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Does gender diversity on banks' boards matter? Evidence from public bailouts

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ABSTRACT

We are the first to examine the impact of gender diversity on banks' boards on the probability and size of public bailouts. Our findings, based on a sample of listed European banks over the period 2005–2017, suggest that banks with more gender-diverse boards are less likely to receive a public bailout and receive a lower amount of bailout funds as a percentage of total assets than banks with less gender-diverse boards. Specifically, an increase by one standard deviation in gender diversity decreases the probability of a bailout by at least 2.44%, a significant reduction considering that the unconditional probability is 18.7%. Gender diversity is also positively related to bank performance, as proxied by ROA and Tobin's Q and with dividend payout ratios, consistent with the hypothesis that female directors are better monitors than male directors. These results are robust to a variety of econometric approaches and provide support for recent reforms in several EU countries regarding gender quotas.

1. Introduction

> When there is a very difficult situation, women are called in to do the work. To sort out the mess.
>
> Christine Lagarde, President of the ECB

Does gender diversity in boards affect bank conduct? Are banks with a significant presence of women on their board of directors more or less likely to need a government bailout during banking crises? These are the two questions that this paper seeks to answer.

Gender diversity might affect the probability of bank bailouts because female directors might affect firm profitability and risk, two important determinants of the probability that a bank will receive a public bailout.[1] The impact on firm performance can be ascribed, among other things, to a monitoring channel: female directors are likely to exert stronger monitoring efforts than their male counterparts, and this might increase performance for firms with weak governance mechanisms (Adams and Ferreira, 2009). This prediction is confirmed by recent contributions focusing on European firms (Bennouri et al., 2018; Green and Homroy, 2018). Because of this monitoring channel, gender diversity might also affect dividend policy. For example, Chen et al. (2017) show that in firms with weak corporate governance mechanisms, female directors tend to increase payout ratios.

Moreover, female directors are likely to be more risk averse than their male counterparts, which might lead to a decrease in

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[1] We use the term "*public*" because the decision of rescuing banks usually requires the involvement of multiple public authorities (Dam and Koetter, 2012, and Vallascas et al., 2017).

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financial distress costs and systemic risk (Bayazitova and Shivdasani, 2012) and, in turn, a decrease in the probability that the bank needs a public bailout. However, the existing literature about the impact of gender diversity on bank risk lacks consensus: for example, while Palvia et al. (2015) and Farag and Mallin (2017) provide evidence of a negative impact of gender diversity on bank risk, Berger et al. (2014) find a positive association, and Adams and Ragunathan (2017) and Sila et al. (2016) provide evidence that the relationship is insignificant. The reason for such discrepancies is likely to be due to the sample under consideration (for example, US rather than European banks) as well as the different econometric techniques used. In particular, Berger et al. (2014) focus only on German banks, while Palvia et al. (2015), Sila et al. (2016) and Adams and Ragunathan (2017) focus on US banks. Similar to our paper, Farag and Mallin (2017) consider European banks. In terms of methodology, Farag and Mallin (2017) rely on dynamic panel data models to allow for endogeneity. However, Farag and Mallin's sample period is shorter than ours (2004–2012), and they focus only on credit risk (measured by the ratio of impaired loans to gross loans). Importantly, none of these studies considers the role of gender diversity in determining the probability of bank bailouts, and ours is the first study to use a combination of techniques (including PSM and IV regressions based on external instruments) to examine the role of gender diversity on three different risk proxies: the NPL ratio, *Z*-score, and the probability of receiving a bailout. Our paper is also the only one that controls for systemic risk.

In this paper, we are the first to provide evidence on the influence of women on banks' boards on the probability of receiving a public bailout and the size of the bailout. This is a timely question for bank regulators and academics alike because of the public discontent that has arisen both in the US and in Europe with respect to the use of taxpayers' money to prop up illiquid banks. Several recent papers investigate the determinants of government bailouts of banks (among others, Bayazitova and Shivdasani, 2012, and Berger et al., 2016), but to the best of our knowledge, this is the first study that seeks to determine the role of gender diversity.

We investigate public bailouts in EU banks for two reasons. First, the Eurozone crisis has protracted the period of financial instability in Europe that started with the 2007–2008 financial crisis: we focus on a sample period from 2005 to 2017, which includes the Euro Sovereign Debt Crisis (2010−2012), consistent with the recent literature on policy interventions for banks (Fiordelisi and Ricci, 2016). This allows us to study a longer time series than for the US.

Second, although US and EU-member states rescue programs share many similarities in dealing with the financial crisis, there exist important institutional differences in both the supervisory approach to bank distress and in central banking features, providing fertile ground for novel research.[2] In particular, we are able to exploit information on a broad range of public bailouts (capitalizations, guarantees and credit lines), while studies based on US data consider only equity capital injections through the Troubled Asset Relief Program (TARP, Bayazitova and Shivdasani, 2012).

Investigating gender diversity in EU banks is important because although many EU-member states introduced both legal instruments and voluntary gender quotas to promote gender equality in decision-making positions (De Cabo et al. 2012, Ahern and Dittmar, 2012) during the early 2000s, only a few banks have met the targets (European Banking Authority (EBA), 2016a). To address this issue, and in line with the requirements of Directive 2013/36/EU and Directive 2014/65/EU, the EBA and the European Securities and Market Authority (ESMA) issued joint guidelines (ESMA and EBA, 2017). These guidelines introduced the requirement for financial intermediaries to set up a diversity policy and establish a target for the representation of the underrepresented gender on their boards.

Moreover, while the empirical literature on the impact of board diversity on bank performance and/or bank risk tends to focus on one country (Campbell and Mínguez-Vera, 2008; Ahern and Dittmar, 2012; Berger et al., 2014; Liu et al., 2014), we examine a sample of banks located in 15 EU countries. By investigating a cross-country sample, our study captures a higher degree of heterogeneity than the previous literature (for example, Berger et al., 2016) in terms of institutional, socioeconomic and cultural factors that may affect corporate governance in banks. In this respect, our paper is close to Arnaboldi et al. (2018), which investigates the relationship between gender diversity and bank performance. However, Arnaboldi et al. (2018) do not focus specifically on the impact of gender diversity on the likelihood and size of public bailouts. Moreover, our sample is more homogeneous than the sample in Arnaboldi et al. (2018) in terms of the regulatory framework and economic development because we concentrate on banks from Western European countries in the EU, while Arnaboldi et al. (2018) include Switzerland (which is not in the EU), the Czech Republic, Lithuania, Poland, and Romania (which are not in Western Europe).

Investigating the determinants of bank bailouts, as opposed to investigating those of other proxies for bank risk and performance, is important for three reasons. First, bank bailouts are a less arbitrary measure than other proxies of bank risk and performance. In fact, while there can be a variety of proxies for risk and performance, bank bailouts can simply be expressed by a binary variable (one for bailouts and zero otherwise). Therefore, this measure is less subject to data mining than other proxies for risk and performance and is also less likely to be affected by different bank business models and managerial discretion in financial reporting. Second, for each bailout, we can retrieve the type of bailout and the bailout amount (in billions of euros). This allows us to quantify the cost of the bailouts and how gender diversity can reduce/increase such costs, which may help inform public policy. Third, the probability and size of bank bailouts can also depend on risk-shifting and monitoring, and therefore, examining the impact of gender diversity on bank bailouts can help us understand to what extent gender diversity influences risk-shifting and monitoring incentives in banks.

[2] For example, due to the widespread fragmentation and market-orientation of the US banking system, US supervisory agencies are generally inclined to enforce Prompt Corrective Actions (PCAs), while European supervisors tend to exercise forbearance to avoid bank runs (Dermine and Schoenmaker, 2010). Moreover, the Federal Reserve supported financial institutions individually during the financial crisis, while the Eurosystem's authorities, as well as the Bank of England, focused on liquidity extension measures (Stolz and Wedow, 2010). In addition to these discrepancies, the two frameworks diverge in terms of the treatment of depositors in the resolution process and approaches used to address bank distress (Danisewicz et al., 2018).

Institutional discrepancies between the EU and the US banking systems are very important for the contribution of this paper to the existing literature on public bailouts. For this reason, we now provide a brief account of the main features of the EU institutional framework with respect to bank rescue packages.

The recent financial crisis revealed drawbacks in the EU banking system, both at the member-state level and at the aggregate level, because of the absence of a comprehensive Pan-European regulatory and legal framework for the financial sector (De Larosiére Group report, 2009). These shortcomings led to the creation of the new European supervisory system, namely, the Banking Union (BU). The BU is based on three pillars: the Single Supervisory Mechanism (SSM), the Single Resolution Mechanism (SRM), and the European Deposit Insurance Scheme (EDIS).[3]

In response to the crisis, EU countries launched rescue measures to address funding problems in banks, to restore confidence in the financial system and to limit the negative externalities of bank distress. The Member States allocated more than €30 billion to support financial institutions in accordance with the guidelines provided by the Economic and Financial Affairs Council (Ecofin). European action plans consisted of three types of bailout measures: capital injections, credit lines, and guarantees. Each of these rescue-packages had a specific aim. *Capital Injections*, the most common form of bailout packages in the aftermath of the last financial crisis (Philippon and Schnabl, 2013), aim to strengthen the banks' capital and to ensure the correct functioning and financing of the wider economy. *Guarantees* on deposits and debts aim to calm markets in an effort to lower risk premia. European governments used *Guarantees* extensively during the crisis period because they did not have to be recorded in the public budget, nor did they require any explicit legislative process. Finally, *Credit Lines* are employed in particular cases to enhance the liquidity position of impaired banks. Importantly, the amount of bailout funding received by the banks in our sample is a staggering €2182 billion: €280 billion for capital injections, €353 billion for credit lines, and €1549 billion for guarantees.

Table 1 reports the amounts of the public bailouts during the period 2008–2017 for the banking systems in our sample. There are no public bailouts from 2005 to 2007. In total, there were €793 billion spent on recapitalizations, €4334 billion spent on guarantees, and €263 billion spent on credit lines. Therefore, our sample covers approximately 40.48% (€2182/€5390) of the total amount of public bailouts to banks in our sample countries.

To answer our research questions, we use a unique dataset on the boards of directors and ownership structures of 105 listed banks in 15 European Union countries, including data on the presence of female directors and government officials on the board and the presence of institutional shareholders. The data on the corporate governance variables were hand-collected from annual reports and cross-checked with Board-Ex.

Our main findings are as follows. First, we find that an increase in gender diversity on banks' boards decreases the probability of a public bailout. These findings are robust to a variety of specifications, including the use of probit and logit models with different types of fixed effects (henceforth, FE), as well as duration models. The robustness of our results is confirmed when we employ propensity score matching (PSM) techniques and instrumental-variable (IV) regressions to allow for potential endogeneity. Second, employing IV-Tobit and panel Tobit regressions to allow for left-censoring of the data, we find that banks entering the financial crisis with a more gender-diverse board need less public funding than banks with less gender-diverse boards, in the form of capital injections, credit lines and guarantees, although the results for capital injections are less robust.

We are also the first to document the mechanism through which board diversity may affect the probability of receiving a bailout. We find that gender diversity on bank boards improves bank performance as proxied by Tobin's Q and ROA. However, we do not find evidence that gender diversity on banks' boards affects bank risk, as proxied by the ratio of nonperforming loans to total loans or *Z-score*. In line with Chen et al. (2017) and Ye et al. (2019), we find that banks with more gender-diverse boards have higher payout ratios than banks with less gender-diverse boards. These findings suggest that gender diversity enhances the monitoring of bank executives.

Our contribution to the previous literature is twofold.

First, we provide evidence that the economic impact of gender diversity on the probability of a bailout is substantial: an increase by one standard deviation in the percentage of female directors (12.3 percentage points) leads to a reduction in the probability of a bailout (in the form of capital injections, credit lines or guarantees) by at least 2.44 percentage points (0.1203*0.2025). This reduction is economically significant considering that in our sample, the unconditional probability of a public bailout is approximately 18.7% from 2008 to 2013, the period when most of the bailouts (95% of the sample) take place, and 9.6% over the total sample period (2005–2017).

Second, previous empirical studies focus on bailouts in the form of capital support, overlooking that governments use different tools to restore financial stability (Philippon and Schnabl, 2013; Berger et al., 2016). However, public authorities use a variety of bailout measures to address generalized distress in the banking system (Dewatripoint, 2014). For instance, governments make use of guarantees, either for deposits to prevent market panic or for debt securities to lower risk premia in capital markets. These alternative mechanisms are understudied, despite the fact that guarantees have been extensively used by governments. Our results suggest that banks with more gender-diverse boards receive a lower amount of guarantees than banks with less gender-diverse boards. For instance, according to the IV-Tobit regressions, an increase by one standard deviation in the proportion of women on the board (0.1203)

[3] The SSM confers to the European Central Bank (ECB) supervisory powers over banks that are deemed to be of "significant" importance for the Euro-Area, while the national supervisory agencies are in charge of supervisory activities of banks outside of the SSM framework. The SRM manages the resolution process for banks in distress with the aim to reduce the cost of bank bailouts to the taxpayer by improving banks' incentives to operate prudently (De Haan et al., 2009). The EDIS, which was introduced in 2015, is supposed to complement national deposit guarantee schemes (DGS). The main objective of EDIS is to reduce the extent to which national DGS are vulnerable to local shocks and to mitigate the two-way feedback effects between sovereign credit risk and banks (Acharya et al., 2014).

Table 1
Public bailouts in EU-15 countries during the period 2005–2017.

Member state	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Panel A: Capital Injections										
Belgium	12.90	5.00	2.50	0.00	2.92	0.00	0.00	0.00	0.00	0.00
Denmark	0.50	13.53	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.07
Germany	99.33	11.00	0.65	2.70	0.93	0.00	0.00	0.00	0.00	0.00
Ireland	0.00	12.50	52.06	26.05	0.00	0.00	0.25	0.78	0.78	0.78
Greece	5.00	0.00	10.00	0.47	20.28	0.86	12.37	10.61	0.00	0.00
Spain	0.00	0.00	101.10	0.00	72.55	0.61	0.06	0.00	0.00	0.00
France	23.45	0.50	2.70	0.00	2.59	0.00	0.00	0.00	0.00	0.00
Italy	20.00	0.00	0.00	0.00	2.00	0.00	0.00	3.82	0.00	11.29
Luxembourg	2.40	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Netherlands	26.55	0.00	11.09	0.00	0.00	2.20	0.00	0.00	0.00	0.00
Austria	15.00	0.65	0.00	0.00	3.22	21.26	0.00	0.00	0.00	0.00
Portugal	0.00	4.00	0.00	8.00	14.25	1.10	4.90	2.58	0.00	5.89
Finland	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sweden	0.33	4.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
United Kingdom	64.15	47.59	2.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Panel B: Guarantees										
Belgium	275.75	1.00	0.00	27.20	21.47	0.00	0.00	0.00	0.00	0.00
Denmark	580.00	0.00	0.00	0.00	7.90	0.00	0.00	0.00	0.00	0.00
Germany	447.75	2.50	0.00	5.60	0.00	0.00	0.00	0.00	0.00	0.00
Ireland	376.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Greece	15.00	0.00	40.00	30.00	0.00	0.00	0.00	93.00	93.38	93.00
Spain	200.00	0.00	1.15	0.00	119.65	0.01	0.44	0.00	0.00	0.00
France	319.75	0.00	0.00	16.40	17.33	29.20	0.00	0.00	0.00	0.00
Italy	0.00	0.00	0.00	80.00	30.00	0.00	0.00	0.00	150.00	175.10
Luxembourg	4.50	0.00	0.00	1.30	1.25	0.00	0.00	0.00	0.00	0.00
Netherlands	200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Austria	75.00	0.00	0.00	0.20	5.64	3.30	0.00	0.00	0.00	0.00
Portugal	16.00	0.45	0.00	19.00	5.22	3.60	0.00	28.17	24.67	22.80
Finland	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sweden	156.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
United Kingdom	364.53	67.91	3.27	0.00	23.04	0.00	0.00	0.00	0.00	0.00
Panel C: Credit Lines										
Belgium	0.00	0.00	0.00	0.00	20.50	0.00	0.00	0.00	0.00	0.00
Denmark	4.94	0.68	0.46	0.00	1.80	0.00	0.00	0.00	0.00	0.91
Germany	0.00	0.00	0.00	9.50	0.00	0.00	0.00	0.00	0.00	0.00
Ireland	0.00	0.00	0.00	40.73	0.00	0.00	0.00	0.00	0.00	0.00
Greece	8.00	0.00	0.00	0.00	0.00	7.74	0.10	0.00	0.00	0.00
Spain	30.00	0.00	1.85	0.00	0.00	0.80	0.00	0.00	0.00	0.00
France	0.00	0.00	0.00	0.00	8.65	0.00	0.00	0.00	0.00	0.00
Italy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.28
Luxembourg	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Netherlands	0.00	0.00	52.90	0.00	0.00	1.10	0.00	0.00	0.00	0.00
Austria	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Portugal	0.00	0.00	0.00	0.00	6.06	0.00	0.00	0.00	0.00	0.00
Finland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sweden	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
United Kingdom	39.89	4.49	7.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00

This table provides information on the institutional setup of the national schemes over the sample period from 2008 to 2017 in EU-15 countries. Panels A, B, and C report information on capital injections, guarantees, and credit lines, respectively. From 2005 to 2007, no bailouts were reported. All values are in billions of euros.
Source: http://ec.europa.eu/competition/state_aid/scoreboard/state_aid_approved_2008_2017_final.xlsx

decreases the ratio of guarantees to total assets by 0.457 percentage points (0.038*0.1203). Because the banks in our sample have average total assets equal to approximately 250 billion euros, this implies a reduction in the average amount of guarantees equal to (0.00457*250 =) 1.14 billion euros.

The rest of the paper is structured as follows. Section 2 develops hypotheses that relate gender diversity in the boardroom to the probability of bank bailouts. Section 3 describes the dataset and the methodology. Section 4 reports the main results. Section 5 provides a discussion of the mechanism through which gender diversity affects the probability of a bailout. Section 6 concludes the paper and provides policy recommendations.

