2011) used marginal expected shortfall (*MES*) to assess a bank's systemic risk.

[2] On this subject, see the speech by Danièle Nouy, Chair of the Supervisory Board of the ECB, at the VIII Financial Forum, Madrid, 27 September 2017.
https://www.bankingsupervision.europa.eu/press/speeches/date/2017/html/ssm.sp170927.en.html

[3] See Acharya *et al.* (2012) or Brownlees and Engle (2017) for a detailed presentation of the SRISK.

$$SRISK_{it} = kD_{it} - (1-k)W_{it}(1-LRMES_{it})$$

where k is the prudential ratio,[4] W_{it} is the market value of equity, D_{it} is the book value of debt, and $LRMES_{it}$[5] is the long-run marginal expected shortfall. Its aim is to capture the interconnection between a bank and the rest of the system.

Conceptually, *SRISK* measures the expected capital shortfall of a given bank, conditional on a crisis affecting the financial system (Benoit *et al*. (2017)).[6] Thenceforth, by definition, *SRISK* cannot take on negative values. In this paper, following Leroy and Lucotte (2017) or Fina Kamani (2018), I allow *SRISK* to take negative values because they provide information on the relative contribution of banks' exposure to systemic risk.[7]

The independent variables of interest are bank trading activities and banking industry concentration. As in Engle *et al.* (2014) and Moshirian *et al.* (2011), the former is computed as a bank's share of trading income to total operating income, by dividing trading income by total operating income; and the second is evaluated by the Hirschmann-Herfindhal index approach. The Hirschmann-Herfindhal Index (HHI) is calculated as the sum of the share squared.[8]

The other bank-specific variables are included in the paper to capture various other dimensions of a bank's business model. In particular, I included loan provisions to loans, deposits to liquid assets, return on equity, and bank size computed as the natural logarithm of total assets. I also included annual gross domestic product (GDP) growth and inflation to capture macroeconomic conditions.

2. 2 - Data

The data used in this paper came from three sources. Balance sheet and income statement data came from the Bankscope and Fitch database. I obtained *SRISK* information on the Volatility Institute (V-Lab) website.[9] Following Leroy and Lucotte (2017) and Fina Kamani (2018), I considered *SRISK* at the end of each period. The macroeconomic variables came from the World Bank's World Development Indicators (WDI). Concretely, to construct my sample, I proceeded in three steps. Firstly, to ensure that the banks included in my sample had traditional banking activities, I only selected deposit-taking banks for which the information on financial statements was available for the period of study in the Bankscope and Fitch databases in a consolidated account.[10] Then, as *SRISK* is evaluated from market data, unlisted banks are excluded from the study. Finally, I excluded banks for which *SRISK* was not available on the website of ''Volatility Institute"(V-Lab) of NYU-Stern. At the end of these three steps, the resulting sample consisted of 72 listed deposits-taking institutions. My data spanned the period

[4] As suggested by Engle *et al*. (2015) and Brownlees and Engle (2017), we set the prudential capital ratio at 5.5%.

[5] The $LRMES_{it}$ is approximated by using the daily *MES* as follows: $LRMES_{it} = 1 - \exp(-18 * MES_{it})$. This approximation represents the firm's expected loss over a six-month horizon, obtained conditionally on the market falling by more than 40% within the next six months.

[6] The higher the *SRISK* indicated the greater the systemic risk exposure of the bank.

[7] In the robustness section, I do not allow *SRISK* to take negative values and find similar results.

[8] The share of a bank in an economy is its total assets divided by the total banking assets in the country.

[9] http://vlab.stern.nyu.edu/.

[10] However, to calculate our concentration indicator, we considered all European banks (listed and unlisted) for which Bankscope gives consolidated data.

from 2002 to 2016.[11] Table C1 (in appendices) gives more information about the banks included in my sample, and Table 1 presents descriptive statistics of all the variables used.

Table 1 - Descriptive statistics

Variable	Mean	Standard Deviation	Min	Max
SRISK	8.82	21.62	-10.85	120.64
Size	17.62	1.87	13.34	21.44
HHI	0.14	0.05	0.06	0.27
Trading	0.07	0.15	0	0.86
Credit	0.007	0.01	-0.002	0.06
Liquidity	6.37	5.77	0.02	29.43
Roe	0.06	0.14	-0.86	0.34
Inflation	1.63	1.18	-4.47	4.87
Gdp growth	0.84	2.36	-7.3	5.79

Note: This table presents descriptive statistics of the variables used in this article. *SRISK* is the measure of systemic risk proposed by Acharya *et al*. (2012) and Brownlees and Engle. (2017). It is expressed in billions of euros. Trading is share of trading income to total operating income. HHI is the measure of concentration evaluated by the Hirschmann-Herfindhal index. Size is the natural logarithm of bank total assets expressed in thousands of euros. Credit is the ratio of loan provisions to total loans. Liquidity is deposits to liquid assets. ROE is the ratio of net income to equity.

