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## Article

# Board gender diversity and financial stability: Evidence from microfinance institutions

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*Suggested Citation:* Dang, Thuy T.; Trang Nt Ho; Duc Nguyen Nguyen (2023) : Board gender diversity and financial stability: Evidence from microfinance institutions, Cogent Economics & Finance, ISSN 2332-2039, Taylor & Francis, Abingdon, Vol. 11, Iss. 2, pp. 1-21, https://doi.org/10.1080/23322039.2023.2244860

This Version is available at: https://hdl.handle.net/10419/304178

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**Cogent Economics & Finance** 

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/oaef20

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To cite this article: Thuy T. Dang, Trang NT Ho & Duc Nguyen Nguyen (2023) Board gender diversity and financial stability: Evidence from microfinance institutions, Cogent Economics & Finance, 11:2, 2244860, DOI: 10.1080/23322039.2023.2244860

To link to this article: https://doi.org/10.1080/23322039.2023.2244860

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Published online: 07 Aug 2023.

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Received: 27 April 2023 Accepted: 31 July 2023

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Reviewing editor: David McMillan, University of Stirling, UK

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# FINANCIAL ECONOMICS | RESEARCH ARTICLE Board gender diversity and financial stabi

# Board gender diversity and financial stability: Evidence from microfinance institutions

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**Abstract:** The effects of board gender diversity (BGD) on financial stability of financial institutions have long been an important topic, creating a rich strand of literature that focuses extensively on banks. Meanwhile, little is known about the implications of BGD on risk in microfinance institutions (MFI). This study aims to fill this gap. Using a data sample retrieved from the MIX Market database spanning the 2009–2018 period and the random-effects estimator, we find that the proportion of female directors on the board is positively associated with financial stability of MFIs measured by the Z-score. The result is robust when using alternative measures of financial stability and BGD, and alternative estimation techniques. In addition, we document a negative relationship between BGD and risk-taking behavior of MFIs. Further, the research result favors the critical mass theory rather than tokenism. Lastly, we find that BGD links with financial stability in a monotonic instead of non-monotonic manner.

### Subjects: Economics; Finance; Business, Management and Accounting

Keywords: gender diversity; female directors; microfinance institutions; risk; financial stability

JEL Classification: G21; G32; G34; M14

## 1. Introduction

One of the most compelling topics in the corporate governance literature is the issue of gender diversity on boards of directors (Carter et al., 2003). A hefty number of empirical studies has emerged investigating the roles of female representation on various facets of firm operations such

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© 2023 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent. as value (Carter et al., 2003), performance (Adams & Ferreira, 2009; Campbell & Mínguez-Vera, 2008; Y. Liu et al., 2014; Marquez-Cardenas et al., 2022; T. Nguyen et al., 2015), innovation (J. Chen et al., 2018; Griffin et al., 2021; Naveed et al., 2023), and other critical financial decisions (Bernile et al., 2018; J. Chen et al., 2017; Kamarudin et al., 2022; Nerantzidis et al., 2022). The most important type of financial institution, banks, also attracts considerable attention from scholars when various studies depict that board gender diversity (BGD) has repercussions for bank performance (García-Meca et al., 2015; Owen & Temesvary, 2018; Pathan & Faff, 2013).

BGD also matters for financial stability due to the difference in risk aversion between males and females (Byrnes et al., 1999; Croson & Gneezy, 2009; Fehr-Duda et al., 2006).<sup>1</sup> Such theoretical ground motivates a rich strand of literature targeting not only non-financial firms (Jane Lenard et al., 2014; Sila et al., 2016; e.g.; Bernile et al., 2018) but also banks (Mateos de Cabo et al., 2012; e.g.; Berger et al., 2014; Farag & Mallin, 2017; Kinateder et al., 2021).

Despite mounting evidence that BGD impacts risk in banks and non-financial firms, as briefly stated above, the literature remains silent on whether it is a friend or a foe of the stability of microfinance institutions (MFI). This study aims to fill this gap. To the best of our knowledge, this is the first study that aims to investigate the relationship between BGD and the financial stability of MFIs.

We target MFIs since they play an essential role in promoting access to financial services to poor households, small businesses, and less privileged populations (Hermes & Hudon, 2018; Strøm et al., 2014). Recent studies also depict that MFIs may eliminate poverty and gender inequality (Q. Zhang, 2017; Q. Zhang & Posso, 2017), and promote financial development (Abrar et al., 2021). Hence, the stability of MFIs ensures and maintains their ability to meet their social goals.

Notably, the microfinance industry provides an ideal environment to study the influence of BGD due to its unique features, such as mission orientation and entrepreneurial nature (Strøm et al., 2014). According to Renée B Adams and Ragunathan (2017), there are higher barriers to female representation in banks. Farag and Mallin (2017) also conclude that because of the risk in the banking sector, the likelihood of hiring female directors is lower compared to other industries. Interestingly, the presence of female directors on boards of MFIs is far higher than for banks. Strøm et al. (2014) find that female directors held nearly 30% of seats in the boardrooms of MFIs, making studies on female leadership relevant and compelling.

Using a data sample of 498 MFIs worldwide from the MIX Market database spanning the 2009 – 2018 period, we find that the share of women on the board is positively associated with financial stability measured by the natural logarithm of Z-score. This result holds with a battery of robustness tests, including the use of econometric approaches which tackle potential endogeneity concerns. In addition, when finding the mechanism linking BGD and stability, we find that higher BGD is associated with lower risk-taking behavior in MFIs. Further, we find evidence supporting critical mass theory instead of tokenism. Lastly, unlike prior studies showing the non-linear relationship between BGD and bank risk (Farag & Mallin, 2017; J. J. Liu et al., 2022), our result suggests that BGD does not link with financial stability in a non-monotonic manner.

This study contributes to the existing literature in several aspects. Specifically, by directing the focus to MFIs, we complement corporate governance literature, which profoundly focuses on the influence of gender diversity on banks' stability (Gulamhussen & Santa, 2015; Mateos de Cabo et al., 2012; Palvia et al., 2015; e.g.; Kinateder et al., 2021). In addition, studies on MFIs have shown the effects of BGD on performance (Adusei et al., 2017), efficiency (F. S. Fall et al., 2021; Van Damme et al., 2016), and capital structure (Adusei & Obeng, 2019). We add that gender diversity in the boardroom also provides a positive role to an important dimension of MFI operations: financial stability.