2. Hypotheses development: gender diversity and public bailouts

The recent literature investigates the factors affecting the likelihood that banks will receive a public bailout (Faccio et al., 2006;

Bayazitova and Shivdasani, 2012; Dam and Koetter, 2012; Berger et al., 2016) and, specifically, the effects of governance mechanisms on bailout probability (Vallascas et al., 2017). However, to the best of our knowledge, the literature neglects gender diversity on banks' boards as a factor that may affect the probability of a public bailout.

Board diversity can have both benefits and costs. Diversity broadens the array of perspectives on the board (Erhardt et al., 2003), leading to a larger number of potential solutions. Moreover, board diversity improves the degree of heterogeneity of functional expertise (or unique skills), which can in turn improve advisory effectiveness (Kim and Starks, 2018). Board diversity can also result in new personal connections, for example political connections or investors from a different demographic background. Diversity may nonetheless be costly because it can result in communication problems among subgroups and create conflict (Ferreira, 2011). However, some of the literature suggests that conflicts might improve collective decisions because they lead to a stricter scrutiny of board members (Cumming et al., 2015).

We argue that it is plausible that gender diversity may affect the probability that a bank receives a bailout. This hypothesis stems from the previous literature, which posits that gender diversity in boardrooms affects economic outcomes (i.e. Adams and Ferreira, 2009; Ahern and Dittmar, 2012). In particular, female directors may influence both bank profitability and risk (Matsa and Miller, 2013; Berger et al., 2014) and ultimately, the probability that the bank receives a public bailout.

The risk-taking channel is important because the decision to rescue a bank depends mainly on the financial distress costs and systemic risk of that bank (Bayazitova and Shivdasani, 2012), and female directors tend to be more risk averse and less confident than their male counterparts (Bordo et al., 1994; Arch, 1993; Croson and Gneezy, 2009; Adams and Funk, 2012; Huang and Kisgen, 2013). Therefore, gender diversity may reduce bank risk-taking and ultimately, the probability that a bank needs a public bailout to avoid liquidation.

A second channel through which gender diversity may reduce the probability of a public bailout is performance because a key determinant of a public bailout is bank profitability (Dam and Koetter, 2012). Female directors tend to monitor more strongly than male directors, and gender diversity tends to improve the sensitivity of the executive compensation and CEO turnover to firm performance. Moreover, gender diversity tends to improve the performance of firms with weak governance mechanisms (Adams and Ferreira, 2009).

Empirical contributions on the association between gender diversity on the board and firm profitability provide mixed findings, both in the management literature (Kramer, 1991; Hillman et al., 2000; Hillman et al., 2002; Peterson and Philpot, 2007; Francoeur et al., 2008; Adams and Funk, 2012) and in the finance literature (Campbell and Mínguez-Vera, 2008; Cheng, 2008; Adams and Ferreira, 2009; Ahern and Dittmar, 2012; Liu et al., 2014), probably due to discrepancies in the institutional and legal environments of different countries. In particular, Campbell and Mínguez-Vera (2008) find a positive impact of gender diversity on the profitability of Spanish firms. Similar results are provided by Francoeur et al. (2008) and Liu et al. (2014) for Canada and China, respectively. In contrast, Adams and Ferreira (2009) and Ahern and Dittmar (2012) provide evidence of a negative relationship between gender diversity and firm profitability.[4] Finally, Gregory-Smith et al. (2014) show that gender diversity on the board of UK companies does not affect firm performance.

In addition to these two channels, gender diversity on boards may also play a role in bank dividend policy. Dividend payouts can be used as a monitoring device to decrease agency costs (Easterbrook, 1984; Abreu and Gulamhussen, 2013; Onali et al., 2016; Chen et al., 2017) because dividends decrease the amount of excess cash that insiders can invest in projects with a negative net present value (Jensen, 1986). Chen et al. (2017) report that gender diversity on corporate boards increases the payout ratios of firms with weak governance structures, indicating that female directors use dividends to decrease agency costs. However, Chen et al. (2017) focus on nonfinancial firms. The recent literature finds that the relationship between bank dividend policy and corporate governance variables is subject to dynamics that differ from those typical of nonfinancial firms (Abreu and Gulamhussen, 2013; Onali et al., 2016). In particular, banks may pay dividends to shift default risk to bank creditors and, in the case of bailouts, to taxpayers (Acharya et al., 2011; Onali, 2014).

Empirical contributions on the relationship between gender diversity in boards and risk provide conflicting findings (Matsa and Miller, 2013; Sila et al., 2016). For example, Berger et al. (2014) find a positive association between gender diversity in the executive board and bank risk in Germany, while Adams and Ragunathan (2017) and Sila et al. (2016) do not find any significant association between gender diversity and bank risk in the US. It is important to emphasize that the inconsistencies in these results may be due to different factors, such as the proxy for risk used, the country under examination, and the type of bank examined. For example, Sila et al. (2016) focus on large listed companies (including bank holding companies) in the US, while the sample used in Berger et al. (2014) consists mainly of unlisted German banks. Moreover, the results for nonfinancial firms may not be valid for banks because banks tend to have different governance arrangements (Adams and Mehran, 2003; Mulbert, 2010).[5]

These considerations suggest that *ex-ante* the relationship between gender diversity on banks' boards and the probability of a public bailout is unclear:

[4] Recent contributions provide two potential explanations for a negative relationship: women may exert stronger monitoring efforts than men, leading to an increase in monitoring costs and a decrease in profitability (Adams and Ferreira, 2009); women may be less experienced, on average, than men (Ahern and Dittmar, 2012).

[5] Monitoring conducted by a variety of stakeholders complicates the governance of financial institutions. For instance, bank regulators can act on the behalf of depositors, and the government can actively seek to monitor bank conduct (Onali et al., 2016). Additionally, bank instability can lead to severe negative externalities (Adams and Mehran, 2003).

H1a. Banks with more gender-diverse boards are less likely to receive a public bailout than banks with less gender-diverse boards.

H1b. Banks with more gender-diverse board are more likely to receive a public bailout than banks with less gender-diverse boards.

Hypotheses H1a and H1b are concerned with the probability of a bailout. However, we can also develop similar hypotheses about the size of the bailout received by a bank. Because bank size can affect the overall amount of a bailout, we focus on the size of the bailout scaled by total assets.

3. Data and methodology

This section describes the methodology and data. Section 3.1 describes our econometric strategy. Section 3.2 describes our dataset. Section 3.3 provides the descriptive statistics.

3.1. Methodology

3.1.1. Estimating the probability of a bailout

To test our hypotheses, we first use a broad definition of public bailout that includes any kind of last-resort measures used by public authorities to support ailing banks. To this end, we build the variable *Public Bailout*, defined as a dummy variable that takes the value of one if bank *i* receives a public bailout at time *t* and zero otherwise.

In further tests, we distinguish among different kinds of bailouts:

- *Capital Injections*: a dummy variable that takes the value of one if capital support is provided for bank *i* at time *t* and zero otherwise (Berger et al., 2016);
- *Guarantees*: a dummy variable that takes the value one if one or more guarantees are provided for bank *i* at time *t* and zero otherwise;
- *Credit Lines*: a dummy that takes the value one if bank *i* receives a favoured credit line from the government at time *t* and zero otherwise.

Past studies mainly document the importance of capital injections (Philippon and Schnabl, 2013; Berger et al., 2016) as the core of rescue programs. However, in Europe, guarantees played a very important role. In contrast to capital injections, guarantees are not required to be shown in public budgets or to be allotted after an explicit legislative process. For these reasons, they were used extensively during the financial crisis and the Eurozone sovereign debt crisis.

To test H1, we rely on a probit model, in line with the previous literature on bank bailouts (Faccio et al., 2006; Bayazitova and Shivdasani, 2012):

$$E\left[Bailout_{i,t} \middle| \, Gender\ Diversity, Controls\right] = \mathbf{\Phi}\left(Gender\ Diversity_{i,t-1}, Controls_{i,t-1}\right) \tag{1}$$

where $i = 1,2, \ldots N$ labels banks, while $t = 1, 2 \ldots T$ labels the year. To reduce simultaneity concerns, we consider the explanatory variables lagged by 1 year. We cluster the standard errors at the bank level to correct for serial correlation in the errors within each bank.[6] *Gender Diversity* is the percentage of female directors on the board of bank *i* at time *t* (Campbell and Mínguez-Vera, 2008; De Cabo et al., 2012), and *Controls* is a vector of bank-specific variables and macroeconomic variables to allow for country-level time-varying factors that may affect bailout probability.

We choose the variables to include in the vector *Controls* on the basis of the previous literature on bank bailouts (Faccio et al., 2006; Bayazitova and Shivdasani, 2012; Dam and Koetter, 2012; Berger et al., 2014; Berger et al., 2016, Vallascas et al., 2017). In line with the too-big-to-fail (TBTF) perspective (O'Hara and Shaw, 1990), we control for bank size, measured as the log of total assets (*Size*).[7] For robustness, we use as an alternative proxy for systemic risk, the long run marginal expected shortfall (hereafter, *LRMES*), an extension of the marginal expected shortfall (Vallascas et al., 2017).[8] We also control for the market-to-book ratio (*MTB Ratio*), a common proxy for growth opportunities, and for bank profitability, proxied by *ROA* and *Tobin's Q*. The former is defined as the net income of the bank divided by total assets (Adams and Ferreira, 2009; Liu et al., 2014). The latter is measured as the ratio of the market value of equity plus the face value of debt divided by the book value of equity plus the face value of the debt (Lindenberg and Ross, 1981; Adams and Ferreira, 2009; Onali et al., 2016).

We also allow for the potential impact of the bank's funding structure and asset composition in the baseline model or in the robustness checks: *Capital Ratio*, defined as bank equity capital to total assets (Gropp et al., 2011; Acharya and Thakor, 2016); *Tier 1 Ratio*, defined as the Tier 1 regulatory capital to risk-weighted assets (Beltratti and Stulz, 2012); *Deposits Ratio*, defined as the ratio of

[6] We cluster the standard errors at the bank level in our baseline regressions because clustering at the country level may result in biased standard errors because the number of clusters is small (Cameron and Miller, 2015).

[7] As well as being a rough indicator of a bank's systemic relevance (Drehmann and Tarashev, 2013), *Size* is also a proxy for market power and a measure of diversification (Demsetz and Strahan, 1997; Gropp et al., 2011).

[8] *MES* is defined as the one-day loss expected if market returns are <2%, and it is measured as of 31 December of a given year (Acharya et al., 2012). Data on this variable are no longer available from the V-Stern Lab website, and only data for *LRMES* are available.

deposits divided by total assets[9]; *Liquid Assets Ratio*, calculated as the ratio of cash plus marketable securities to total assets (Wang et al., 2009); and *Derivatives to Assets Ratio*, which is the amount of derivatives scaled by total assets (Bayazitova and Shivdasani, 2012). We control for ownership concentration, which may decrease bank risk according to some of the literature (Iannotta et al., 2007): we use *Herfindahl-Hirschman Index* (hereafter, *HHI*), calculated as the sum of squared ownership shares for each recorded shareholder.[10]

It is important to control for other corporate governance variables that might correlate with *Gender Diversity*, to reduce the probability of omitted variable bias. For this reason, we also include *Board size (*ln*)* (the log of the number of board members) and *Board Independence* (the number of independent directors[11] divided by the number of board members), following the previous literature (Erkens et al., 2012; Vallascas et al., 2017). We also control for the presence of a female CEO (Faccio et al., 2016), using a dummy variable that takes the value one if the CEO is female and zero otherwise (*Female CEO*).

Moreover, politically connected banks might be more likely to attract public attention and receive a public bailout than banks that are not politically connected (Faccio et al., 2006). For this reason, we also include among our control variables in the probit regressions a dummy equal to one if there is a government official on the board (Onali et al., 2016). We call this variable *Political Connection*. To further increase the robustness of our results, we also control for the presence of institutional investors[12] in the ownership structure of the bank using the variable *Institutional Ownership* (Diaz and Jafarinejad, 2016).

Finally, we also consider an array of country-level variables commonly used in the banking literature as controls. This is necessary because bailout policies and bank performance could be influenced by institutional and macroeconomic factors (Faccio et al., 2006; Gropp et al., 2011). We control for the annual *GDP growth* (real) to allow for business cycle effects at the country level (Anginer et al., 2014). To capture changes in the probability of a bailout due to financial crises, we include two dummy variables: *US-Mortgage Crisis Dummy,* which takes the value one for the years 2007 and 2008 (and zero otherwise), and *EU-Sovereign Debt Crisis Dummy, which* takes the value one for the period from 2010 to 2012 and zero otherwise (Erkens et al., 2012; Arellano et al., 2012).

3.1.2. Propensity score matching (PSM) and instrumental variables (IV) regressions

Studies about corporate governance mechanisms might suffer from endogeneity problems (Coles et al., 2012). In our case, there could be reverse causality between public bailouts and *Gender Diversity*: when a bank receives a bailout, dismissals of executives and board replacements may ensue (Berger et al., 2016). Moreover, in our specifications, we may be omitting unobservable variables that are correlated with board composition. First, reverse causality could drive our results due to the so-called *sorting-effect*: better-performing banks are more likely to hire female directors on their board than other banks (Adams and Ferreira, 2009), and bank performance might affect the probability of a bailout. Second, provided that women are indeed more risk averse than men, it is plausible that women can self-select onto the boards of less risky banks. Finally, there may be factors that are unobservable to the econometrician and correlated with *Gender Diversity*, engendering an omitted variable bias problem (Coles et al., 2012).[13]

It may also be argued that rescued banks and non-rescued banks differ systematically because of the variables whose impact might be confounded with the effect of *Gender Diversity*. For this purpose, we employ a PSM approach to eliminate these differences. In particular, we first split the sample into two groups – banks with high levels of *Gender Diversity* and banks with low levels of *Gender Diversity* – on the basis of the median value for *Gender Diversity*. Then, we match the banks of the two groups within the country strata so that the two subsamples are similar as possible in terms of the variables that might be correlated with the probability of being rescued. This procedure reduces the likelihood that such underlying differences (for example, differences in terms of size) are driving our results, rather than *Gender Diversity*. In particular, our PSM contains variables that might be related to bank risk and bank performance, such as *Tier 1 Ratio* and *ROA*, as well as other variables that might affect the probability of a bailout, such as *Political Connection*.

We follow Fang et al. (2014) and rely on a probit model where the dependent variable is equal to one if *Gender Diversity* is higher than the sample median and zero otherwise. This probit regression includes all the bank-specific controls used in our main regressions: *Size*, *Capital Ratio*, *Deposits Ratio*, *MTB Ratio*, *ROA*, *Tier 1 Ratio*, *HHI*, *Female CEO*, *Board Size (*ln*), Board Independence, Political Connection* and *Institutional Ownership*. We also require a tolerance level for the maximum propensity score distance (*caliper*) between the treatment and the control group equal to 0.05; this is comparable to the values used in recent contributions about corporate governance in banks (among others, Ivashina et al., 2008). Once obtained the treatment and control groups, we rerun the probit regressions as in Eq. (1), allowing for country FE and year FE.

As an additional robustness check, we employ an IV-probit model based on a two-stage approach:

$$STAGE\ 1: Gender\ Diversity_{i,t-1} = f\left(IV_{i,t-1}, Controls_{i,t-1}\right) \tag{2a}$$

$$STAGE\ 2: E\left[Public\ Bailout_{i,t} \middle| Gender\ Diversity, Controls\right] = \mathbf{\Phi}\left(Gender\ Diversity_{i,t-1}, Controls_{i,t-1}\right) \tag{2b}$$

[9] By scaling deposits by total assets, we measure the degree to which the bank's activities depend on deposits funding (Demsetz and Strahan, 1997; EBA, 2016b).

[10] In the specifications related to the mechanism, we also employ the dummy variable *Widely Held*, which is an indicator variable equal to one if there is no owner with >10% of bank share rights and zero otherwise. This variable has been employed previously in the literature about bank risk taking (Laeven and Levine, 2009).

[11] To identify independent directors, we follow the same criteria used by Onali et al. (2016).

[12] We distinguish among four different kinds of institutional investors: (i) mutual funds, (ii) banks, (iii) pension funds, and (iv) hedge funds.

[13] Other previous studies on bank risk (Sila et al. (2016); Chhaochharia and Laeven, 2009; Faccio et al., 2016) employ a dynamic panel data model using the generalized method of moments (GMM) estimation (Arellano and Bond, 1991; Blundell and Bond, 1998). However, this approach can lead to bias in the presence of time-varying omitted variables (Wintoki et al., 2012).

where *Public Bailout* is the probability that a bank receives a public bailout and *Controls* is a vector of control variables.

IV-estimation methods rely on two assumptions: the relevance restriction requires that the instrument affects the potentially endogenous variable (*Gender Diversity*), and the exclusion restriction requires that the instrument is not directly correlated to the dependent variable (*Public Bailout*). To choose an appropriate instrument, we need to search for a source of exogenous variation in our main variable of interest, *Gender Diversity*. We borrow the idea for our instruments from Knyazeva et al. (2013) and Chen et al. (2017), who show that local labor-market conditions affect board composition. We identify two instruments based on regional labor-market characteristics: *Female Participation Rate*, which is the female labor force participation divided by the male labor force participation in the NUTS 2 region where the bank's headquarter is located, and *Female Participation Rate*, which is calculated as the employment rate for women with tertiary education in the NUTS 2 where the bank's headquarter is located. Both of these instruments are likely to be positively correlated with *Gender Diversity*, and therefore they satisfy the relevance restriction, a necessary condition for instrumental variables to be valid.

Female Participation Rate is based on the total number of women who are economically active in a particular region, and one may argue that this could be a weak instrument because the board of directors tends to consist of highly qualified individuals. For this reason, we also consider *Female Employment Rate*, which measures the educational attainment of women, focusing on the regional employment rate of women with only tertiary education.

