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DOES FEMALE MANAGEMENT INFLUENCE FIRM PERFORMANCE? EVIDENCE FROM LUXEMBOURG BANKS

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Keywords: management diversity, female management representation, bank performance

JEL Classification Numbers: G21, J16, L25, M14.

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Abstract

This study examines the relationship between the proportion of women in top management positions of banks and the financial performance of these institutions. Using prudential data from supervisory reporting for all credit institutions in the Grand-Duchy of Luxembourg from 1999 to 2013, we find a positive association between female management representation and firm performance. The economic effect is substantial: A 10% increase of women in top management positions improves the bank's future return on equity by more than 3% p.a. Moreover, we show that this positive relationship is (i) almost twice as large during the global financial crisis than in stable market conditions and (ii) non-linear with the most successful banks having a female management share in the range between 20% and 40%.

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1 Introduction

Several countries in the European Economic Area already voted for (e.g., Norway) or will introduce (e.g., Germany) legally binding quotas for the gender composition of the management board and the board of directors of private firms. Norway passed a law in 2003 requiring that women make up 40 percent of the boards of public companies. In Germany, 30% of the members of the board of directors of 108 large listed companies shall be women as from 2016 onwards. In addition, some 3,500 small and medium enterprises (SMEs) have to set own targets in 2015 for a higher proportion of women on the board of directors, the executive board, and the senior management.

Although there has been an increasing focus on the impact of gender diversity in management boards on firm performance, findings remain to be inconclusive (Harrison and Klein (2007); Joshi and Roh (2009); van Knippenberg and Schippers (2007)). Pioneering studies are typically based on samples of large US corporations listed on a stock exchange (Adler (2001); Bell (2005); Carter, Simkins, and Simpson (2003); Catalyst (2004); Kochran et al. (2003); Shrader, Blackburn, and Iles (1997)) or based on samples with very short observation periods (Adams and Ragunathan (2012); Smith, Smith, and Werner (2006)). In addition, according to Dezsö and Ross (2012), some studies do not sufficiently take into account the impact of control variables (such as different corporate characteristics) in the empirical analysis (Terjesen, Sealey, and Singh (2009)). Consequently, the results of previous studies might not be representative for the true relationship between female management share and firm performance.

With this in mind and in response to the mixed results and explained shortcomings of the existing empirical work, our study analyzes whether gender diversity has a significant impact on the financial performance of 264 banks in the Grand-Duchy of Luxembourg, the premier private banking center in the Eurozone. By focusing on these institutions and the data provided by their supervisory reporting our analysis is based on reliable, comprehensive and consistent data, thus allowing valid conclusions regarding gender diversity to be drawn. During our sample period from January 1999 to December 2013, we document a strongly

positive association between female management share and firm performance.[1]. The economic significance is substantial: A 10% increase of women in top management positions improves the bank's future return on equity by 0.86% per quarter. Annualized, this change improves the bank's future return on equity by $0.86\% \times 4 = 3.44\%$ p.a. Our results are robust if we control for a wide array of different corporate characteristics, such as firm size, the amount of client deposits, staff expenditure, return on equity (RoE) volatility, firm age, the status of firm law, and the firm's country of origin and if we apply alternative regression techniques. Moreover, we show that the positive influence of the proportion of women in top management on bank performance almost doubles during the global financial crisis from 2007 to 2009 as compared to stable market conditions. This indicates that women's contributions to firm performance seem to be of particular value during periods of economic downturn.[2]

Although our results from regression analysis indicate a *positive* trend between female management share and firm performance, this does not necessarily mean that this trend is *monotonic*. Indeed, when performing non-parametric portfolio sorts, our results indicate that the association between the proportion of women in top management position and firm performance is non-linear and there is an *optimal* proportion of women in top management positions. Credit institutions with a female management share between 20% and 40% deliver the highest future performance and outperform banks with a female management share smaller than 20% or larger than 40% in terms of future return on equity. This result is of particular relevance in the current discussion of imposing female quotas for new appointments to management boards in the European Economic Area.

[1] Our result of a positive relationship between the proportion of women in top management positions and financial performance of firms is in line with Carter, Simkins, and Simpson (2003) and Erhard, Webel, and Shrader (2003).

[2] A coherent reason might be that women are more risk-averse than men (Eckel and Grossman (2008)) which is beneficial to firm performance during crisis periods. The correlation between risk appetite concerning investment decisions and gender differences has been studied by Barsky, Juster, Kimball, and Shapiro (1997), Jianakoplos and Bernasek (1998), Sundén and Surette (1998), and Agnew, Balduzzi, and Sundén (2003). A detailed literature overview of differences in male and female risk aversion can be found in Croson and Gneezy (2009). In conclusion, women are more risk averse regarding financial decision-making and are less overconfident than men (Barber and Odean (2001); Niederle and Vesterlund (2007)).

The remainder of the paper is organized as follows. Section 2 summarizes the related literature. Section 3 introduces our dataset and introduces the main variables. We present our empirical results in Section 4 and conclude in Section 5.

