Financial Crisis and Female Entrepreneurship:

Evidence from South Korea

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February 28, 2023

Abstract

We document a drastic increase in the number of female-owned manufacturing firms in South Korea following the Korean financial crisis of 1997. During the crisis, a major banking sector reform was conducted, and many underperforming bank branches were forced to close down. We find that female-owned new firms were more likely to be created after the reform in areas where a higher proportion of bank branches had closed down. We present evidence that closed-down bank branches tended to favor male-owned firms, despite male-owned firms having higher risks and lower returns than female-owned firms. We argue that an inefficient banking sector that relied on government bailouts acted against female entrepreneurship before the crisis by incentivizing banks to invest in risky businesses or allowing irrational factors to influence lending decisions. Our findings indicate that the banking sector reform, although not specifically aimed at addressing gender disparities, substantially benefited female entrepreneurs by improving efficiency in the financial market.

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1 Introduction

Entrepreneurship plays a crucial role in driving economic growth. However, women are significantly underrepresented among entrepreneurs. For instance, the World Bank Enterprise Survey shows that across 144 countries, only 14.6% of manufacturing firms are owned by female entrepreneurs. Many policy interventions have been unsuccessful in promoting female entrepreneurship, and how to effectively promote female entrepreneurship has become an important issue in many countries.

Figure 1 illustrates the proportion of female-owned establishments out of all newly established non-incorporated manufacturing establishments in South Korea with at least five employees from 1982 to 2005. Between 1982 and 1996, the female share remained consistently low and stable, with approximately 3% and 6% shares in the early 1980s and 1996, respectively. However, the female share among new entrepreneurs experienced a remarkable surge between 1997 and 1999. In 1997, the share increased to 9%, and in 1999, it reached 14%. It took over 15 years for the female share among entrepreneurs to increase by three percentage points, but it grew by eight percentage points in just two years after 1997. This paper aims to explore the reasons behind the consistently low number of female entrepreneurs in the manufacturing sector for over 15 years and the sudden surge after 1997.

Understanding the trend described above is important for several reasons. First, the manufacturing sector in South Korea, which is the focus of this study, accounted for 87% of all manufacturing employment between 1996 and 2005.[1] Therefore, the trend captures the emergence of transformational female entrepreneurs with high growth potential, who have a distinct role to play in driving economic development compared to those who start businesses for subsistence income (Schoar (2010)).

Second, South Korea is one of the few countries that have experienced rapid economic growth. In 1961, the GDP per capita of South Korea was comparable to that of Ghana, Sudan, and Nepal, but it had grown at an annual rate of 9% from 1961 to 1996, reaching a level comparable to that

[1] Source: Census on Establishments. The initial year of the census is 1996.

of Portugal, Spain, and New Zealand in 1996.[2] Although gender gaps in other economic activities such as education, labor supply, and wages have continuously decreased (sections 6.5 and 6.6), female entrepreneurship in South Korea remained stagnant until 1996, indicating that economic development alone is insufficient to close gender gaps in entrepreneurship. The case of South Korea provides an empirical context that can help other developing countries understand the various gender-specific barriers to female entrepreneurship and how to remove them.

Finally, the sudden and episodic increase in female entrepreneurship provides an opportunity to identify the sources of the gender gap in entrepreneurship. Distinguishing the role of gender-specific barriers from innate differences between men and women is empirically challenging. However, the significant increase in female entrepreneurs in South Korea after 1997 is more likely to have been driven by changes in gender-specific barriers rather than innate differences because innate characteristics are less likely to change within a short period.

In 1997 and 1998, the Korean financial sector experienced an unprecedented shock induced by the foreign exchange crisis, known as the "Korean Financial Crisis of 1997."[3] Along with the bankruptcy of several conglomerates (Chaebols), many Korean banks failed to repay their short-term foreign liabilities. In response, the South Korean government and the International Monetary Fund (IMF) agreed on December 4, 1997, that the IMF would provide a financial package worth 21 billion USD under the condition that the government implement IMF-supported programs. Identifying the inefficient banking sector as the root cause of the crisis, the IMF and the South Korean government conducted a banking sector reform to restore the confidence of foreign investors.

Prior to the crisis, no bank in South Korean history had ever failed. The banks' belief that the government would provide bailouts in the event of a crisis, coupled with an ineffective regulatory regime, led them to engage in highly risky investments and poor lending practices. By the end of

[2]Source: World Bank.

[3]During the same period, many Asian countries experienced a foreign exchange crisis. This series of foreign exchange crises in Asia is often called the "Asian Financial Crisis."