2. 3 - Econometric methodology

To assess the relationship between trading activities, banking industry concentration and the banks' exposure to systemic risk, I estimated the specific and joint effects of trading activities and banking industry concentration on the banks' exposure to systemic risk. To take into account the time persistence of bank systemic risk, the lagged dependent variable was introduced on the right side of the equation as follows:[12]

$$SRISK_{i,t} = \delta SRISK_{i,t-1} + \beta_1 Trading_{i,t} + \beta_2 HHI_{i,t} + \beta_3 Trading_{i,t} * HHI + \beta' X_{i,t} + \alpha + \mu_i + \xi_{i,t}$$

where $SRISK_{i,t}$ represents banks' systemic risk exposure; $Trading_{i,t}$ represents banks' trading activities; HHI is banking industry concentration; $X_{i,t}$ is the matrix of control variables; α is the constant term; μ_i is individual fixed effects and ζ is the error term.

With a dynamic specification, some econometric bias can arise with traditional panel data estimators. Thenceforward, my estimations were made by the two-step generalized-method-of-moments[13] in *system* with the robust estimator of variance. Moreover, to ensure the robustness of our results, I limited the proliferation of instruments and applied the Windmeijer (2005) correction as suggested by Roodman (2009) for small samples.

3 - Results

I followed in two steps to gauge the relationship between trading activities, the concentration of the banking market and the banks' systemic risk. I first performed a cross-sectional dependence test between the banks for my sample. As indicated in introduction, this first step is important because geographical diversification is likely to create common factors between banks, and any estimate with significant unobservable common factors between individuals in panel data is likely to provide inconsistent results (Chudik and Pesaran (2015)). Following the results of the cross-sectional dependence analysis, I then estimated the specific and joint effects of trading activities and concentration of the banking market on the banks' exposure to systemic risk.

[11] At the end of 2016, the total assets of these banks amounted to € 16,554 billion, representing more than half of all Eurozone banking assets.

[12] Such a specification is also important because it allows us to deal with the omission of variables in our econometric modeling.

[13] For a detailed presentation of GMM, see Blundell and Bond (1998) or Roodman (2009).

3. 1 - Cross-Sectional Dependence Test

To conduct the cross-sectional dependence test, I performed the test of Pesaran (2015). Table 2 reports the results of this test for all the variables selected in this study. I find that, whatever the variable selected for this study, I could not accept the null hypothesis of independence of the errors between the banks of my panel. Thus, as suggested by Chudik and Pesaran (2015), I added to my explanatory variables the time lags of their cross-sectional average.

Table 2 - Cross-Sectional Dependence Test

	SRISK	*Size*	*Trading*	*HHI*	*Credit*	*Liquid*	*Roe*	*Inflation*	*Gdp_growth*
Statistic test	90.5***	126.5***	25.5***	195.6***	45.2***	14.5***	45.2***	185.9***	151.3***

Note: *** indicate statistical significance at 1% levels. The null hypothesis of the test is a strong inter-individual independence of errors.

3. 2 - Banks' trading activities, banking industry concentration and systemic risk

To deal with the relationship between trading activities of banks and banking industry concentration and systemic risk, I proceeded in three steps. I first impose the constraint that there is no interaction effect between trading incomes and market concentration, i.e. I impose that $\beta_3 = 0$. Secondly, I relax the restriction that $\beta_3 = 0$, and considering the rationale that includes the interaction term between two variables derived from the Taylor approximation, I added the square of trading incomes and market concentration to my control variables. Thirdly, I re-estimated the equation without the square of the bank trading activities indicator because of its non-significance in the second step.