The remainder of this article is structured as follows. Section 2 presents a review of the existing literature. Section 3 shows the research methods, while section 4 displays the empirical findings. Finally, section 5 concludes.

#### 2. Literature review

The literature does not sharply distinguish the effects of BGD on financial and non-financial firms. Thus, in the following section, we review relevant theories and empirics on the effects of BGD on financial stability in financial and non-financial firms.

Experimental economics literature well depicts that women are more risk averse than men (Byrnes et al., 1999; Croson & Gneezy, 2009; Fehr-Duda et al., 2006). Using a survey designed to measure managerial risk aversion of corporate directors in Sweden, Adams and Funk (2011) also conclude that female directors are less risk averse than their male counterparts. In support, biological studies demonstrate that when compared to women, men have a higher level of salivary testosterone, which is negatively correlated with risk aversion (Sapienza et al., 2009). Such differences in risk aversion between the two genders subsequently affect crucial financial decisions and risk-taking behavior.

Various studies have emerged tackling the association between BGD and risk in both nonfinancial firms and financial institutions (i.e., banks). Extensive attention has been drawn to nonfinancial corporations, and the results are mixed. For example, Jane Lenard et al. (2014) find that higher gender diversity in the board is associated with lower risk measured by the variability of stock market returns. In a similar vein, Bernile et al. (2018) suggest that diversity on the board of directors decreases stock return volatility when using a sample of non-financial and non-utility firms from 1996 to 2014. Mohsni et al. (2021) suggest a negative association between the number of female directors on corporate boards and firm risk.

L. H. Chen et al. (2019) find that BGD is negatively associated with tax avoidance, implying that diverse-board firms tend to be more careful about reputation risk. However, the authors suggest a positive relationship between BGD and financial risk.

Interestingly, using a sample of 2,000 US firms, Sila et al. (2016) find no evidence that the representation of female directors in the boardroom influences equity risk. They conclude that female-dominated boards of directors are not necessarily more or less risk-taking when compared to male-dominated boards.

Meanwhile, a strand of literature targeting financial institutions (i.e., banks) does not yield an unambiguous prediction on the role of BGD on risk. Some studies consider BGD to be a friend of financial stability. For instance, using a sample of 612 European banks in 20 countries, Mateos de Cabo et al. (2012) find that the share of women on the board is higher for lower-risk banks. In support, Palvia et al. (2015) add that banks with female CEOs tended to have more equity capital and less default risk during the global financial crisis. Gulamhussen and Santa (2015) use a sample of 461 large banks in OECD countries to investigate the role of women representation in board-rooms on performance and risk-taking. The authors find a negative association between BGD and risk-taking. Using a sample of banks operating in 20 countries from 2016 to 2017, Kinateder et al. (2021) suggest that BGD reduces credit risk.

By contrast, Berger et al. (2014) find that an increase in female board representation is associated with a rise in portfolio risk when using a large sample of 19,750 bank-year observations of banks in Germany. Using data from 365 bank holding companies and commercial banks spanning the 2006–2009 period, Adams and Ragunathan (2017) find that banks with more women directors did not necessarily have a lower risk level during the crisis. The authors argue that women working in the financial industry may have a similar level of risk aversion to their male counterparts. Interestingly, some studies document a non-linear relationship between gender diversity on boards of directors and risk. For example, Farag and Mallin (2017) focus on European banks over the period 2004 – 2012 and ask whether there is a negative relationship between the proportion of female directors and financial fragility. Using the system generalized method of moments (GMM) estimator, the authors report an insignificant relationship between the proportion of female directors and financial fragility. Notably, when allowing the non-monotonic relationship, Farag and Mallin (2017) find that BGD links with fragility in a non-linear manner (inverted U shape). In a similar vein, J. J. Liu et al. (2022) find a third-order non-linear relationship between board diversity and bank risk when using a sample of Australian banks from 2004 to 2019.

Furthermore, the number of women directors also matters. Traditional theory predicts that a group of few women (i.e., a token group) may be controlled by men (Kanter, 1984). Conversely, a board with a high proportion of female directors could express their opinion and influence decision-making practices (Gulamhussen & Santa, 2015; Kinateder et al., 2021). Konrad et al. (2008) suggest that for companies with at least three women directors, tokenism is no longer a severe issue, and women directors can add value to corporate performance and operations. In support, Torchia et al. (2011), Joecks et al. (2013), Y. Liu et al. (2014), and Fan et al. (2019) demonstrate the benefits of boards with at least three directors (i.e., a critical mass) to various facets of corporate outcomes. Recently, Kinateder et al. (2021) also aim to check whether tokenism or critical mass theory is supported in a sample of 1,692 bank-year observations across 20 countries. The authors find that banks with three or more females on the board have lower credit risk.

#### 3. Research method

#### 3.1. Measuring BGD

In accordance with the literature targeting the issue of gender diversity in non-financial corporations (Bernile et al., 2018; T. Nguyen et al., 2015), banks (Abou-El-Sood, 2021; Farag & Mallin, 2017; Kinateder et al., 2021), and MFIs (Adusei & Obeng, 2019), we use the share of women board members on the total number of board members to measure BGD. For robustness checking, following Adusei and Obeng (2019), we use a dummy variable (DBGD) which equals 1 if the share of women directors is above the sample mean and 0 otherwise. Furthermore, in accordance with Mohsni et al. (2021), we employ the number of female directors on the board (FNUM) as the alternative measure of BGD. We use the natural logarithm of this indicator to enhance the normality of the data.