1997, the balance sheets of many Korean commercial banks consisted of a large number of nonperforming loans, and 14 out of 26 commercial banks failed to satisfy the required 8% BIS (Bank for International Settlements) capital adequacy ratio. The main focus of the banking sector reform was on the resolution of troubled banks and the disposal of nonperforming loans. Using market-oriented evaluation criteria, five non-viable banks were forced to close down, and the remaining banks were required to downsize their branches and lay off employees. All the good assets, liabilities, and depositor contracts were transferred to other healthier banks' branches for the five closed banks, or to better-managed bank branches within the same bank for other surviving banks. As a result, the reform effectively replaced inefficient bank asset management with better management. Throughout the reform in 1998, 1,008 bank branches disappeared, which corresponded to approximately 16% of the bank branches at the end of 1997.

Start-up firms in the manufacturing sector often require substantial capital and labor inputs from the outset, and local commercial banks are the primary external funding source for most small and medium-sized Korean manufacturing enterprises. Given the close proximity between these firms and bank branches, we use a geographical variation of banking sector reform to assess its impact on female entrepreneurship. Specifically, we measure the extent of the banking sector reform across regions using the percentage changes in bank branches between 1997 and 1998 across counties. We find a significant increase in the number of new female-owned firms and a corresponding decrease in the number of new male-owned firms in counties that were more severely impacted by the banking sector reform following the crisis. This finding remains robust even after controlling for industry fixed effects or using changes in the number of bank workers between 1997 and 1998 as an alternative measure of the banking sector reform. Given the nature of banking sector reform and the resulting changes in bank branches, our finding indicates that the rise of female entrepreneurs was more prominent in areas where a larger share of inefficient bank branches existed before the reform.

To understand the underlying mechanisms behind our empirical findings, we first consider the optimal investment strategy of banks based on their beliefs about a government bailout. The belief in a potential bailout and inadequate government supervision can create a moral hazard problem for banks, leading to excessive investment in risky projects. Our analysis indeed shows that male-owned firms had a significantly higher failure rate compared to female-owned firms before the banking sector reform. Additionally, we find evidence that banks in the areas that were hit harder by the reform were more likely to lend to risky businesses. Following the reform, many commercial banks shifted their portfolio towards safer assets, and this change in investment strategy could explain the observed pattern in the data. From the banks' perspective, female-owned firms could be considered safer assets than male-owned firms, which could account for the increased funding for female entrepreneurship after the reform.

However, the first mechanism alone cannot fully explain the low level of female entrepreneurship prior to the banking sector reform. If banks' investment in male-owned firms is solely driven by higher returns, then the returns from male-owned firms should have been greater than those of female-owned firms among the surviving firms. However, we found the opposite to be true: on average, female-owned firms had a higher revenue product of capital than male-owned firms before 1997. Therefore, it appears that banks had not fully capitalized on better investment opportunities that would have generated higher returns and lower risks prior to the reform. Additionally, we observed that the gender gap in the revenue product of capital was more pronounced in areas that were hit harder by the reform, which suggests that the cross-sectional variation of female entrepreneurship that we documented earlier cannot be fully explained by banks' optimal investment strategy alone. We provide evidence that poor lending practices before the reform may have been acting against female firms by creating an environment where irrational screening processes, such as discrimination, affect lending decisions. During the reform, banks with poor loan management were forced to close down, and

many commercial banks improved their lending practices, which favored female entrepreneurs. After the reform, both the failure rate and the revenue to capital ratios between female- and male-owned firms became equalized.

Our findings demonstrate how an inefficient banking sector that relies on a government bailout can discourage female entrepreneurship by either incentivizing banks to invest in risky businesses or creating an environment where irrational factors affect lending decisions. Furthermore, our results highlight that how policies aimed at improving the efficiency of the banking sector, although not specifically targeting gender disparities, can benefit female entrepreneurs.

We explore alternative explanations given that the financial crisis affected the South Korean economy in many different ways. Our findings indicate that gender-specific barriers in the labor market, product market, or intermediary goods market cannot account for the significant surge in female entrepreneurship in the manufacturing sector. We further demonstrate that joint labor supply and business transfer within households, changes in women's characteristics or outside options, demand-side factors, and government policies are not the primary drivers of the rise in female entrepreneurship in South Korea.

This paper contributes to the literature by investigating barriers to female entrepreneurship (e.g., Chiplunkar and Goldberg (2021); Morazzoni and Sy (2022)). Using an incidence of banking sector reform driven by a financial crisis, our findings clearly demonstrate how an inefficient banking sector can impede high-growth potential female entrepreneurship. Our paper also complements recent studies that explore promoting female entrepreneurship through financial subsidy policies in developing countries (e,g., De Mel et al. (2008, 2009); Karlan and Valdivia (2011); Field et al. (2013); Fafchamps et al. (2014); Banerjee et al. (2015a,b); Meager (2019)). We suggest that promoting efficiency in the banking sector can substantially increase transformational female entrepreneurship, even without direct subsidies to female entrepreneurs. Finally, our paper relates to the literature discussing

the cleansing effect of recessions, where resources are reallocated from less productive firms to more productive ones (e.g., Schumpeter (1942); Caballero et al. (1994); Barlevy (2003); Ouyang (2009); Osotimehin and Pappadà (2017)). Our findings illustrate a novel mechanism for the cleansing effect, showing how a banking sector reform driven by a recession can facilitate the reallocation of resources from less productive male-owned firms to more productive female-owned firms.