The second necessary condition for the validity of our instruments is that they do not have any first-order effect on our dependent variable. Because the percentage of women in the local labor market is unlikely to have a direct impact on the probability that a specific bank will experience financial distress, this variable plausibly satisfies the exclusion restriction. While it is true that female directors might choose to join high performing banks or banks with low risk (e.g., De Cabo et al., 2012), the percentage of women in the local labor market is unlikely to be correlated with the riskiness and performance of individual banks whose headquarters are in that region. In fact, the banks in our sample are large listed banks, for which geographical diversification occurs at the national (and possibly international level). For this reason, it is unlikely that local labor-market conditions play an important role in the probability that a bank will be in distress (and vice versa). It may be argued, however, that the economic conditions of the country where the bank has its headquarters can affect the soundness of the bank, especially for countries for which there is a feedback effect between sovereign debt risk and the risk of the domestic financial sector (Acharya et al., 2014), and excluding this variable from the analysis may generate omitted variable bias. For example, if economic growth is positively related to female labor participation and employment rates, then the banks located in countries with high GDP growth rates may be more likely to have a high value for *Gender Diversity* than banks in other countries For this reason, we address potential omitted variable bias by controlling for national GDP growth rate in our regressions (*GDP growth*).

Using regional labor-market characteristics is also superior to using national labor-market characteristics because it reduces the probability that the correlation between the instrument and the endogenous variable depends on other national-level variables that are omitted from the analysis. In fact, one may argue that national-level labor-market variables may be important factors in the decision-making processes of national governments when assigning bailouts to local banks. However, this last point is (in our view) rather weak because a bailout cannot be granted without the approval of the European Commission (in particular, the Directorate General for Competition), which needs to consider potential distortions in competition resulting from a bailout (Dewatripoint, 2014).[14] In fact, EU authorities have to implement a concerted action plan for bank rescue measures to avoid national measures impairing the functioning of the single market because of potential distortions in competition (Stolz and Wedow, 2010; Calderon and Schaeck, 2016). For example, in 2009, the European Commission launched an investigation in the restructuring plan for Dexia to verify whether it was consistent with European Commission Treaty rules.[15]

3.1.3. Duration models

As a robustness check, we conduct survival data analysis to estimate the impact of gender diversity on the probability that a bank receives a bailout (Cox, 1972, Cleves et al., 2016, Chen et al., 2017). We employ both a Cox hazard model[16] and a parametric Weibull regression, and we estimate the probability that bank *i* has received a bailout since the start of the financial crisis.[17] More specifically, we implement the following regression setup:

$$Pr\left(Public\ Bailout_t | \mu\left[X_i = Gender\ Diversity_{i,precrisis}, Controls_{i,precrisis}\right]\right) = h_0(t) exp \sum_{i=1}^{n} \beta_i \mu(X_i) + Country\ FE + \varepsilon_i \tag{3}$$

[14] It may be argued that national programs requiring gender quotas for boards mandated by EU-15 governments (or other authorities) could be exploited as exogenous shocks that could be used as instrumental variables or for a difference-in-differences approach. However, as we show in Supplementary Appendix B, in most cases these quotas were for state-owned companies or companies with state ownership; therefore, they were not binding for listed banks. Moreover, in some cases there were no specific sanctions for noncompliance. Italy is the only country for which the gender quotas apply to listed banks, the implementation took place during our sample period and there are specific sanctions for noncompliance. In this case, we do observe an increase in the number of sample banks during the first phase of the implementation of the gender-quota program. However, during the second period of the program, only two banks were compliant with the new gender quota.

[15] See: http://europa.eu/rapid/press-release_IP-09-399_en.htm?locale=en.

[16] The Cox proportional hazard model (1972) is less restrictive than the full parametric probit regression since it requires fewer assumptions and fits better smaller samples (Cleves et al., 2016; Chen et al., 2017).

[17] If a bank received more than one public bailout during the crisis, we consider the date of the first bailout.

We estimate the probability of receiving a bailout as a function of the number of years starting from the beginning of the crisis to the end of the sample period as well the mean value of the variable of interest, *Gender Diversity* (and other control variables), across the pre-bailouts period (2005–2007). Furthermore, to demonstrate the robustness of our results, instead of using macroeconomic and institutional factors (see Section 3.1.1), we consider country fixed effects (*Country FE*) in the specification. In further tests, we also estimate the probability of receiving a bailout as a function of the number of days starting from the beginning of the crisis to the end of the sample period.

3.1.4. Tobit regressions for the size of the public bailout

Gender Diversity may affect not only the probability of receiving a public bailout but also the amount of funding granted to the bank. In particular, we consider for each specific type of public bailout the total amount of funding scaled by total assets (*Public Funds*). Clearly, this is a censored variable because

$$Public\ Funds^{*}_{j,i,t} = f\left(Gender\_Diversity_{j,i,t-1}, Controls_{j,i,t-1}\right)$$

$$\text{where } Public\,Funds^{*}_{j,i,t} = \begin{cases} Public\,Funds_{j,i,t} & \text{if } Public\,Funds_{j,i,t} > 0 \\ 0 & \text{otherwise} \end{cases} \tag{4}$$

where $j = 1,2,3$ labels the specific type of public bailout (*Capital Injections*, *Credit Lines* or *Guarantees*), $i = 1,2,\ldots N$ labels banks, and $t = 1, 2\ldots T$ labels the year. The vector *Controls* is defined as before.

To test whether *Gender Diversity* affects the amount of funding granted to the bank, we employ IV-Tobit models, with the same instruments as for the IV-probit regressions above, as well as panel censored regression models (Honoré, 1992; Arena and Kutner, 2015), which allow for the estimation of limited dependent variables in the presence of panel FE. As a further robustness test, we also run Poisson models (with fixed effects and population average models).

3.2. Data and sample selection

To test our hypotheses, we build a new and unique hand-collected dataset with information on all public bailouts and board composition for listed banks in 15 EU countries during the period from 2005 through 2017. Concentrating the analysis on listed EU banks is useful for improving the within-sample comparability of the banks from different countries because these banks have to comply with IFRS and the market for their shares tends to be liquid.[18]

Our sample selection steps are as follows. In the same vein as Onali et al. (2016), we select all banks defined by Bankscope as commercial banks, bank holding companies (BHC), or cooperative banks. Second, we consider only listed banks that adopt International Financial Reporting Standards (IFRS) to avoid confounding effects from differences in national accounting standards. Next, we select all banks for which information on total assets is available for at least one of the sampled years (resulting in 118 banks). Finally, we exclude financial institutions for which data on regulatory and other financial ratios are unavailable (13 banks) over the sample period. The final sample consists of 105 banks and covers the largest banks in EU-15 countries. In the multivariate regressions below, some of the 105 banks exit the sample, and the exact number of banks entering each regression depends on the specification employed.

Table 2 Panel A reports the composition of our sample by country. Table 2 Panel B provides an analysis of the sample representativeness in relation to the population of the listed banks in the EU-15 countries over the sample period. While we select only a subsample of banks in EU-15 countries, our sample covers >90% of the entire European Banking System in terms of total assets, deposits and total lending.

Our sample representativeness is similar to that in Arnaboldi et al. (2018), who examine a sample of 77 listed banks across 20 countries. Our sample consists of 105 banks and 15 countries, and thus, we have a larger sample in terms of the number of banks (and a higher average number of banks per country). The two samples are very similar in terms of the total assets of the banks in the samples (approximately 24 trillion euros).

For our econometric analysis, we match data collected from multiple data sources. The data on public bailouts until 2013 were obtained from the document "*Public Support Measures in Europe and in the United States*", which is available on Mediobanca's website (http://www.mbres.it/en/),[19] the European Commission Database,[20] and the Global Trade Alert from CEPR website. We also conducted keyword-based searches using Lexis-Nexis. In line with previous studies (among others, Faccio et al., 2006), we combined the name of the rescued banks with keywords such as: "bailout," "bail-out," "bailed out," "rescue," "rescue package," "injection," "restructure", "restructuring", "aid," "liquidity facilities" and "guarantees", along with the Boolean operator AND to consider the words "government" or "state" (for example, "government bailout"). Furthermore, we replicated the same search strategy by directly using the main national newspapers of each sampled country.

[18] These considerations are consistent with those put forward by Laeven and Levine (2009), who select an international sample of large banks because "*Focusing on the largest banks enhances comparability because they tend to comply with international accounting standards and have more liquid shares, reducing concerns that accounting or liquidity differences drive the results*." (p. 261).

[19] This document can be found at the link: https://www.mbres.it/sites/default/files/resources/download_it/rs_Piani%20di%20stabilizzazione%20finanziaria.pdf

[20] See http://ec.europa.eu/competition.html.

Table 2
Sample composition and representativeness.

Panel A: Overview

Country name	Banks	Sample %
Austria	7	6.67
Belgium	3	2.86
Denmark	11	10.48
Finland	3	2.86
France	8	7.62
Germany	9	10.48
Greece	11	9.35
Ireland	2	1.90
Italy	20	19.05
Luxembourg	2	1.90
Netherlands	4	3.81
Portugal	4	3.81
Spain	8	7.62
Sweden	4	3.81
United Kingdom	9	8.41
Total	105	100.00

Panel B: Sample representativeness

Year		Size (th)[a]	Loans (th)	Deposits (th)
2013	Sample (€)	23,298,505,109	9,843,846,495	9,045,624,892
	All listed banks (€)	24,229,329,832	10,352,703,424	9,403,368,359
	Representativeness (%)	*0.96*	*0.95*	*0.96*
	Sample (€)	23,298,505,109	9,843,846,495	9,045,624,892
	All banks in EU-15 (€)	46,653,506,422	21,379,781,685	18,586,373,465
	Representativeness	*0.50*	*0.46*	*0.49*
2015	Sample (€)	23,521,241,029	10,203,214,410	9,867,628,892
	All listed banks (€)	23,941,763,624	10,563,046,898	10,063,161,700
	Representativeness (%)	*0.98*	*0.97*	*0.98*
	Sample (€)	23,521,241,029	10,203,214,410	9,867,628,892
	All banks in EU-15 (€)	48,780,527,597	23,499,578,558	21,264,567,217
	Representativeness (%)	*0.48*	*0.43*	*0.46*
2017	Sample (€)	22,148,876,792	9,893,047,617	9,948,230,704
	All listed banks (€)	23,613,551,402	10,790,652,567	10,579,760,857
	Representativeness (%)	*0.94*	*0.92*	*0.94*
	Sample (€)	22,148,876,792	9,893,047,617	9,948,230,704
	All banks in EU-15 (€)	46,360,876,882	22,667,439,304	20,740,555,549
	Representativeness (%)	*0.48*	*0.44*	*0.48*

The table reports the sample composition (Panel A) and representativeness (Panel B). Sample representativeness is calculated for 2013, 2015, and 2017. We report the percentage of total assets, total loans, and total customer deposits covered by our sample with respect to the population of listed institutions in the 15 countries considered and the population of listed and unlisted banks in the sample countries.

[a] (th) stands for thousand of euros.

Bank-specific variables were collected from either Bankscope up to 2013 and Orbis Bank Focus thereafter (balance sheet and income statement items) or V-Stern-lab (*LRMES*). Information on macroeconomic and institutional factors was obtained from the AMECO database of the European Commission and the World Bank Database.

Tables 3 reports the summary statistics (mean, median, minimum and maximum) for each variable used in the subsequent multivariate analysis (all variables are winsorized at the 1% level) for the whole sample period (2005–2017). We also report the statistics for the proxies of bank performance, risk, and dividend payout ratios and a short explanation for each variable (we provide a more detailed explanation in Section 6). The mean and standard deviation for *Gender Diversity* are 14.98% and 12.03%, respectively. *Female Participation Rate* ranges between 70.70% and 98.48%, while *Female Participation Rate* ranges from 43.60% to 92%, suggesting a substantial variation in the extent to which women are involved in the social and economic environments in Europe (European Commission, 2012a, 2012b).

Table 4 reports the pairwise correlations of the main variables (dependent and independent) in our analysis. The probability of receiving a bailout is negatively correlated with accounting-based and market-based measures of performance, such as *ROA*, *Tobin's Q*, and *MTB Ratio*. Distance-to-default, proxied by *Z-score,* is negatively related to the probability of a bailout and thus *Capital Ratio*. However, the correlation between *Tier 1 Ratio* and *Public Bailout* is insignificant. Banks with high systemic risk (proxied by *LRMES*) and large banks are more likely to receive a bailout, which is consistent with the previous literature. The dummy variable *Political Connection* is positively correlated with *Public Bailout* and *Size,* while it is negatively correlated with *Tobin's Q*, confirming that

Table 3
Descriptive statistics.

	Description	Obs	Mean	Median	Std. Dev.	Min	Max
Key dependent variables for the main hypotheses							
Public Bailout	1 if the bank was bailed out, and 0 otherwise.	1290	0.0961	0.0000	0.2949	0.0000	1.0000
Capital Injections	1 if the bank received a public capital injection, and 0 otherwise.	1290	0.0333	0.0000	0.1796	0.0000	1.0000
Credit Lines	1 if the bank received a credit line from the government.	1290	0.0186	0.0000	0.1352	0.0000	1.0000
Guarantees	1 if the bank received a guarantee from the government.	1290	0.0651	0.0000	0.2468	0.0000	1.0000
Public funds (Capital Injections)	Amount of the capital injection received by the bank scaled by total assets (excluding zeros).	49	0.0193	0.0150	0.0126	0.0006	0.0348
Public funds (Credit Lines)	Amount of the credit line received by the bank scaled by total assets (excluding zeros).	27	0.0092	0.0112	0.0015	0.0006	0.0125
Public funds (Guarantees)	Amount of the guarantee received by the bank scaled by total assets (excluding zeros).	84	0.0533	0.0352	0.0179	0.0001	0.1264
Dependent variables used to explore the mechanism							
Tobin	Market Value of equity plus the face value of debt divided by the book value of equity plus the face value of debt.	1169	1.0279	0.9925	0.1666	0.7237	2.1844
NPL Ratio	Nonperforming loans to total loans.	708	0.0087	0.0005	0.0362	0.0000	0.2603
Z-score	Sum of return on assets (ROA) and the equity capital to total assets ratio divided by the standard deviation of ROA.	976	51.806	28.123	69.081	−0.381	404.690
DPE	Dividends paid for a given year divided by bank equity.	1212	0.0246	0.0015	0.0454	0.0000	0.2790
Potentially endogenous explanatory variable							
Gender Diversity	The percentage of female directors on the board.	1211	0.1498	0.1250	0.1203	0.0000	0.4667
Instruments							
Female Participation Rate	Female labour force participation (unit: thousands of people) divided by male labour force participation (unit: thousands of people) in the NUTS 2 region where the bank's headquarter is located.	1259	0.8525	0.8469	0.0701	0.7070	0.9948
Female Employment Rate	Employment rate for women with tertiary education in the NUTS 2 region where the bank's headquarter is located.	1205	0.7779	0.7840	0.0552	0.6530	0.8610
Other corporate governance variables							
Female CEO	1 if the bank CEO is female, 0 otherwise.	1227	0.0293	0.0000	0.1688	0.0000	1.0000
Board Size	Number of board members.	1232	13.8815	13.0000	5.4996	5.0000	34.0000
Board Independence	Proportion of independent directors on the board.	1183	0.5181	0.5333	0.2843	0.0000	1.0000
Political Connection	1 if there is at least one government representative on the board	1289	0.1001	0.0000	0.3002	0.0000	1.0000
Ownership variables							
Institutional Ownership	Fraction of total equity held by institutional investors	1290	0.0509	0.0169	0.0795	0.0000	0.4970
HHI	Sum of squared ownership shares for all recorded shareholders of the bank.	1199	0.2905	0.1474	0.3258	0.0000	1.0000
Widely Held	1 if there is no owner with >10% of bank share rights, and zero otherwise.	1184	0.2466	0.0000	0.4312	0.0000	1.0000
Other control variables							
Size	Logarithm of total assets.	1203	17.3689	17.5216	2.3850	12.1975	21.4449
LRMES	Marginal contribution of the bank to the expected shortfall of the financial system in a left-tail (crisis) scenario.	926	41.3926	42.8850	14.3106	5.6700	71.2900
Market-to-Book Ratio	Market value of equity divided by book value of equity.	1096	1.1321	0.8375	1.0371	0.0126	6.7054
ROA	Net-income to total assets.	1203	0.0069	0.0048	0.0239	−0.0651	0.1460
Capital Ratio[a]	Equity capital to total assets.	1192	0.0926	0.0672	0.0973	0.0000	0.6257
Tier 1 Ratio	Tier 1 regulatory capital divided by risk-weighted assets.	1173	0.1088	0.1050	0.0639	0.0003	0.3450
Deposits Ratio[a]	Deposits divided by total assets.	1100	0.4698	0.4760	0.1932	0.0101	0.8928
GDP growth	Gross domestic product annual growth rate.	1290	0.7731	1.4160	2.5482	−7.3005	5.9889

This table reports the summary statistics for all the variables used in our empirical analysis. We also report a short description of the variables. The sample period goes from 2005 to 2017. For each variable, we report the following statistics: the number of observations ("Obs"), mean ("Mean"), median ("Median"), standard deviation ("Std. Dev."), minimum value ("Min"), and maximum value ("Max"). Information on public bailouts was collected from the following sources: Mediobanca's website, Global Trade Alert's website, the European Commission's website, Lexis-Nexis, and the websites of national newspapers of the countries under examination. Bank-specific information was collected from Bankscope and Orbis Bank Focus with the only exception of *LRMES* (*Long run Marginal Expected Shortfall*), which was obtained from the V-stern Lab website. Information on bank ownership structure was collected from Bankscope and Orbis Bank Focus. All variables are winsorized at the 1st and 99th percentiles.