#### 3.2. Measuring financial stability

To measure financial stability of MFIs, following Schulte and Winkler (2019) and Hossain et al. (2023), we use the Z-score, which measures the distance from insolvency.<sup>2</sup> Operationally, Z-score is calculated as follows:

$$Z - score_{i,t} = \frac{ROA_{i,t} + Equity_{i,t}/Total \ assets_{i,t}}{\sigma ROA_{i,t}}$$
(1)

where the denominator is the standard deviation of return on assets (ROA) calculated using the three-year rolling window. We use the natural logarithm of Z-score (LnZ) since its value is highly skewed (Beck et al., 2013). Note that higher value of LnZ means higher stability, and vice versa. We also employ an alternative indicator of LnZ for sensitivity testing purposes. For instance, we use the standard deviation of ROA calculated over the entire period, following Laeven and Levine (2009). Further, we also use loan loss rate (LLOSS) as an alternative indicator of risk. Note that higher values of LLOSS indicate greater credit risk.<sup>3</sup>

#### 3.3. Data source and sampling

The main source of data is from the MIX Market database provided by the World Bank.<sup>4</sup> In addition, macroeconomics variables (such as GDP growth and inflation) are obtained from the World Development Indicators (WDI). Further, we obtain data from Worldwide Governance Indicators (WGI) to calculate the indicator of institutional development.

To construct the data sample, we apply some filters as follows. First, we remove quarterly data from the original dataset since all country-level variables are on an annual basis. In addition, to enhance the consistency of the information across the sample, we select data at the end of the calendar year (December 31). Second, MFIs without information on board size and number of women directors (i.e., inputs needed to calculate the BGD indicator) are dropped from the sample. Third, we delete MFIs with negative values of equity and with equity to total assets ratio bigger than 1. Fourth, we drop MFIs in countries where macroeconomic variables are not available (such as Palestine). Finally, we remove MFIs that do not have at least three consecutive annual observations in ROA because our outcome variable is estimated using the three-year rolling window. The final sample contains information of 498 MFIs operating in 82 countries from 2009 to 2018.

#### 3.4. Model

To investigate the implications of BGD on each MFI's efficiency and financial stability, we employ the following baseline model:

$$LnZ_{i,c,t} = \alpha + \beta * BGD_{i,c,t} + \gamma * F_{i,t,c} + \delta * C_{c,t} + Year \ dummies + \varepsilon_{i,t,c}$$
(2)

where *i*, *c*, and *t* represent MFI, country, and year, respectively. In specification (2), F(C) is the matrix of MFI-level (country-level) control variables. The dependent variable is financial stability measured by LnZ. We pay attention to the estimates on BGD variable. The positive (negative) sign means higher gender diversity is positively (negatively) related to the financial stability of MFIs.

At the MFI level, following recent literature related to determinants of risk of financial institutions in general and MFIs in particular (e.g., Beck et al., 2013; Schulte & Winkler, 2019), we include the following control variables in specification (2):

- LnTA: MFI size measured by the natural logarithm of total assets.
- BSIZE: Board size measured by the number of board members.
- LOANS: The share of gross loans to total assets.
- DEPOSITS: The share of deposits to total assets.
- PROVISIONS: Provision for loan impairment on total assets.

At the country level, we employ the annual growth rate of GDP (GDPgr) and inflation measured by annual change in consumer price index (INFLATION). Those variables capture the economic development of countries included in the data sample. In addition, we control for institutional development since it provides positive repercussions on the stability of the financial sector (Canh et al., 2021; Hossain et al., 2023; Lassoued, 2017). Following relevant studies (e.g., Canh et al., 2021; Nguyen, Tran, et al., 2022), the country governance index (GOVERNANCE) is calculated using the mean of six dimensions, namely control of corruption, government effectiveness, political stability and absence of violence, regulatory quality, rule of law, and voice and accountability. We also include year dummies to capture global business cycle. All variables are winsorized at the first and 99<sup>th</sup> percentile to reduce potential influences of outliers.

Regarding the estimating technique, since our sample is panel data, the pooled OLS, fixed effects, or random effects are econometrically feasible. Strøm et al. (2014) and Adusei and Obeng (2019) apply the random effects estimator when studying the relationship between BGD

and MFI performance. With caution, following Torres-Reyna (2007), we employ some formal tests to select the most appropriate estimation technique for the current study.

First, we use the Hausman test to determine the more suitable technique between fixed effects and random effects. The statistics from this test (Chi-square = 21.840; p-value = 0.1120) supports the utilization of random effects. Next, we confirm the appropriateness of random effects by using the Breusch-Pagan Lagrange test, which helps to choose between random effects and OLS. The result (Chi-square = 414.35; p-value = 0.000) reveals that the random effects technique is superior to OLS. Therefore, throughout the study, we employ the random effects technique to estimate model (2).<sup>5</sup>

Operationally, the random effects estimator is suitable when differences across entities have effects on the outcome variable (Torres-Reyna, 2007). According to Greene (2003), the difference between the random effects estimator and the fixed effects counterpart is whether the unobserved individual effect contains some elements which are correlated with the regressor. With a random effects technique, scholars can include time-invariant variables, which are observed by the intercept when using the fixed effects estimator (Torres-Reyna, 2007).

#### 4. Empirical findings

#### 4.1. Descriptive statistics

Table 1 presents descriptive statistics of all variables employed in this study. The mean (standard deviation) of BGD is 0.324 (0.243). As stated in the introduction, the mean value of BGD is far higher than that in relevant papers focusing on banks (e.g., Kinateder et al., 2021) or non-financial firms (e.g., Bernile et al., 2018). This statistic is in line with Strøm et al. (2014), suggesting that the share of women on boards of MFIs is far higher than in non-financial firms or banks. In addition, the mean of LnZ is 3.221, while its standard deviation is 1.146.

Table 2 displays the correlation matrix of all variables. We observe a positive and statistical correlation between BGD and LnZ. The result from the correlation test allows us to expect a positive relationship between the two. Moreover, size and the proportion of deposits and loans to total assets are positively correlated with LnZ. Conversely, MFIs with high credit risk measured by the share of provisions for loan impairment to total assets tend to be less financially stable.

The correlation coefficient of each pair of variables is far less than 0.80. In addition, in an untabulated result, we also estimate the variance inflation factor (VIF). The result shows that the mean of VIF is 1.15, suggesting that multicollinearity is less likely an issue in our study (Wooldridge, 2015).