Table 3 presents my regression results. I will focus my discussion only on the impacts of the variables of interest, which corresponds with the coefficients β_1, β_2 and β_3. In the first column, I report the results when I impose that $\beta_3 = 0$. I find that the coefficient associated with trading incomes is negative but statistically insignificant. Concerning banking concentration, I find that it has a negative and statistically significant effect on the *SRISK*. This finding is in lines with the idea that concentration reduces banks' exposure to systemic risk, and support the encouragement by the European Banking Union authorities for mergers between banks. In column 2 and 3, I report the results when I relax the restriction that $\beta_3 = 0$. I find that the coefficient associated with trading incomes and the coefficient associated the interaction term between trading incomes and banking industry concentration are significant at the 1% level. This finding indicates that the effects of trading incomes on banks' systemic risk exposures vary according to banking market concentration. The negative sign associated with the trading incomes and positive sign associated with the interaction term between trading incomes and banking industry concentration indicate that trading incomes lead to an increase in banks' systemic risk exposure in low concentrated market and could lead to an increase in banks' systemic risk exposure in concentrated market.

To take the interpretation of my results further, I calculated the marginal effects of trading income on *SRISK* according to the level of banking industry concentration. These marginal effects are calculated and the results are reported in column (3). Figure 1 depicts the marginal effect of the trading income on banks' systemic risk exposure over the observed range of levels of the banking industry concentration indicator in the sample. I find that trading activities increase banks' exposure to systemic risk only in a concentrated market. This result can be explained by the fact that, if diversification offers opportunities for risk reduction within the financial institution (Dewatripont and Mitchell (2005)) and risk sharing with the financial system (van Oordt (2013)), banks are more exposed to *too big to fail* policies in a concentrated market, encouraging banks to have risky investment strategies (Mishkin (1999)) and, thus, ultimately increasing their exposure to systemic risk. This finding can be also explained by the

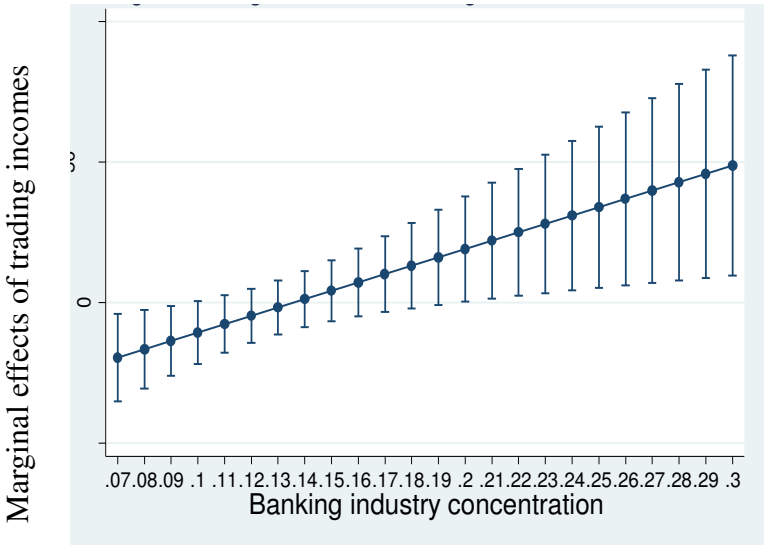
fact that banking supervision in a concentrated banking industry is more difficult, as banks in these markets tend to be larger and more complex than their counterparts operating in less concentrated markets (De Nicoló, (2004), Beck *et al.* (2006)).

Table 3: Results of the specific and joint effects of trading incomes share in total operating incomes and banking industry concentration on SRISK

	(1)	**(2)**	**(3)**
Srisk(-1)	0.64***	0.49***	0.49***
	(7.69)	(7.75)	(8.59)
Trading	**-5.7**	**-40.92*** **	**-40.33*** **
	(-0.7)	(-2.73)	(-2.7)
HHI	-105.18*	-190.67**	-191.84**
	(-1.85)	(-2.13)	(2.42)
Trading*HHI	**-**	**305.12*** **	**297.26*** **
	-	(2.7)	(2.66)
Trading*Trading	**-**	**-1.61**	**-**
	-	(-0.19)	-
*HHI*HHI*	-	378.55*	380.2*
	-	(1.7)	(1.88)
Size	28.78***	11.44***	11.44***
	(3.18)	(5.6)	(5.1)
Credit	-231.14	-77.5	-73.87
	(-1.37)	(-0.75)	(-0.71)
Liquidity	-0.57	0.38	0.39
	(-0.79)	(0.92)	(0.8)
Roe	-15.9*	-16.79	-16.07
	(-1.68)	(-1.54)	(-1.56)
Inflation	0.93	2.1	2.17
	(1.51)	(1.22)	(1.57)
Gdp growth	-0.29	1.58**	1.65
	(-0.69)	(2.01)	(1.57)
second-order serial correlation test (P-value)	0.178	0.206	0.221
Hansen test (P-value)	0.089	0.271	0.274
Pesaran test (P-value)	0.076	0.732	0.706
Number of lags on cross-sectional average	3	3	3
Threshold switches sign	-	-	0.136
Observations	716	716	716