2 Related Literature

Executive management is responsible for a bank's most important strategic and organizational decisions. For this reason, a bank's performance is to a large extent a function of its top management team (Hambrick and Mason (1984); Carpenter, Geletkanycz, and Sanders (2004)). Dezsö and Ross (2012) argue that increased female representation in top management through informational and social diversity improves managerial task performance which in return will directly be translated into better firm performance. Carter, Simkins, and Simpson (2003) apply principal agent theory on diversity management and inter alia argue that heterogeneous teams benefit from more evaluations regarding decision alternatives and have a better understanding of the company's market environment. In addition, higher female representation in management could also increase the firm's reputation (Bear, Rahman, and Post (2010)) and consequently strengthen the firm's performance if the positive image translates into positive effects by its customers. However, not all studies predict a positive association between the proportion of women in management and firm performance. Smith, Smith, and Werner (2006) argue that increased gender diversity decreases the efficiency of the decision-making process and complicates communication between executives. This is particularly severe for firms operating in a highly competitive environment where time to market is key.

Up to now, empirical studies fail to deliver consistent results whether female management share has an impact on firm performance (see Harrison and Klein (2007); Jonsen, Maznevski, and Schneider (2011); Joshi and Roh (2009); van Knippenberg and Schippers (2007)). Joshi and Roh (2009) summarize that a majority of studies report a non-significant correlation between gender diversity in management and firm performance. In addition, only very few

empirical studies from outside the USA exist (Smith, Smith, and Werner (2006)).[3] For Sweden, du Rietz and Henrekson (2000) do not find empirical evidence of a statistically significant relationship between the percentage of women on boards and financial performance. Similar results for Danish firms are found by Rose (2004). Based on the importance of management teams throughout organizations (Kirchmeyer and McLellan (1991)) and inconsistent results of previous empirical work, Richard, Kirby, and Chadwickc (2013) demand further studies on the economic impact of gender diversity on firm performance.

In addressing this request, our paper makes the following contributions. First, we document a positive and statistically significant relationship between the proportion of women in top management positions and firm performance. By focusing on banks and their supervisory reporting we can analyze reliable, comprehensive and consistent data over a set period of time. Unlike prior studies, our data encompass all credit institutions in Luxembourg (264 banks in total) with a long sample period of 15 years. Data is directly obtained from the banks and external auditors provide for quality assurance. Therefore, our data sample is free from biases and includes non-exchange listed credit institutions as well. Second, we provide evidence that gender diversity in management boards is particularly valuable for companies in times of economic downturn. Our results indicate that during the global financial crisis from 2007 to 2009 the positive impact of gender diversity is more than 1.8 times higher than during the rest of our sample period. Finally, our study documents that the relationship between the proportion of women in top management positions and financial performance of banks is not monotonic. Banks with a female management share between 20% and 40% outperform banks with a female management share smaller than 20% or larger than 40% in terms of future return on equity. All of our results are robust if we control for different corporate characteristics and apply alternative empirical estimation setups.

[3]Most studies from outside the USA are done in Scandinavia (e.g., in Sweden and Denmark). This is not surprising since these countries were the first ones to introduce quotas for female representation on management boards.

3 Data and Main Variables

We obtain data at the firm level from all credit institutions established in the Grand-Duchy of Luxembourg – namely all Luxembourg public institutions, public limited companies under Luxembourg law (S.A.), partnerships limited by shares under Luxembourg law, co-operative banks under Luxembourg law, rural banks, banks issuing mortgage bonds, branches of credit institutions originating from a non-Member State of the European Union, and branches of credit institutions originating from a Member State of the European Union – 264 banks in total. The sample time period ranges from the first quarter of 1999 to the last quarter of 2013.[4]

Banks enter or leave the dataset from the first quarter of 1999 to the fourth quarter of 2013 due to the beginning or end of banking activities in Luxembourg, spin-offs, mergers, and takeovers – hence, our dataset is free from survivorship bias. Due to prudential requirements of the Grand-Duchy of Luxembourg, all resident credit institutions regardless of their legal status (subsidiary or branch) must provide financial information (following Financial Reporting Framework FINREP and Common Reporting Framework COREP) and we also obtain financial information from small, non-exchange listed corporations. Most of the 264 credit institutions appear for multiple years resulting in 5,280 bank quarters in the sample. The entities can be split into two banking institutions with 50 billion EUR or more in average total assets, 44 banking institutions with 5 - 40 billion EUR in average total assets and 218 banking institutions with 5 billion EUR or less in average total assets. The average amount of total assets is 4.8 billion EUR. The mean number of banking staff in the sample is 93 with 35 managers; 20 percent of the companies have more than 100 staff members.

[4]The observation period of 15 years from 1999 to 2013 serves two reasons. First, measuring bank performance throughout several years enables us to observe performance during different states of the economy and indicates more consistent results in comparison to very short sample periods (Adams and Ragunathan (2012); Smith, Smith, and Werner (2006)). Second, the impact of strategic decision-making on organizational performance typically requires several years to observe. Thus, a multi-year interval allows observing and evaluating diverse candidates' potential contributions on strategic decision-making. We are consequently able to provide a remarkably robust analysis of the financial impact of female representation in bank management.

We now introduce the dependent and independent variables used in the empirical analysis of Section 4. Summary statistics of all variables are displayed in Table 1.