#### 4.2. The relationship between BGD and financial stability

#### 4.2.1. Regression results of the relationship between BGD and financial stability

Table 3 displays the results of specification (2) with random effects and year dummies. In the first column, BGD is the only independent variable. In column (2), we include all independent variables except BGD. In column (3), only MFI-level variables are employed. In the last three columns, we include country-level variables one by one.

The results from the second column depict that larger MFIs tend to be more financially stable since the estimate on LnTA is positive and significant at the 1% level. The result is consistent with prior studies exploring the determinants of bank (e.g., Beck et al., 2013) and MFI stability (e.g., Duho et al., 2023; Hossain et al., 2023) since larger entities have sufficient resources and conditions to monitor and manage risk. Next, MFIs with higher credit risk exposure, measured by higher values of PROVISIONS, are more financially fragile. At the country level, the estimates suggest an insignificant relationship between economic condition and development (GDPgr, INFLATION) and

Table 1. Varid	ble description and summary statisti	cs						
This table shows	; the definition, source, and summary statis	tics of all variables.						
Variable	Definition	Source	z	Mean	SD	P.25	Median	P.75
LnZ	Measure of financial stability calculated using equation (1). The denominator is computed by the three-year rolling window of return on assets (ROA).	MIX Market; authors' calculation	1,463	3.221	1.146	2.519	3.266	3.963
LnZ_all	Alternative indicator of financial stability calculated using equation (1) but the denominator is estimated using the standard deviation of ROA over the entire period.	MIX Market; authors' calculation	2,411	2.841	1.071	2.269	2.907	3.524
ross	The loan loss rate, which is a measure of credit risk.	MIX Market	2,431	0.014	0.025	0.000	0.006	0.019
BGD	Indicator of board gender diversity. It is the share of female board members on number of board members.	MIX Market; authors' calculation	2,464	0.324	0.243	0.143	0.286	0.429
DBGD	Dummy variable which equals 1 if the share of women directors is above the sample mean and 0 otherwise.	MIX Market; authors' calculation	2,464	0.467	0.499	0.000	0.000	1.000
FNUM	The natural logarithm of the number of female directors.	MIX Market; authors' calculation	2,128	0.794	0.753	0.000	0.693	1.386
Risk-taking	The indicator of risk-taking behaviour. It is calculated as the standard deviation of ROA using the three-year rolling window.	MIX Market; authors' calculation	1,489	0.021	0.029	0.005	0.011	0.024
MFI-level control	S							
LnTA	Measure of MFI size calculated by the natural logarithm of total assets.	MIX Market; authors' calculation	2,464	16.869	1.894	15.511	16.821	18.166
BSIZE	Board size measured as the number of board members.	MIX Market	2,464	8.713	14.232	IJ	7	6

(Continued)

<sup>\*</sup> cogent - economics & finance

This table shows	the definition, source, and summary statis	tics of all variables.			-			
Variable	Definition	Source	N	Mean	SD	P.25	Median	P.75
LOANS	Gross loan to total assets.	MIX Market	2,464	0.774	0.16	0.701	0.808	0.878
DEPOSITS	The share of deposits to total assets.	MIX Market	2,464	0.266	0.306	0	0.084	0.553
PROVISIONS	Provisions for loan impairment to total assets.	MIX Market	2,464	0.016	0.02	0.003	0.011	0.022
Country-level cor	itrols							
GDPgr	GDP growth rate.	WDI	2,464	0.043	0.026	0.027	0.043	0.062
INFLATION	Inflation measured by annual change in consumer prices.	WDI	2,464	0.044	0.034	0.023	0.039	0.060
GOVERNANCE	Mean value of six dimensions: control of corruption, government effectiveness, political stability and absence of violence, regulatory quality, rule of law, and voice and accountability.	WGI	2,464	-0.495	0.371	-0.689	-0.543	-0.270

Table 1. (Continued)

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This table presents the correlation matrix of all variables engaged in the baseline regression. The definition and source of all variables are shown in Table 1. Asterisks indicate statistical significance at 10% (\*), 5% (\*\*), and 1% (\*\*\*).

	LnZ	BGD	LnTA	BSIZE	LOANS	DEPOSITS	PROVISIONS	GDPgr	INFLATION	GOVERNANCE
LnZ	1									
BGD	0.092***	1								
LnTA	0.168***	-0.189***	1							
BSIZE	0.039	-0.026	0.156***	7						
LOANS	0.074***	0.004	600.0	-0.126***	1					
DEPOSITS	0.109***	-0.010	0.398***	0.207***	-0.269***	1				
PROVISIONS	-0.148***	-0.061***	0.054***	-0.011	0.168***	-0.072***	1			
GDPgr	-0.043*	0.011	-0.002	0.029	-0.070***	0.056***	-0.089***	1		
INFLATION	-0.180***	-0.065***	-0.072***	-0.100***	-0.089***	-0.090***	0.053***	0.0426**	1	
GOVERNANCE	0.140***	0.044**	-0.061***	-0.073***	0.151***	-0.133***	0.049**	-0.1209***	-0.1898***	1

#### Table 3. Board gender diversity and financial stability of MFIs

This table presents the relationship between board gender diversity (BGD) and risk in microfinance institutions (MFI) using model (2) with random effects. The dependent variable is financial stability measured by the natural logarithm of Z-score. The key independent variable (BGD) is the fraction of number of female directors on total number of board members. Year dummies are included but not reported for brevity. The definition and source of all variables are shown in Table 1. Robust standard errors adjusted for heteroskedasticity and autocorrelation clustered at the MFI level are in parentheses. Asterisks indicate statistical significance at 10% (\*), 5% (\*\*), and 1% (\*\*\*).