Note: *, ** and *** indicate respectively statistical significance at 10%, 5% and 1%. The Student *t* values are in brackets. The null hypothesis of the Hansen test is that the instruments used are not correlated with the residuals. The null hypothesis of the second serial correlation test is that the errors in the first-difference regression exhibit no second-order serial correlation. The null hypothesis of the Pesaran test is a strong inter-individual independence of errors.

Figure 1: Marginal effects of trading incomes on SRISK



Note: This figure presents the marginal effect of trading incomes on bank systemic risk by banking industry concentration as well as the 95 percent confidence bounds. It is based on the results presented in column 3 of Table 3. As a reminder, the estimated coefficient for trading incomes is -40.33, and its interaction with banking industry concentration is 297.26.

4 - Robustness checks

I test the robustness of my results in several ways. First, following Acharya *et al.* (2012) and Brownlees and Engle (2017), I did not allow *SRISK* to take negative values. Secondly, I calculated my concentration indicator by the amount of customer deposits. Thirdly, following De Jonghe *et al.* (2015) or Elsas *et al.* (2010), I considered the Hirschmann-Herfindhal approach to measure banks' trading activities as below:

$$\text{Trading}(HHI) = 1 - \left(\left(\frac{\text{Trading income}}{\text{Total income}} \right)^2 + \left(\frac{\text{Total income-Trading income}}{\text{Total income}} \right)^2 \right)$$

A higher value indicates high trading income diversification, and therefore more trading activities. The results of the estimates are reported, respectively, in Tables B1, B2 and B3 (in appendices) and the marginal effects in Figures B1, B2 and B3 (in appendices). Whatever the robustness analysis performed, once again, I find that trading activities increased banks' systemic risk exposure only in a concentrated market.

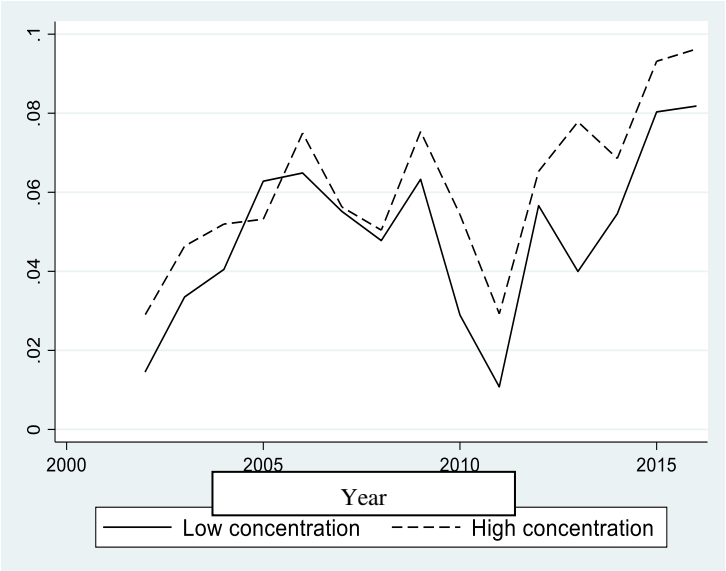
5 - Conclusion

In a context where the authorities of the European Banking Union are promoting the consolidation of the European banking industry, this paper analyses how the effects of the trading activities of European banks on their systemic risk exposure differ according to banking industry concentration. I have used the generalized-method-of-moments while taking into account the unobservable common factors between banks. I found that trading activities increased banks' exposure to systemic risk only in a concentrated banking industry. This paper therefore does not support the encouragement by the European Banking Union of mergers between banks.