[a] The reason for such low values for the column "Min" for *Deposit Ratio* is that several banks in the sample have a *Deposits Ratio* lower than 2%. For example, Fortis/Ageas, which was bailed out in 2008, had a *Deposits Ratio* equal to 0.3279 in 2006, 0.3011 in 2007, and 0.0016 in 2008, when it received a bailout. Similarly, there are some outliers for *Capital Ratio*. For example, Lloyds Banking Group Plc had a bailout in 2008, when this ratio

was 2.2%. One bank in our sample, Laan & Spar Bank A/S, had a *Capital Ratio* of 0.000012, which rounds up to 0%. Disposing of these banks would create a sample selection bias because one of the potential determinants of the probability of a bailout is undercapitalization.

government intervention might occur in large underperforming banks. Banks whose ownership is dispersed (as proxied by *Widely Held*) tend to be more likely to receive a bailout than other banks. However, *HHI* is positively correlated with *Public Bailout*. Because *HHI* and *Widely Held* are clearly negatively correlated (−0.332, significant at the 1% level), these two variables capture different features of the degree of concentration of ownership. Finally, *GDP growth* is negatively correlated with *Public Bailout*, which confirms the importance of that country-specific characteristic.

3.3. Descriptive statistics

In this section, we report the descriptive statistics focusing on the distributions of our main explanatory variable, *Gender Diversity,* and our main dependent variable, *Public Bailout*. Table 5, Panel A reports the average and maximum number of female directors, the average and maximum value for *Gender Diversity* and the number of bailouts by country, while Table A, Panel B reports the same statistics for each year in our sample. Moreover, Figs. 1 and 2 graphically report the trend over time for the average value of *Gender Diversity* and the number of bailouts.

Panel A of Table 5 indicates that there are 12 countries in our sample – Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Spain, Sweden and the United Kingdom – where female directors account for at least 10% (on average) of the total number of board members, while Greece, Luxembourg, and Portugal have an average value of *Gender Diversity* below 10%. The country that received the largest number of bailouts is Italy, followed by Greece. This is likely to be a result of the "feedback effect" between sovereign debt risk and the risk of the banking sector during the Eurozone crisis.

Fig. 1 and Panel B of Table 5 show a remarkable increase in the percentage of female directors on banks' boards over the sample period. This is line with the initiatives of the European Commission and Member States to boost and ensure better gender equality in companies' boards in terms of female representation.[21] The total number of bailouts over the sample period is 151. The number of bailouts is particularly high for the years 2009 (45) and 2012 (27), and after 2013, there are only five bailouts (2 capital injections and 3 guarantees).

Do rescued banks differ from nonrescued banks? Table 6 provides the results of the two-sided *t*-tests for the differences in means of a set of variables that may be related to the probability of receiving a public bailout. We provide the results separately for the pre-bailouts period (2005–2007) and the bailouts period (2008–2017) and separately for capital injections, credit lines, and guarantees. In addition to the t-tests already reported, we conduct the Wilcoxon test to allow for the possibility that the normality assumption does not hold in our sample. The untabulated results (reported in Supplementary Appendix A) confirm the results reported in Table 6.

Our results suggest that nonrescued banks have, on average, a higher value for *Gender Diversity* than rescued banks in the bailouts period. For the pre-bailouts period, the difference in the means is statistically nonsignificant. Consistent with TBTF considerations, the rescued banks are significantly larger than nonrescued banks in both periods. These results are consistent with the argument that large banks are more likely to attract public support than small banks (Dam and Koetter, 2012) because of their stronger spill-over effects in the case of liquidation (Bayazitova and Shivdasani, 2012). As expected, this result is also confirmed by the differences in means for *LRMES* but only for the bailouts period (for the pre-bailouts period this is true only for capital injections).

Our results also show that the nonrescued banks have a higher *MTB Ratio* both in the pre-bailouts period and in the bailouts period than the rescued banks. Furthermore, the rescued banks tend to have a lower *Deposits Ratio* than the rescued peers in the bailouts period (but not in the pre-bailouts period), which is consistent with the view that deposits provide a stable source of funding for banks (Bruno et al., 2018); thus, banks with a low *Deposits Ratio* are more likely to suffer from a lack of liquidity during a crisis. Unsurprisingly, the nonrescued banks have, on average, better performance (proxied by *Tobin's Q* and *MTB Ratio*) and lower riskiness (proxied by *Z-score*) than the rescued banks, although for *Z-score,* the results are significant only for the crisis period. Comparing the results for the bailouts period with those for the pre-bailouts period, we notice that the crisis weakened the performance (in terms of *ROA*, *Tobin's Q* and *MTB Ratio*) of both rescued and nonrescued banks but affected the rescued banks more severely. Similar results are confirmed in Brei and Gadanecz (2012). Since dividend payout ratios may be related to risk-shifting incentives (Acharya et al., 2011), we also report the results for *t*-tests based on the dividends to equity ratio (*DPE*), as well as for its logarithmic form. On average, the nonrescued banks have higher *DPE* and *DPE* (ln) than rescued banks during the crisis. A possible explanation for this result is that the rescued banks are subject to increased monitoring intensity from public authorities, which decreases the payout ratios (Onali et al., 2016). Finally, politically connected banks, as one might expect, are more likely to receive a bailout than other banks.

4. Results

4.1. Probit regressions: results

Table 7 presents the results for the probit regressions for the likelihood that a bank receives a public bailout. To demonstrate that our results are robust, we present the results with different sets of controls, with and without country, bank, and year FE.

[21] For instance, in 2011, the European Commission introduced legislation to improve gender balance in EU-listed companies: http://ec.europa.eu/newsroom/document.cfm?doc_id=46280.

Table 4
Correlation analysis.

	Public Bailout	*Tobin's Q*	*NPL Ratio*	*DPE*	*Z-score*	*Gender Diversity*	*Female CEO*	*Board Size (ln)*
Tobin	−0.0792							
	0.0067							
NPL Ratio	−0.0175	−0.0412						
	0.6427	0.2814						
DPE	−0.0848	0.3951	−0.1241					
	0.0031	0.0000	0.0010					
Z score	−0.1781	0.0354	−0.2517	−0.0221				
	0.0000	0.2783	0.0000	0.4939				
Gender Diversity	−0.1035	0.1119	−0.1326	0.0614	0.1130			
	0.0003	0.0001	0.0004	0.0347	0.0005			
Female CEO	−0.0420	−0.0272	−0.0447	−0.0006	0.0721	0.1216		
	0.1419	0.3575	0.2373	0.9829	0.0268	0.0000		
Board Size (ln)	0.0881	−0.1872	−0.0452	−0.1270	0.0429	−0.0498	−0.0096	
	0.0020	0.0000	0.2323	0.0000	0.1872	0.0808	0.7377	
Board Independence	0.0037	−0.0808	−0.2022	0.0429	0.0420	0.2945	0.0015	−0.1456
	0.8989	0.0069	0.0000	0.1481	0.2024	0.0000	0.9592	0.0000
Political Connection	0.1016	−0.0979	−0.0478	−0.1127	0.0144	−0.0151	−0.0081	0.2723
	0.0003	0.0008	0.2045	0.0001	0.6552	0.5955	0.7778	0.0000
Institutional Ownership	−0.0260	0.0696	−0.1284	0.2367	−0.0404	0.1837	0.0801	−0.0540
	0.3512	0.0173	0.0006	0.0000	0.2111	0.0000	0.0050	0.0581
Size	0.1360	−0.3064	−0.2103	−0.1445	0.0443	0.2226	0.0212	0.5414
	0.0000	0.0000	0.0000	0.0000	0.1704	0.0000	0.4682	0.0000
LRMES	0.2465	−0.1691	0.2513	−0.1291	−0.2802	0.0649	−0.0007	0.0542
	0.0000	0.0000	0.0000	0.0001	0.0000	0.0490	0.9842	0.1002
MTB Ratio	−0.1568	0.6055	−0.0442	0.4652	0.0157	0.0311	0.0007	−0.2888
	0.0000	0.0000	0.2710	0.0000	0.6417	0.3079	0.9825	0.0000
ROA	−0.1422	0.5865	−0.2824	0.2764	0.0986	0.0770	−0.0142	−0.1810
	0.0000	0.0000	0.0000	0.0000	0.0022	0.0083	0.6282	0.0000
Capital Ratio	−0.1131	0.4230	0.0080	0.0951	−0.0096	−0.0663	−0.0339	−0.2706
	0.0001	0.0000	0.8330	0.0010	0.7652	0.0235	0.2488	0.0000
Tier 1 Ratio	−0.0200	−0.1312	−0.1100	−0.1353	0.1272	0.3219	0.0537	−0.1003
	0.4940	0.0000	0.0037	0.0000	0.0001	0.0000	0.0699	0.0007
Deposits Ratio	−0.0611	−0.1669	0.1434	−0.0801	−0.0616	−0.1117	0.0164	−0.1999
	0.0428	0.0000	0.0002	0.0079	0.0678	0.0002	0.5929	0.0000
Widely Held	0.0832	−0.0207	−0.0544	0.0171	−0.0273	−0.0224	−0.0682	0.1357
	0.0042	0.4892	0.1521	0.5641	0.4098	0.4427	0.0195	0.0000
HHI	0.0767	0.1289	0.1566	−0.0597	−0.1050	−0.2318	−0.1053	−0.0961
	0.0079	0.0000	0.0001	0.0423	0.0014	0.0000	0.0003	0.0010
GDP growth	−0.3179	0.1292	−0.2046	0.1537	0.1739	0.1721	0.0610	−0.0603
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0327	0.0345

	Board Independence	*Political Connection*	*Institutional Ownership*	*Size*	*LRMES*	*MTB Ratio*	*ROA*	*Capital Ratio*	*Tier 1 Ratio*
Political Connection	−0.0608								
	0.0365								
Institutional Ownership	0.1452	−0.0695							
	0.0000	0.0126							
Size	0.1743	0.0519	0.2683						
	0.0000	0.0722	0.0000						
LRMES	0.0908	−0.0545	0.1598	0.4531					
	0.0068	0.0973	0.0000	0.0000					
MTB Ratio	−0.0487	−0.1405	0.1507	−0.2813	−0.1209				
	0.1160	0.0000	0.0000	0.0000	0.0005				
ROA	0.0175	−0.0858	0.0796	−0.2038	−0.2124	0.3703			
	0.5580	0.0029	0.0057	0.0000	0.0000	0.0000			
Capital Ratio	−0.1588	−0.0365	−0.1085	−0.5396	−0.2194	0.1562	0.4780		
	0.0000	0.2075	0.0002	0.0000	0.0000	0.0000	0.0000		
Tier 1 Ratio	0.0424	0.0342	−0.1003	−0.0606	0.0383	−0.1250	−0.0911	−0.0689	
	0.1587	0.2421	0.0006	0.0394	0.2556	0.0000	0.0019	0.0191	
Deposits Ratio	0.0106	0.0629	−0.1452	−0.3639	−0.1455	−0.0455	−0.1595	−0.1073	0.1219
	0.7336	0.0372	0.0000	0.0000	0.0000	0.1476	0.0000	0.0004	0.0001
Widely Held	0.1494	−0.0860	0.0961	0.2140	0.1641	−0.0501	−0.0335	−0.0739	−0.0990
	0.0000	0.0031	0.0009	0.0000	0.0000	0.1058	0.2592	0.0131	0.0010
HHI	−0.1947	−0.0508	−0.2367	−0.1748	−0.1634	0.0123	0.0680	0.0353	−0.0998
	0.0000	0.0786	0.0000	0.0000	0.0000	0.6871	0.0213	0.2340	0.0008
GDP growth	0.1197	−0.0937	0.1249	0.0678	−0.1784	0.2295	0.2052	−0.0270	0.0309
	0.0000	0.0008	0.0000	0.0187	0.0000	0.0000	0.0000	0.3522	0.2908

	Deposits Ratio	*Widely Held*	*HHI*
Widely Held	−0.0236		
	0.4491		
HHI	0.0083	−0.3321	
	0.7846	0.0000	
GDP growth	−0.0307	−0.0137	−0.1495
	0.3086	0.6385	0.0000

This table reports the pairwise correlation rates of the main variables for the period from 2005 to 2017. *Public Bailout* is a dummy variable equal to one if the bank was bailed out and zero otherwise. *Tobin's Q* is the market value of equity plus the face value of debt divided by the book value of equity plus the face value of debt. *NPL Ratio* is calculated as the ratio of nonperforming loans to total loans. *DPE* is calculated as the dividends paid in a given year divided by total equity. *ROA* is net income scaled by total assets. *Z-score* is the sum of *ROA* and the equity capital to total assets ratio divided by the standard deviation of ROA. *Gender Diversity* is the percentage of female directors on the board. *Female CEO* is a dummy variable equal to one if the bank has a female CEO. *Board Size (ln)* is the log of the number of board members. *Board Independence* is the proportion of independent directors on the board. *Political Connection* is a dummy variable equal to one if there is at least one government representative on the board. *Institutional Ownership* is the percentage of total equity held by the institutional investors. *Widely Held* is a dummy equal to one if there is no owner with >10% of voting rights and zero otherwise. *HHI* stands for the Herfindahl-Hirschman Index and is calculated as the sum of the squared ownership shares for all recorded shareholders of the bank. *Size* is the log of total assets. *LRMES* is the expected loss of equity value whenever a broad index falls by 40% over the following 6 months. *MTB Ratio* is the market value of equity divided by the book value of equity. *Capital Ratio* is the ratio of total equity capital to total assets. *Tier 1 Ratio* is the ratio of Tier 1 regulatory capital divided by risk-weighted assets. *Deposits Ratio* is the ratio of total customer deposits to total assets. *GDP growth* is the annual percentage growth rate of the GDP. All variables are winsorized at the 1st and 99th percentiles. p-Values are reported in parentheses.

Table 5
Gender composition and public bailouts: summary statistics.

Panel A	Number of female directors		Gender diversity (%)		Bailouts
Country	Average	Max	Average	Max	
Austria	3	8	15.2185	33.3333	8
Belgium	2	5	12.8940	31.2500	13
Denmark	2	5	16.9020	41.6666	9
Finland	2	4	26.6071	50.0000	0
France	3	9	20.9196	53.8461	6
Germany	3	7	16.4705	35.0000	8
Greece	1	3	8.4979	25.0000	31
Ireland	2	3	13.2488	25.0000	9
Italy	1	7	11.6356	50.0000	29
Luxembourg	0	0	0.0000	0.0000	0
Netherlands	1	4	18.5919	60.0000	5
Portugal	1	3	5.3422	20.0000	5
Spain	2	6	12.2967	40.0000	15
Sweden	4	9	29.5252	52.9412	0
United Kingdom	2	8	14.9748	42.1053	13

Panel B	Number of female directors		Gender diversity (%)		Bailouts
Year	Average	Max	Average	Max	
2005	1	6	9.0000	31.5789	0
2006	1	5	8.8898	33.3333	0
2007	1	6	8.6698	37.5000	0
2008	1	7	9.8901	41.6666	26
2009	1	6	9.7962	36.3636	45
2010	2	7	11.5482	45.4545	18
2011	2	7	12.2151	41.1764	22
2012	2	8	14.6839	47.0588	27
2013	2	8	16.5704	50.0000	8
2014	2	7	20.8372	50.0000	1
2015	3	8	24.3486	50.0000	0
2016	3	9	27.0682	53.8461	3
2017	4	9	28.0139	60.0000	1

This table presents the descriptive statistics about female directors and bailouts by country (Panel A) and year (Panel B). Each panel reports the average and maximum number of female directors on the board (Number of female directors) and the average and maximum percentage of the board represented by female directors (corresponding to our variable Gender Diversity) and the number of bailouts (Bailouts).

We find that banks with a high percentage of female directors are less likely to receive a bailout than those with a low percentage; the coefficient on *Gender Diversity* is statistically significant at the 5% level or 1% level for nine out of the 11 specifications. For the remaining specifications (column (9) and column (11)), *Gender Diversity* is significant at the 10% level, and such an increase in the p-

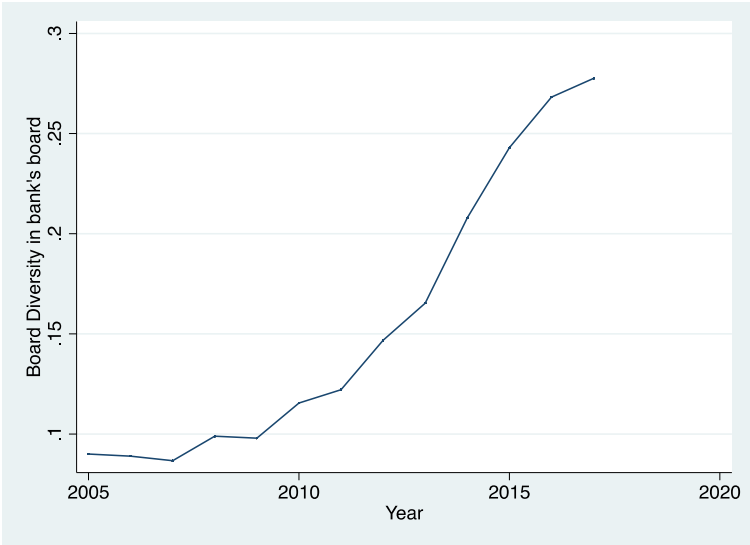

Fig. 1. Average Gender Diversity over the Sample Period (2005–2017).

values is due to the low number of observations: in column (9), using bank and year fixed effects leads to a drop in the number of observations of over 60% with respect to column (1).

Considering the results in column 5, for which we have the lowest value for the marginal effects in the regressions on the whole sample, the magnitude of the marginal effects suggests that an increase by one standard deviation in *Gender Diversity* (0.1203) decreases the probability of a bailout by approximately 2.44% (0.2025*0.1203).

The coefficient on *Size* is positive in all regressions where it is included, but it is significant at the 5% level in only three cases. This result is not unexpected because our sample is mainly composed of large EU banks, and it is also consistent with the previous literature arguing that *Size* is a rough indicator of bank systemic importance (Drehmann and Tarashev, 2013) because it is unable to capture the potential distress costs and negative externalities associated with bank default.