The paper is organized as follows. Section 2 discusses motivating facts about female entrepreneurship in Korean manufacturing industries. Section 3 describes the Korean financial crisis of 1997 and the resulting banking sector reform. Section 4 presents the main empirical findings, and the mechanisms behind the main findings are discussed in section 5. Section 6 discusses alternative explanations. Section 7 concludes.

2 A Rise of Female Entrepreneurship in South Korea

In this section, we document how female entrepreneurship evolved in the South Korean manufacturing sector between 1982 and 2005. To this end, we use the Mining and Manufacturing Survey, an annual establishment-level survey that covers *all* establishments with at least five employees in South Korea operating in the mining and manufacturing industry. The survey provides ownership information (incorporated or non-incorporated), the number of owners, and the gender of each owner for non-incorporated firms. To focus on the manufacturing industry, we remove all observations categorized under mining industries.[4]

We define a female-owned firm as a non-incorporated establishment whose owners consist of only females. We use "firm" and "establishment" interchangeably throughout the paper. Similarly, a male-headed firm is defined as a non-incorporated establishment whose owners consist of only males. We do not categorize an establishment with both male and female owners as a female-owned firm because

[4] A detailed explanation of the dataset can be found in the Appendix A.

those establishments are more likely to be family-owned, and the characteristics of a family-owned business could be different from those solely owned by females. (e.g., Rigbi et al. (2018)).

Although they constitute a small proportion of all establishments in South Korea, the manufacturing establishments with at least five employees are an important subset for understanding South Korean economic development. Rapid economic growth in South Korea was largely driven by the manufacturing industries, and establishments in the manufacturing sector with at least five employees, which are the subject of our study, created 87% of all manufacturing employment between 1996 and 2005 in South Korea.[5] Therefore, our sample captures transformational entrepreneurs with high growth potential who play a different role in economic development from those who become entrepreneurs for subsistence income, as emphasized by Schoar (2010).

Figure 1 depicts the proportion of female-owned firms among all non-incorporated new firms from 1982 to 2005. A new firm is defined as an establishment that was established in the survey year. The share of female-owned firms among entrants was low and stable between 1982 and 1996. For example, the share was about 3% and 6% in the early 1980s and 1996, respectively. However, the female share among entrants increased dramatically between 1997 and 1999. In 1997, the share increased to 9%, and in 1999, it reached 14%. It took more than 15 years for the female share among entrants to increase by 3 percentage points, and in just three years, it increased by 8 percentage points.

Figure 2 displays the number of female-owned new firms from 1982 to 2005. The number of female-owned new firms increased from 58 in 1982 to 281 in 1996. However, a dramatic increase in the number of female new firms is observed after 1997. For example, the number of female-owned new firms became 716 in 1999, which remained high in the early 2000s. Note that the number of female-owned new firms in 1997 was similar to the ones in 1995 and 1996 and substantially increased since 1998. On the other hand, a sudden jump in the share of female-owned firms among entrants is observed in 1997, indicating that an unusually low number of male-owned firms were created in 1997.

[5]Source: Census on Establishment

The increase in female entrepreneurship is observed even after controlling for industry-fixed effects. To demonstrate this point, we estimate a linear probability model that measures the likelihood of a new firm being female-owned, while including year dummies and an industry-fixed effect. We use the 2000 version of the Korean Standard Industry Classification (KSIC) and control for industry at the 3-digit level. The results are shown in Figure 3. Even after controlling for industry-fixed effects, the pattern observed in Figure 1 remains the same, suggesting that the rise in female entrepreneurship after 1997 is not driven by a small number of industries.

Finally, we estimate a linear probability model of the proportion of female-owned firms among all firms, including incumbent firms, with year dummies after controlling for the 3-digit industry fixed effect. The estimation result is shown in Figure 4. The share of female-owned firms remained low and stable between 1982 and 1996. However, it increased dramatically after 1997, suggesting that the sudden increase in female entrants after 1997 contributed to the sharp rise in female entrepreneurship after 1997.