Appendices

Appendix A: Stylized fact

Figure A1: Differences in trading incomes



Note: This figure shows the trading incomes from 2012-2016. The Low Concentration group includes banks which were in countries with levels of asset HHI below the median asset HHI for each year. The High Concentration group includes banks not in the Low Concentration group. Trading incomes are calculated as the share of trading incomes to total operating incomes. The values on the graph are the median trading incomes values for each year within each group

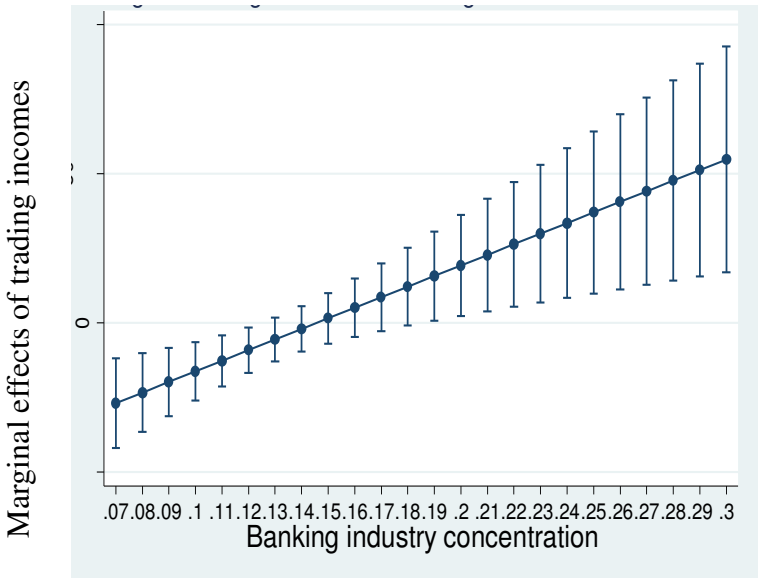
Appendices B: regressions results and marginal effects (robustness checks)

Table B1: Results of the specific and joint effects of trading incomes share in total operating incomes and banking industry concentration on SRISK

	(1)	(2)	(3)
Srisk(-1)	0.70***	0.58***	0.58***
	(9.04)	(11.27)	(11.81)
Trading	**-6.24**	**-51.93*** **	**-51.72*** **
	(-0.87)	(-3.33)	(-3.44)
HHI	110.4**	-162.87**	-155.25**
	(-2.09)	(-1.99)	(2.18)
Trading*HHI	**-**	**350.93*** **	**355.05*** **
	-	(3.09)	(3.18)
Trading*Trading	**-**	**2.06**	**-**
	-	(0.28)	-
*HHI*HHI*	-	324.73	307.44*
	-	(1.49)	(1.69)
Size	31.91***	9.29***	9.43***
	(3.23)	(4.43)	(4.62)
Credit	-137.91	-37.24	-39.8
	(-1.37)	(-0.47)	(-0.51)
Liquidity	-1.33**	0.22	0.23
	(2.01)	(0.57)	(0.58)
Roe	-12.35	-13.72	-14.31*
	(-1.35)	(-1.49)	(-1.65)
Inflation	0.66	1.66	1.71
	(0.98)	(1.13)	(1.14)
Gdp growth	-0.71*	1.27*	1.71
	(-1.9)	(1.95)	(1.14)
second-order serial correlation test (P-value)	0.141	0.271	0.244
Hansen test (P-value)	0.237	0.22	0.245
Pesaran test (P-value)	0.256	0.517	0.473
Number of lags on cross-sectional average	3	3	3
Threshold switches sign	-	-	0.145
Observations	716	716	716

Note: *, ** and *** indicate respectively statistical significance at 10%, 5% and 1%. The Student *t* values are in brackets. The null hypothesis of the Hansen test is that the instruments used are not correlated with the residuals. The null hypothesis of the second serial correlation test is that the errors in the first-difference regression exhibit no second-order serial correlation. The null hypothesis of the Pesaran test is a strong inter-individual independence of errors.

