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Why Did EU banks change their business models in last years and what was the impact of net fee and commission income on their performance?

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Why Did EU Banks Change Their Business Models in Last Years and What Was the Impact of Net Fee and Commission Income on Their Performance?

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Abstract:

This paper contributes to the current literature dealing with the drivers of bank business model changes by analyzing the relationship between fee and commission income share and banks' performance in terms of profitability, risk and risk-adjusted profitability in the European Union. We apply System Generalized Method of Moments on a unique data set of 329 EU banks in 2005-2014 period. We did not find any diversification benefits by increasing the fee income share based on which we conclude that increase in fee income share observed during last years in EU banks was driven mainly by external factors like increased competition rather than by internal reasons. As expected higher reliance on equity financing and better quality of provided loans enhance banks' performance. Finally, bank business strategy and macroeconomic factors are crucial in the determination of banks' performance.

Keywords: bank, fee and commission income, profitability, risk

JEL: C23, G21, L25

1 Introduction

In last few decades, an expansion of bank activities into non-traditional fee and commission bearing services can be observed (Brighi and Venturelli, 2016).¹ Banks are becoming more and more universal by combining traditional and non-traditional activities. Between 1989 and 1998, non-interest income (NII) in EU banks has increased from 26% to 41% of total income (Lepetit et al., 2005). The most pronounced part of NII is net fee and commission income (NFCI) that accounted on average for almost 28% of total income in EU countries in 2015 (ECB, 2016). The academicians as well as bank managers are mainly concerned by the impact of NII on the risk-return tradeoff. The theory of finance suggests that expanding into non-traditional activities should decrease the risk level of banks via diversification as fee income, trading income and other NII are not perfectly correlated with interest income (DeYoung and Roland, 2001, Smith et al., 2003). Moreover, the diversification should also lead to higher risk-adjusted profits and higher efficiency due to economies of scope (Klein and Seidenberg, 1998, Elsas et al., 2010). However, the empirical evidence is mixed.

Some authors such as Stiroh (2004), DeYoung and Rice (2004) and Stiroh and Rumble (2006) found out that diversification benefits are more than offset by increased exposure to potentially more risky fee bearing activities. For these banks the decision to expand into non-traditional activities is possibly connected with other reasons than only with the effort to increase risk adjusted returns and is possibly influenced by external factors. This might be rather connected with technological development and widespread deregulation that increased the competition among financial institutions which in turn led to decreased cost advantages of banks. As a result, the profitability of traditional activities of banks dropped which consequently led to an expansion of banking activities into non-traditional fee and commission bearing services. An overall effort to find the optimal banking strategy and to identify the most appropriate level of banking fees can be observed.

Our study is motivated by increasing share of NII in the EU banks in last years and lack of literature dealing with this phenomenon across EU countries. Most of the current studies are based on US or individual countries data from which it is not possible to draw a general conclusion about the European banking market. In this paper, we use EU banks' data to analyze the links between bank NFCI magnitude, profitability, riskiness and risk-adjusted profitability between 2005 and 2014. Based on the found relationship we make conclusions about the basic reasons, why European banks increased their NII share in last years. We also study whether basic risk-return tradeoff (riskier activities - higher return) holds for NFCI.

¹ Traditional activities include deposit taking and loan providing. Non-traditional activities are for example retail brokerage, insurance sales, securities issuance.

The rest of the paper is structured as follows: Section 2 provides a literature review. In Section 3, we study the relationship between fee income magnitude and profitability, riskiness and risk-adjusted profitability of EU banks. Section 4 summarizes the paper and provides conclusion.

2 Literature review

Stiroh and Rumble (2006), Goddard et al. (2008), Sanya and Wolfe (2011) and Gürbüz et al. (2013) all provide detailed literature reviews on the link between income diversification and bank performance. We discuss just the most important papers.

Stiroh (2002), Stiroh (2004), DeYoung and Rice (2004) and Stiroh and Rumble (2006) conclude based on U.S. data that diversification benefits might exist but they are more than offset by the increased exposure to volatile NII bearing activities and therefore NII tends to increase the risk and decrease risk-adjusted profits.

On data from OECD countries, Gischer and Jüttner (2003) discovered that higher fee to income ratio tends to decrease the profitability while Hahn (2008) and Moshirian et al. (2011) found an inverse effect of higher NII share. Higher reliance on non-traditional activities seems to increase the bank's profitability, but considering also the macroeconomic factors this relationship becomes weaker. Therefore, the revenue diversification does not necessarily imply a shift toward superior return-risk frontiers. Baele et al. (2007), Lepetit et al. (2008), Köhler (2012), Chiorazzo et al. (2008), Busch and Kick (2015), Dietrich and Wanzenried (2011), Dumičić and Ridzak (2013), Köhler (2013) tested the correlation between NII and performance based on EU banks data. Also in European studies the results seem to be highly different and Köhler (2013) claims that the link is highly dependent on the bank type.

Similar inconsistency of results can be observed also in studies of banking sectors in emerging economies. While Odesanmi and Wolfe (2007) found that diversification gains are present even though increased share of NII lowers risk-adjusted profits, Sanya and Wolfe (2011) found that the impact of NII share on the risk-adjusted performance differs across various model specifications. Still, higher share of NII tends to decrease the insolvency risk. Contrary, Gamra and Plihon (2011) found that higher reliance on NII has negative impact on risk-adjusted profitability and it increases insolvency risk.

We conclude that despite of the theory of finance which suggests that diversification should lead to better risk-return tradeoff and economies of scope, many papers found that expansion in non-traditional activities decreases rather than improves the bank's risk-adjusted performance. This may be caused primarily by higher volatility of NII compared to interest income documented in many studies (DeYoung and Roland, 1999, Stiroh, 2002, Smith et al., 2003) or by increasing correlation of NII with interest income (Stiroh, 2002). Furthermore, the diversification effect depends on the actual portfolio held by the bank (Köhler, 2013) and

it affects differently small and large banks (Goddard et al., 2008, Köhler, 2013). Despite the fact that the literature is not unanimous about the income diversification effects, it is very important to study how non-traditional activities affect the risk and performance of banks, because these are crucial indicators for bank managers.

3 Empirical analysis

In this section we examine the impact of the magnitude of NFCI on bank performance. Besides the basic bank interior factors, we also include sector and country specific variables as determinants of profitability, riskiness and risk-adjusted profitability of banks.

3.1 Data set

The analysis is based on EU data from 2005 to 2014. The data were taken from the Bankscope and the ECB databases and Eurostat. The final data set is a balanced panel. Our study is based on data from 329 EU banks (182 commercial banks, 57 savings banks, 45 cooperative banks, 17 real estate and mortgage banks, 9 investment banks, and 19 bank holdings and holding companies), i.e. on average we have data for almost 12 banks in each country. Table 1 displays the number of banks included in the study by country.²

Table 1: Number of banks included in the study by country

Austria	: 13	Romania	: 11	Luxemburg	: 1	Hungary	: 5
Estonia	: 3	Bulgaria	: 8	Slovenia	: 5	Netherlands	: 8
Italy	: 33	France	: 55	Cyprus	: 3	Sweden	: 37
Portugal	: 11	Lithuania	: 5	Greece	: 1	Denmark	: 11
Belgium	: 3	Slovakia	: 6	Malta	: 3	Ireland	: 1
Finland	: 3	Croatia	: 15	Spain	: 12	Poland	: 13
Latvia	: 8	Germany	: 6	Czech Republic	: 11	United Kingdom	: 38

Source: Author's computation

3.2 Methodology

We apply System Generalized Method of Moments (GMM), which is appropriate for time persistent data and data set with large number of banks and small number of time periods and is able to deal with explanatory variables that are not strictly exogenous.