[Insert Table 1 around here]

Dependent variables

Our main measure of firm performance is **Return on Equity (RoE)**. RoE of bank i in quarter t is defined as the net income at the end of quarter t divided by bank i's equity capital at the end of quarter $t-1$. The measure provides useful information about how much the bank is earning on the equity investment of the owners and is frequently used by market and financial analysts in assessing a company's performance (Rose (2004)). To remedy the impact of outliers in our analysis we winsorize RoE at the one percent level.[5] The average (median) value of RoE over all firms in our sample is 11.69% (5.82%) with a standard deviation of 19.66%.

As a robustness check in Table 4 we also use **Return on Assets (RoA)** as a dependent variable. RoA of bank i in quarter t is defined as the net income at the end of quarter t divided by its total assets at the end of quarter $t-1$. The measure provides information how well a bank's assets are being used to generate profits. Again, we winsorize RoA at the one percent level. The mean (median) value of RoA is 0.70% (0.33%) with a standard deviation of 1.49%.

Independent, Time-Varying Variables

Female Management Share (FMS) is our main independent variable in the empirical analysis. We define FMS of bank i in quarter t as the proportion of women among all managers, including senior executives as well as members of the board. Therefore, its value must lie between 0% and 100%. The average (median) value of FMS is 18.04% (17.31%) with a standard deviation of 16.89%.

[5]Winsorization does not affect our results. We obtain very similar results when we do not winsorize the dependent variable or we apply different cut-off points.

To get an impression of the evolution of FMS over time, we plot average FMS over all banks for each quarter in Figure 1. There is a steady upward trend for FMS in our sample with a peak in the first two quarters of 2010.

[Insert Figure 1 around here]

Firm Size of bank i at quarter t is calculated as the natural logarithm of the winsorized total assets (in EUR) at the end of quarter $t-1$. The mean (median) of firm size is 7.06 (7.02) with a standard deviation of 1.89.

Client Deposits (log CD) of bank i at quarter t is computed as the natural logarithm of the winsorized client deposits (in million of EUR) at the end of quarter $t-1$. The mean (median) value of log CD amounts to 6.15 (6.12) with a standard deviation of 1.79.

Total Staff Expenditures per Capita (log SEPC) of bank i at quarter t is calculated as the natural logarithm of the winsorized personnel expenditures including remuneration, social security contributions as well as expenses for pension plans (in EUR) at the end of quarter $t-1$. The average (median) value of log SEPC is 10.01 (9.99) with a standard deviation of 0.39.

Total Staff Expenditures per Manager (log SEPM) of bank i at quarter t is calculated as the natural logarithm of the winsorized manager expenditures including remuneration, social security contributions as well as expenses for pension plans (in EUR) at the end of quarter $t-1$. The average (median) value of log SEPM amounts to 11.49 (11.36) with a standard deviation of 0.86.

Volatiltiy of RoE (Vola RoE) of bank i at quarter t is calculated as the firm's historical standard deviation of RoE over the past 12 quarters. We require a firm to have at least six valid RoE observations in the past 12 quarters. The average (median) Vola RoE amounts to 7.25% (3.00%) with a standard deviation of 14.72%.

Volatiltiy of RoA (Vola RoA) of bank i at quarter t is calculated as the firm's historical standard deviation of RoA over the past 12 quarters. We require a firm to have at least six valid RoA observations in the past 12 quarters. The average (median) value of Vola RoA amounts to 0.85% (0.31%) with a standard deviation of 1.81%.

Independent, Time-Invariant Variables

log Bank Age of bank i is measured as the natural logarithm of the number of years that the credit institution provides services in Luxembourg (= log(2014 - starting year of entity)). The average (median) value of log Bank Age amounts to 2.97 (3.13) with a standard deviation of 0.91.

Dummy SL of bank i represents a dummy variable that takes on the value 0 if the credit institution under review is a branch of a foreign bank; the variable takes on the value 1 if the credit institution is a Luxembourg parent company or a Luxembourg subsidiary of a foreign bank. The sample includes 183 subsidiaries and 81 foreign branches. The average (median) value of Dummy SL is 0.69 (1.00) with a standard deviation of 0.46.

Dummy CO of bank i is a dummy variable taking on the value 0 if the bank's country of origin is Luxembourg and the value 1 if otherwise (indicating all foreign banks). 10 credit institutions are banks originating from Luxembourg (representing 4% of the sample); the country of origin which is represented the most frequently in Luxembourg is Germany with 68 banks (26% of the sample), followed by France with 27 banks (10%), Italy with 24 banks (9%), Switzerland with 23 banks (9%) and Belgium with 15 banks (6%). The average (median) value of Dummy CO is 0.96 (1.00) with a standard deviation of 0.19.

Cross-correlations between the dependent variables (RoE and RoA) and time-varying, independent variables used in our study are shown in Table 2.

[Insert Table 2 around here]

Table 2 reports that the correlations between FMS and other variables are mainly moderate to small. Among the dependent variables, we find that FMS is positively related to firm size, log CD, Vola RoE, and Vola RoA. It is negatively correlated to log SEPC and log SEPM.

4 Empirical Results

This section provides the main results of our empirical analysis. We start by investigating the impact of female management share (FMS) on future bank performance using multivariate regression analysis in Section 4.1. We then confirm the stability of our findings by conducting a battery of robustness tests in Section 4.2. In Section 4.3 we analyze the relationship between FMS and future performance during the global financial crisis from 2007 to 2009. Finally, Section 4.4 investigates non-linearities in the relationship between FMS and future firm performance and derives an optimal range for FMS in management boards.