In line with Bayazitova and Shivdasani (2012), we find that high profitability, proxied by *ROA*, reduces the probability of a public bailout. *Capital Ratio* is also negatively related to the probability of obtaining a bailout. The coefficients for *Tier 1 Ratio* are also negative, but they tend to be insignificant. The fact that the coefficients on *Tier 1 Ratio* are insignificant in all cases but one, but *Capital Ratio* is significant in all regressions, suggests that authorities may consider *Capital Ratio* to be an informative variable when deciding

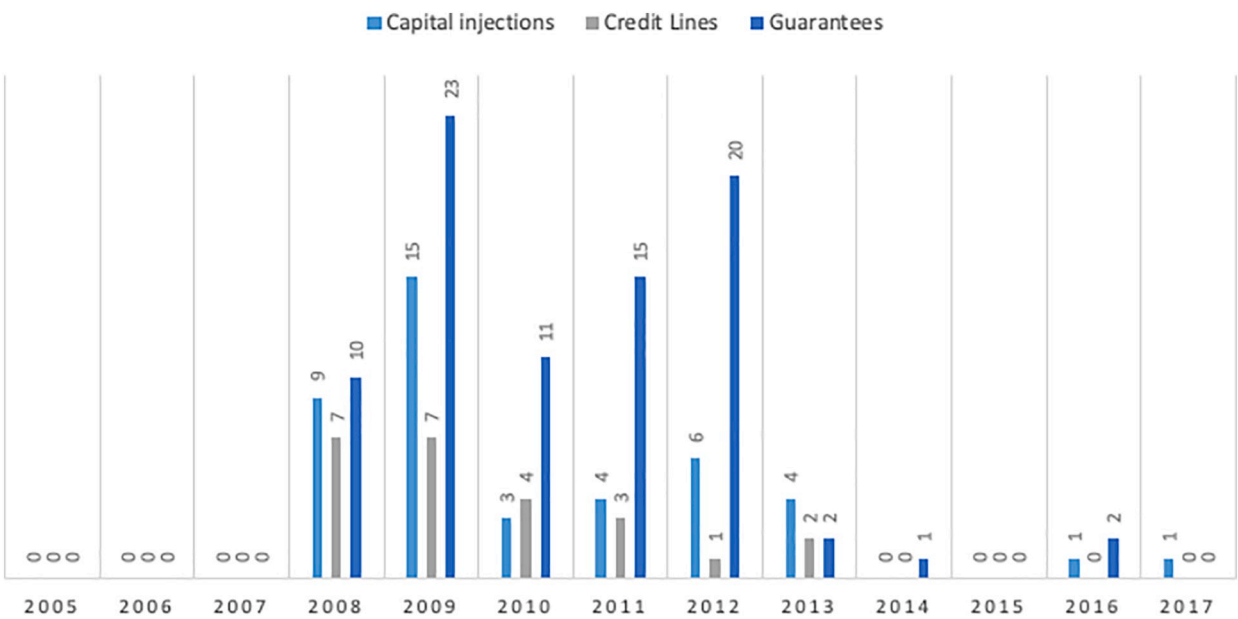

Fig. 2. Public bailouts over the sample period (2005–2017).

Table 6
T-tests for subsamples of rescued and nonrescued banks.

Panel A: Pre-bailouts period (2005–2007)

Variables	Non-rescued banks	Rescued banks	Significance	No capital injections	Capital injections	Significance	No credit lines	Credit lines	Significance	No guarantee	Guarantee	Significance
Gender Diversity	0.0950	0.0829		0.0818	0.1064	**	0.0882	0.0879		0.0968	0.0776	*
Size	16.5329	17.7377	***	16.7445	18.6864	***	16.8983	18.4991	***	17.0119	17.4533	
Deposits Ratio	0.4521	0.4369		0.4452	0.4372		0.4447	0.4375		0.4436	0.4430	
NPL Ratio	0.0075	0.0042		0.0051	0.0056		0.0062	0.0026		0.0055	0.0051	
Tobin's Q	1.1393	1.0460	***	1.0987	1.0488	***	1.0954	1.0468	***	1.1207	1.0454	***
ROA	0.0203	0.0115	***	0.0158	0.0139		0.0169	0.0089	***	0.0211	0.0085	***
MTB Ratio	2.0660	1.7012	**	1.8792	1.8397		1.8762	1.8442		2.0301	1.6539	***
LRMES	34.3539	35.1731		33.6771	37.3512	**	34.2532	36.8271		36.3266	32.8004	**
Z-score (ln)	3.2473	3.3391		3.3724	3.0646		3.2785	3.3842		3.1742	3.4501	
DPE	0.0410	0.0368		0.0384	0.0391		0.0356	0.0510	**	0.0438	0.0326	**
Female CEO	0.0252	0.0000	*	0.0146	0.0000	*	0.0136	0.0000	*	0.0201	0.0000	*
Board Size (ln)	2.4739	2.6534	***	2.5214	2.7269	***	2.5454	2.6872	***	2.5008	2.6647	***
Board Independence	0.4894	0.4319		0.4545	0.4663		0.4545	0.4663		0.5037	0.3997	***
Political Connection	0.0574	0.0255		0.0381	0.0435		0.0487	0.0000	***	0.0461	0.0315	
Institutional Ownership	0.0702	0.0669		0.0626	0.0860		0.0609	0.1001	*	0.0814	0.0527	*

Panel B: Bailouts period (2008–2017)

Variables	Non-rescued banks	Rescued banks	Significance	No capital injections	Capital injections	Significance	No credit lines	Credit lines	Significance	No guarantee	Guarantee	Significance
Gender Diversity	0.1752	0.1111	***	0.1689	0.1240	***	0.1687	0.0967	***	0.1737	0.0956	***
Size	17.2834	18.3519	***	17.3563	18.8485	***	17.3747	19.1585	***	17.3586	18.0678	***
Deposits Ratio	0.4839	0.4337	***	0.4789	0.4497		0.4793	0.4066		0.4822	0.4284	***
NPL Ratio	0.0105	0.0072		0.0098	0.0099		0.0102	0.0019	***	0.0104	0.0060	
Tobin's Q	1.0143	0.9883	**	1.0121	0.9864	***	1.0117	0.9818	***	1.0131	0.9892	
ROA	0.0055	−0.0035	***	0.0048	−0.0045	***	0.0046	−0.0029	**	0.0052	−0.0046	***
MTB Ratio	0.9819	0.6162	***	0.9518	0.6571	***	0.9463	0.6347	**	0.9697	0.5929	***
LRMES	41.9021	51.5270	***	42.6913	53.7760	***	42.9895	51.5340	***	42.4411	51.0795	***
Z-score (ln)	3.3849	2.6508	***	3.3363	2.1792	***	3.3089	2.5837	*	3.3409	2.7764	***
DPE	0.0216	0.0130	***	0.0205	0.0198		0.0206	0.0174		0.0215	0.0104	***
Female CEO	0.0386	0.0081	***	0.0352	0.0233		0.0356	0.0000	***	0.0369	0.0120	
Board Size (ln)	2.5324	2.6580	***	2.5423	2.6828	***	2.5460	2.6511	*	2.5398	2.6398	**
Board Independence	0.5370	0.5212		0.5360	0.5128		0.5383	0.4102		0.5354	0.5297	
Political Connection	0.1065	0.1935	**	0.1100	0.2791	**	0.1139	0.2500		0.1105	0.1905	*
Institutional Ownership	0.0465	0.0447		0.0464	0.0452		0.0458	0.0664		0.0465	0.0438	

This table reports the following summary statistics: the mean differences between the rescued banks (that is, those that received a bailout) and nonrescued banks (those that did not receive a bailout). Panel A reports the results for the pre-bailouts period, and Panel B presents those for the bailouts period. In both panels, the table reports the statistics for three kinds of public bailouts – *Capital Injections*, *Guarantees*, and *Credit Lines*. The t-tests do not assume equal variances for the two subsamples. All variables are winsorized at the 1st and 99th percentiles. ***p < .01, **p < .05, *p < .1.

Table 7
Gender diversity and public bailouts.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No FE	No FE	No FE	Country dummies	Country dummies	Year FE	Country FE and crises dummies	Bank and year FE	Bank and year FE
Gender Diversity	−2.7034***	−2.6003***	−2.9323**	−2.3290**	−2.1759**	−2.2096**	−2.0328**	−4.7143**	−4.3770*
	(−3.2461)	(−2.8913)	(−2.3778)	(−2.5284)	(−2.1338)	(−2.4481)	(−2.1117)	(−2.0319)	(−1.9106)
Marginal Effects[a]	−0.3152	−0.3145	−0.3770	−0.2535	−0.2025	−0.2771	−0.2165	−1.0715	−1.0682
Size$_{t-1}$	0.0623		0.0065	0.1067*		0.0718	0.1110**	1.1628**	1.0473**
	(1.5493)		(0.0819)	(1.9111)		(1.6020)	(1.9949)	(2.2546)	(2.0373)
LRMES$_{t-1}$		0.0119**	0.0071		0.0057				
		(1.9817)	(0.7127)		(0.9309)				
MTB Ratio$_{t-1}$			−0.2362						
			(−1.0312)						
ROA$_{t-1}$	−17.9873***	−15.6622**	−19.1536*	−13.6794**	−12.2678**	−18.6259***	−14.0171**	−55.2333***	−59.7371***
	(−3.2513)	(−2.4669)	(−1.8255)	(−2.3085)	(−1.9890)	(−2.7518)	(−2.2717)	(−4.6200)	(−4.6839)
Tobin's Q$_{t-1}$	−0.7358	−0.0044	0.6832	−0.5679	0.1121	0.2852	−0.1367	2.4960	2.4451
	(−0.7056)	(−0.0052)	(0.7432)	(−0.5127)	(0.1164)	(0.3020)	(−0.1237)	(1.5378)	(1.3809)
Capital Ratio$_{t-1}$	−6.9363***	−8.3663***	−11.3422**	−9.5819***	−17.1059***	−6.2176***	−9.5343***	−30.2142**	−31.9004**
	(−3.4622)	(−3.4934)	(−2.3159)	(−3.0124)	(−2.9479)	(−3.4569)	(−2.9737)	(−2.3012)	(−2.3953)
Tier 1 Ratio$_{t-1}$	−1.5231	−3.2171*	−8.4622***	−2.6196	−4.6685*	0.5199	−2.8223	6.7245	6.2127
	(−0.8904)	(−1.7551)	(−2.7094)	(−1.3368)	(−1.9419)	(0.2774)	(−1.3595)	(1.0258)	(1.0493)
Derivatives Ratio$_{t-1}$			−0.5259						
			(−0.5801)						
Liquid Assets Ratio$_{t-1}$			−0.0011						
			(−0.2514)						
Deposits Ratio$_{t-1}$			−0.3006						
			(−0.3818)						
HHI$_{t-1}$	−0.1292	−0.4255	−0.5403*	−0.1307	−0.3759*	−0.2701	−0.2623	−1.6969*	−1.5808*
	(−0.5727)	(−1.5836)	(−1.7298)	(−0.6713)	(−1.6921)	(−1.0271)	(−1.3645)	(−1.9598)	(−1.8312)
GDP growth$_{t-1}$	−0.0462*	−0.0268	0.0015	−0.0394	−0.0166	−0.0978**	−0.0148	0.0777	0.0810
	(−1.8412)	(−0.9151)	(0.0368)	(−1.3555)	(−0.5152)	(−1.9972)	(−0.4556)	(0.8511)	(0.7649)
Female CEO$_{t-1}$	−0.4913	−0.4080		−0.3113	−0.0707	−0.5613	−0.3703		0.3383
	(−1.3226)	(−1.2122)		(−0.8982)	(−0.2226)	(−1.2075)	(−1.0323)		(0.8205)
Board size (ln)$_{t-1}$	−0.0736	0.1860		−0.2527	0.2707	0.0290	−0.3180		0.4306
	(−0.3443)	(0.8272)		(−0.9555)	(0.9015)	(0.1242)	(−1.1890)		(0.4274)
Board Independence$_{t-1}$	0.0595	0.1069		0.1750	0.5507*	0.1019	0.1628		0.5974
	(0.2383)	(0.3379)		(0.7316)	(1.7075)	(0.3535)	(0.6780)		(0.5873)
Political Connection$_{t-1}$	0.1866	0.2327		−0.0222	−0.1301	0.1749	−0.0408		−0.4239
	(0.7592)	(0.8613)		(−0.0643)	(−0.3487)	(0.6249)	(−0.1184)		(−0.5820)
Institutional Ownership$_{t-1}$	−0.3605	−2.9626*		0.9154	−2.0360	0.5805	1.1238		3.9072
	(−0.3662)	(−1.9171)		(0.9189)	(−1.3583)	(0.5579)	(1.1465)		(1.2142)
Intercept	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	956	754	480	864	666	755	864	368	357
US-Mortgage Crisis	No	No	No	No	No	No	Yes	No	No
EU-Sovereign Crisis	No	No	No	No	No	No	Yes	No	No
Time FEs	No	No	No	No	No	Yes	864	Yes	Yes
Country FEs	No	No	No	Yes	Yes	Yes	Yes	No	No
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Bank FEs	No	No	No	No	No	No	No	Yes	Yes
Number of banks	105	77	65	95	68	105	95	55	52

This table shows the results of the probit regressions. The dependent variable is an indicator variable equal to one if a bank receives a bailout during the sample period (2005–2017) and zero otherwise. *Gender Diversity* is the percentage of female directors on the board. *Size* is the log of total assets. *LRMES* is the expected loss of the equity value when a broad index falls by 40% over the following 6 months. *MTB Ratio* is the market value of equity divided by the book value of equity. *ROA* is net income scaled by total assets. *Tobin's Q* is the market value of equity plus the face value of debt divided by the book value of equity plus the face value of debt. *Capital Ratio* is the ratio of total equity capital to total assets. *Tier 1 Ratio* is the ratio of Tier 1 regulatory capital divided by risk-weighted assets. *Deposits Ratio* is the ratio of total customer deposits to total assets. *Liquid Assets Ratio* is calculated as cash plus marketable securities to total assets. *Derivatives to Assets Ratio* is the amount of total derivatives scaled by total assets. *HHI* stands for Herfindahl–Hirschman Index and is calculated as the sum of squared ownership shares for all recorded shareholders of the bank. *GDP growth* is annual percentage growth rate of GDP. *Female CEO* is a dummy variable equal to one if the bank has a female CEO. *Board Size (*ln*)* is the log of the number of board members. *Board Independence* is the proportion of independent directors on the board. *Political Connection* is a dummy variable equal to one if there is at least one government representative on the board. *Institutional Ownership* is the fraction of total equity held by institutional investors. *US-Mortgage Crisis dummy* is a dummy equal to one for the years 2007 and 2008. *EU-Sovereign Debt Crisis* a dummy equal to one for the years from 2010 to 2012. Constants are included but not reported. All variables are winsorized at the 1st and 99th percentiles with the only exception of *Size*. Robust z-statistics appear in parentheses. ***p < .01, **p < .05, *p < .1.

[a] Data on the marginal effects are not available because of the number of observations.

which bank should be bailed out. The other control variables, including *Institutional Ownership*, *Political Connection* and corporate governance variables (such as *Board Independence*), are insignificant in all regressions, apart from *Board Size (*ln*)*, which is significant at the 1% level in column (11).

The results for the control variables are, therefore, consistent with our expectations: better-capitalized and profitable banks are less likely to obtain a public bailout than other banks. However, gender diversity on the board also plays a key role.

4.2. Robustness checks

Table 8 reports the results of the robustness checks. We start by running regressions for two different subsamples, a subsample for which *Political Connection* is equal to zero (column 1) and a subsample for which it is equal to one (column 2), to understand whether our main results are driven by politically connected banks. Discarding banks for which *Political Connection* is equal to zero results in a reduction in the number of observations of over 90%. In columns (3) and (4), we consider the impact of *Gender Diversity* on the probability of a bailout for $t + 1$ and $t + 2$, respectively. The coefficient on *Gender Diversity* in column (3) is still negative and significant, but for column (4) it becomes insignificant. Because we are lagging all explanatory variables, including *Gender Diversity*, these results suggest that the impact of *Gender Diversity* on *Public Bailout* lasts for approximately 2 years and then disappears.

In specifications (5)–(7), we report the results of the PSM regressions. The results for *Gender Diversity* are unaltered and suggest that the impact of *Gender Diversity* is still negative and significant, regardless of whether we include country fixed effects or bank fixed effects.

Fig. 3 reports the kernel density estimates of the estimated propensity score for the treatment (banks with high *Gender Diversity*) and control sample (banks with low *Gender Diversity*) before and after the matching. The graphs clearly suggest that matching improves the degree of similarity between the two subsamples, and a strong overlap exists between the treated group and the control group with respect to the covariates that we use for the matching strategies. In the untabulated results (see Supplementary Appendix C), we show the results of diagnostics tests for propensity score matching. Before matching, the score for the treatment group is 1.1412, which is larger than that of the control group (0.9814). After matching, the scores for the treated and control groups are 1.1412 and 1.1403, respectively. The *t*-test for the equality of the means is significant before matching but insignificant after matching, and the bias drops from 44.5% to 0.3%. The results suggest that the control group does not differ from the "treated" group.[22]

The untabulated results of the IV-probit regressions (Supplementary Appendix D) confirm our main inferences. The coefficients on *Gender Diversity* are again negative and significant at the 5% level, except for one specification for which the coefficient is significant at the 10% level. At the bottom of the table, we report the results for the diagnostic tests. The p-value of the Wald Test under the null hypothesis of no endogeneity of *Gender Diversity* is lower than 5%, suggesting that the null hypothesis of no endogeneity of *Gender Diversity* can be rejected. Thus, the coefficient estimates for these four specifications are inconsistent with those of the probit regressions without IVs. The instruments employed are strong, as shown by the Cragg-Donald and Kleibergen-Paap test statistics. For specification (10), for which we include both IVs in the first-stage regression, we also report the Hansen test of over-identifying restrictions, which suggests that the instruments are valid.

To increase the robustness of our results, we provide further evidence of the impact of political connections and institutional ownership on the relationship between *Gender Diversity* and *Public Bailout*.