The general model is defined as:

² The inclusion of more banks was not possible due to missing data. Moreover, we excluded banks with negative NFCI and operating income, because their NFCI/TI ratio would be misleading. We also excluded bank with negative Z-Score, because we would not be able to construct the log transformation.

$$y_{i,t} = \alpha y_{i,t-1} + X'_{i,t} \beta + \varepsilon_{i,t} \quad 1$$

$$\varepsilon_{i,t} = \mu_i + v_{i,t}$$

$$E[\mu_i] = E[v_{i,t}] = E[\mu_i v_{i,t}] = 0$$

where $|\alpha| < 1$, $i = 1, \dots, N$ is an individual's index and $t = 1, \dots, T$ is a time index. The disturbance is composed of the fixed effects μ_i and the idiosyncratic shocks, $v_{i,t}$. Pooled OLS is inappropriate for the estimation because exogeneity assumption is violated since $y_{i,t-1}$ and μ_i are correlated (Wooldridge, 2002). Least Squares Dummy Variable or Within Groups estimator are not able to eliminate the dynamic panel bias (Nickell, 1981 and Bond, 2002). It is suggested to use both pooled OLS and Within Groups estimator as a robustness check since both methods are biased in opposite directions (Bond, 2002).

Two transformations are commonly used for dynamic panel data. The first method, Difference GMM, originally developed by Holtz-Eakin et al. (1988) and by Arellano and Bond (1991), uses the first-difference transformation applied on equation (1). The fixed effects are no more present, but the lagged dependent variable is still endogenous, which can be addressed by assuming that $v_{i,t}$ are serially uncorrelated. The drawback of this method is that it does not allow for time-invariant variables.

The second method, System GMM, was developed by Blundell and Bond (1998) and it combines the differences equation with the level equation (1). As long as $v_{i,t}$ are serially uncorrelated, the explanatory variables do not need to be strictly exogenous. Moreover, this method allows using time-invariant variables. The instruments are differenced to make them uncorrelated with the fixed effects (Sanya and Wolfe, 2011).

We include time dummies in the regressions,³ because they make the assumption of no correlation between idiosyncratic shocks more likely to hold (Roodman, 2006, Sanya and Wolfe, 2011). We use two-step System GMM with clustered standard errors robust to heteroscedasticity and autocorrelation within individuals and with small sample corrections to the covariance matrix. We apply Windmeijer (2005) correction to prevent the downward bias of standard errors estimation that may arise when the number of instrument is large (Arellano and Bond, 1991).

The estimation is performed in Stata. The estimation equation representing our model for each performance measure is:

$$Y_{i,c,t} = \alpha + \beta Y_{i,c,t-1} + \gamma X_{i,c,t} + \delta Z_{c,t-1} + \epsilon W_{c,t} + \theta D_i + \vartheta T_t + (\mu_i + v_{i,c,t}) \quad 2$$

³ Time dummies are not reported in the tables.

where:

$Y_{i,c,t}$ performance of bank i in country c at time t (dependent variable),
measured as described in Section 3.3,

$Y_{i,c,t-1}$...performance of bank i in country c at time $t - 1$,

$X_{i,c,t}$ vector of bank-specific variables for bank i in country c at time t ,

$Z_{c,t-1}$... vector of country-specific variables for country c at time $t - 1$,

$W_{c,t}$ vector of banking sector-specific variables for country c at time t ,

D_i bank type dummy,

T_t time dummy,

μ_i unobserved bank-specific time-invariant effect,

$v_{i,c,t}$ disturbance term which is independent across banks.

3.3 Variables

The dependent variable captures the bank performance measured by:

- Return on average assets (*roaa*): $ROAA_{i,t} = \frac{Net\ income_{i,t}}{Average\ assets_{i,t}}$,
- Return on average equity (*roae*): $ROAE_{i,t} = \frac{Net\ income_{i,t}}{Average\ equity_{i,t}}$,
- Net interest margin (*nim*): $NIM_{i,t} = \frac{Interest\ income_{i,t} - Interest\ expense_{i,t}}{Assets_{i,t}}$,
- Risk-adjusted ROAA (*raroaa*): $RAROOA_{i,t} = \frac{ROAA_{i,t}}{\sigma(ROAA)_i}$,
- Risk-adjusted ROAE (*raroae*): $RAROAE_{i,t} = \frac{ROAE_{i,t}}{\sigma(ROAE)_i}$,
- Risk-adjusted NIM (*ranim*): $RANIM_{i,t} = \frac{NIM_{i,t}}{\sigma(NIM)_i}$,
- Log-transformed Z-Score (*ln_z_score*): $\ln(Z - Score)_{i,t} = \ln\left(\frac{ROAA_{i,t} + \frac{Equity_{t,i}}{Assets_{t,i}}}{\sigma(ROAA)_i}\right)$,
- Log-transformed risk-adjusted equity to assets ratio (*ln_RAEAR*): $\ln(RAEAR)_{i,t} = \ln\left(\frac{\frac{Equity_{t,i}}{Assets_{t,i}}}{\sigma(ROAA)_i}\right)$,⁴

where $\sigma(\cdot)_i$ stands for the standard deviation of each variable in bank i , computed over the examined ten-years period.

⁴ Log-transformation is needed due to high skewness of Z-Score and RAEAR.

ROAA, ROAE and NIM are standard measures of the bank profitability. Still, since there is mostly some risk-return tradeoff it is important to measure the performance adjusted by risk. For this purpose RAROOA, RAROE and RANIM are constructed.

The literature on bank performance widely uses Z-Score as a measure of risk (Stiroh 2002, Köhler, 2012). Higher Z-Score indicates lower probability of insolvency. More precisely, it states how many standard deviations below the expected value the bank's profits (measured by ROAA) must fall in order to eliminate equity. Furthermore, we follow Köhler (2012, 2013) and use as risk indicators also individual components of Z-Score that capture the portfolio and the leverage risk. The portfolio risk is measured by RAROOA, while RAEAR stands for the leverage risk. For both measures, higher values indicate increased stability.

By choosing the proper explanatory variables, we follow the actual best practice which follows from the literature review in Section 2. Originally we had 9 bank specific, 3 sector specific and 4 country specific variables, but some of them had to be excluded due to their mutual correlation or insignificance. The independent variables used in the final analysis are summarized in Table 2.