	LnZ	LnZ	LnZ	LnZ	LnZ	LnZ
	(1)	(2)	(3)	(4)	(5)	(6)
BGD	0.475***		0.571***	0.570***	0.566***	0.557***
	(0.153)		(0.148)	(0.148)	(0.147)	(0.147)
LnTA		0.098***	0.114***	0.114***	0.112***	0.112***
		(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
BSIZE		0.000	0.000	0.000	0.000	0.001
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
LOANS		0.956***	1.068***	1.065***	1.041***	0.978***
		(0.274)	(0.275)	(0.274)	(0.274)	(0.273)
DEPOSITS		0.193	0.138	0.134	0.134	0.175
		(0.170)	(0.168)	(0.168)	(0.168)	(0.170)
PROVISIONS		-8.745***	-8.774***	-8.749***	-8.521***	-8.669***
		(2.191)	(2.125)	(2.147)	(2.177)	(2.164)
GDPgr		0.720		0.323	0.192	0.669
		(1.239)		(1.255)	(1.257)	(1.238)
INFLATION		-1.106			-1.530	-1.046
		(1.070)			(1.021)	(1.051)
GOVERNANCE		0.403***				0.394***
		(0.132)				(0.130)
Constant	4.235***	3.249***	1.891***	1.882***	2.036***	2.450***
	(0.153)	(0.407)	(0.432)	(0.436)	(0.446)	(0.455)
Observations	1,463	1,463	1,463	1,463	1,463	1,463
Random effects	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes

financial stability. Next, we find that MFIs operating in countries with better institutional development are financially safer. Our baseline result is consistent with prior studies targeting banks and MFI stability such as Canh et al. (2021), Lassoued (2017), and Hossain et al. (2023). Specifically, countries with better institutional development tend to have more effective regulatory frameworks and governance mechanisms, which subsequently reduce risk for MFIs (Hossain et al., 2023; Lassoued, 2017).

We observe that the estimates on BGD are positive and significant with or without controls. In addition, the coefficients of other controls are similar to those in column (2). Hence, the relationship between BGD and financial stability is not driven by spurious correlations between other variables.

The research results demonstrate a positive association between BGD and financial stability, measured by the natural logarithm of Z-score. This finding is consistent with theoretical foundations indicating that women are more risk averse than men (Byrnes et al., 1999; Croson & Gneezy, 2009; Fehr-Duda et al., 2006). Such differences in risk aversion between the two genders subsequently affect crucial financial decisions and risk-taking behavior. MFIs with lower female representation on boards tend to be riskier. Our result is in accordance with previous studies that depict the positive roles of BGD on bank financial stability, such as Mateos de Cabo et al. (2012), Palvia et al. (2015), Gulamhussen and Santa (2015), and Kinateder et al. (2021). The finding is in contrast to some studies which yield a positive association between BGD and risk such as Berger et al. (2014) or Adams and Ragunathan (2017).

The effect of BGD on financial stability is economically meaningful. Using the estimates from column (6) of Table 3 for illustration, we find that a one standard deviation increase in the value of BGD (0.243) is associated with an increase of 0.135 in the value of LnZ (0.243  $\times$  0.557), representing approximately 12% of its standard deviation.

#### 4.3. Robustness check

In this section, we present a battery of robustness tests to gauge a convincing view on the positive association between BGD and the financial stability of MFIs.

#### 4.3.1. Robustness check using different indicators of BGD and financial stability

First, we employ alternative measures of MFI risk and BGD. Specifically, we compute the Z-score using a three-year rolling window in the main analysis. For the sensitivity test, following Laeven and Levine (2009), we calculate the volatility or ROA over the entire period and present the estimates in column (1). The estimate on BGD is positive and significant in column (1), suggesting that BGD is positively associated with financial stability. Next, in column (2) of Table 4, we use loan loss rate (LLOSS) as an alternative measure of risk. We find that the estimated coefficient of BGD is negative and significant at the 10% level. Thus, higher BGD is associated with a lower level of credit risk.

In column (3) and (4), alternative indicators of BGD are used. Specifically, following Adusei and Obeng (2019), we use a dummy variable (DBGD) which equals 1 if the share of women directors is above the sample mean and 0 otherwise. In column (4), following Mohsni et al. (2021), we employ FNUM as the alternative measure of BGD. It is observed that the estimates on DBGD and FNUM are positive and significant at the 1% level. Therefore, we can conclude that the main result is robust to alternative measures of BGD and stability.

#### 4.3.2. Robustness check using different econometric techniques

Next, we apply alternative techniques other than the random effects estimator used in Table 3. First, in column (5), following J. J. Liu et al. (2022), we apply MFI fixed effects and year dummies. Renée B. Adams and Ferreira (2009) suggest that some entities may be more progressive than others and thus may have more female directors. Given that corporate culture may not vary over time, it could potentially be an omitted and time-invariant variable that leads to the biased result. Practically, the fixed effects estimator can control for all time-invariant differences between MFIs (such as culture or ownership structure). According to Torres-Reyna (2007), the fixed effect estimator is superior for investigating the causes of changes within an entity (such as an MFI). Therefore, the estimates of the fixed effects models cannot be biased because of omitted time-invariant characteristics (Kohler & Kreuter, 2005).

Next, in column (6), we use country fixed effects and time fixed effects. This technique can take into account various time-invariant traits at the country level, which may affect risk and operations of financial institutions such as language (e.g., Osei-Tutu & Weill, 2021) or legal matters (e.g., González, 2005). We also apply time fixed effects and OLS in columns (7) and (8), respectively, to observe the consistency in estimates on BGD. It is evident that the estimates on BGD are all