Figure B1: Marginal effects of trading incomes on SRISK



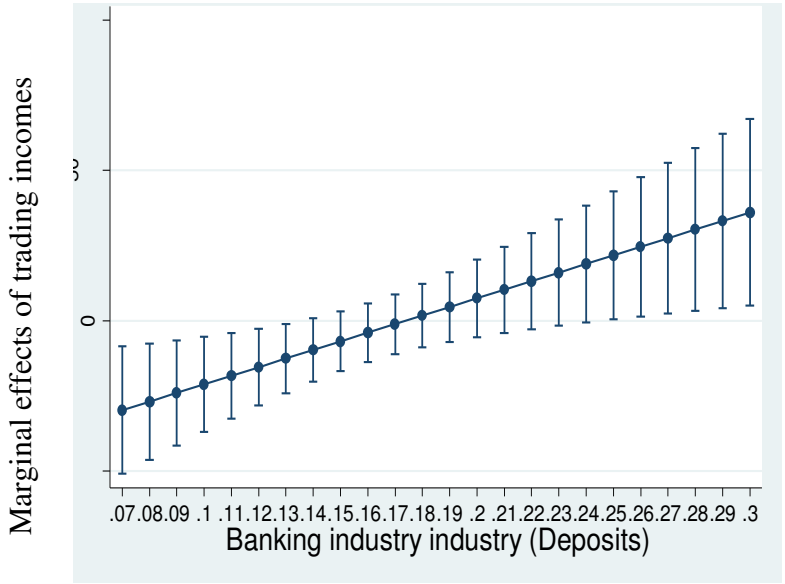
Note: This figure presents the marginal effect of trading incomes on bank systemic risk by banking industry concentration as well as the 95 percent confidence bounds. It is based on the results presented in column 3 of Table 4. As a reminder, the estimated coefficient for trading incomes is -51.72, and its interaction with banking industry concentration is 355.05.

Table B2: Results of the specific and joint effects of trading incomes and banking industry concentration (Deposit) on *SRISK*

	(1)	**(2)**	**(3)**
Srisk(-1)	0.61***	0.52***	0.53***
	(14.24)	(6.46)	(6.74)
Trading	**-11.38***	**-49.74****	**-49.78*****
	(-1.78)	(-2.57)	(2.7)
HHI	-41.32**	-180.02	-184.02
	(-2.28)	(-1.26)	(1.35)
Trading*HHI	**-**	**293.89****	**286.07*****
	-	(2.6)	(2.67)
Trading*Trading	**-**	**-3.38**	**-**
	-	(-0.41)	-
*HHI*HHI*	-	325.82	328.41
	-	(1.06)	(1.09)
Size	8.72***	10.67***	10.31***
	(5.98)	(3.72)	(4.21)
Credit	-126.7	37.11	55.88
	(-1.19)	(0.16)	(0.28)
Liquidity	0.12	0.34	0.33
	(0.61)	(0.66)	(0.6)
Roe	-13.07	-14.56	-13.25
	(-1.09)	(-1.44)	(-1.25)
Inflation	0.73***	1.95	2.1
	(2.65)	(0.93)	(0.79)
Gdp growth	-0.52	1.89*	1.87
	(-2.28)	(1.64)	(1.52)
second-order serial correlation test (P-value)	0.074	0.147	0.155
Hansen test (P-value)	0.18	0.249	0.261
Pesaran test (P-value)	0.657	0.764	0.898
Number of lags on cross-sectional average	3	3	3
Threshold switches sign	-	-	0.174
Observations	716	716	716

Note: *, ** and *** indicate respectively statistical significance at 10%, 5% and 1%. The Student *t* values are in brackets. The null hypothesis of the Hansen test is that the instruments used are not correlated with the residuals. The null hypothesis of the second serial correlation test is that the errors in the first-difference regression exhibit no second-order serial correlation. The null hypothesis of the Pesaran test is a strong inter-individual independence of errors.

Figure B2: Marginal effects of trading incomes on *SRISK*



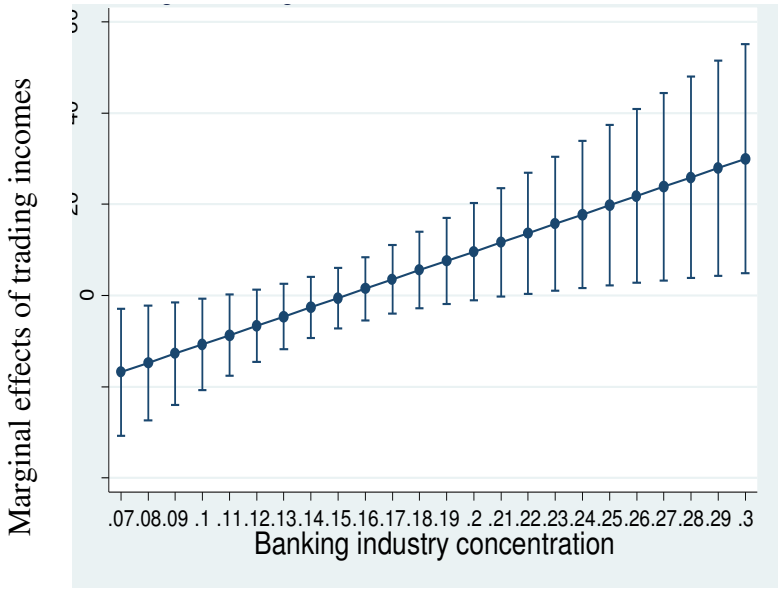
Note: This figure presents the marginal effect of trading incomes on bank systemic risk by banking industry concentration as well as the 95 percent confidence bounds. It is based on the results presented in column 3 of Table 5. As a reminder, the estimated coefficient for trading incomes is -49.78, and its interaction with banking industry concentration is 286.07.