Table 2: List of independent variables

Variable	Description
<i>nfc_i_ti</i>	Net fee and commission income to total operating income
<i>depos_ass</i>	Total customer deposits to asset ratio
<i>eq_ass</i>	Total equity to total assets ratio
<i>loans_depos</i>	Loans to deposits ratio
<i>losres_loans</i>	Loan-loss reserves to gross loans ratio
<i>hi</i>	Herfindahl index
<i>lag_gdp</i>	Lagged real annual GDP growth rate
<i>lag_inf</i>	Lagged annual inflation rate

Source: Author

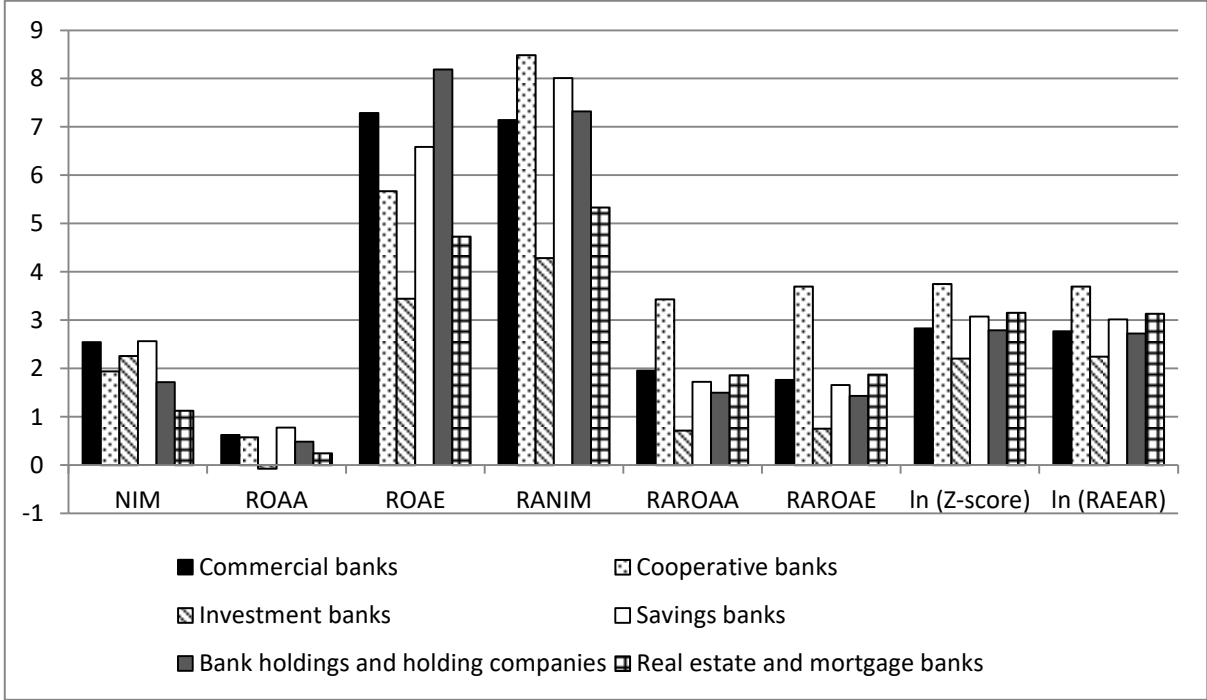
Moreover, we include also lagged dependent variable (*lag_DV*) and bank-type dummy variables: *dcom*: 1 = commercial bank, *dcoop*: 1 = cooperative bank, *dsav*: 1 = savings bank, *dinv*: 1 = investment bank, *dhold*: 1 = bank holdings and holding companies, 0 = real estate and mortgage banks.

3.4 Descriptive analysis

In this section, we provide a descriptive analysis of used variables. Firstly, we analyze the dependent variables ROAA, ROAE, NIM, RAROOA, RAROE, RANIM, ln (Z-Score) and ln (RAEAR). The scatter plots depicting the relationship between dependent variables and NFCI/TI can be found in Appendix in Figure A.1. Figure 1 displays the mean of each dependent variable by bank type computed over the period 2005 to 2014. Cooperative banks seem to outperform the other banking models in terms of stability and risk-adjusted profitability. The opposite holds true for investment banks. This is probably given by the

small number of investment banks included in the study and the fact that 7 out of the 9 investment banks are from PIIGS⁵ countries which were affected by the 2008 financial crisis the most.

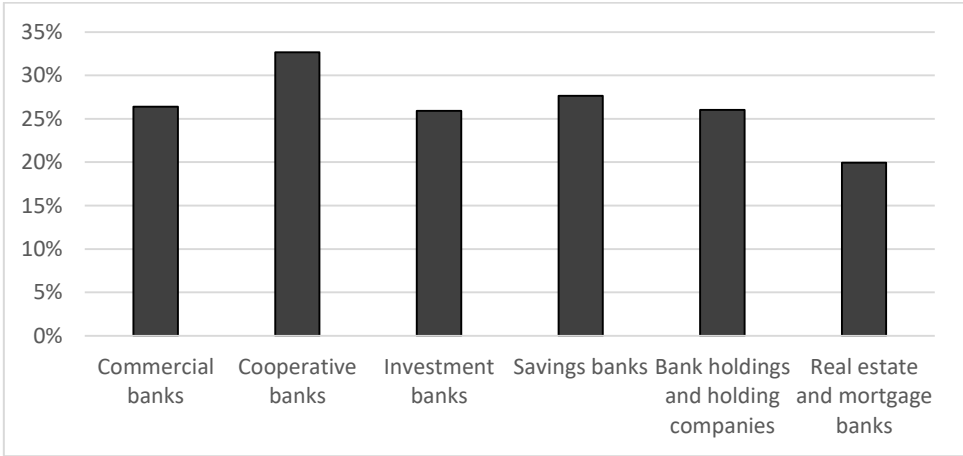
Figure 1: Average performance measures by bank type



For NIM, ROAA, ROAE, RANIM, RAROOA, RAROE the values on the vertical axis are in %.
 Source: Author based on Bankscope

Average NFCI/TI reported in the dataset during the analyzed period was 27.11%. Figure 2 displays that average NFCI/TI between 2005 and 2014 was the lowest in real estate and mortgage banks (20%) and the highest in Cooperative banks (32.66%).