To better understand the industry composition of newly created female-owned firms after 1997, we present the number of female-owned new firms in the 2-digit industry categories for the five years before and after 1997 in Table 1. Except for the industry category of Office, Accounting, and Computing Machines, the number of female-owned new firms increased after 1997 for all industry categories, which is consistent with Figure 3. Compared to the period between 1992 and 1996, the number of female-owned new firms increased by an average of 138% between 1997 and 2001. The rise of female entrepreneurship was observed not only in traditionally female-dominated industries such as textile or clothing products but also in other industries producing communication devices, medical equipment, and motor vehicles.

We next examine the demographic characteristics of female entrepreneurs before and after 1997. As the Mining and Manufacturing Survey does not contain information on entrepreneurs' demographic

characteristics beyond sex, we use data from the 1995 and 2000 versions of the Population and Housing Census. Since the census surveys all residents in South Korea every five years, we can observe changes in the demographic composition of female entrepreneurs in the manufacturing sector before and after 1997. Table 2 summarizes the college attendance rate, marital status, and age distribution of female employers in the manufacturing industry in 1995 and 2000. We find that most demographic characteristics, such as age, college attendance rate, and marital status, are similar between 1995 and 2000, suggesting that the rise of female entrepreneurship after 1997 is not driven by a particular demographic group.

3 The Korean Financial Crisis of 1997

The sudden rise in female entrepreneurship after 1997 raises questions about what happened in South Korea during that year. In 1997 and 1998, the Korean financial sector experienced an unprecedented shock induced by the foreign exchange crisis, commonly referred to as the "Korean Financial Crisis of 1997."[6] In this section, we provide an overview of the Korean Financial Crisis of 1997 and the banking sector reform that followed the crisis.

In the early 1990s, Korean banks financed the investment demands of Korean manufacturing companies using short-term foreign-currency-denominated debts. The banks' balance sheets comprised a large amount of foreign short-term debts and loans to domestic companies that were typically used for long-term investment projects. At the same time, high debt-equity ratios with low returns on assets were pervasive problems among Korean manufacturing companies in the 90s. Since early 1997, many Korean conglomerates (Chaebols) have filed for bankruptcy due to their highly leveraged investments in less-profitable projects. Concerns about the soundness of financial institutions and Chaebols made it difficult for Korean banks to roll over their short-term foreign liabilities. The government often in-

[6]For more information about the Korean Financial Crisis of 1997, refer to Krugman (1999); Lane (1999); Ubide and Baliño (1999); Ghosh et al. (1999); Boorman et al. (2000); Cho (2002); Lee (2011).

tervened in the foreign exchange market to maintain the exchange rate within a certain range, and the Bank of Korea used its foreign exchange reserves to meet Korean banks' need for foreign currencies. However, as more foreign investors refused to roll over their loans, usable foreign exchange reserves had declined dramatically by early December 1997, and the Korean won had depreciated by over 20 percent against the US dollar. On December 4, 1997, the South Korean government and the IMF agreed on an IMF financial package worth 21 billion USD under the condition that the government implements IMF-supported programs.

3.1 Financial Crisis and Banking Sector

The IMF identified an inefficient financial market as the root cause of the financial crisis. By the end of 1997, many financial institutions had balance sheets that consisted of a large number of nonperforming loans.[7] Commercial banks, in particular, held 82.5 percent of all nonperforming loans among banks and 78 percent among all financial institutions. Additionally, 14 out of 26 commercial banks failed to meet the government's requirement of an 8% BIS capital adequacy ratio. The large number of nonperforming loans and the low capital ratios raised doubts about the creditworthiness of Korean financial institutions and undermined confidence in the South Korean currency. Therefore, in addition to monetary and fiscal policies, the IMF-supported programs included structural reforms that focused on the financial sector, particularly the commercial banking sector.[8]

Before presenting the banking sector reform driven by the financial crisis, we first discuss why most commercial banks performed poorly before 1997. On the surface, most commercial banks failed to properly price the risk associated with their loans. Before the financial crisis, Korean commercial

[7]Loans in December 1997 were classified into three categories: normal (loans in arrears by less than three months), precautionary (loans in arrears by three months to less than six months), and standard and below (loans in arrears by no less than six months). Nonperforming loans refer to loans classified as either precautionary or standard and below.

[8]The other reforms include measures to facilitate corporate restructuring, capital account liberalization, and privatization. However, as shown in the first Letter of Intent from the government of Korea (December 3, 1997), the primary focus of the reforms was on the financial market. For more information about the banking sector reform in South Korea, refer to Ji and Park (1999); Lee (2002); Cho (2002); Shin (2003); Akama et al. (2003); Kim et al. (2006).

banks had few skills in credit analysis and risk management. For example, lending decisions were largely based on the value of collateral rather than on an assessment of risk or future repayment capacity. Additionally, banks' standards for risk concentration or large exposures to risks were lax, and most banks lacked a good risk management system (Ubide and Baliño (1999)).