First, we construct three additional proxies for political connections: i) *Representatives* is a dummy variable equal to one if there is more than one government representative on the board; ii) *Government members* is the proportion of directors that are government representatives; and iii) *Government stake* is the percentage of total equity held by the government (excluding stakes classified as a bailout). In these regressions, we include all the controls used thus far. For the sake of brevity, these results are untabulated, but we report them in the Supplementary Appendix E (columns (1)–(4)).

Second, we perform additional regressions to allow for the effect of different types of institutional investors. The untabulated results (reported in Columns 5–9 of the Supplementary Appendix E) confirm that the relation between *Gender Diversity* and *Public Bailout* is not affected by the presence of institutional investors. We also find that the presence of hedge funds in the ownership structure of a bank is negatively related to the probability of receiving a public bailout.

Third, we run robustness checks related to our sample period. Thus far, we report regressions for the full sample period (2005–2017). However, after 2013, we had only five bailouts in our sample. To rule out the possibility that our results are driven by these five bailouts, we run our main regressions again, considering only the subperiod 2005–2013. Even during this shorter sample period, the probability of a public bailout in our sample varies over time. For example, in 2009, the probability is 31%; then, it drops to 24% in 2012, and in 2016, it is 2%. This occurs because rescue programs are a temporary tool used for the management of generalized distress in the whole financial sector (Stolz and Wedow, 2010; Bayazitova and Shivdasani, 2012). The untabulated results for the subperiod 2005–2013 (see Supplementary Appendix F) are similar to those obtained for the full sample period.

Finally, contrary to our expectations, the coefficient on *LRMES* tends to be insignificant. To investigate the potential cause of this result, we consider a different measure of systemic risk, *MES* (Vallascas et al., 2017), rather than *LRMES*. We again consider the subperiod up to 2013 because of data availability from V-lab's website for *MES* (for later years, only *LRMES* is reported). For comparability, we use the subperiod up to 2013 even for the regressions with *LRMES*. These findings are untabulated but reported in the Supplementary Appendix G (*LRMES*) and H (*MES*). For *LRMES*, although the coefficient enters all regressions with a positive sign, it

[22] The receiver operating characteristic (ROC) curve, a measure of the goodness-of-fit of the PSM estimation, is approximately 0.748.

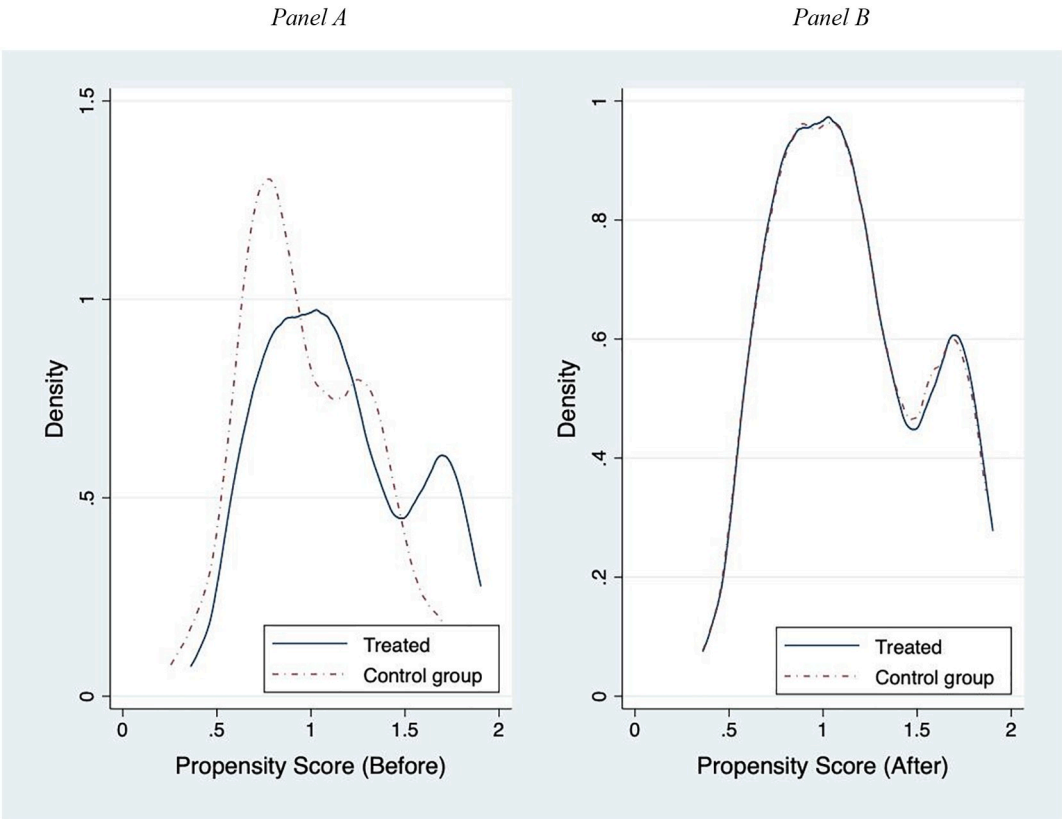

Fig. 3. Balancing Test for the PSM.
This figure reports the performance of the balancing test between high-gender diversity banks (treated group) and low-gender diversity (control group) banks for the sample before matching (*Panel A*) and after matching (*Panel B*).

is significant at the 5% level in four cases out of ten. The coefficient on *MES*, on the other hand, is positive and significant in nine out of ten specifications. These results suggest that *MES* is a better proxy for systemic risk than *LRMES* when predicting public bailouts. In all regressions provided in the Supplementary Appendix G and H, the coefficient on *Gender Diversity* remains negative and statistically significant.

Table 8
Robustness checks for the regressions on *Public Bailouts*.

Dependent variable: Bailouts	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	With political connections	Without political connections	Public Bailout$_{(t+1)}$	Public Bailout$_{(t+2)}$	PSM without country FE	PSM with country FE	PSM with bank FE
Gender Diversity$_{t-1}$	−1.9945**	−7.2796*	−1.8012**	−1.0580	−2.7147***	−2.2354**	−4.5479***
	(−2.0899)	(−1.8380)	(−2.0989)	(−1.1703)	(−2.9365)	(−2.3006)	(−2.5853)
Marginal effect	a	a	−0.2099	a	−0.3426	−0.2631	−1.0010
Intercept	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	785	62	794	713	833	766	443
Banks	92	11	92	91	100	92	49
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	No	Yes	No
Year FE	No	No	No	No	No	No	No
Bank FE	No	No	No	No	No	No	Yes

This table shows the results of the probit regressions and probit regressions with PSM. The dependent variable is an indicator variable equal to one if a bank receives a bailout during the sample period (2005–2017) and zero otherwise. *Gender Diversity* is the percentage of female directors on the board. The controls include *Size*, *Capital Ratio*, *Tobin's Q*, *Tier 1 Ratio*, *ROA*, *HHI*, *GDP growth*, *Female CEO*, *Board Independence*, *Board Size (ln)*, *Institutional Ownership* and *Political Connection* (except for columns (1) and (2)). Constants are included but not reported. All variables are winsorized at the 1st and 99th percentiles. ***p < .01, **p < .05, *p < .1. a: The matrix has missing values; thus, the marginal effects cannot be reported.

4.3. Duration models

In this section, we test our main hypotheses by using survival data analysis. The results in Table 9 complement the results in Tables 7 and 8. The coefficient on the *hazard ratio* for *Gender Diversity* is less than one and statistically significant in all specifications, suggesting that banks with a high value for *Gender Diversity* in the pre-bailouts period are less likely to receive a bailout during the financial crisis than the other banks.[23] In column (2), we control for the presence of a female CEO in the bank, while in column (3), we control for other board characteristics. The results for these tests remain unaltered.

In columns (4) and (5), we employ a duration model estimating the probability of receiving a bailout as a function of the number of calendar days from the beginning of the crisis to the end of the sample period.[24] In column (5), we implement a parametric survival model for which the baseline hazard function has the *Weibull* form because the proportional-hazards assumption[25] does not hold when we consider the probability of receiving a bailout as a function of the number of calendar days. The results are qualitatively and quantitatively similar across specifications.

In Fig. 4, we provide graphs of the estimated survival functions. In particular, we show graphs separately for countries that experienced sovereign debt problems during the Eurozone crisis (Greece, Ireland, Italy, Portugal and Spain) and for the whole sample. The graphs show that for Greek banks, the estimated survival function starts from a lower value (approximately 0.2) and decades more rapidly than for the whole sample. This finding suggests that Greek banks in our sample are likely to receive a bailout earlier than other European banks.

4.4. Amount of public bailouts: Tobit models

Table 10, Panel A shows the results of the IV-Tobit regressions (columns (1)–(6)) and panel Tobit regressions with bank FE (columns (7)–(9)). The coefficients on *Gender Diversity* are negative and significant at the 5% level (or better) in six out of nine cases, indicating that banks with a large percentage of female directors tend to receive a smaller amount of capital injections, credit lines and guarantees as a percentage of total assets than banks with a small percentage of female directors. The economic magnitude of the results is also substantial. For example, an increase by one standard deviation in the proportion of women on the board decreases *Capital Injections* by 0.428 percentage points (0.0356*0.1203), *Credit Lines* by 0.022 percentage points (0.0018*0.1203), and *Guarantees* by 0.457 percentage points (0.038*0.1203). These values are equal to 12.86%, 1.16%, and 7.02% of the respective means for cases where a bailout occurs.

However, for the regressions with bank FE, the coefficient on *Gender Diversity* is insignificant for *Capital Injections* and *Guarantees*, but it is significant at the 5% level for *Credit Lines*.

In Table 10, Panel B, we consider panel Tobit regressions in conjunction with the PSM (columns (10)–(12)), Poisson models with bank FE (columns (13)–(15)), and population-averaged Poisson models (columns (16)–(18)). The results confirm the negative relationship between *Gender Diversity* and the size of the public bailouts for *Credit Lines* and *Guarantees*[26] but not for *Capital Injections*.

5. The mechanism: bank profitability, risk and dividend payout ratios

In this section, we aim to identify the channels through which gender diversity on banks' boards influences the probability of a public bailout during a financial crisis. We identify three potential channels: bank profitability, bank soundness, and bank dividend policy. As before, we rely on an IV setup as well as PSM for our inferences.

5.1. Dependent variables

To test the profitability channel, we use two measures that have been widely employed in the finance literature: *Tobin's Q* and *ROA*. To investigate the risk channel, following Dam and Koetter (2012), we consider a proxy for credit risk, the nonperforming loans ratio, calculated as the ratio of nonperforming loans to total loans (*NPL Ratio*). Second, consistent with the recent literature on risk-shifting, we employ *Z-score*, which is an accounting-based and backward-looking proxy for bank soundness, and it is calculated as the ratio of the *ROA* plus the ratio of equity to total assets divided by the standard deviation of the *ROA*. To test the dividend-policy channel, we employ the dividends to equity ratio, *DPE*, in the main specifications as the dependent variable. Since *Z-score* and the *DPE* are skewed to the right (Onali, 2014; and Onali et al., 2016), we report the results even using the log transformation for *Z-score* (*Z-score (*ln*)*) and the *DPE* (*DPE (ln)*).

5.2. Model specifications

To explore the mechanism behind the relation between gender diversity on banks' boards and the probability of receiving a bailout, we run three sets of regressions based on the following equation:

[23] For the sake of brevity, we do not tabulate the results for the bank-specific control variables, and these results are available upon request.
[24] For the scope of this analysis, we define the starting day of the crisis as 1 January 2007, following Erkens et al. (2012) and Ryan (2008).
[25] We check the proportional-hazards assumption using Schoenfeld's (1982) residuals test.
[26] All three coefficients for *Credit Lines* are significant, and two out of three coefficients for *Guarantees* are significant.

Table 9
Timing of public bailouts and gender diversity.

Proportional hazard models					
	Public Bailout	*Public Bailout*	*Public Bailout*	*Public Bailout*	*Public Bailout*
	(1)	(2)	(3)	(4)	(5)
Gender Diversity$_{precrisis}$	**0.9390*****	**0.9390*****	**0.9469****	**0.9030*****	**0.9783****
	(−3.0618)	(−3.0618)	(−2.5038)	(−2.8376)	(−2.3922)
Bank-specific controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Female CEO	No	Yes	No	No	No
Board size (ln)	No	No	Yes	No	No
Board Independence	No	No	Yes	No	No
Proportional Hazard Model	Semi-Parametric	Semi-parametric	Semi-Parametric	Semi-Parametric	Parametric
Intercept	No	No	No	No	Yes
PH-test (Chi-Squared)	7.47	7.47	7.63	32. 51***	(N/A)
Rescued banks	43	43	43	46	46
Banks	105	105	105	105	105
Duration	Years	Years	Years	Days	Days
Log-Likelihood	−117.71	−117.71	−116.95	−106.90	−47.68

The table shows the results of Cox (1972) and Weibull regressions (column 5), where the dependent variable is the probability that a bank has received a bailout since the start of the financial crisis (2007). The sample period ends in 2017. The predictors are expressed as averages and calculated across the pre-bailouts period. The variable of our interest is *Gender Diversity*. The controls are *Size*, *Capital Ratio*, *Tier 1 Ratio*, *Deposits Ratio, Female CEO, Board Independence*, and *Board Size*. *Female CEO* is an indicator variable that takes the value of one if the CEO is a woman and zero otherwise. *Board Independence* is the proportion of independent directors on the board. *Board Size (ln)* is the natural logarithm of the number of board members. In columns (4) and (5), we estimate the Cox hazard model (1972), where the duration is measured in number of days. All regressions include the country fixed effects (*Country FE*). We report the *Hazard Ratio* for ease of interpretation. PH test stands for the Schoenfeld residuals test (Schoenfeld, 1982). Robust z-statistics appear in parentheses. ***p < .01, **p < .05, *p < .1.

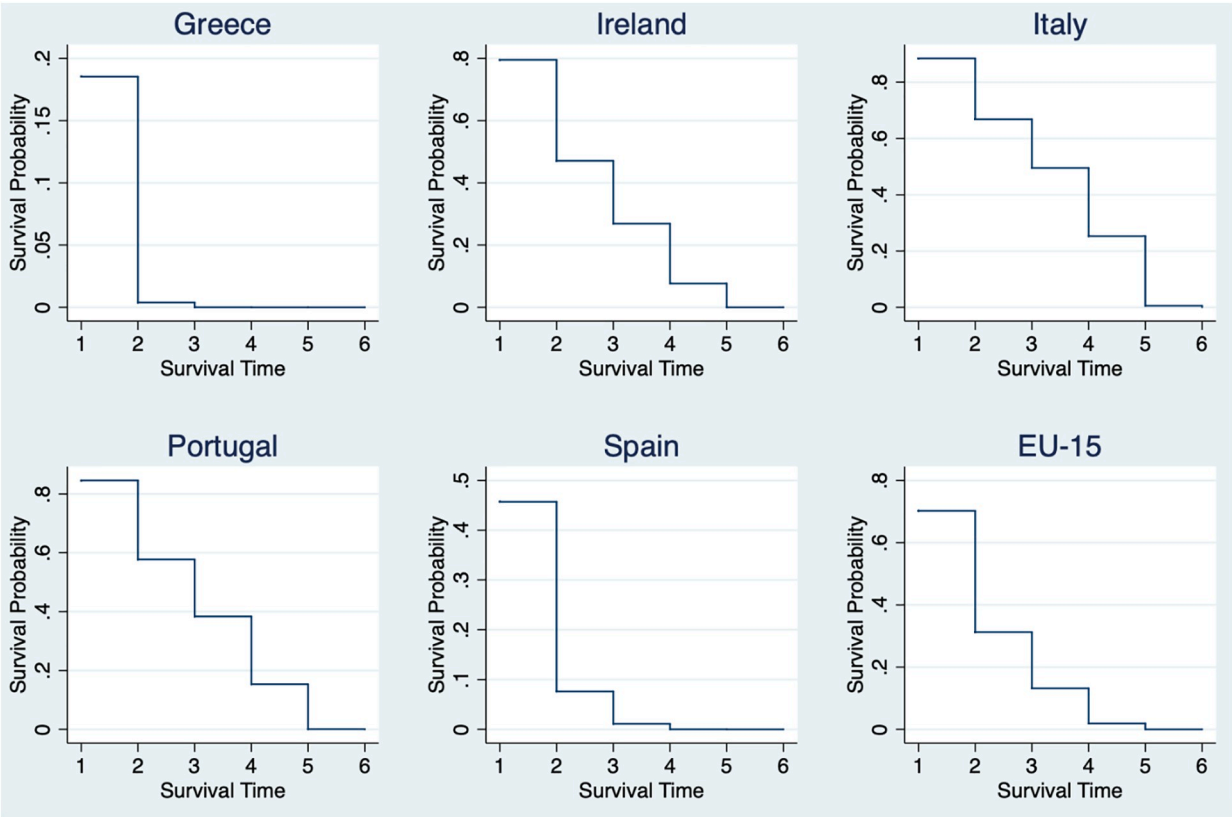

Fig. 4. Proportional Cox hazard models: estimated survival functions.

Table 10
Censored regression models: amount of public bailouts and gender diversity.