4.1 Female Management Share (FMS) and Bank Performance

Table 3 contains different regressions to analyze the impact of FMS on future firm performance. As the dependent variable, we use RoE of bank i in quarter $t+1$. All dependent variables in the regressions (see Section 3) for bank i are measured in quarter t. As our empirical setup we use OLS (Ordinary Least Squares) regressions with (quarterly) time dummies and heteroscedasticity-robust White (1980) standard errors.

[Insert Table 3 around here]

Regression (1) describes the results of a univariate regression of future RoE on FMS. We find that FMS has a positive coefficient of 0.086 and is statistically significant at the one percent level with a t-statistic of 6.17. Turning to economic significance, our results indicate that a 10% increase of women in top management positions increases a bank's future RoE by 0.86% per quarter. Annualizing this number, we find that a 10% increase in FMS increases a bank's future return on equity by 3.44% p.a.

In regressions (2) - (6) we respectively add different corporate characteristics to our model. These variables are described in Section 3 and include Firm Size, log CD, log SEPC, log SEPM, Vola RoE, log Bank Age, Dummy SL, and Dummy CO. We do so to investigate the impact of FMS on future RoE controlling for the influence of these corporate characteristics at the same time. Our results indicate that log CD, log SEPM, Vola RoE, and Dummy CO are positively associated with future RoE whereas log SEPC, log Bank Age, and Dummy SL are negatively related. The coefficient of Firm Size changes signs between regression (2) and regressions (3) - (6). More importantly for our analysis, we find that the impact of FMS on RoE is positive and statistically significant at the one percent level in each specification (with t-statistics ranging from 4.67 to 6.13). The last column presents the economic significance based on a one standard deviation change of each explanatory variable based on the results from regression (6): a one standard deviation increase of FMS leads to an economically meaningful increase in future RoE of 1.31% per quarter (5.24% p.a.). This is the fifth largest effect in absolute numbers among all independent variables.

4.2 Stability Checks

Table 3 indicates a positive and statistically significant relationship between FMS and firm performance (measured by future RoE). To check the robustness of this result we now perform various stability checks with the full set of dependent variables as in regression (6) of Table 3. In particular, we investigate the robustness of our results if we use an alternative dependent variable or modify the regression technique. Results of the stability checks are reported in Table 4.

[Insert Table 4 around here]

In regression (1), we apply future RoA instead of future RoE as our measure of firm performance. Regressions (2) - (3) use RoE in quarter $t+2$ and quarter $t+3$ (instead of quarter $t+1$) as the dependent variable, respectively. Specifications (4) - (7) are modifications of our baseline OLS regression technique with time dummies and robust White (1980) standard

errors (as in Table 3). In specification (4), we do not include time dummies in the regression setup. Regressions (5) - (6) cluster standard errors by quarter and firm, respectively. Finally, in regression (7), we adjust standard errors for serial correlation using the Newey and West (1987) technique with four time lags.

We find – no matter which specification we use – that there is a positive and statistically significant impact of FMS on future firm performance. In all specifications the FMS coefficient is statistically significant at least at the 10% level with t-statistics ranging from 1.82 to 4.88. Hence, our main result of a positive and statistically significant relationship between FMS and future firm performance is robust to different measures of firm performance and alternative regression setups.

4.3 FMS and Bank Performance in the Global Financial Crisis

Does gender diversity matter for firm performance particularly during periods of financial crisis? Neelie Kroes, European Union Commissioner for Competition from 2004 to 2010, famously said "My clear line is that if Lehman Brothers had been 'Lehman Sisters', would the crisis have happened like it did? No." (Adams and Ragunathan (2012)). It was *inter alia* her speech that has ensued a – still on-going – public debate on improving and reforming governance arrangements in banking, and on which factors influence a bank's risk appetite (Berger, Kick, and Schaeck (2014); Laeven and Levine (2009)). Indeed, many experimental and survey-based studies find that women are more risk-averse than men (Croson and Gneezy (2009); Eckel and Grossman (2008)). We therefore find it particularly worthwhile to examine the role of gender diversity on firm performance in the recent global financial crisis from 2007 to 2009.[6] Table 5 reports the results.

[6]For the last two decades, the role and the impact of the board of directors have been a special focus of corporate governance research (Berger, Kick, and Schaeck (2014)). Corporate governance literature reports a positive correlation between women's presence on the board of directors and financial performance (Adams and Ferreira (2009); Hartarska (2005); Hartarska and Mersland (2012); Hartarska and Nadolnyak (2012)). Yet there are only very few studies on the financial impact of the gender composition of a bank's top management team, i.e. the managers that are charged with the day-to-day running of the bank such as the Chief Executive Officer, the Chief Financial Officer, the Chief Operating Officer, the Chief Risk Officer, the Chief Compliance Officer, the Chief Internal Auditor, and the executives of other subdivisions (Adams

[Insert Table 5 around here]

To investigate whether gender diversity matters for firm performance particularly during financial crises, we run regression (6) from Table 3 for two sub-periods: The "Crisis" period in the timeframe from Quarter 3 in 2007 to Quarter 4 in 2009 and the "Non-Crisis" period with the remaining quarters. Our results indicate that the impact of FMS is positive and statistically significant at the one percent level for both sub-periods. However, the economic significance based on a one standard deviation change implies that FMS has a much greater impact during the global financial crisis. A one standard deviation of FMS change in the "Crisis" period increases future RoE by 2.31% per quarter whereas the increase during "Non-Crisis" periods is 1.27% per quarter. Hence, the impact of FMS on future performance is around 1.82 higher during the global financial crisis than in the remaining periods.[7]

4.4 Is There An Optimal FMS To Maximize Firm Performance?

Section 4.1 documents that there is a *positive* relationship between FMS and firm performance. However, it is not clear whether this trend is *monotonically* increasing and whether non-linearities play a determining role.