Figure 2: Average NFCI/TI from 2005 to 2014 by bank type

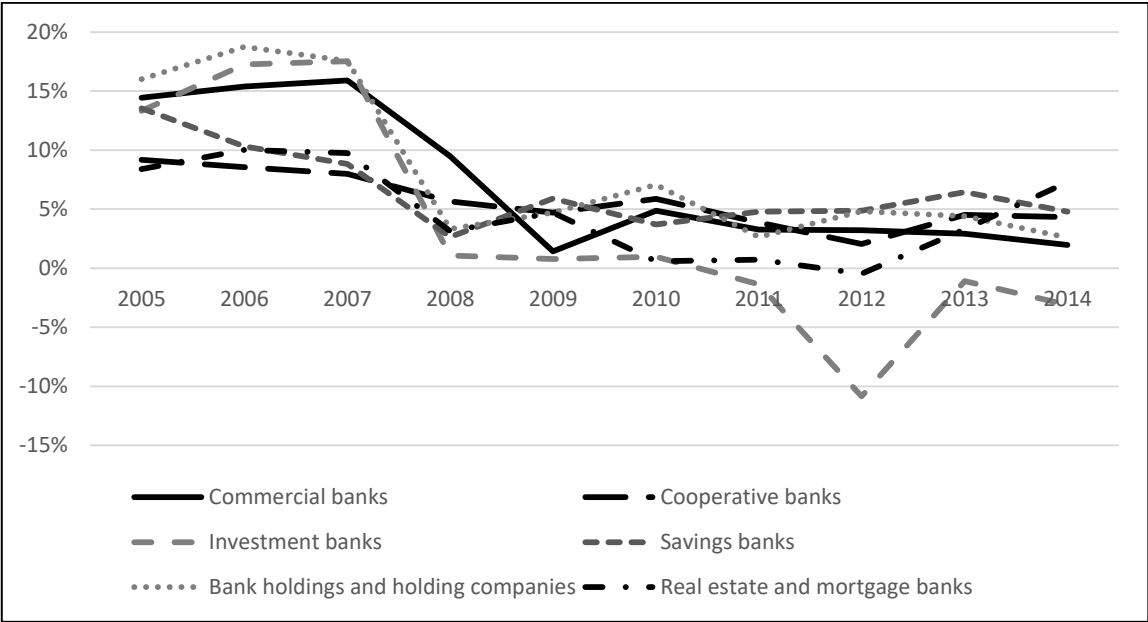


Source: Author based on Bankscope

⁵ PIIGS refers to Portugal, Ireland, Italy Greece and Spain.

Figure 3 shows the evolution of average ROAE from 2005 to 2014 by bank type. As can be seen, the ROAE dropped by about 10% after the financial crisis in 2008 in all bank types. While in 2005 the ROAE was around 12.5% in 2009 it dropped to less than 4% and it remained on similar levels until 2014. Most pronounced decrease in ROAE was observed in investment banks. Again, this can be related to the special features of the group that is represented by low number of banks mainly from PIIGS countries.

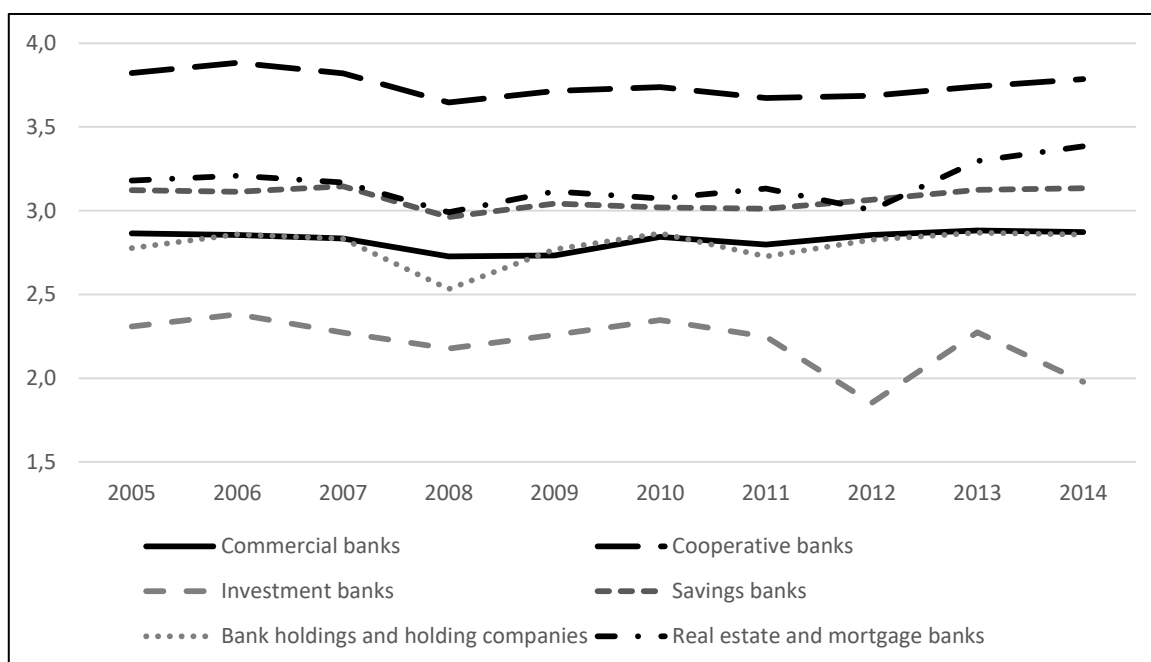
Figure 3: Development of average ROAE by bank type



Source: Author based on Bankscope

Figure 4 shows that compared to ROAE which significantly decreased after the crisis, ln (Z-Score) is much more stable measure. In reaction on the crisis, there was only a short term deterioration in ln (Z-Score), i.e. an increase in the probability of insolvency, in 2008.

Figure 4: Development of average ln (Z-Score) by bank type



Source: Author based on Bankscope

Figure A.2 in Appendix shows average NFCI/TI by country. It can be seen that the highest share of fee income was in 2005-2014 reported in Spain while the lowest share in Ireland. Generally speaking, PIIGS countries reported compared to other EU countries extreme NFCI/TI on both sides. Figure A.3 in Appendix shows average Herfindahl index (HI) by country. On average, there is a moderate banking sector concentration in the EU. Figure A.4 in Appendix shows country-specific macroeconomic indicators in year 2013.⁶ It can be seen that the macroeconomic conditions of PIIGS are still very poor. This is reflected by very low or negative GDP growth rate. Table A.1 in Appendix shows summary statistics of used variables.

3.5 Results and findings

First, we performed Wooldridge test for autocorrelation (Table 3). The null hypothesis of no first-order autocorrelation was rejected for all dependent variables. Therefore System GMM will be used as the main estimation method. Other methods will be applied for robustness check.

Table 3: Wooldridge test for autocorrelation

	ROAA	ROAE	NIM	RAROOA	RAROAE	RANIM	ln (Z-Score)	ln (RAEAR)
F statistics	9.902	52.864	74.035	211.975	204.863	518.410	11.478	220.306
	(d.f. 1, 329)	(d.f. 1, 329)	(d.f. 1, 329)	(d.f. 1, 329)	(d.f. 1, 329)	(d.f. 1, 329)	(d.f. 1, 329)	(d.f. 1, 329)

⁶ We are using lagged country-specific variables and therefore the last observations entering the model are from 2013.

p-value	0.0018	0.0000	0.0000	0.0000	0.0000	0.0000	0.0008	0.0000
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H0: no first-order autocorrelation, d.f. = degrees of freedom

Source: Author based on Bankscope

The regression results of the model that investigates the determinants of profitability, riskiness and risk-adjusted profitability in EU banks can be found in Table 4. In all reported regressions, the coefficient of *lag_DV* is significantly positive, proving the necessity of application of estimation method suitable for dynamic panel data. The first-order autocorrelation in residuals is proved also by Arellano-Bond AR (1) test. Moreover, significant AR (2) test suggest that there may exist even longer time persistence in NIM and all risk-adjusted profitability measures, which was tested among robustness tests. The results were not significantly influenced by inclusion of higher lags of dependent variable into the regressions. We instrument all endogenous and predetermined variables mainly speaking about *lag_DV*, *eq_ass*, *nfc_i_ti*, *loans_depos*, *losres_loans* and *depos_ass* with their lagged values (lag 1 – lag 9). In models with significant AR (2), higher lags of *lag_DV* were used as instruments because the second lag of dependent variable would be endogenous. Therefore, in models with significant AR (2), the number of used instruments is by 9 lower than in models with shorter time persistence. The model is unlikely to suffer from overidentification, because the Hansen test proves the exogeneity of instruments and also the rule of thumb that instruments should not exceed the number of groups is not violated. Significant F-test indicates a joint significance of used variables in all models.