At the root of the problem could be the implicit government guarantee of a bailout in case of severe losses. Prior to the banking sector reform driven by the IMF program, no bank in South Korean history had ever failed. This belief in the government guarantee led banks to invest in highly risky projects and may have reduced their incentive to develop screening technology capable of distinguishing between good and bad firms (Krugman (1999)).

An ineffective regulatory regime made the problem worse. For example, the Office of Bank Supervision, which was an internal organization of the Bank of Korea (BOK), was in charge of supervising commercial banks, but the trust business of commercial banks was under the supervision of the Ministry of Finance and Economy (MOFE). Moreover, only MOFE had the authority to grant and revoke bank licenses. This division of regulatory responsibility may have led to coordination failures between BOK and MOFE in monitoring the corporate governance of commercial banks. In addition, an informal and close relationship between financial institutions and regulatory organizations prevailed before the financial crisis, and the government often appointed former regulators to management positions in financial institutions (Ji and Park (1999)).

3.2 Banking Sector Reform

The banking sector reform began by consolidating supervisory agencies. In April 1998, the Financial Supervisory Commission (FSC) was created to combine the roles previously assumed by BOK and MOFE. In order to ensure its independence from other government authorities, the FSC was established as an independent agency under the Office of the Prime Minister. The FSC implemented several measures to improve the governance framework for banks. For example, the loan classification

standards and provisioning requirements were updated to meet international standards.[9]

The main focus of the banking sector reform was on the closing or resolution of troubled banks and the disposal of nonperforming loans. First, among the 14 commercial banks that failed to satisfy the required 8% BIS capital adequacy ratio, the South Korean government recapitalized two insolvent banks (Korea First Bank and Seoul Bank) in January 1998. The newly established FSC required the remaining 12 banks whose BIS ratio was below eight percent to submit their rehabilitation plan by April 30, 1998. In evaluating the plans, the FSC announced that it would set up and follow transparent and objective procedures to minimize conflicts with the involved parties and obtain justification for public funding. The 12-member Bank Appraisal Committee was formed, and they evaluated the rehabilitation plans based on (1) capital adequacy, (2) recapitalization plan, (3) asset quality classification, (4) reduction plan for risky assets, (5) cost reduction scheme, and (6) management improvement plans.

As a part of the review, accounting firms conducted a due-diligence review of those 12 banks from 1 May to 8 June 1998 with the new loan-specification criteria. Table 3 shows the result of the due diligence reviews, published on July 1, 1998. The assessment results reveal that 8 out of 12 banks had a negative BIS ratio, meaning the liabilities exceed the risk-weighted asset values. The value of nonperforming loans out of the total loan values (NPL ratio) was also very high for all 12 banks: the average NPL ratio was 30%. After evaluating the rehabilitation plans, the Bank Appraisal Committee concluded five banks were non-viable based on the pre-announced selection criteria and disapproved of their plans.[10] The remaining seven banks' rehabilitation plans were approved under the condition that they follow the government-guided rehabilitation plans.[11]

[9]Prior to the crisis, loans were classified as normal (loans in arrears by less than 3 months), precautionary (loans in arrears by 3 months to less than 6 months), or standard and below (loans in arrears by no less than 6 months). The new specification classified loans as normal if loans were in arrears by less than 1 month, precautionary if loans were in arrears by 1 month to less than 3 months, or standard and below if loans were in arrears by no less than 3 months. The provisioning requirements for each loan status were also strengthened. The new loan specification was officially adopted in June 1998.

[10]Kangwon bank could avoid liquidation despite the second-highest NPL ratio because the bank proposed a voluntary merger with Hyundai Merchant Bank, and the Bank Appraisal Committee approved it.

[11]The reform process draw national attention and the detailed review process was made public. The review result

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Based on the evaluation result, the FSC ordered the five banks to immediately close down, marking the first bank failures in South Korean history after the Korean War. Their good assets and liabilities were transferred to five designated banks with healthier balance sheets under the Purchase of Assets and Assumption of Liabilities (P&A) arrangement. The board, top managers, and many staff members of the suspended banks were laid off. The branches of the suspended banks were either closed or merged with the acquiring banks' branches. All the depositor contracts were transferred to the acquiring banks.[14]

Throughout the process, a large amount of public funds was injected into the banking sector. The government purchased the nonperforming loans of the five acquired and acquiring banks and injected capital into them to prevent the acquiring banks' capital ratios from falling. Public funds were also used for recapitalization and the purchase of nonperforming loans of the remaining banks. To qualify

was announced at the press conference on June 29, 1998. On the same day, the chairman of FSC published a public statement explaining the necessity of bank closures and seeking an understanding from the public.