In order to check whether the association between FMS and future firm performance is monotonic, we first look at non-parametric univariate portfolio sorts. Each quarter t we sort firms into four portfolios based on their current FMS: Portfolio Q1 consists of banks with a FMS of 0%, portfolio Q2 consists of banks with a FMS between 0% and 20%, portfolio Q3 consists of banks with a FMS between 20% and 40%, and portfolio Q4 comprises banks with a FMS larger than 40%. For each portfolio we compute the equal-weighted and value-weighted average RoE in quarter $t+1$ over our sample period.[8] Panel A of Table 6 reports the results.

and Ragunathan (2012); Beck, Behr, and Guettler (2013); Berger, Kick, and Schaeck (2014); Hartarska, Mersland, Nadolnyak, and Parmeter (2013)).

[7]Therefore, in the same vein as Berger, Kick, and Schaeck (2014), our empirical analysis suggests that not only a bank's corporate governance structure influences financial performance, but also the gender diversity of the management team in a given credit institution's structure.

[8]We compute the value-weighted average RoE in quarter $t+1$ by weighting each financial institution by its total assets in quarter t.

[Insert Table 6 around here]

We find that (both on an equal-weighted and on a value-weighted scheme) the relationship between FMS and future RoE is not monotonic. Instead, our results indicate that portfolio Q3 has the highest average RoE with a value of 15.64% (16.38%) with regard to the equal-weighted (value-weighted) sorting procedure. The difference between average RoE of portfolio Q3 and the remaining portfolios lies between 3.76% and 7.34% per quarter (2.56% and 6.81% per quarter) and is statistically significant from zero at least at the 10% level in all cases. Hence, banks with a FMS between 20% and 40% deliver the highest future financial performance. Figure 2 visualizes the hump-shaped relationship between FMS and future RoE.

[Insert Figure 2 around here]

The hump-shaped relationship between FMS and future RoE could be driven by differences in corporate characteristics correlated to FMS. Thus, we conduct dependent double-sorts based on FMS and log CD (Panel B), FMS and Vola RoE (Panel C), as well as FMS and log Bank Age (Panel D). We focus on these variables because they are the ones that have the largest economic impact on firm performance as shown in regression (6) of Table 3.

To perform double-sorts, we first form quartile portfolios sorted on log CD, Vola RoE, and log Bank Age, respectively. Then, within each portfolio, we again sort banks according to FMS into portfolios Q1 - Q4. Panels B - D of Table 6 report the equal-weighted RoE in quarter $t + 1$ of the 4×4 portfolios with the respective row average. Looking at the row averages of Panels B - D, we find that the hump-shaped relationship between FMS and future RoE prevails in each panel and is not explained by log CD, Vola RoE, or log Bank Age. Still, the row average of portfolio Q3 has the highest average RoE controlling for these different corporate characteristics.

To sum up, we find strong evidence that the relationship between FMS and firm performance is non-linear. Banks with a FMS between 20% and 40% appear to be the most successful in terms of financial performance.

5 Conclusion

This paper analyzes the relationship between female management share and financial performance of banks. Using a sample of all credit institutions in the Grand-Duchy of Luxembourg from 1999 to 2013, we find strong evidence of a positive and statistically significant relationship between the proportion of women in top management positions and future firm performance. In terms of economic significance, our results indicate that a 10% increase of women in top management positions improves the bank's future return on equity by more than 3% p.a. Our results cannot be explained by the impact of different corporate characteristics (such as firm size, age, or return volatility) and do not hinge on a specific regression setup.

In addition, we contribute to the literature with two novel findings: First, we document that the positive relationship between female management share and financial performance was particularly strong during the global financial crisis from 2007 to 2009 which indicates that gender diversity seems to be of particular value during periods of economic downturn. Second, we show that the optimal range of female management share lies between 20% and 40% and banks having a proportion of women in top management positions within that range deliver sustainable future financial outperformance.

Our results are important and align nicely in the current discussion of imposing female quotas for new appointments to board of directors and management boards in countries of the European Economic Area. Our empirical findings suggest that a more gender balanced management composition can help to increase future performance of financial institutions, particularly during times of financial crisis and economic downturn.