This table shows the (columns 5 to 8), and and year dummies a MFI level are in pare	estimates of a d approaches 1 ire included bu intheses. Aster	various robustr to handle the at not reported risks indicate s	ness tests using endogeneity iss for brevity. Th tatistical signif	g alternative n sue (columns <sup>5</sup> e full table is o ficance at 10%	neasures of fir to 12). The d ivailable on re 6 (*), 5% (**),	nancial stability efinition and s quest. Robust and 1% (***).	/ (columns 1 al ource of all var standard error	nd 2) and BGD iables are sho s adjusted for	(columns 3 ar wn in Table 1. heteroskedast	nd 4), alternati MFI-level cont icity and autoo	ve econometric rols, country-le correlation clus	techniques vel controls, tered at the
	LnZ_all	SSOTI	LnZ	LnZ	LnZ	LnZ	LnZ	LnZ	LnZ <sub>t +1</sub>	LnZ <sub>t +2</sub>	LnZ <sub>t +3</sub>	LnZ
	(1)	(2)	(3)	(†)	(2)	(9)	(2)	(8)	(6)	(10)	(11)	(12)
BGD	0.162***	-0.004*			0.597***	0.372**	0.473***	0.499***	0.552***	0.454**	0.353**	1.564***
	(090.0)	(0.002)			(0.213)	(0.164)	(0.179)	(0.178)	(0.162)	(0.180)	(0.180)	(0.573)
DBGD			0.207***									
			(0.064)									
FNUM				0.178***								
				(0.058)								
LnZ <sub>t-1</sub>												0.423***
												(0.077)
Constant	3.815***	0.035***	2.897***	3.121***	0.511	6.354***	2.921***	1.130**	2.823***	0.890	1.369**	-1.962
	(0.452)	(0.007)	(0.418)	(0.439)	(2.378)	(1.096)	(0.454)	(0.461)	(0.466)	(0.571)	(0.688)	(1.735)
MFI-level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,411	2,431	1,463	1,308	1,463	1,463	1,463	1,463	1,433	955	651	939
Random effects	Yes	Yes	Yes	Yes	-	—	Ι	Ι	Yes	Yes	Yes	I
MFI fixed effects	I	I	I	I	Yes	I	I	I	I	I	I	I
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Ι	Yes	Yes	Yes	Yes
Country fixed effects	I	I	I	I	I	Yes		I	I	I	-	I
R squared					0.047	0.301	0.122	0.118				
Adjusted R squared					0.037	0.253	0.112	0.112				

Table 4. Robustness tests

(Continued)

This table shows the estimates of various robustness tests using alternative measures of financial stability (columns 1 and 2) and BGD (columns 3 and 4), alternative econometric techniques (columns 5 to 8), and approaches to handle the endogeneity issue (columns 9 to 12). The definition and source of all variables are shown in Table 1. MFI-level controls, country-level controls, and year dummies are included but not reported for brevity. The full table is available on request. Robust standard errors adjusted for heteroskedasticity and autocorrelation clustered at the MFI level are included but not reported for brevity. The full table is available on request. Robust standard errors adjusted for heteroskedasticity and autocorrelation clustered at the MFI level are in parentheses. Asterisks indicate statistical significance at 10% (\*), 5% (\*\*), and 1% (\*\*\*).

	LnZ_all	SSOTI	LnZ	LnZ	LnZ	LnZ	LnZ	LnZ	LnZ <sub>t +1</sub>	LnZ <sub>t +2</sub>	LnZ <sub>t +3</sub>	LnZ
	(1)	(2)	(3)	(4)	(2)	(9)	(2)	(8)	(6)	(10)	(11)	(12)
AR1 (p-value)												0.000
AR2 (p-value)												0.449
Hansen J-test (p-value)							<u>.</u>					0.492

positive and statistically significant in columns (5) to (8), suggesting that financial stability of MFIs increases with BGD. Thus, our result is robust to alternative estimation techniques.

#### 4.3.3. Endogeneity issues

Furthermore, the association between BGD and financial stability may suffer from endogeneity issues (Hermalin & Weisbach, 2001). Specifically, the reverse causality issue is still a concern that attracts lively discussion (see Adams & Ferreira, 2009). To allay this concern, following the method described by C. Chen et al. (2016), we measure financial stability using different time leads.<sup>6</sup> In columns (9), (10), and (11), we replace LnZ with  $LnZ_{t+1}$ ,  $LnZ_{t+2}$ , and  $LnZ_{t+3}$ , respectively. The estimated coefficients of BGD when using different time leads are all consistent with our main finding.

Next, after determining BGD is an endogenous variable, scholars can apply the instrumental approach (Adams & Ferreira, 2009; Adams & Ragunathan, 2017; Abou-El-Sood, 2021). For instance, Abou-El-Sood (2021) employs regulations that require listed firms to disclose policies regarding BGD. Adams and Ferreira (2009) employ the share of males with connections to female directors as an instrument. Focusing on banks, Adams and Ragunathan (2017) use the gender balance in director connections outside their sample. Nonetheless, the denoted instruments are not available for MFIs, which are small and unlisted entities. In addition, it is challenging to find regulation-related or other instruments for MFIs operating in a large number of developing countries as in our data sample.

Following Pathan and Faff (2013), T. Nguyen et al. (2015), and Farag and Mallin (2017), we utilize the two-step system GMM proposed by Blundell and Bond (1998). According to Roodman (2009), system GMM is econometrically feasible for studies that lack external instruments since it allows the use of internal instruments. Moreover, Wintoki et al. (2012) suggest that the dynamic nature of governance features (such as BGD) should be considered, and the system GMM technique can efficiently deal with such dynamic endogeneity (Flannery & Hankins, 2013; Zhou et al., 2014).

Technically, the two-step system GMM integrates both lagged differences and lagged levels that are used as instruments for the differential equation and level equation, respectively (Blundell & Bond, 1998). Thus, all the explanatory variables in our model may be considered endogenous and are subject to being treated as instruments. Further, the utilization of longer lagged values leads to an increase in the number of moment conditions, which in turn causes a downward bias in two-step estimates of standard errors (Distinguin et al., 2013). As a result, our endogenous variables with lagged values are confined to one year exclusively. The reliability of our system GMM estimates is also assessed by using the Arellano—Bond autocorrelation (AR) tests and the Hansen test. Specifically, the purpose of the AR tests is to check the presence of serial correlation in the idiosyncratic error term in levels (Arellano & Bond, 1991). If the null hypothesis of the first-order AR(1) test is disproven, while the second-order AR(2) is approved, there will be an absence of serial correlation in our idiosyncratic errors in level. Otherwise, the Hansen test is used to determine the validity of instruments, and the rejection of the null hypothesis by the Hansen test indicates that the instruments fail to satisfy the conditions of orthogonality (Pathan & Faff, 2013).