Table B3: Results of the specific and joint effects of trading incomes (trading (HHI)) and banking industry concentration on *SRISK*

	(1)	**(2)**	**(3)**
Srisk(-1)	0.64***	0.49***	0.65***
	(12.76)	(8.59)	(13.14)
Trading (HHI)	**-12.29*** **	**-40.33*** **	**-31.05** **
	(-3.43)	(2.7)	(2.5)
HHI	-32.4**	-191.84**	-265.88*
	(-2)	(2.42)	(1.92)
Trading(HHI)*HHI	**-**	**297.26*** **	**203.4** **
	-	(2.47)	(2.51)
Trading(HHI)*Trading(HHI)	**-**	**2.33**	**-**
	-	(0.45)	-
*HHI*HHI*	-	590.57**	609.08**
	-	(2.02)	(1.96)
Size	8.39***	7.6***	7.86***
	(4.79)	(3.61)	(3.83)
Credit	-87.4	125.65	126.01
	(-1.22)	(1.43)	(1.34)
Liquidity	0.38*	-0.09	-0.09
	(1.85)	(-0.38)	(-0.33)
Roe	-0.93	-6.52	-7.09
	(-0.26)	(-0.56)	(-0.63)
Inflation	0.46	0.81	0.78
	(1.47)	(0.53)	(0.48)
Gdp growth	-0.48**	0.81	1.33
	(-2.4)	(1.54)	(1.41)
second-order serial correlation test (P-value)	0.065	0.37	0.39
Hansen test (P-value)	0.207	0.204	0.23
Pesaran test (P-value)	0.123	0.118	0.138
Number of lags on cross-sectional average	3	2	2
Threshold switches sign	-	-	0.152
Observations	716	755	755

Note: *, ** and *** indicate respectively statistical significance at 10%, 5% and 1%. The Student *t* values are in brackets. The null hypothesis of the Hansen test is that the instruments used are not correlated with the residuals. The null hypothesis of the second serial correlation test is that the errors in the first-difference regression exhibit no second-order serial correlation. The null hypothesis of the Pesaran test is a strong inter-individual independence of errors.

Figure B3: Marginal effects of DIV_TRAD on *SRISK*



Note: This figure presents the marginal effect of trading incomes on bank systemic risk by banking industry concentration as well as the 95 percent confidence bounds. It is based on the results presented in column 3 of Table 6. As a reminder, the estimated coefficient for trading incomes is -31.05, and its interaction with banking industry concentration is 203.4.