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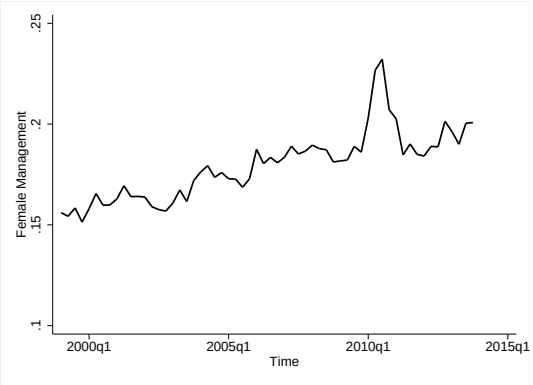
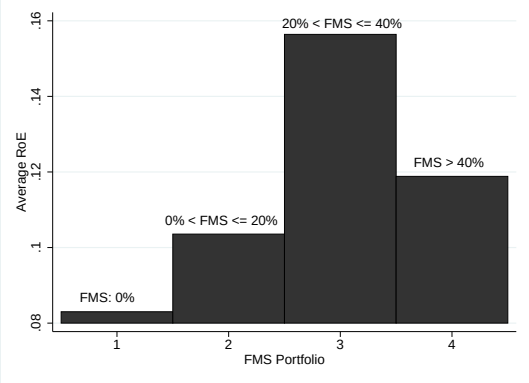
Figure 1: Time Variation of Female Management Share (FMS) Over Time



This figure shows the evolution of average female management share (FMS) over all firms over time. The sample covers all credit institutions established in Luxembourg and the sample time period is from 1999 to 2013.

Figure 2: Optimal Female Management Share



This figure displays the results from univariate portfolio sorts based on female management share (FMS). In each quarter, we rank companies into four equal-weighted portfolios (Q1-Q4). We show the average return on equity (RoE) over the following quarter for each portfolio. The sample covers all credit institutions established in Luxembourg and the sample time period is from 1999 to 2013.

Table 1: Summary Statistics

	Observations	Mean	25%-Percentiles	Median	75%-Percentiles	Standard Deviation	Skewness	Kurtosis
RoE	8,745	11.69%	1.83%	5.82%	13.71%	19.66%	3.19	15.78
RoA	8,914	0.70%	0.12%	0.33%	0.77%	1.49%	3.76	22.67
FMS	8,604	18.04%	0.00%	17.31%	29.03%	16.89%	0.96	4.69
Firm Size	9,031	7.06	5.75	7.02	8.51	1.89	-0.26	2.79
log CD	8,366	6.15	5.03	6.12	7.43	1.79	-0.37	3.43
log SEPC	8,080	10.01	9.79	9.99	10.21	0.39	0.35	4.74
log SEPM	7,871	11.49	10.98	11.36	11.92	0.86	0.15	6.31
Vola RoE	10,668	7.25%	0.85%	3.00%	7.48%	14.72%	4.33	24.87
Vola RoA	7,465	0.85%	0.15%	0.31%	0.67%	1.81%	4.62	26.72
log Bank Age	263	2.97	2.71	3.13	3.55	0.91	-1.46	5.71
Dummy SL	264	0.69	0.00	1.00	1.00	0.46	-0.83	1.70
Dummy CO	264	0.96	0.00	1.00	1.00	0.19	-4.84	24.43

This table displays summary statistics for the main variables used in this study. The first column shows the number of observations for each variable. Columns two to six depict the mean, the 25%-quantile, the 50%-quantile (median), the 75%-quantile, as well as the standard deviation of each variable. The last two columns show skewness and kurtosis to interpret the distribution of our data. All variables are described in detail in Section 3. The sample covers all credit institutions established in Luxembourg and the sample period is from 1999 to 2013.

Table 2: Correlations

	RoE	RoA	FMS	Firm Size	log CD	log SEPC	log SEPM	Vola RoE	Vola RoA
RoE	1.00	-	-	-	-	-	-	-	-
RoA	0.57	1.00	-	-	-	-	-	-	-
FMS	0.08	0.06	1.00	-	-	-	-	-	-
Firm Size	0.03	-0.18	0.04	1.00	-	-	-	-	-
log CD	0.06	-0.11	0.03	0.79	1.00	-	-	-	-
log SEPC	-0.03	-0.04	-0.01	0.04	0.06	1.00	-	-	-
log SEPM	-0.01	-0.06	-0.31	0.10	0.13	0.31	1.00	-	-
Vola RoE	0.49	0.16	0.08	0.02	-0.00	0.06	-0.05	1.00	-
Vola RoA	0.19	0.34	0.08	-0.26	-0.21	0.04	-0.08	0.44	1.00

This table shows linear cross-correlations between the dependent and time-varying independent variables used in our study. As dependent variables, we use return on equity (RoE) and return on assets (RoA) to measure bank performance in quarter $t + 1$. Our independent variable is female management share (FMS) in quarter t. Furthermore, as time-variant control variables we use firm size, the logarithm transformation of client deposits (log CD), staff expenditures per capita (log SEPC), staff expenditures per manager (log SEPM), return on equity volatility (Vola RoE), and return on assets volatility (Vola RoA) in quarter t. A detailed description of these variables can be found in Section 3. The sample covers all credit institutions established in Luxembourg and the sample period is from 1999 to 2013.