Panel A: IV-tobit, Panel tobit

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Capital Injections	*Credit Lines*	*Guarantees*	*Capital Injections*	*Credit Lines*	*Guarantees*	*Capital Injections*	*Credit Lines*	*Guarantees*
Gender Diversity	−0.5905***	−0.2179**	−0.9522***	−0.5445***	−0.2075**	−0.9594***	−0.0075	−0.1473**	−0.2945
	(−3.1967)	(−2.2245)	(−3.4723)	(−3.1088)	(−2.0076)	(−3.4795)	(−0.2301)	(−2.4316)	(−1.3635)
Marginal effects	*−0.0356*	*−0.0018*	*−0.0380*	*−0.0430*	*−0.0013*	*−0.0490*	*N/A*	*N/A*	*N/A*
Observations	916	916	916	741	741	741	810	810	810
Intercept	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Set of Controls	1	1	1	2	2	2	2	2	2
US-Mortgage Crisis	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EU-Sovereign Debt Crisis	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	No	No	No	No	No	No	Yes	Yes	Yes
Banks	103	103	103	77	77	77	78	78	78
Lagged variables	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Model	IV TOBIT	IV TOBIT	IV-TOBIT	IV TOBIT	IV TOBIT	IV-TOBIT	Panel tobit	Panel tobit	Panel tobit

Panel B: Panel tobit with PSM, fixed-effects Poisson, and population averaged Poisson models

Variables	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	Capital Injections	*Credit Lines*	*Guarantees*	*Capital Injections*	*Credit lines*	*Guarantees*	*Capital Injections*	*Credit Lines*	*Guarantee*
Gender Diversity	−0.0377	−0.1191**	−0.2122*	3.3416	−15.3958**	−5.7187*	−0.2763	−7.0747***	−6.1228***
	(−0.8525)	(−2.2756)	(−1.7150)	(1.2218)	(−2.2198)	(−1.8886)	(−0.0849)	(−2.6328)	(−3.1511)
Marginal effects	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Observations	652	652	652	256	162	440	936	936	936
Intercept	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Set of Controls	2	2	2	1	1	1	1	1	1
US-Mortgage Crisis	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EU-Sovereign Debt Crisis	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Banks	73	73	73	29	17	47	104	104	104
Lagged variables	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Model	Panel tobit & PSM	Panel tobit & PSM	Panel tobit & PSM	Fixed-effects Poisson Model	Fixed-effects Poisson Model	Fixed-effects Poisson Model	PA Poisson models	PA Poisson models	PA Poisson models

This table shows the results of the IV-Tobit models, panel Tobit with bank fixed effects (Honorè, 1992), fixed-effects Poisson models, and population-averaged Poisson models. The dependent variables are *Capital Injections*, *Credit Lines*, and *Guarantees*. *Capital Injections* is the amount of equity capital injections received by a bank scaled by total assets. *Credit Lines* is the amount of the credit lines received by a bank scaled by total assets. *Guarantees* represents the amount of the guarantees received by a bank scaled by total assets. *Gender Diversity is* the percentage of female directors on the board. *Set of Controls 1* includes *Size*, *Capital ratio*, *Tobin's Q*, *Tier 1 Ratio*, *ROA*, *HHI*, *GDP growth, Female CEO, Board Size (ln), Board Independence, Political Connection,* and *Institutional Ownership. Set of Controls 2* includes *LRMES*, *Capital ratio*, *Tobin*, *Tier 1 Ratio*, *ROA*, *HHI*, *GDP growth*, *Female CEO, Board Size (*ln*), Board Independence, Political Connection,* and *Institutional Ownership*. All regressions include *US-Mortgage Crisis dummy* (which is a dummy that takes the value of one if the observation refers to the years 2007 and 2008) and *EU-Sovereign Debt Crisis* (which is a dummy that takes the value of one if the observation refers to the years of 2010 and 2012). For the Panel Tobit regressions, the variables are not lagged because this would be inconsistent with the assumptions of the model. *N/A* stands for not available because the marginal effects cannot be estimated for panel Tobit and panel Poisson models. Constants are included but not reported. All variables are winsorized at the 1st and 99th percentiles. The standard errors are clustered at the bank level. Robust z-statistics appear in parentheses. ***p < .01, **p < .05, *p < .1.

$$Y_{i,t} = f\left(Gender\ Diversity_{i,t-1}, Controls_{i,t-1}\right) \tag{5}$$

where $Y_{i,t}$ is the variable of interest of our hypotheses (profitability, risk and dividends), and *Controls* is a vector of bank-level and macroeconomic control variables. We cluster the standard errors at the bank level, and we run the regressions with different sets of controls: *Size*, *Widely Held*, *Capital Ratio*, *Deposits Ratio*, *HHI*, *GDP growth*, *Female CEO*, *Board Independence*, *Board Size* (ln), *Political Connection*, and *Institutional Ownership*.

In addition to using OLS regressions, we employ PSM and IV models to allow for potential endogeneity for three reasons. The PSM regressions are based on the same variables as those used for the probit regressions (see Table 8). Then, we run OLS regressions after matching, considering the same sets of controls employed for the OLS regressions. For the IV regressions, we employ *Female Participation Rate* as an instrument. More precisely, we run three sets of regressions based on:

$$\text{Second stage}: Y_{i,t} = f\left(Gender\ Diversity_{i,t-1}, Controls_{i,t-1.}\right)$$

$$\text{First stage}: Gender\ Diversity_{i,t-1} = f\left(IV_{i,t-1}, Controls_{i,t-1}\right) \tag{6}$$

To understand whether the impact of *Gender Diversity* on the dependent variables occurs after several years, we run the OLS, PSM, and IV regressions on $Y_{i,t+1}$ and $Y_{i,t+2}$.

5.3. Mechanism regressions: results

We report the results of the OLS regressions without PSM in Table 11. Panel A reports the results for *Tobin's Q*, *ROA* and *NPL Ratio*; Panel B reports the results for *Z-score, DPE* and *Z-score* (ln); and Panel C reports the results for *DPE (ln)* only. The results suggest that *Gender Diversity* increases *Tobin's Q*, and the coefficient on *Gender Diversity* is larger for $t+1$ and $t+2$ than for t. The coefficients on *Gender Diversity* in the regressions for *ROA*, however, are insignificant, and therefore, the evidence regarding the impact of female directors on profitability is not very robust. The results also show that *Gender Diversity* does not have a significant impact on risk (proxied by *NPL Ratio*, *Z-score* or *Z-score* (ln)). There is, however, some evidence that *Gender Diversity* has a positive impact on dividend payout ratios; this is consistent with the previous literature (Chen et al., 2017; Ye et al., 2019). Among the control variables, it seems that *Political Connection* increases *Z-score*, while *GDP growth* increases *ROA* and *DPE*. Moreover, *Institutional Ownership* has a positive impact on *DPE* (ln), while *Female CEO* has a negative impact on *DPE (ln)*.

Table 12 reports the results of the OLS regressions in conjunction with PSM. The results reported in Panel A for *Tobin's Q*, *ROA* and *NPL Ratio* mirror those reported in Table 11, Panel A: *Gender Diversity* has a positive impact on *Tobin's Q* but not on *ROA* or *NPL Ratio*. Panel B of Table 12 reports the results for *Z-score*, *DPE* and *Z-score (ln)*. These results are consistent with those reported in Panel B of Table 11: the results for *DPE* suggest that *Gender Diversity* increases payout ratios, while the results for *Z-score* and *Z-score (ln)* indicate that *Gender Diversity* does not affect risk. Similar to what is reported in Table 11, the impact of *Gender Diversity* on *DPE* is stronger for $t+1$ and $t+2$ than for t. Consistent with the results reported in Table 11, *Political Connection* increases *Z-score,* and *GDP growth* increases profitability and payout ratios. In the untabulated results (Supplementary Appendix I), the IV regressions provide similar results.

These findings are in line with management theories arguing that a more diverse board might improve profitability (Adams and Ferreira, 2009). These theories support the hypothesis that female directors can help a firm by attracting valuable resources and improving profitability (Hillman et al., 2002), and they also corroborate the findings reported by Berger et al. (2014).[27] Our results for *DPE* corroborate the hypothesis that *Gender Diversity* decreases agency costs because female directors are better monitors than their male counterparts (Chen et al., 2017). The results for the *NPL Ratio* and *Z-score* suggest that *Gender Diversity* does not affect bank risk and that there is no evidence of a risk channel.

We also investigate the channel through which *Gender Diversity* increases the payout ratios and decreases the probability of a bailout. Similar to Bhagat and Bolton (2008, 2013) and Onali et al. (2016), we employ a 3-stage least squares (3SLS) framework to examine the interlinkages across the following variables: *Public Bailout*, *ROA*, *DPE* (ln), and *Gender Diversity* (instrumented by *Female Participation Rate*). In the untabulated results (Supplementary Appendix J), we show that *Gender Diversity* increases *ROA*, which in turn leads to a higher payout ratio. A high payout ratio reduces the probability of a bailout, which is consistent with the agency cost hypothesis. Ceteris paribus, large dividends reduce the amount of free cash flow available to bank managers; this free cash flow can be used for investments in projects with a negative net present value (Jensen, 1986), such as loans that are unlikely to be repaid. Such a monitoring effect of dividends can reduce the agency costs of bank executives and bank shareholders. Our results thus suggest that gender diversity can reduce agency costs because female directors tend to pay higher dividends than their male counterparts. This can in turn decrease the probability of a bailout.

6. Conclusions and recommendations

This paper is the first attempt to estimate the impact of gender diversity on banks' boards on the probability that banks need a public bailout. While recent academic papers investigate the role of gender diversity on banks' boards (Aebi et al., 2012; Pathan and

[27] Berger et al. (2014) suggest that although female directors represent a minority on banks' boards (European Commission, 2012a, 2012b), they are not marginalized on male-dominated boards.

Table 11
The mechanism: OLS regressions.

Panel A: Tobin's Q, ROA, and NPL Ratio	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Tobin's Q_t	*Tobin's Q_t*	*Tobin's Q_{t+1}*	*Tobin's Q_{t+2}*	*ROA_t*	*ROA_t*	*ROA_{t+1}*	*ROA_{t+2}*	*NPL Ratio$_t$*	*NPL Ratio$_t$*	*NPL Ratio$_{t+1}$*	*NPL Ratio$_{t+2}$*
Gender Diversity$_{t-1}$	0.3119***	0.3293**	0.3276***	0.3705***	0.0074	0.0088	0.0012	0.0048	−0.0024	−0.0028	0.0089	0.0139
	(2.7055)	(2.5998)	(2.9263)	(3.1294)	(1.2491)	(1.4989)	(0.1974)	(0.5835)	(−0.1129)	(−0.1551)	(0.3838)	(0.5031)
Size$_{t-1}$	−0.0138*	−0.0164*	−0.0114	−0.0116					−0.0022	−0.0026	−0.0023	−0.0024
	(−1.9307)	(−1.9336)	(−1.5571)	(−1.4930)					(−0.8603)	(−1.0698)	(−0.8516)	(−0.8008)
LRMES$_{t-1}$					−0.0000	−0.0000	0.0000	0.0001				
					(−0.1949)	(−0.2823)	(0.1643)	(0.8084)				
Widely Held$_{t-1}$	0.0287	0.0340	0.0286	0.0248	0.0036*	0.0040*	0.0032	0.0032	0.0010	0.0031	0.0055	0.0055
	(1.0346)	(1.1020)	(0.9902)	(0.8279)	(1.7812)	(1.7034)	(1.4512)	(1.3305)	(0.1070)	(0.3046)	(0.5881)	(0.5367)
Capital Ratio$_{t-1}$	0.8178	0.7819	0.8101	0.7674	0.1910***	0.1878***	0.1832***	0.1781***	−0.0411	−0.0413	−0.0428	−0.0484
	(1.5766)	(1.5404)	(1.5228)	(1.4312)	(6.3764)	(6.0533)	(5.2873)	(5.1607)	(−0.6618)	(−0.7205)	(−0.6526)	(−0.6695)
Deposits Ratio$_{t-1}$	−0.0486	−0.0462	−0.0383	−0.0418	−0.0068	−0.0069	−0.0084	−0.0089	−0.0145	−0.0166	−0.0149	−0.0066
	(−0.8254)	(−0.8248)	(−0.6388)	(−0.6247)	(−1.0097)	(−1.1502)	(−1.1166)	(−1.1358)	(−0.7491)	(−0.8392)	(−0.7920)	(−0.3529)
HHI$_{t-1}$	0.1125*	0.1136*	0.1179*	0.1104	0.0108**	0.0107**	0.0096*	0.0124**	0.0034	−0.0002	0.0104	0.0078
	(1.6762)	(1.6684)	(1.7285)	(1.6119)	(2.2080)	(2.1057)	(1.8870)	(2.4087)	(0.4185)	(−0.0261)	(1.1718)	(0.8875)
GDP growth$_{t-1}$	−0.0032	−0.0037	−0.0049	−0.0017	0.0019***	0.0019***	0.0008	−0.0004	−0.0016	−0.0019	0.0006	0.0027
	(−0.9949)	(−1.1522)	(−1.6318)	(−0.6661)	(3.3411)	(3.2507)	(0.9945)	(−0.6063)	(−0.8671)	(−1.0607)	(0.5389)	(1.4999)
Female CEO$_{t-1}$		−0.0243				−0.0015				−0.0059		
		(−0.7959)				(−0.5791)				(−1.3221)		
Board Independence$_{t-1}$		−0.0392				−0.0032				−0.0116		
		(−0.8751)				(−0.7966)				(−0.8243)		
Board Size (ln)$_{t-1}$		0.0261				0.0004				0.0052		
		(0.8180)				(0.1293)				(0.5070)		
Political Connection$_{t-1}$		−0.0247*				−0.0001				−0.0228		
		(−1.7273)				(−0.0545)				(−1.4659)		
Institutional Ownership$_{t-1}$		0.0827				0.0036				−0.0333		
		(0.9942)				(0.3350)				(−1.3560)		
Observations	896	871	809	724	721	702	659	595	568	556	504	436
R-squared	0.479	0.469	0.464	0.447	0.721	0.705	0.677	0.675	0.171	0.205	0.152	0.157
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of banks	101	101	99	98	74	74	74	74	86	86	84	82

Panel B: *Z*-score, DPE, Z-score (ln)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	Z-score$_t$	*Z-score$_t$*	*Z-score$_{t+1}$*	*Z-score$_{t+2}$*	*DPE$_t$*	*DPE$_t$*	*DPE$_{t+1}$*	*DPE$_{t+2}$*	*Z-score (ln)$_t$*	*Z-score (ln)$_t$*	*Z-score (ln)$_{t+1}$*	*Z-score (ln)$_{t+2}$*
Gender Diversity$_{t-1}$	−64.9983	−63.8443	−77.3841*	−64.5334	0.0287*	0.0291*	0.0414*	0.0847**	−0.7851	−0.7260	−1.0626	−1.1280
	(−1.5738)	(−1.6508)	(−1.8537)	(−1.6136)	(1.8813)	(1.7162)	(1.8674)	(2.0716)	(−1.0803)	(−0.9905)	(−1.4042)	(−1.4562)
Size$_{t-1}$	2.0354	2.8688	2.0592	2.3372	−0.0059**	−0.0078**	−0.0059**	−0.0061**	0.0433	0.0811*	0.0421	0.0421
	(1.2872)	(1.2692)	(1.3665)	(1.4831)	(−2.1349)	(−2.4749)	(−2.0935)	(−2.0071)	(1.4582)	(1.8844)	(1.3933)	(1.3115)
Widely Held$_{t-1}$	−8.3722	−7.9184	−6.3189	−2.2728	0.0102	0.0106	0.0047	0.0016	−0.0597	−0.0549	−0.0812	0.0084
	(−1.2411)	(−1.1636)	(−0.8548)	(−0.2840)	(1.2527)	(1.4391)	(0.6310)	(0.1978)	(−0.4464)	(−0.4261)	(−0.5239)	(0.0477)
Capital Ratio$_{t-1}$					0.0248	0.0347	0.0389	0.0508				
					(0.3132)	(0.4794)	(0.4823)	(0.6201)				
Deposits Ratio$_{t-1}$	2.6378	4.2210	5.3363	6.8644	−0.0009	−0.0023	0.0031	0.0103	0.1502	0.2092	0.1388	0.0497
	(0.1362)	(0.2210)	(0.3186)	(0.3818)	(−0.0420)	(−0.1299)	(0.1416)	(0.4212)	(0.3600)	(0.5492)	(0.3357)	(0.1161)

(*continued on next page*)

Table 11 (*continued*)

Panel B: *Z*-score, DPE, Z-score (ln)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	$Z\text{-}score_t$	$Z\text{-}score_t$	$Z\text{-}score_{t+1}$	$Z\text{-}score_{t+2}$	DPE_t	DPE_t	DPE_{t+1}	DPE_{t+2}	$Z\text{-}score\ (ln)_t$	$Z\text{-}score\ (ln)_t$	$Z\text{-}score\ (ln)_{t+1}$	$Z\text{-}score\ (ln)_{t+2}$
HHI_{t-1}	−9.2865	−8.0135	−4.7559	−3.3351	0.0007	0.0058	−0.0018	−0.0072	−0.0292	−0.0627	0.0326	0.1076
	(−0.7304)	(−0.6654)	(−0.3432)	(−0.2102)	(0.0497)	(0.4725)	(−0.1232)	(−0.4889)	(−0.1216)	(−0.2896)	(0.1263)	(0.3544)
$GDP\ growth_{t-1}$	3.0392*	3.9943*	−1.4423	−1.5412	0.0025**	0.0023**	0.0015*	0.0016	0.1488***	0.1718***	0.0345	−0.0075
	(1.7792)	(1.9011)	(−0.7949)	(−0.6825)	(2.3430)	(2.2402)	(1.7619)	(1.3693)	(2.8908)	(3.1389)	(0.9971)	(−0.2060)
$Female\ CEO_{t-1}$		−21.4010				−0.0257				0.1252		
		(−1.2982)				(−1.6051)				(0.4372)		
$Board\ Independence_{t-1}$		−9.1870				0.0076				−0.1418		
		(−0.7179)				(0.6571)				(−0.5440)		
$Board\ Size\ (ln)_{t-1}$		−6.7101				0.0177*				−0.3313		
		(−0.4976)				(1.7755)				(−1.2837)		
$Political\ Connection_{t-1}$		46.3370**				−0.0114				0.7056**		
		(2.1830)				(−1.6119)				(2.6155)		
$Institutional\ Ownership_{t-1}$		−23.3935				0.0635				−1.0383		
		(−0.7601)				(1.6424)				(−1.4329)		
Intercept	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	834	812	748	663	916	888	830	745	824	802	738	653
R-squared	0.126	0.162	0.139	0.134	0.315	0.354	0.322	0.346	0.203	0.233	0.206	0.224
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of banks	100	100	99	92	102	102	100	99	100	100	99	92
PSM	No	No	No	No	No	No	No	No	No	No	No	No