Appendix C: Banks included in the sample

Tableau C1: Banks included in the sample

Bank Name	Specialisation	Country	Total asset	Bank Name	Specialisation	Country	Total asset
Raiffeisen Bank International AG	Commercial bank	Austria	1.12e+08	Crédit Agricole S.A.	Cooperative bank	France	1.52e+09
Bank fur Tirol und Vorarlberg AG-BTV	Commercial bank	Austria	1.00e+07	BNP Paribas	Commercial bank	France	2.06e+09
Oberbank AG	Commercial bank	Austria	1.92e+07	Crédit agricole mutuel de l'Ille-et-Vilaine SA	Cooperative bank	France	1.14e+07
BKS Bank AG	Commercial bank	Austria	7581053	Crédit agricole mutuel de Paris SC	Cooperative bank	France	4.09e+07
Erste Group Bank AG	Holding bank	Austria	2.08e+08	Crédit Agricole mutuel du Morbihan SC	Cooperative bank	France	9374332
KBC Group	Holding bank	Belgium	2.75e+08	Attica Bank SA-Bank of Attica SA	Commercial bank	Greece	3611081
Dexia	Holding bank	Belgium	2,13e+08	National Bank of Greece SA	Commercial bank	Greece	7.85e+07
Commerzbank AG	Commercial bank	Germany	4.80e+08	Alpha Bank AE	Commercial bank	Greece	6.49e+07
Deutsche Bank AG	Commercial bank	Germany	4.77e+07	Eurobank Ergasias SA	Commercial bank	Greece	6.64e+07
Aareal Bank AG	Commercial bank	Germany	4.77e+07	Piraeus Bank SA	Commercial bank	Greece	8.15e+07
Deutsche Postbank AG	Commercial bank	Germany	1.47e+08	Allied Irish Banks plc	Commercial bank	Irlande	9.56e+07
MLP Ag	Holding bank	Germany	1944055	Unione di Banche Italiane Scpa	Cooperative bank	Italy	1.12e+08
Wustenrot & Wurttembergische	Commercial bank	Germany	7.23e+07	Banco di Sardegna SpA	Commercial bank	Italy	1.25e+07
Sydbank A/S	Commercial bank	Denmark	1.97e+07	Banca Carige SpA	Commercial bank	Italy	2.61e+07
Spar Nord Bank	Commercial bank	Denmark	1.06e+07	Banco di Desio e della Brianza SpA	Commercial bank	Italy	1.24e+07
Jyske Bank A/S (Group)	Commercial bank	Denmark	7.89e+07	Banca Popolare di Milano SCaRL	Cooperative bank	Italy	5.11e+07
Danske Bank A/S	Commercial bank	Denmark	4.69e+08	Banca Profilo SpA	Cooperative bank	Italy	1778412
Banco de Sabadell SA	Commercial bank	Spain	2.13e+08	Azimut Holding SpA	Holding bank	Italy	7727274
Banco Popular Espanol SA	Commercial bank	Spain	1.48e+08	Credito Emiliano SpA-CREDEM	Commercial bank	Italy	3.96e+07
Bankinter SA	Commercial bank	Spain	6.72e+07	Banca Monte dei Paschi di Siena SpA	Commercial bank	Italy	1.53e+08
Banco Santander SA	Commercial bank	Spain	1.34e+09	Credito Valtellinese Soc Coop	Cooperative bank	Italy	2.55e+07
Banco Bilbao Vizcaya Argentaria SA	Commercial bank	Spain	7.32e+08	Banca Popolare di Sondrio	Cooperative bank	Italy	3.72e+07
Alandsbanken Abp-Bank of Aland Plc	Commercial bank	Finland	5136794	Intesa Sanpaolo	Commercial bank	Italy	7.25e+08
Pohjola Bank plc-Pohjola Pankki Oyj	Commercial bank	Finland	6.30e+07	Banca Generali SpA-Generbanca	Commercial bank	Italy	8356737
Foncière de Paris SIIC*	Commercial bank	France	1771700	Banco Popolare	Cooperative bank	Italy	1.17e+08
Boursorama*	Commercial bank	France	7587143	Van Lanschot NV	Holding bank	Netherlands	1.49e+07
Crédit agricole mutuel Loire Haute-Loire SC	Cooperative bank	France	1.07e+07	Delta Lloyd NV-Delta Lloyd Group	Holding bank	Netherlands	7.64e+07
Credit agricole mutuel d'Alpes-Provence SC	Cooperative bank	France	1.76e+07	ING Groep NV	Holding bank	Netherlands	8.45e+08
Crédit agricole mutuel de la Touraine et du Poitou SC	Cooperative bank	France	1.20e+07	Banco Espirito Santo SA*	Commercial bank	Portugal	623077
Crédit agricole mutuel Sud Rhone -Alpes SC	Cooperative bank	France	1.82e+07	Banco BPI SA	Holding bank	Portugal	3.83e+07
Crédit agricole mutuel de Normandie-Seine	Cooperative bank	France	1.38e+07	Banco Comercial Portugues	Commercial bank	Portugal	7.13e+07
Crédit agricole mutuel Atlantique Vendée SC	Cooperative bank	France	1.93e+07	Svenska Handelsbanken	Cooperative bank	Sweden	2.75e+08
Crédit agricole mutuel Nord de France SC	Cooperative bank	France	2.72e+07	Swedbank AB	Savings bank	Sweden	2.26e+08
Crédit Industriel et Commercial SA	Commercial bank	France	2.69e+08	Skandinaviska Enskilda Banken AB	Commercial bank	Sweden	2.74e+08
Natixis SA	Commercial bank	France	5.28e+08	Nordea Bank AB (publ)	Holding bank	Sweden	6.16e+08
Société Générale SA	Commercial bank	France	1.38e+09	Avanza Bank Holding AB	Holding bank	Sweden	1.05e+07

Note: total assets are given for 2016 in thousand Euros, with the exception of banks marked with an asterisk whose total assets correspond to the last available observation.

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