Table 3: Multivariate Regressions

	(1) RoE	(2) RoE	(3) RoE	(4) RoE	(5) RoE	(6) RoE	Econ. Sign.
FMS	0.086***	0.085***	0.077***	0.082***	0.073***	0.077***	+1.31%
	(6.17)	(6.13)	(5.33)	(5.47)	(4.67)	(4.91)	
Firm Size		0.524***	-0.426**	-0.612***	-1.006***	-0.823***	-1.56%
		(4.49)	(-1.97)	(-2.81)	(-4.15)	(-3.39)	
log CD			1.047***	1.130***	1.569***	1.735***	+3.12%
			(5.40)	(5.68)	(6.56)	(7.25)	
log SEPC				-0.855	-2.488***	-3.142***	-1.26%
				(-1.15)	(-3.45)	(-4.25)	
log SEPM				0.487	1.218***	1.388***	+1.20%
				(1.53)	(4.11)	(4.48)	
Vola RoE					0.670***	0.656***	+3.66%
					(16.47)	(16.29)	
log Bank Age						-2.244***	-2.05%
						(-4.58)	
Dummy SL						-0.819	-0.37%
						(-1.00)	
Dummy CO						1.225*	+0.24%
						(1.74)	
Constant	10.39***	6.668***	7.373***	11.12	11.84*	21.02***	
	(35.39)	(7.71)	(8.08)	(1.49)	(1.65)	(2.76)	
N	7680	7655	7314	7082	5397	5397	
adj. R^2	0.067	0.069	0.072	0.074	0.337	0.341	

This table reports the main results of various multivariate OLS-regressions with quarterly time dummies and White (1980) robust standard errors. As dependent variable, we use return on equity (RoE) in quarter $t+1$. Our independent variables are female management share (FMS), firm size, the logarithm transformation of client deposits (log CD), staff expenditures per capita (log SEPC), staff expenditures per manager (log SEPM), return on equity volatility (Vola RoE), age (log Bank Age), a dummy that takes on the value one if the credit institution is a Société Anonyme according to Luxembourg law (Dummy SL), and a dummy that takes on the value one if the credit institution's country of origin is Luxembourg (Dummy CO). All dependent variables are measured in quarter t. The sample covers all credit institutions established in Luxembourg and the sample period is from 1999 to 2013. t-statistics are in parentheses. ***, **, and * indicate significance at the one, five, and ten percent level, respectively.

Table 4: Stability

	(1) RoA	(2) RoE_{t+2}	(3) RoE_{t+3}	(4) RoE	(5) RoE	(6) RoE	(7) RoE
FMS	0.003***	0.078***	0.068***	0.069***	0.077***	0.077*	0.069***
	(2.92)	(4.75)	(4.32)	(4.61)	(4.88)	(1.82)	(2.68)
Firm Size	-0.191***	-0.780***	-0.686***	-0.795***	-0.823***	-0.823	-0.795*
	(-11.77)	(-3.10)	(-2.69)	(-3.60)	(-3.46)	(-1.20)	(-1.92)
log CD	0.0530***	1.686***	1.569***	1.583***	1.735***	1.735***	1.583***
	(3.32)	(6.81)	(6.24)	(7.36)	(6.54)	(2.91)	(3.96)
log SEPC	-0.00338	-1.509**	-1.182	-5.240***	-3.142***	-3.142	-5.240***
	(-0.07)	(-1.97)	(-1.39)	(-7.51)	(-3.82)	(-1.60)	(-4.48)
log SEPM	-0.0549***	1.366***	1.342***	1.305***	1.388***	1.388	1.305**
	(-2.87)	(4.14)	(3.90)	(4.16)	(5.25)	(1.48)	(2.44)
Vola	0.0166***	0.652***	0.670***	0.636***	0.656***	0.656***	0.636***
	(8.86)	(15.91)	(16.26)	(40.55)	(10.72)	(6.23)	(8.75)
log Bank Age	0.0747***	-2.186***	-2.081***	-1.809***	-2.244***	-2.244*	-1.809**
	(2.82)	(-4.19)	(-3.88)	(-3.91)	(-4.46)	(-1.86)	(-2.21)
Dummy SL	0.606***	-1.138	-1.433	-0.426	-0.819	-0.819	-0.426
	(13.01)	(-1.32)	(-1.59)	(-0.63)	(-1.36)	(-0.34)	(-0.30)
Dummy CO	0.204***	1.024	0.844	2.138	1.225*	1.225	2.138**
	(2.81)	(1.38)	(1.13)	(1.51)	(1.83)	(0.78)	(2.12)
Constant	1.175**	5.323	2.533	41.56***	21.02**	21.02	41.56***
	(2.33)	(0.66)	(0.28)	(5.70)	(2.65)	(1.12)	(3.53)
Time Dummies	Yes	Yes	Yes	No	Yes	Yes	Yes
Standard Errors	Robust	Robust	Robust	Robust	Clustered Time	Clustered Firm	Newey-West (4 Lags)
N	5390	5220	5067	5397	5397	5397	5397
adj. R^2	0.155	0.325	0.327	0.262	0.341	0.341	

This table reports the results of stability checks by using different OLS regression techniques. We include the same independent variables as in regression (6) of Table 3. In regression (1) we use return on assets (RoA) instead of RoE as our independent variable (and use Vola RoA instead of Vola RoE as independent variable). Regressions (2) and (3) uses RoE in quarters $t+2$ and $t+3$ (instead of RoE in quarter $t+1$) as dependent variable, respectively. In specification (4) we perform a OLS regression without quarterly time dummies and robust White (1980) standard errors. Specifications (5) and (6) perform OLS regressions with time dummies and clustered standard errors by quarter and firm, respectively. Finally, in specification (7) we perform a OLS regression with time dummies and Newey-West (1987) corrected standard errors. We use four lags for the adjustment of autocorrelation. The sample covers all credit institutions established in Luxembourg and the sample period is from 1999 to 2013. t-statistics are in parentheses. ***, **, and * indicate significance at the one, five, and ten percent level, respectively.