In column (12), we show the result using the system GMM estimator.<sup>7</sup> It is found that BGD positively affects financial stability in MFIs when its estimate is positive and significant at the 1% level. In addition, the post-estimation test such as AR1 (p-value = 0.000), AR2 (p-value = 0.449) and Hansen J-test of over-identification (p-value = 0.492) statistically validate the application of system GMM for our analysis. Overall, we find that the positive relationship between BGD and financial stability is insensitive to econometric techniques, confirming a positive association between the two.

#### 4.4. The relations between BGD and financial stability: is risk taking a channel?

We have shown that higher BGD is associated with greater financial stability. This finding is in line with the theoretical ground demonstrating the difference in risk aversion between males and females (Byrnes et al., 1999; Croson & Gneezy, 2009; Fehr-Duda et al., 2006). In this analysis, we ask whether higher BGD is associated with lower risk-taking behavior. In other words, we propose that risk-taking is a potential channel linking BGD and financial stability.

To do so, we follow the method proposed by Baron and Kenny (1986) and estimate the following models:

$$Risk - taking_{i,c,t} = \alpha + \beta * BGD_{i,c,t} + \gamma * F_{i,t,c} + \delta * C_{c,t} + Year \ dummies + \varepsilon_{i,t,c}$$
(3)

#### Table 5. Risk-taking behavior as a potential channel

This table shows the estimated coefficients of model (3) and (4) with random effects. Year dummies are included but not reported for brevity. The definition and source of all variables are shown in Table 1. Robust standard errors adjusted for heteroskedasticity and autocorrelation clustered at the MFI level are in parentheses. Asterisks indicate statistical significance at 10% (\*), 5% (\*\*), and 1% (\*\*\*).

	Risk-taking	<b>Risk-taking</b>	LnZ	LnZ
	(1)	(2)	(3)	(4)
BGD	-0.007**	-0.007**	0.388***	0.378***
	(0.003)	(0.003)	(0.107)	(0.105)
Risk-taking			-28.847***	-28.746***
			(1.937)	(1.926)
LnTA	-0.005***	-0.005***	0.012	0.010
	(0.001)	(0.001)	(0.020)	(0.020)
BSIZE	-0.000*	-0.000**	-0.001	-0.001
	(0.000)	(0.000)	(0.002)	(0.002)
LOANS	-0.030***	-0.029***	0.201	0.140
	(0.009)	(0.009)	(0.213)	(0.213)
DEPOSITS	-0.011**	-0.011**	-0.285**	-0.257**
	(0.004)	(0.004)	(0.128)	(0.129)
PROVISIONS	0.184***	0.184***	-5.554***	-5.395***
	(0.057)	(0.058)	(1.370)	(1.380)
GDPgr		-0.043		0.199
		(0.035)		(0.967)
INFLATION		-0.013		-1.283*
		(0.028)		(0.740)
GOVERNANCE		-0.006		0.264***
		(0.004)		(0.099)
Constant	0.101***	0.096***	4.411***	4.840***
	(0.013)	(0.014)	(0.338)	(0.353)
Observations	1,489	1,489	1,463	1,463
Random effects	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes

$$LnZ_{i,c,t} = \alpha + \beta * BGD_{i,c,t} + \theta * Risk - taking_{i,c,t} + \gamma * F_{i,t,c} + \delta * C_{c,t} + Year dummies + \varepsilon_{i,t,c}$$
(4)

Risk-taking is often measured by earnings volatility (C. Zhang et al., 2021). Thus, to measure MFI risk-taking behavior, we employ the standard deviation of ROA calculated using the three-year window. This is a standard indicator widely applied in the banking and finance literature (see Illiashenko & Laidroo, 2020; Mohsni et al., 2021; Nguyen, Nguyen, et al., 2022 among others). In our data sample, the risk-taking variable has a mean of 0.021 and standard deviation of 0.029. Note that higher values of this variable indicate greater risk-taking.

The result of this analysis is shown in Table 5. We include MFI-level variables in columns (1) and (3), while all controls are employed in columns (2) and (4). It is observed that higher BGD is associated with lower risk-taking (columns 1 and 2) and thereupon lower risk-taking contributes to higher financial stability (columns 3 and 4).

#### 4.5. Additional analysis

Literature targeting the topic of gender diversity has moved beyond the basic relationship between BGD and financial stability. Specifically, scholars aims to understand (i) whether BGD links with financial stability in a non-linear association (e.g., Farag & Mallin, 2017; J. J. Liu et al., 2022), and (ii) whether a group of at least three female directors can enhance financial stability in support of critical mass theory (Gulamhussen & Santa, 2015; Kinateder et al., 2021; Konrad et al., 2008). This study aims to achieve these two objectives. In doing so, we seek to better comprehend the relationship between BGD and

#### Table 6. Additional analysis

This table shows the result of the baseline model (2) when introducing the non-monotonic relationship between board gender diversity (BGD) and financial stability. In column (1), BGD and BGD<sup>2</sup> are included, while in column (2), BGD, BGD<sup>2</sup> and BGD<sup>3</sup> are employed. Control variables and year dummies are included but not reported for brevity. The definition and source of all variables are shown in Table 1. Robust standard errors adjusted for heteroskedasticity and autocorrelation clustered at the MFI level are in parentheses. Asterisks indicate statistical significance at 10% (\*), 5% (\*\*), and 1% (\*\*\*).

	LnZ	LnZ	LnZ
	(1)	(2)	(3)
BGD	0.580	-0.394	
	(0.460)	(0.884)	
BGD <sup>2</sup>	-0.027	2.904	
	(0.466)	(2.191)	
BGD <sup>3</sup>		-2.145	
		(1.512)	
FR1			0.028
			(0.128)
FR2			0.174
			(0.132)
FR3			0.326**
			(0.134)
Constant	2.455***	2.657***	2.901***
	(0.448)	(0.469)	(0.434)
MFI-level controls	Yes	Yes	Yes
Country-level controls	Yes	Yes	Yes
Observations	1,463	1,463	1,463
Random effects	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes

financial stability in MFIs, which has so far attracted only modest attention from scholars. Table 6 presents the results of the analysis.