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[14]From the depositors' point of view, nothing changed except the name of their banks and available bank branches, as their funds were transferred to the acquiring banks and they continued to have access to their deposits through the new banks' branches and services.

for this government assistance, banks were required to downsize their branches and lay off employees, and they were also encouraged to seek voluntary mergers.

Table 4 summarizes the changes in the banking sector in 1998. At the beginning of the year, there were 26 commercial banks. As a result of the reforms, about 680 branches of the five closed down banks disappeared, while the number of branches of the five acquiring banks increased. However, the magnitude of the increase was only about 40% of the number of branches that disappeared due to bank closures, suggesting that many branches of the acquired banks were closed down. Almost all of the remaining banks (except for the five acquiring banks) reduced their number of branches, particularly the conditionally approved banks. Overall, 1,008 bank branches disappeared within one year, which corresponds to about 16% of the number of bank branches at the end of 1997.

The injection of public funds, together with closing down less-profitable branches and downsizing of the workforce, reduced nonperforming loans and improved banks' profitability. The composition of banks' loans also changed toward safer assets after the crisis. For example, the share of loans to households increased dramatically from less than 30% of the total loans before the crisis to nearly 50% in 2002 (Shin (2003)).[15] In addition, the loan screening practice of banks was improved after the crisis. Before the crisis, the lending decision typically relied on the amount of collateral and an individual banker's subjective evaluation. After the crisis, many banks developed their own credit rating systems to evaluate corporate loans. The lending decision became more systematic, with loans being reviewed by multiple loan officers, including specialized loan officers in headquarters. The loan screening process became recorded, and the loan review after lending became a common practice.[16]

After the reform, the banking sector showed improvement in several performance measures. For instance, the BIS capital ratio increased from 7.04% in 1997 to 10.91% in 2001, and the ratio of

[15]Commercial banks considered the expected losses from consumer loans to be lower than corporate loans because they can construct a well-diversified portfolio from numerous small-sized consumer loans.

[16]Improving commercial banks' lending practices was a policy target by the FSC. In January 1999, the FSC formed a task force to improve the loan process and monitored commercial banks' development of better loan screening processes and risk management.

bad loans to total loans decreased from 6.0% in 1997 to 3.3% in 2001.[17] Commercial banks' average return on assets (ROA) also improved from -1.06% in 1997 to 0.76% in 2001.[18]

4 Banking Sector Reform and Female Entrepreneurship

In this section, we demonstrate how the rise of female entrepreneurship is associated with the banking sector reform that took place after the crisis.

The Mining and Manufacturing Survey shows that a significant amount of assets and wage bills are required to start a manufacturing establishment.[19] Between 1982 and 1996, the median asset value and median wage bill for new unincorporated manufacturing establishments were 72 million and 59 million 2015 Korean won, respectively.[20] Given the large amount of funds required from the beginning, many potential start-up owners would need external financing to establish their business. On the other hand, small and medium-sized enterprises in South Korea largely rely on commercial banks for financing. For example, Choi (2004) shows that between 2002 and 2004, approximately 95% of the external funds for small and medium-sized manufacturing enterprises were financed from commercial banks. Therefore, the large-scale banking sector reform in 1998 was more likely to have an impact on start-up financing in manufacturing firms with high-growth potential.

To capture the effects of the banking sector reform in 1998, we use the Census on Establishments, which has surveyed establishments with one or more employees doing business in South Korea at the end of each year since 1996. The dataset provides basic information on each establishment, such as industry, location, and the number of employees. We focus on the 3-digit industry code (651) for "General Financial Intermediation" in 1997 and 1998. This category includes the central bank, specialized banks, commercial banks, savings banks, and merchant banks.[21] As a result, the

[17] Bad loans are the loans classified as standard and below (loans in arrears by no less than 6 months).
[18] Source: Bank Management Statistics, Financial Supervisory Service.
[19] The Mining and Manufacturing Survey does not provide the number of debts for non-incorporated establishments.
[20] During the period between 1982 and 1996, the exchange rate was approximately 750 Korean won per 1 USD
[21] The specialized banks include the National Agricultural Cooperative Federation, the National Federation of Fisheries

total number of establishments in the General Financial Intermediation industry category is greater than the number of bank branches listed in Table 4. Nevertheless, the changes in the number of establishments between 1997 and 1998 (-1,141) are comparable to the changes in the number of bank branches in Table 4 (-1,008), indicating that the changes in the number of establishments between 1997 and 1998 in the General Financial Intermediation industry category were mainly driven by the banking sector reform, particularly the reform in the commercial banking sector.