The effect of NFCI/TI on bank's performance is stable with the used performance measure. Not only higher NFCI/TI decreases the profitability measured by NIM, ROAA and ROAE, it also tends to increase the insolvency and portfolio risk, while the effect on leverage risk does not seem to be present. It is then straight forward that also risk-adjusted performance measures are deteriorated by higher fee income shares. We do not find any positive diversification effects of increasing fee income share. Therefore, the expansion into NFCI bearing activities seems to be connected with external drivers rather than with the effort to achieve better risk-return tradeoff. This might reflect the fact that higher NFCI/TI is connected with higher competition. Vozková and Teplý (2017) claim that competition pushes the banks to offer more non-traditional fee income bearing services which are potentially more risky than the traditional ones. Moreover, competition decreases profitability which might explain why increased NFCI is connected with both, decrease in profitability (general decrease of profitability due to competition) and increase in riskiness (due to higher exposure to more volatile NFCI) and therefore by increased NFCI share, we cannot observe the standard risk-return tradeoff. Still it is possible that without the expansion into fee bearing activities the profitability and risk-adjusted profitability of banks would due to high competition drop more than in case of increased reliance on non-traditional activities. Therefore, the standard risk-return tradeoff is not generally rejected for fee and commission income.

The measure of liquidity *loans_depos* seems to have significantly negative impact on ROAA, ROAE and risk-adjusted profitability measures, but the size of the coefficients is so small that we do not take them into consideration. *Depos_ass* has a positive impact on NIM, ROAE, RAROOA and ln (Z-Score) which proves that deposits count to rather cheap sources of funds and this way of financing is connected with low risk. The coefficient of *losres_loans* is significantly negative in all models with exception of NIM and RANIM supporting the hypothesis that higher loan-loss reserves are sign of poor quality of loans. As expected, higher *eq_ass*, a measure of capital risk (from accounting perspective), the ability of a bank to meet its obligations and absorb potential losses, increases the bank's stability.

Hi has significantly negative coefficient in almost all performance models, but the coefficient is close to zero, therefore, market competition does not seem to play an important role in determining performance of EU banks. This might be given by the fact that in almost all EU countries there is moderate market concentration (see Appendix Figure A.3). On the other hand, country specific variables, as expected, seem to be very important. While higher growth of GDP leads to better performance of banks, inflation tends to have the opposite impact.

It can be seen that also business model influence the bank's profitability and stability. Highest profitability can be found in commercial and cooperative banks, while real estate and mortgage banks display lower profitability using all three measures. Using NIM, high profits have also investment banks while using ROAE, bank holdings and holding companies seem to be the most profitable. Cooperative banks outperform the other types of banks in terms of risks and risk-adjusted profitability. These findings are in line with Figure 1.

Table 4: Relationship between performance measures and NFCI/TI – System GMM regression results

Independent variables	Dependent variable							
	NIM	ROAA	ROAE	RANIM	RAROOA	RAROE	ln (Z-Score)	ln (RAEAR)
lag_DV	0.7725*** (0.0000)	0.3226*** (0.0000)	0.3521*** (0.0000)	0.9297*** (0.0000)	0.7258*** (0.0000)	0.6967*** (0.0000)	0.7665*** (0.0000)	0.8708*** (0.0000)
nfc_i	-0.0078*** (0.0000)	-0.0088** (0.0230)	-0.1652*** (0.0000)	-0.0115** (0.0000)	-0.0188*** (0.0000)	-0.0169*** (0.0000)	-0.0046*** (0.0000)	-0.0017*** (0.0020)
loans_depos	-0.0000 (0.2530)	-0.0000*** (0.0010)	-0.0000** (0.0120)	0.0000 (0.3770)	-0.0000*** (0.0000)	-0.0000*** (0.0000)	0.0000 (0.1520)	0.0000 (0.7360)
depos_ass	0.0022** (0.0470)	0.0005 (0.8240)	0.0629** (0.0140)	0.0022 (0.1820)	0.0050** (0.0420)	0.0042 (0.1440)	0.0025** (0.0200)	0.0000 (0.8890)
losres_loans	0.0048 (0.3950)	-0.1297*** (0.0000)	-1.0478*** (0.0000)	-0.0098 (0.1060)	-0.0648*** (0.0000)	-0.0658*** (0.0000)	-0.0350*** (0.0000)	-0.0161*** (0.0000)
eq_ass	0.0111*** (0.0010)	0.0340** (0.0150)	0.2117*** (0.0070)	0.0091* (0.0980)	0.0176** (0.0100)	0.0111 (0.1150)	0.0227*** (0.0000)	0.0141*** (0.0000)
hi	-0.0000 (0.1850)	-0.0000** (0.0350)	-0.0018*** (0.0030)	-0.0000** (0.0190)	-0.0002*** (0.0000)	-0.0002*** (0.0000)	-0.0001*** (0.0000)	-0.0000*** (0.0000)