Table 5: Financial Crisis

	(1) RoE Crisis	Econ. Sign.	(2) RoE Non-Crisis	Econ. Sign.
FMS	0.126***	+2.31%	0.072***	+1.27%
	(3.00)		(4.96)	
Firm Size	-0.334%	-0.63	-0.976***	-1.87%
	(-0.64)		(-4.38)	
log CD	1.380***	+2.42%	1.815***	+3.27%
	(2.67)		(8.32)	
log SEPC	-4.236**	-1.76%	-2.744***	-1.13%
	(-2.45)		(-3.77)	
log SEPM	0.754	+0.68	1.539***	+1.35%
	(0.94)		(4.95)	
Vola RoE	0.455***	+2.75%	0.731***	+3.77%
	(13.32)		(44.22)	
log Bank Age	-0.775	-0.75%	-2.569***	-2.39%
	(-0.67)		(-5.50)	
Dummy SL	-1.867	-0.84%	-0.607	-0.25%
	(-1.06)		(-0.91)	
Dummy CO	2.562	+0.59%	0.666	+0.17%
	(0.75)		(0.47)	
Constant	32.54*		17.16**	
	(1.74)		(2.28)	
N	1092		4305	
adj. R^2	0.232		0.387	

This table reports the results of OLS regressions with time dummies and White (1980) robust standard errors as in regression (6) of Table 3. We provide results for two sub-samples: the "Crisis" sub-sample containing the period from Quarter 3 in 2007 to Quarter 4 in 2009 and the "Non-Crisis" sub-sample with the remaining quarters of our sample period. We also show the percentage change of quarterly RoE for a one-standard deviation change of the independent variables for both sub-samples. The sample covers all credit institutions established in Luxembourg and the sample period is from 1999 to 2013. t-statistics are in parentheses. ***, **, and * indicate significance at the one, five, and ten percent level, respectively.

Table 6: Optimal Female Management Share (FMS)

Panel A: Univariate Portfolio Sorts

Portfolio	FMS Share	Avg. No. Entities	Equal-Weighted FMS	Equal-Weighted RoE	Value-Weighted FMS	Value-Weighted RoE
Q1	0%	45.7	0.00%	8.30%	0.00%	9.57%
Q2	0%-20%	32.0	13.24%	10.35%	13.03%	9.92%
Q3	20%-40%	51.3	28.04%	15.64%	27.28%	16.38%
Q4	>40%	18.2	50.80%	11.88%	49.84%	13.82%

Panel B: Equal-Weighted Bivariate Portfolio Sorts: log CD and FMS

Portfolio	P1: log CD	P2: log CD	P3: log CD	P4: log CD	Average
Q1: FMS	4.72%	11.37%	14.72%	14.12%	11.23%
Q2: FMS	9.48%	13.87%	9.75%	9.77%	10.72%
Q3: FMS	10.15%	13.69%	18.06%	18.47%	15.09%
Q4: FMS	12.82%	12.16%	16.22%	12.86%	13.51%

Panel C: Equal-Weighted Bivariate Portfolio Sorts: Vola RoE and FMS

Portfolio	P1: Vola RoE	P2: Vola RoE	P3: Vola RoE	P4: Vola RoE	Average
Q1: FMS	2.41%	3.48%	6.26%	14.62%	6.69%
Q2: FMS	2.54%	5.26%	6.82%	11.87%	6.62%
Q3: FMS	2.41%	3.98%	6.39%	27.37%	10.04%
Q4: FMS	2.22%	4.39%	6.28%	26.51%	9.85%

Panel D: Equal-Weighted Bivariate Portfolio Sorts: log Bank Age and FMS

Portfolio	P1: Bank Age	P2: Bank Age	P3: Bank Age	P4: Bank Age	Average
Q1: FMS	13.35%	5.02%	6.91%	8.88%	8.54%
Q2: FMS	8.44%	16.26%	8.45%	9.10%	10.56%
Q3: FMS	19.20%	25.83%	16.30%	10.34%	17.92%
Q4: FMS	15.99%	21.15%	8.77%	15.32%	15.31%

This table reports results from univariate and bivariate portfolio sorts. Panel A reports the results from equal-weighted and value-weighted portfolio sorts based on female management share (FMS). In each quarter, we rank banks into four portfolios (Q1-Q4) and form equal- and value-weighted portfolios. We report the average number of entities in each portfolio, average FMS, and average return on equity (RoE) over the following quarter. Panel B - Panel D show the results of dependent equal-weighted portfolio sorts based on FMS and log CD (Panel B), FMS and Vola RoE (Panel C), as well as FMS and log Bank Age (Panel D). First, we form quartile portfolios sorted on log CD, Vola RoE, and log Bank Age, respectively. Then, within each of those quartiles, we sort stocks into portfolios Q1 - Q4 based on FMS. We report the average RoE for each of the 16 portfolios over the next quarter. The sample covers all credit institutions established in Luxembourg and the sample period is from 1999 to 2013. t-statistics are in parentheses. ***, **, and * indicate significance at the one, five, and ten percent level, respectively.