Panel C; DPE (ln)	(25)	(26)	(27)	(28)
	$DPE(ln)_t$	$DPE(ln)_t$	$DPE(ln)_{t+1}$	$DPE(ln)_{t+2}$
$Gender\ Diversity_{t-1}$	1.7785*	1.6853	3.2349*	5.1413**
	(1.7159)	(1.4299)	(1.8460)	(2.1394)
$Size_{t-1}$	−0.2056**	−0.2795**	−0.2312**	−0.2437**
	(−2.1136)	(−2.1142)	(−2.2340)	(−2.3751)
$Widely\ Held_{t-1}$	0.1052	0.1599	−0.0623	−0.3533
	(0.3776)	(0.6619)	(−0.1872)	(−0.8913)
$Capital\ Ratio_{t-1}$	−1.7228	−0.9323	−2.0068	−2.3966
	(−0.6381)	(−0.4351)	(−0.7802)	(−0.9719)
$Deposits\ Ratio_{t-1}$	−0.1301	−0.1694	0.0601	0.1897
	(−0.1259)	(−0.1913)	(0.0538)	(0.1439)
HHI_{t-1}	0.0638	0.2524	−0.1254	−0.4277
	(0.1084)	(0.5584)	(−0.1807)	(−0.5359)
$GDP\ growth_{t-1}$	0.0979**	0.0807	0.0655	0.1316**
	(2.0488)	(1.4347)	(1.2195)	(2.2245)
$Female\ CEO_{t-1}$		−1.2000**		
		(−2.4202)		
$Board\ Independence_{t-1}$		0.1051		
		(0.3256)		
$Board\ Size\ (ln)_{t-1}$		0.9774		
		(1.6419)		
$Political\ Connection_{t-1}$		−0.7277		
		(−1.6336)		

(*continued on next page*)

Table 11 (*continued*)

Panel C; DPE (ln)	(25)	(26)	(27)	(28)
	DPE(ln)$_t$	*DPE(ln)*$_t$	*DPE(ln)*$_{t+1}$	*DPE(ln)*$_{t+2}$
Institutional Ownership$_{t-1}$		3.4347**		
		(2.0980)		
Intercept	Yes	Yes	Yes	Yes
Observations	476	462	421	368
R-squared	0.278	0.319	0.292	0.329
Cluster	Bank	Bank	Bank	Bank
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Number of banks	84	84	81	73
PSM	No	No	No	No

This table shows the results of OLS regressions where the dependent variables are proxies for bank profitability, risk and dividend payout ratios. *Gender Diversity* is the percentage of female directors on the board. *Size* is the log of total assets. *LRMES* is the expected loss of equity value when a broad index falls by 40% over the following 6 months. *Widely Held* is a dummy equal to one if there is no owner with >10% of share rights and zero otherwise. *Capital Ratio* is the ratio of total equity capital to total assets. *Deposits Ratio* is the ratio of total deposits to total assets. *HHI* stands for the Herfindahl-Hirschman Index and is calculated as the sum of squared ownership shares for all recorded shareholders. *GDP growth* is the annual percentage growth rate of the GDP. *Female CEO* is a dummy variable that takes the value of 1 if the CEO is female and 0 otherwise. *Board size (*ln*)* is the logarithm of the number of board members. *Board Independence* is measured as the proportion of independent directors on the total board. The regressions include year fixed effects. Constants are included but not reported. All variables are winsorized at the 1st and 99th percentiles. The standard errors are clustered at the bank level. Robust z-statistics are reported in parentheses. ***p < .01, **p < .05, *p < .1.

Table 12
The mechanism: OLS regressions with PSM.

Panel A: Tobin's Q, ROA, and NPL ratio	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Tobin's Q_t	*Tobin's Q_t*	*Tobin's Q_{t+1}*	*Tobin's Q_{t+2}*	*ROA_t*	*ROA_t*	*ROA_{t+1}*	*ROA_{t+2}*	*NPL Ratio$_t$*	*NPL Ratio$_t$*	*NPL Ratio$_{t+1}$*	*NPL Ratio$_{t+2}$*
Gender Diversity$_{t-1}$	0.3423**	0.3378**	0.3768***	0.4384***	0.0097	0.0104	0.0027	0.0092	−0.0010	−0.0044	0.0190	0.0236
	(2.4119)	(2.4333)	(2.6535)	(2.7880)	(1.2974)	(1.4439)	(0.3792)	(1.0406)	(−0.0603)	(−0.2965)	(0.9769)	(1.2111)
Size$_{t-1}$	−0.0154**	−0.0170*	−0.0126	−0.0131					−0.0006	−0.0011	0.0003	0.0005
	(−1.9849)	(−1.9309)	(−1.6252)	(−1.6337)					(−0.5137)	(−0.8133)	(0.4336)	(0.7606)
LRMES$_{t-1}$					−0.0000	−0.0000	0.0000	0.0001				
					(−0.0711)	(−0.0270)	(0.3295)	(0.7088)				
Widely Held$_{t-1}$	0.0311	0.0364	0.0310	0.0268	0.0036	0.0041*	0.0040	0.0042*	−0.0016	−0.0005	−0.0014	−0.0011
	(1.0488)	(1.1234)	(1.0313)	(0.8878)	(1.6612)	(1.7012)	(1.6501)	(1.7433)	(−0.3238)	(−0.0893)	(−0.4271)	(−0.3789)
Capital Ratio$_{t-1}$	0.7188	0.7304	0.7134	0.6498	0.1840***	0.1831***	0.1773***	0.1680***	0.0017	0.0013	0.0214	0.0219
	(1.3997)	(1.4260)	(1.3623)	(1.2463)	(6.3692)	(6.2250)	(5.1443)	(5.0731)	(0.0543)	(0.0431)	(0.8090)	(0.7360)
Deposits Ratio$_{t-1}$	−0.0617	−0.0565	−0.0427	−0.0431	−0.0070	−0.0077	−0.0087	−0.0082	−0.0103	−0.0113	−0.0008	0.0044
	(−0.9330)	(−0.8948)	(−0.6632)	(−0.6285)	(−0.9582)	(−1.1134)	(−1.0705)	(−1.0460)	(−0.7492)	(−0.7735)	(−0.1104)	(0.7279)
HHI$_{t-1}$	0.1138	0.1119	0.1160*	0.1049	0.0110**	0.0107**	0.0100*	0.0120**	0.0110	0.0082	0.0168	0.0150
	(1.6216)	(1.6306)	(1.6877)	(1.5728)	(2.2784)	(2.2128)	(1.9694)	(2.5830)	(1.0242)	(0.7774)	(1.6307)	(1.5781)
GDP growth$_{t-1}$	−0.0039	−0.0041	−0.0058*	−0.0015	0.0017***	0.0017***	0.0009	−0.0003	−0.0017	−0.0020	0.0015	0.0036
	(−1.0460)	(−1.0987)	(−1.7336)	(−0.5429)	(2.7994)	(2.7557)	(1.2094)	(−0.7294)	(−0.7932)	(−0.9899)	(1.2397)	(1.6644)
Female CEO$_{t-1}$		−0.0208				−0.0007				−0.0051		
		(−0.7047)				(−0.2995)				(−1.1362)		
Board Independence$_{t-1}$		−0.0393				−0.0033				−0.0059		
		(−0.8210)				(−0.8327)				(−0.7846)		
Board Size (ln)$_{t-1}$		0.0205				−0.0006				0.0083		
		(0.6507)				(−0.1967)				(0.6629)		
Political Connection$_{t-1}$		−0.0230				−0.0002				−0.0259		
		(−1.4689)				(−0.1475)				(−1.5846)		
Institutional Ownership$_{t-1}$		0.0835				0.0022				−0.0187		
		(0.9155)				(0.1795)				(−1.2878)		
Observations	791	791	715	642	642	642	589	534	500	500	440	378
R-squared	0.447	0.453	0.436	0.425	0.709	0.710	0.671	0.677	0.242	0.285	0.299	0.331
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of banks	98	98	94	93	72	72	72	72	84	84	80	79
PSM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Z-score, DPE, Z-score (ln)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	Z-score$_t$	*Z-score$_t$*	*Z-score$_{t+1}$*	*Z-score$_{t+2}$*	*DPE$_t$*	*DPE$_t$*	*DPE$_{t+1}$*	*DPE$_{t+2}$*	*Z-score (ln)$_t$*	*Z-score (ln)$_t$*	*Z-score (ln)$_{t+1}$*	*Z-score (ln)$_{t+2}$*
Gender Diversity$_{t-1}$	−59.0754	−55.8568	−86.3316*	−82.2240*	0.0371**	0.0283*	0.0533*	0.0898**	−1.0383	−0.8985	−1.4042*	−1.5787*
	(−1.3254)	(−1.4221)	(−1.8712)	(−1.8584)	(2.1850)	(1.7780)	(1.9819)	(2.1464)	(−1.2662)	(−1.1826)	(−1.7028)	(−1.8386)
Size$_{t-1}$	2.2371	2.7255	1.8732	2.1406	−0.0058**	−0.0075**	−0.0055**	−0.0061**	0.0488*	0.0834**	0.0479	0.0477
	(1.4832)	(1.2616)	(1.2264)	(1.3508)	(−1.9849)	(−2.4302)	(−1.9906)	(−2.0965)	(1.7216)	(2.0129)	(1.5901)	(1.4570)
Widely Held$_{t-1}$	−7.5961	−7.2552	−2.1710	0.7762	0.0121	0.0104	0.0054	0.0021	−0.0927	−0.0613	0.0072	0.1029
	(−0.9489)	(−0.9156)	(−0.2621)	(0.0856)	(1.4402)	(1.2554)	(0.6853)	(0.2125)	(−0.6473)	(−0.4210)	(0.0441)	(0.5578)
Capital Ratio$_{t-1}$					0.0172	0.0236	0.0364	0.0514				
					(0.2289)	(0.3308)	(0.4589)	(0.6023)				
Deposits Ratio$_{t-1}$	14.9224	16.5768	1.7667	−1.7694	−0.0068	0.0001	0.0093	0.0158	0.3572	0.2945	0.0735	−0.1035

(*continued on next page*)

Table 12 (*continued*)

Panel B: Z-score, DPE, Z-score (ln)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	Z-score$_t$	*Z-score*$_t$	*Z-score*$_{t+1}$	*Z-score*$_{t+2}$	*DPE*$_t$	*DPE*$_t$	*DPE*$_{t+1}$	*DPE*$_{t+2}$	*Z-score (ln)*$_t$	*Z-score (ln)*$_t$	*Z-score (ln)*$_{t+1}$	*Z-score (ln)*$_{t+2}$
	(0.9503)	(1.0392)	(0.1065)	(−0.0944)	(−0.2814)	(0.0041)	(0.3527)	(0.5095)	(0.8930)	(0.7714)	(0.1840)	(−0.2428)
HHI$_{t-1}$	−10.3153	−7.4122	−4.8655	−6.3282	0.0023	0.0031	−0.0043	−0.0071	−0.1223	−0.1066	0.0082	0.0597
	(−0.7267)	(−0.5870)	(−0.3235)	(−0.3837)	(0.1822)	(0.2595)	(−0.3056)	(−0.3975)	(−0.4938)	(−0.4723)	(0.0315)	(0.1997)
GDP growth$_{t-1}$	1.8517	3.0484	−2.9621	−2.6286	0.0031**	0.0030**	0.0023**	0.0021*	0.1451***	0.1628***	0.0105	−0.0467
	(0.9806)	(1.3067)	(−1.4268)	(−0.9464)	(2.5690)	(2.4972)	(2.4440)	(1.8803)	(2.7230)	(2.8777)	(0.3048)	(−1.2856)
Female CEO$_{t-1}$		−22.3515				−0.0228				0.1182		
		(−1.2141)				(−1.5704)				(0.3972)		
Board Independence$_{t-1}$		−4.0452				0.0076				−0.1223		
		(−0.3085)				(0.6578)				(−0.4395)		
Board Size (ln)$_{t-1}$		−2.7669				0.0180				−0.2983		
		(−0.1911)				(1.6347)				(−1.0386)		
Political Connection$_{t-1}$		50.8596**				−0.0124*				0.7413**		
		(2.2030)				(−1.7746)				(2.5739)		
Institutional Ownership$_{t-1}$		−17.3258				0.0457				−1.0916		
		(−0.5333)				(1.2422)				(−1.4493)		
Observations	733	733	661	589	805	805	731	660	724	724	655	585
R-squared	0.134	0.164	0.143	0.127	0.316	0.338	0.320	0.328	0.211	0.232	0.217	0.226
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of banks	95	95	94	88	99	99	95	94	95	95	94	88
PSM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel C: DPE (ln)	(25)	(26)	(27)	(28)
	DPE(ln)$_t$	*DPE(ln)*$_t$	*DPE(ln)*$_{t+1}$	*DPE(ln)*$_{t+2}$
Gender Diversity$_{t-1}$	2.3600	1.5807	3.8921*	5.6080**
	(1.5535)	(1.2944)	(1.7721)	(2.1843)
Size$_{t-1}$	−0.2107**	−0.2936**	−0.2537**	−0.2698**
	(−2.2242)	(−2.2291)	(−2.3309)	(−2.3848)
Widely Held$_{t-1}$	0.1885	0.1511	0.1001	−0.2651
	(0.6853)	(0.5593)	(0.2942)	(−0.6114)
Capital Ratio$_{t-1}$	−2.0706	−1.0859	−2.5244	−3.1246
	(−0.7940)	(−0.5052)	(−0.9429)	(−1.1594)
Deposits Ratio$_{t-1}$	−0.3942	0.0414	−0.0203	0.1127
	(−0.3274)	(0.0346)	(−0.0153)	(0.0761)
HHI$_{t-1}$	0.1537	0.2137	−0.1046	−0.3536
	(0.2843)	(0.4524)	(−0.1545)	(−0.4337)
GDP growth$_{t-1}$	0.0540	0.0389	0.0839	0.1249**
	(1.2655)	(0.8365)	(1.6599)	(2.1978)
Female CEO$_{t-1}$		−1.2765**		
		(−2.4249)		
Board Independence$_{t-1}$		0.1615		
		(0.4086)		
Board Size (ln)$_{t-1}$		1.2002*		
		(1.6965)		
Political Connection$_{t-1}$		−0.9105*		
		(−1.8979)		

(*continued on next page*)

Table 12 (*continued*)

Panel C: DPE (ln)	(25)	(26)	(27)	(28)
	$DPE(ln)_t$	$DPE(ln)_t$	$DPE(ln)_{t+1}$	$DPE(ln)_{t+2}$
Institutional Ownership$_{t-1}$		3.3611*		
		(1.9701)		
Observations	414	414	368	331
R-squared	0.238	0.318	0.266	0.329
Cluster	Bank	Bank	Bank	Bank
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Number of banks	80	80	72	66
PSM	Yes	Yes	Yes	Yes

This table shows the results of OLS regressions where the dependent variables are proxies for bank profitability, risk and dividend payout ratios. *Gender Diversity* is the percentage of female directors on the board. *Size* is the log of total assets. *LRMES* is the expected loss of equity value when a broad index falls by 40% over the following 6 months. *Widely Held* is a dummy equal to one if there is no owner with >10% of share rights and zero otherwise. *Capital Ratio* is the ratio of total equity capital to total assets. *Deposits Ratio* is the ratio of total deposits to total assets. *HHI* stands for the Herfindahl-Hirschman Index and is calculated as the sum of squared ownership shares for all recorded shareholders. *GDP growth* is the annual percentage growth rate of the GDP. *Female CEO* is a dummy variable that takes the value 1 if the CEO is female and 0 otherwise. *Board size (ln)* is the logarithm of the number of board members. *Board Independence* is measured as the proportion of independent directors on the total board. The regressions include year fixed effects. Constants are included but not reported. All variables are winsorized at the 1st and 99th percentiles. The standard errors are clustered at the bank level. Robust z-statistics are reported in parentheses. ***p < .01, **p < .05, *p < .1.

Faff, 2013; Berger et al., 2014; García-Meca et al., 2015; Palvia et al., 2015; Farag and Mallin, 2017; Arnaboldi et al., 2018), there is currently no evidence about the impact of gender diversity on banks' boards on the likelihood of a public bailout.

Using a hand-collected dataset on a large sample of European banks, we show that gender diversity reduces the probability of a public bailout, although this effect is economically moderate in comparison with the impact of the overall degree of systemic risk of an institution. Moreover, conditional on a public bailout happening, the amount of public funding received, as a percentage of bank assets, decreases as the percentage of women on the board increases.

An investigation of the drivers of such a phenomenon suggests that gender diversity has a positive impact on bank performance (proxied by *Tobin's Q* and *ROA*). Moreover, gender diversity correlates positively with dividend payout ratios, suggesting a decrease in agency costs, which consequently leads to a lower probability of a bailout. However, we do not find evidence that gender diversity decreases bank risk. Our results are robust to a variety of econometric methods, including PSM and IV-estimation methods.

In light of recent reforms in several EU countries regarding gender quotas and the current debate about the need to understand and enhance corporate governance mechanisms in banks (De Larosiere Group, 2009; Principles for Enhancing Corporate Governance, BCBS, 2010), our results provide important insights into the role of female directors in bank conduct: these findings may be interpreted as evidence showing that female directors exert stronger monitoring efforts than their male counterparts (Adams and Ferreira, 2009; Chen et al., 2017; Evgeniou and Vermaelen, 2017), leading to higher profitability and lower agency costs. Therefore, our results support the aim of the European Commission to further improve gender balance on corporate boards. Despite the improvements made over the last decade, the average proportion of women on the board in our sample is well below the target of 40% to be achieved by 2020 proposed by the European Commission for listed companies (COM 2012/614). Improving gender diversity in boards might be especially important for firms in countries with weak institutional environments (Ye et al., 2019). Our findings also provide information on how gender diversity influences the potential cost of different types of bailouts for taxpayers. As far as we know, this is the first paper that provides an estimation of such costs.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jcorpfin.2020.101560.

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