lag_gdp	0.0308*** (0.0000)	0.0564** (0.0110)	0.3329** (0.0150)	0.0465*** (0.0000)	0,0071 (0.5010)	0,0044 (0.6730)	-0,0069 (0.1240)	-0,0013 (0.5170)
lag_inf	0,0034 (0.7060)	-0.0596*** (0.0080)	-0.8312*** (0.0010)	-0.0577*** (0.0000)	-0.0906*** (0.0000)	-0.0884*** (0.0000)	-0.0331*** (0.0000)	-0.0116*** (0.0000)
dcom	0.2462*** (0.0000)	0.5140*** (0.0010)	5.6076*** (0.0010)	0,0753 (0.3940)	0.3107** (0.0300)	0.2637* (0.0810)	0,0175 (0.7160)	-0,0308 (0.1910)
dcoop	0.2407*** (0.0000)	0.3959** (0.0170)	4.9246*** (0.0080)	0,1365 (0.2680)	0.6632*** (0.0010)	0.8077*** (0.0000)	0.1860** (0.0140)	0,0358 (0.2730)
dsav	0.2203*** (0.0000)	0.2817* (0.0510)	1,5128 (0.4200)	-0,0444 (0.6850)	-0,0835 (0.5810)	-0.0800 (0.6230)	-0.1045* (0.0720)	-0.0755*** (0.0050)
dinv	0.3737*** (0.0060)	0.2440 (0.2180)	5.6742** (0.0330)	0,1522 (0.2890)	0,0837 (0.6660)	0,0784 (0.7390)	-0,1403 (0.1650)	-0.1256** (0.0210)
dhold	0.1960*** (0.0070)	0.4124*** (0.0040)	5.9953*** (0.0010)	0,1129 (0.3990)	0,1156 (0.4610)	0,0746 (0.6570)	0,0488 (0.4020)	-0,0194 (0.5260)
_cons	0.2536*** (0.0030)	0.4331*** (0.0080)	3,6246 (0.1150)	0.9152*** (0.0000)	0.9108*** (0.0000)	0.9279*** (0.0000)	0.7604*** (0.0000)	0.4821*** (0.0000)
Estimation diagnostics								
Number of observations	2961	2961	2961	2961	2961	2961	2961	2961
Number of groups	329	329	329	329	329	329	329	329
Observations per group	9	9	9	9	9	9	9	9
Number of instruments	317	326	326	317	317	317	326	326
F-test	278.81***	34.72***	49.85***	378.54***	110.73***	106.57***	295.51***	740.74***
Arellano-Bond AR (1)	-4.94***	-2.5**	-5.18***	-10.73***	-11.55***	-11.24***	-2.81***	-8.55***
Arellano-Bond AR (2)	-2.5**	0.2	0.22	-4.94***	2.94***	3.96***	1.33	0.05
Hansen test	321.49	323.46	324.92	319.02	321.12	319.47	322.55	322.68

Robust standard errors adjusted for 329 clusters in index are in parentheses, ***/**/* indicates significance at 1%/5%/10%, time dummies included in the regression are not reported in the table, *_cons* stands for constant
Source: Author based on Bankscope, Eurostat and the ECB

Besides the inclusion of higher lags into NIM and risk-adjusted profitability regressions as described above, we perform among robustness tests also the regression with exclusion of investment banks since the descriptive statistics suggests that these are in some aspects outlying. Since it is very difficult to stipulate the ideal number of instruments in System GMM, a part of robustness check form regressions estimating the same model using other/less instruments. The results proved to be robust to these model and dataset changes. Moreover, System GMM results proved to be valid since the estimate of lagged dependent variable lies between the FE and pooled OLS estimate (see Appendix Table A.2).

3.5.1 Summary and comparison of results

On the first sight can be seen that the literature is not unanimous about the link between fee income and profitability and riskiness of banks. The greatest disunity is found by RAROOA and Z-Score where all possible outcomes were found in similar quantity. Therefore, the relationship is probably highly dependent on other internal and external condition the bank faces. In our study NFCI/TI has negative impact on all profitability, stability as well as risk-adjusted profitability measures. Therefore, the performance of EU banks seems to decrease with increased reliance on fee income. The link between NFCI/TI and ROAA, RAEAR was under some model specifications tested among robustness tests insignificant. Interestingly, only one paper listed below tested the impact of NII or fee income share on RANIM. This may be due to the fact that NIM is compared to other profitability measures more stable and therefore risk-adjusting may be not so important. Nevertheless, we constructed the RANIM measure and found that fee income not only decreases NIM but also RANIM.

Our evidence of negative impact of NFCI/TI on banks' performance is against the results found in Dietrich and Wanzenried (2011) who performed the analysis based on Swiss banks, Chiorazzo et al. (2008) who used data from Italian banks and Busch and Kick (2009) and Köhler (2012, 2013) who used data from German banks. This might be given by the fact that these studies made the analysis using data just from one country. Sanya and Wolfe (2011) analysed the link in emerging economies and they found that the result is heavily dependent on the exact model specification. Most of the other studies were based on U.S. data or included banks from different countries. Our results are in line with those that show that the relationship between fee income share and bank's performance is negative.

Table 5 provides the comparison of our results about the impact of NFCI/TI on different performance measures with the current literature. Most of the other academic papers examined the impact of NII and not only NFCI on the bank performance. Still, we believe that the results may be compared because NFCI represents the greatest part of NII in most of the banks.

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therefore risk-adjusting may be not so important. Nevertheless, we constructed the RANIM measure and found that fee income not only decreases NIM but also RANIM.

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Table 5: Comparison of our results about the impact of NFCI/TI on different performance measures with existing literature

Authors	Dependent variable							
	ROAA	ROAE	NIM	RAROOA	RAROE	RANIM	Z-Score	RAEAR
Stiroh (2002)		0			-		-	
Gischer and Jüttner (2003)	-		-					
DeYoung and Rice (2004)		+			-			
Stiroh (2004)				-/0	-		-/0	
Stiroh and Rumble (2006)	0	0		-	-		-	
Odesanmi and Wolfe (2007)				-	-			
Goddard, McKillop and Wilson (2008)	0	+		0	0			
Chiorazzo, Milani and Salvini (2008)				+	+			
Hahm (2008)	+/0						0	
Lepetit, Nys, Rous and Tarazi (2008)			-					
Busch and Kick (2009)	+	+		+	+			
Dietrich and Wanzenried (2011)	+	+	+					
Gamra and Plihon (2011)				-	-		-	
Moshirian, Sahgal and Zhang (2011)	+							
Sanya and Wolfe (2011)				+/-/0	+/-/0		+	
Köhler (2012)				+		+	+	
Dumičić and Ridzak (2013)			-					
Köhler (2013)				+/0	+/-/0		+/0	+
This study	-/0	-	-	-	-	-	-	-/0

+/- indicates a statistically positive/negative coefficient at the 10% level or better, 0 indicates insignificant coefficients, in case the results changed under different model specifications or in robustness tests, there are more results reported in one cell, in case of absence of the variable in the given study the cell is left blank

Source: Author based on individual papers and own results

Further research should mainly aim to capture the diversity of banking models and banking market fragmentation better. The exact impact of the fee income share is dependent on the business model and size of the bank. Whereas banks mainly dependent on interest income can

possibly gain by increasing their fees and commission income, non-traditional banks should rather rely more on the interest income to stabilize their profits. Moreover, since some variables needed to be excluded due to their mutual correlation, other measures capturing the bank, sector and country specific factors should be included in the model.

4 Conclusion

In this paper we contributed to the existing literature by studying the impact of net fee and commission income on banks' performance in the EU using a unique cross country data set. From the results found we are able to draw conclusion about the reasons why EU banks expand into non-traditional fee bearing activities and we fulfill the gap in the literature dealing with the drivers of bank business model changes.

Fee income represents almost 30% of the total income in EU banks and therefore it is crucial to set and maintain an appropriate fee policy. But the theoretical as well as empirical evidence about the optimal level of fee income is mixed.