It is well-documented that small and medium-sized firms tend to borrow from nearby banks, due to transaction or monitoring costs (e.g., Degryse and Ongena (2005)). A similar pattern is observed in South Korea. Using a survey of 409 small and medium-sized firms located in Busan, the second most populous city in South Korea, Choi (2011) found that 42% of firms were located within a 10-minute distance, and 78% of firms were located within a 30-minute distance from the bank branches from which they mainly borrowed. Similarly, Lee et al. (2013) analyzed a nationwide bank's loans to 72,956 small and medium-sized manufacturing firms between 2006 and 2010 and found that more than 60% of those firms were located in the same county as the bank branch from which they borrowed.[22]

Given this proximity between manufacturing firms and bank branches, we use a geographical variation of banking sector reform to estimate the reform's impact on female entrepreneurship. Specifically, we construct the following measure to capture the extent of banking sector reform across regions:

$$\text{B.Reform}_c = \ln\left(\frac{\text{Bank}_{c,1997}}{\text{Bank}_{c,1998}}\right), \tag{1}$$

where $\text{Bank}_{c,1997}$ and $\text{Bank}_{c,1998}$ are the total numbers of bank establishments in county c at the end of 1997 and 1998, respectively. B.Reform_c captures the percentage change in the number of bank

Cooperatives, and the National Livestock Cooperatives Federation.

[22] Administrative divisions of South Korea can be classified into (1) large-sized areas (Si-Do), (2) medium-sized areas (Si-Gun-Gu), and (3) small-sized areas (Eup-Myeon-Dong). Based on the average population for each geographical unit, the medium-sized areas are comparable to counties in the United States. For this reason, we refer to the Si-Gun-Gu areas as counties throughout the paper.

establishments in county c between 1997 and 1998. We consider the change in bank establishments in 1998 to capture the extent of reform across regions because the close-down of bank branches in 1998 was mostly forced by the government as a part of the banking sector reform, as illustrated in section 3. In Appendix B, we construct an alternative measure by using the percentage change in the number of bank employees across counties and show that our findings are robust to this alternative measure.

The historical context provides us with a clear interpretation of the measure. As shown in Table 4, most of the changes in bank branches in 1998 were due to failed or conditionally approved banks during the reform in an attempt to weed out less profitable banks or bank branches. All assets, liabilities, and depositor contracts were transferred to other healthier bank branches for the five failed banks or to better-managed bank branches within the same bank for other surviving banks. Consequently, the changes in the total amount of credit available to firms were relatively small compared to the changes in the aggregate number of bank branches. For instance, in the manufacturing sector, the total loan amounts provided by commercial and specialized banks were 69,473.9 billion won in 1996 and 74,288.7 billion won in 1997. This figure reduced to 70,688.8 billion won in 1998 but rebounded to 79,818.1 billion won in 1999. Therefore, the measure (1) captures the extent to which less productive bank management is replaced by more productive ones across regions without significantly affecting the overall level of credit supply.[23]

Based on the above historical facts and institutional background, we investigate the impact of the banking sector reform on female entrepreneurship by estimating the following difference-in-difference

[23] After 1998, many banks voluntarily merged with each other, and the nature of such changes is less clear. For example, suppose Bank A and Bank B decide to merge for strategic reasons at the headquarters level. In that case, the new bank would combine two nearby bank branches previously affiliated with each bank to save operational costs, even though both branches perform well.

equation:

$$\text{Female (male) new firm}_{c,t} = \beta_{s\in\{f,m\}} \cdot (\text{B.Shock}_c \cdot \text{Post}_t) + \tau_t + \tau_c + \epsilon_{c,t}. \quad (2)$$

Female (male) new $\text{firm}_{c,t}$ is the number of new firms in county c in each year t, where the owner(s) of the firm are only females (males). Post_t is a dummy variable that equals one if the year t is 1998 or after, indicating the post-reform period. τ_t and τ_c are the year and county fixed effects, respectively, and $\epsilon_{c,t}$ is the error term.

To estimate equation (2), we merge the Mining and Manufacturing Survey with the Census on Establishments using the county id (5-digit Korea Administrative District Code). A significant change in district classification occurred in 1992 in the Mining and Manufacturing Survey, and for this reason, we estimate equation (2) using observations between 1992 and 2005. Consistent with section 2, we define a female (male) firm as a non-incorporated establishment whose owner(s) consist of only females (males) and a new firm as an establishment that was established in the survey year.

Panel A and C of Table 5 show the summary statistics for each variable. The average number of female-owned new firms in each county was one. After the reform, however, the average number of female-owned new firms increased from 1 to 2.51. In contrast, the average number of male-owned new firms in each county decreased from 17.45 between 1992 and 1997 to 12.59 between 1998 and 2005. On the other hand, in Panel C, about 72% of all counties experienced a reduction in bank establishments, and on average, 8% of bank establishments in a county disappeared in 1998.