First, prior studies by Farag and Mallin (2017) and J. J. Liu et al. (2022) suggest that BGD and bank risk may link with each other in a non-monotonic manner. Columns (1) and (2) of Table 6 aim to test this perspective. Specifically, we include BGD<sup>2</sup> in column (1), and BGD<sup>2</sup> and BGD<sup>3</sup> in column (2). It is found that the estimates on BGD and BGD<sup>2</sup> (column 1), and BGD, BGD<sup>2</sup>, and BGD<sup>3</sup> (column 2) are not statistically significant, although they have expected signs. The results reveal that the non-monotonic effects of BGD on financial stability do not exist for MFIs in our sample.

Next, in line with Kinateder et al. (2021), we test whether critical mass theory or tokenism is supported in the case of MFIs. We include three dummies (FR1, FR2, and FR3) in model (2). Specifically, FR1 equals 1 if there is one female on the board and 0 otherwise. FR2 (FR3) equals 1 if there are two (three or more) female directors on the board and 0 otherwise.

The estimate on FR3 is positive and significant. In addition, the size of the coefficient increases as the representation of women on the board increases. This result suggests that the presence of three or more women on the board of directors enhances financial stability when compared with one or two directors. Such a result is consistent with prior literature supporting the critical mass theory (Fan et al., 2019; Joecks et al., 2013; Kinateder et al., 2021; Konrad et al., 2008; Torchia et al., 2011).

#### 5. Conclusion

The influence of gender diversity on boards of directors has long been discussed in finance literature (Reddy et al., 2019). Gender diversity on the board has repercussions for various facets of corporate operations (Adams & Ferreira, 2009; Campbell & Mínguez-Vera, 2008; J. Chen et al., 2018; T. Nguyen et al., 2015). Notably, a growing body of literature suggests a relationship between BGD and risk due to the difference in risk aversion between men and women (Byrnes et al., 1999; Croson & Gneezy, 2009; Fehr-Duda et al., 2006).

Prior studies on the nexus between BGD and financial stability have paid significant attention to banks (Adams & Ragunathan, 2017; Farag & Mallin, 2017; Gulamhussen & Santa, 2015; Kinateder et al., 2021; J. J. Liu et al., 2022; Mateos de Cabo et al., 2012; Palvia et al., 2015). Yet, surprisingly, the association between BGD and the financial stability of MFIs is a glaring omission in the literature. This study aims to fill this gap. We investigate whether BGD is associated with MFI financial stability, and if so, in which direction.

Using a global data sample of 498 MFIs in 82 countries to study the BGD–stability nexus, our findings can be summarized as follows. First, we find a positive relationship between gender diversity and financial stability measured by the Z-score. This positive association is robust to a battery of sensitivity tests, including the use of alternative indicators and various econometric techniques. Second, when validating the mechanism explaining the relationship, we find that higher BGD is negatively associated with risk-taking behavior. Next, our analysis reveals that BGD monotonically links with financial stability, and a non-linear relationship does not exist in our data sample. Lastly, in accordance with other studies (e.g., Kinateder et al., 2021), the research result statistically supports the critical mass theory instead of tokenism.

By conducting an empirical study on the association between BGD and the financial stability of MFIs, we enrich the literature on corporate governance of MFIs (see Chakrabarty & Bass, 2014). In that literature, pioneer researchers have shown that BGD may alter capital structure (Adusei & Obeng, 2019), and performance (Adusei et al., 2017). This study widens the research direction to financial stability, which is critical for ensuring the social missions and goals of MFIs. In doing so, we also join and contribute to the growing literature targeting the determinants of stability of MFIs (e.g., Durango-Gutiérrez et al., 2023; Hossain et al., 2023; Lassoued, 2017; Schulte & Winkler, 2019). Moreover, we empirically test some theoretical grounds related to the effects of BGD such as the

non-linear effect of BGD, critical mass theory and the idea of tokenism. The results from these tests provide a more comprehensive picture regarding the influences of BGD on stability using a context of MFIs around the world.

Our research offers a fruitful avenue for future study. While the influences of gender diversity have long been studied for corporations and banks, the literature targeting MFIs is still in an early stage. Thus, potential research can address the relationship between gender diversity and other essential facets of MFIs such as cost efficiency or profit efficiency (see F. Fall et al., 2018), or social performance (see Beisland et al., 2021; Bibi et al., 2018). In addition, when more detailed information from the MIX Market database is available, scholars can target alternative features of diversity such as national diversity, as in García-Meca et al. (2015). Finally, a deeper investigation regarding potential moderating effects of regulatory and other institutional characteristics on the relationship between gender diversity and financial stability would make a meaningful contribution to the existing literature.

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#### **Disclosure statement**

No potential conflict of interest was reported by the author(s).

#### **Citation information**

Cite this article as: Board gender diversity and financial stability: Evidence from microfinance institutions, Thuy T. Dang, Trang NT Ho & Duc Nguyen Nguyen, *Cogent Economics & Finance* (2023), 11: 2244860.

#### Notes

- 1. See Reddy et al. (2019) and Teodósio et al. (2021) for a review of the literature.
- This indicator is widely used in relevant studies targeting the stability of banks (e.g., Beck et al., 2013; Houston et al., 2010; Laeven & Levine, 2009) or nonfinancial firms (e.g., D. N. Nguyen, Nguyen & Dang, 2022). Unfortunately, we cannot calculate marketbased indicators of risk as in banking literature (e.g., Anginer et al., 2014; D. N. Nguyen & Dang, 2022) due to data limitations.
- 3. We thank an anonymous reviewer for suggesting this variable.
- 4. The dataset can be found at: https://databank.world bank.org/source/mix-market
- 5. For robustness testing, we apply MFI fixed effects, OLS, time fixed effects and country fixed effects. We also use the lead-lag models and System GMM estimator to deal with the endogeneity issue.
- This econometric setting is widely applied in finance research such as C. Chen et al. (2016) and Liang et al. (2023).
- 7. To proceed with system GMM, we modify model (2) to have a standard form of dynamic setting as follows:  $LnZ_{i,c,t} = \alpha + \theta * LnZ_{i,c,i-1} + \beta * BGD_{i,c,t} + \gamma * F_{i,t,c} + \delta$  $*C_{c,t} + Year dummies + \varepsilon_{i,t,c}$

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