For the analysis we used balanced panel data from 329 EU banks in 2005-2014 period. We employed System GMM estimation method since it is suitable dynamic panel data. Different bank-specific, banking sector-specific and macroeconomic factors were considered. We were primarily concerned about the relationship between fee income magnitude and banks' performance which was measured by different profitability, risk and risk-adjusted profitability measures. The analysis suggests that banks depending more on fee income tend to be less profitable and more risky. We did not find any diversification benefits. Based on this result we claim that substantial levels of fee income might be the result of the effort to maintain sufficient profitability in always more competitive markets rather than the attempt of diversification. Moreover, non-traditional activities are potentially riskier than traditional banking activities. Still, increasing the share of fee income might lead to increased stability in banks which rely solely or heavily on interest income. On the other hand investment banks should rather rely more on the interest income to stabilize their profits. Our results suggest that in the EU, the banks are already universal enough and therefore the current shift in fee income share does not lead to increased risk-adjusted profitability.

Our results confirm that the share of fee income is highly dependent on the bank business model as well as on market conditions. Deposits seem to represent a cheap and not very risky source of finance since they improve the net interest margins and return on average equity and at the same time they decrease insolvency risk. Higher ratio of loan-loss reserves to total loans, a sign of a poor quality of provided loans, has negative impact on all performance measures which is in line with our expectation. Also as expected, greater reliance on equity financing leads to higher stability in banks. Among macroeconomic conditions both GDP growth and inflation significantly affect banks' performance.

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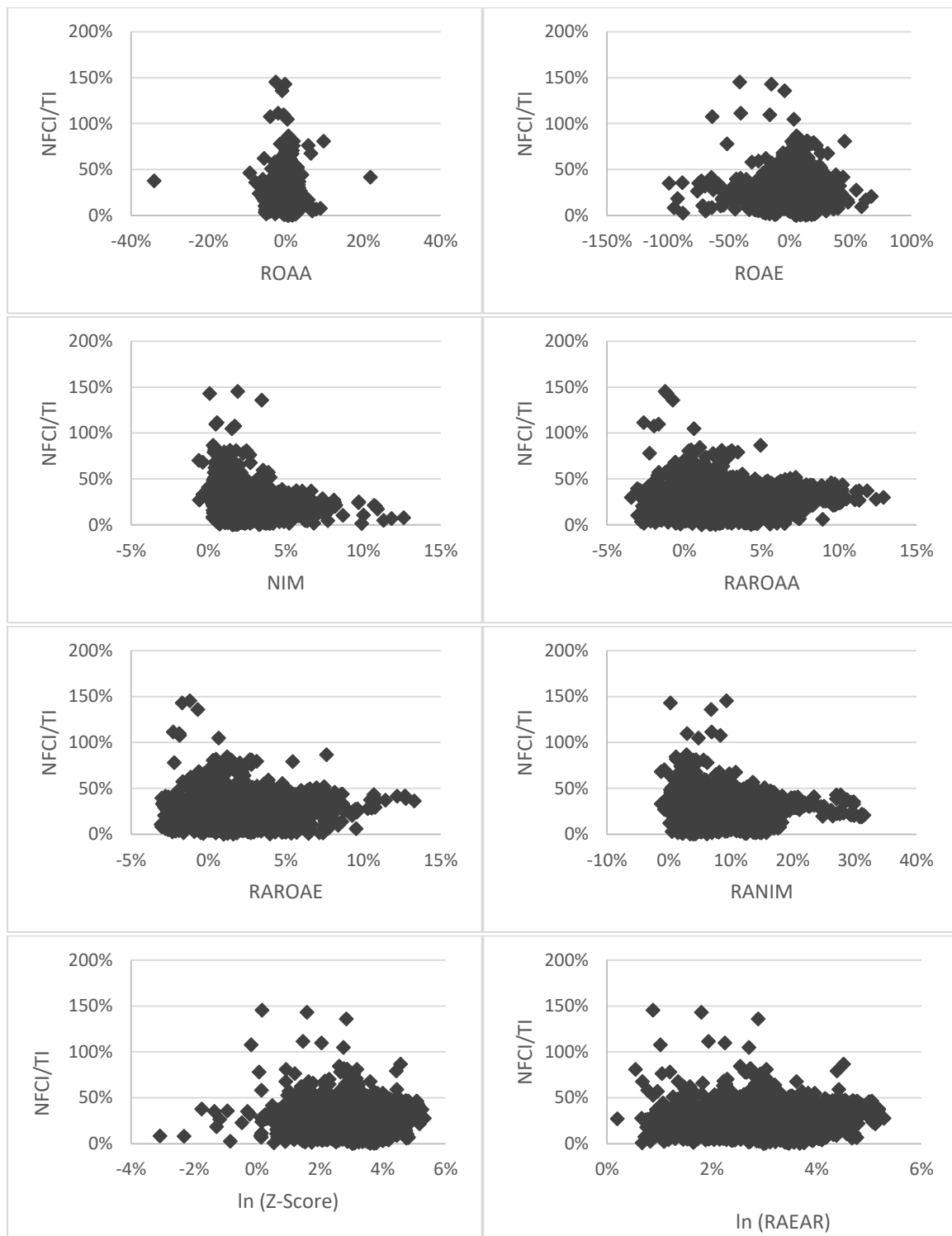
Webpages:

epp.eurostat.ec.europa.eu

sdw.ecb.europa.eu

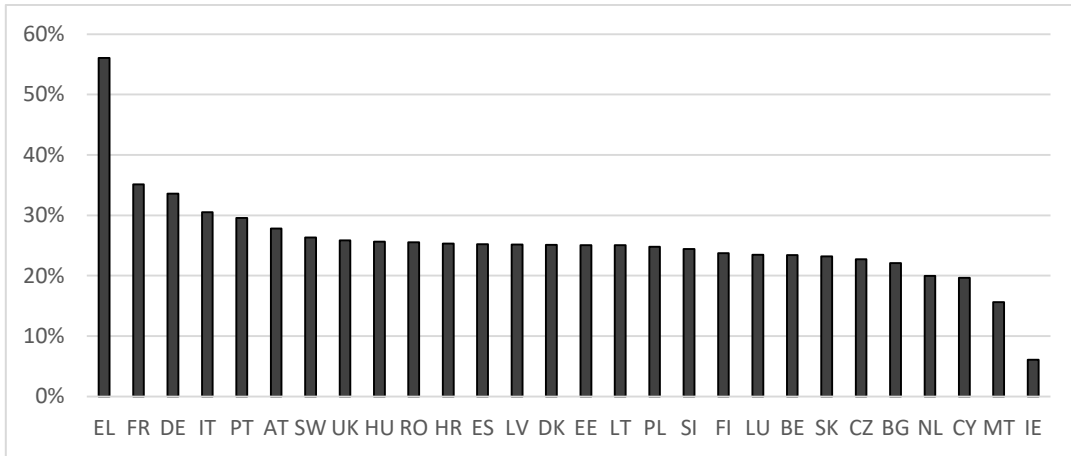
6 Appendix

Figure A.1: Scatter plots performance measures and NFCI/TI



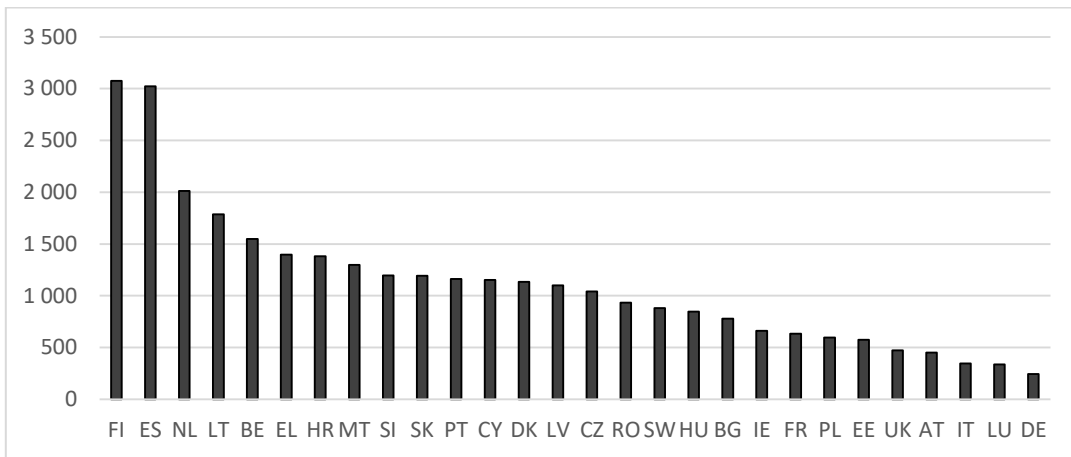
Source: Author based on Bankscope

Figure A.2: Average NFCI/TI from 2005 to 2014



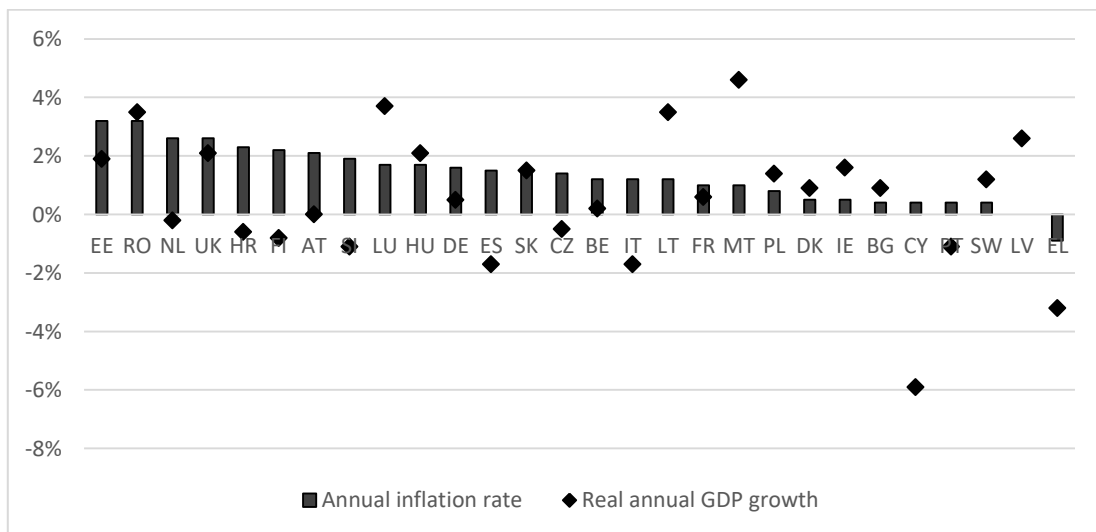
Source: Author based on Bankscope

Figure A.3: Average HI from 2005 to 2014



The HI's values range between 0–10,000, higher values of HI stand for higher concentration
 Source: Author based on the ECB

Figure A.4: Annual inflation rate and real annual GDP growth in 2013



Source: Author based on Eurostat and the ECB

Table A.1: Summary statistics of used variables

Variable	Mean	Std. Dev.	Min	1st quartile	Median	3rd quartile	Max
<i>roae</i>	6.76%	12.39%	-98.82%	3.7%	7.24%	12.41%	67.29%
<i>roaa</i>	0.6%	1.34%	-34.03%	0.25%	0.59%	1.05%	21.91%
<i>nim</i>	2.34%	1.34%	-0.62%	1.4%	2.12%	2.96%	12.63%
<i>raroae</i>	1.97%	2.22%	-3.05%	0.5%	1.51%	3.1%	13.31%
<i>raroaa</i>	2.05%	2.3%	-3.43%	0.53%	1.6%	3.16%	12.89%
<i>ranim</i>	7.31%	4.40%	-1.21%	4.42%	6.47%	8.99%	31.53%
<i>ln_z_score</i>	2.99	0.91	-3.08	2.45	3.03	3.6	5.33
<i>ln_raear</i>	2.94	0.85	0.2	2.38	2.95	3.51	5.29
<i>nfc_i_ti</i>	27.11%	12.29%	0%	19.95%	26.38%	33.44%	145.13%
<i>loans_depos</i>	887%	18740.75%	4.49%	82.22%	107.81%	153.57%	1000000%
<i>depos_ass</i>	54.15%	23.20%	0.01%	36.78%	55.57%	74.14%	96.16%
<i>losres_loans</i>	3.45%	3.78%	0.01%	1.18%	2.39%	4.06%	41.87%
<i>eq_ass</i>	9.32%	5.39%	1.08%	5.78%	8.16%	11.73%	71.4%
<i>hi</i>	840.09	498.46	174	523	726	1061	4039
<i>lag_gdp</i>	1.5%	3.33%	-14.8%	0.2%	1.7%	3.1%	11.9%
<i>lag_inf</i>	2.55%	1.83%	-1.7%	1.6%	2.2%	3.2%	15.3%

Source: Author based on Bankscope, Eurostat and the ECB

Table A.2: Relationship between performance measures and NFCI/TI – robustness check

<i>lag_DV</i>	Dependent variable							
	NIM	ROAA	ROAE	RANIM	RAROOA	RAROE	ln (Z-Score)	ln (RAEAR)
pooled OLS	0.8405*** (0.0000)	0.4342*** (0.0000)	0.4705*** (0.0000)	0.9813*** (0.0000)	0.8713*** (0.0000)	0.8499*** (0.0000)	0.9217*** (0.0000)	0.9626*** (0.0000)
System GMM	0.7725*** (0.0000)	0.3226*** (0.0000)	0.3521*** (0.0000)	0.9297*** (0.0000)	0.7258*** (0.0000)	0.6967*** (0.0000)	0.7665*** (0.0000)	0.8708*** (0.0000)
FE	0.5804*** (0.0000)	0.2047*** (0.0000)	0.1419*** (0.0000)	0.4584*** (0.0000)	0.1525*** (0.0000)	0.1646*** (0.0000)	0.0698 (0.1800)	0.2730*** (0.0000)

Robust standard errors adjusted for 329 clusters in index are in parentheses, ***/**/* indicates significance at 1%/5%/10%, other independents variables included in the regression are not reported in the table

Source: Author based on Bankscope, Eurostat and the ECB

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