Figure 5 further shows the geographical variation of the B.Reform variable. The areas where five disapproved banks were located experienced a relatively larger decrease in bank establishments. For example, Gyeonggi province, Chungcheongnam province, Gyeongsangbuk province, and Gyeongsangnam province correspond to areas where four of the five failed banks' branches were mainly located,

and these are the provinces hit harder by the banking sector reform.[24]

The estimation result for equation (2) is shown in Panel A of Table 6. The estimate for β_f is 3.265, indicating that a county that experienced a 10% reduction in bank branches between 1997 and 1998 produced about 0.33 more female-owned new firms after the reform than a county that experienced no change in bank branches between 1997 and 1998. On the contrary, the estimate for β_m is -12.844, suggesting that a county that experienced a 10% reduction in bank branches between 1997 and 1998 generated about 1.3 fewer male-owned new firms after the reform than a county with no bank-branch changes during the reform. Put differently, compared to the county at the 10th percentile of B.Reform, 0.97 more female-owned new firms and 3.81 fewer male-owned new firms were created in the county at the 90th percentile of B.Reform after the reform.[25] Note that the average number of female-owned new firms at the county-year level between 1992 and 1997 is one. Therefore, the 90-10 percentile difference of the reform measure generated an increase in the number of female-owned new firms that is roughly equivalent to the average number of female-owned new firms before the reform.

Male and female entrepreneurs may have different comparative advantages across different industries, and the industry composition across different counties may affect the estimation result. To control the industry fixed effect, we use the following specification:

$$\text{Female (male) new firm}_{c,d,t} = \beta_{s\in\{f,m\}} \cdot (\text{B.Reform}_c \cdot \text{Post}_t) + \tau_t + \tau_{c,d} + \epsilon_{c,d,t}. \tag{3}$$

Female (male) new firm$_{c,d,t}$ is the number of female (male) new firms for each 2-digit industry d, in county c, in each year t. Post$_t$ is a dummy variable that equals one if the year t is 1998 or after. τ_t and $\tau_{c,d}$ are the year and county-industry fixed effects, respectively. $\epsilon_{c,d,t}$ is the error term. The standard

[24] Gyeonggi province, Chungcheongnam province, Gyeongsangbuk province, and Gyeongsangnam province were the main provinces for Kyungki bank, Chungchong bank, Daedong bank, and Dongnam bank, respectively.

[25] The top and bottom 10 percentiles of the B.Reform measures are 0.223 and -0.074, respectively.

errors are clustered at the county-industry level. Note that the observation in equation (2) is at the county level, whereas the observation in equation (3) is at the county-industry level. In other words, we further divide a county cell for each 2-digit industry and consider the county-industry cell as one observation. As a result, the mean value of the female and male new firm at the county-industry-year level is about 10 times smaller than the county-year level (Panel B of Table 5).

The estimation result for equation (3) is shown in Panel B of Table 6. The estimates of β_f and β_m are 0.159 and -0.696, respectively, and for both estimates, the p-value is less than 0.001. The estimates imply that a county-industry unit located in a county that experienced a 10% reduction in bank branches between 1997 and 1998 generated about 0.02 more female-owned new firms and 0.07 fewer male-owned new firms after the reform than a county-industry unit located in a county without bank-branch changes during the reform. The estimates also imply that compared to the county at the 10th percentile of the reform measure, 0.05 more female-owned new firms and 0.21 fewer male-owned new firms were created in the county at the 90th percentile after 1998. As shown in Panel B of Table 5, the average number of female-owned and male-owned new firms at the county-industry-year level between 1992 and 1997 is 0.06 and 1.12, respectively. Therefore, the 90-10 percentile difference in B.Reform$_c$ generated about the average number of female-owned new firms before the banking sector reform. On the contrary, the number of male-owned new firms became smaller for the counties hit harder by the reform. Overall, the results from equation (2) are qualitatively and quantitatively robust even after controlling for the 2-digit industry fixed effect.

To check the pre-trend and to capture the dynamic effects associated with the banking sector reform, we estimate the following event study models:

$$\text{Female (male) new firm}_{\,c,t} = \sum_{t=1992}^{2005} \beta_{s\in\{f,m\},t} \cdot (\text{B.Reform}_c \cdot I_t) + \tau_t + \tau_c + \epsilon_{c,t} \tag{4}$$

$$\text{Female (male) new firm}_{\,c,d,t} = \sum_{t=1992}^{2005} \beta_{s\in\{f,m\},t} \cdot (\text{B.Reform}_c \cdot I_t) + \tau_t + \tau_{c,d} + \epsilon_{c,d,t}. \tag{5}$$

Equation (4) and (5) are the same as equation (2) and (3), respectively, except that we replaced the Post_t dummy with a series of year dummies (I_t). The standard errors are clustered at the county-year level in equations (5).

Figures 6 and 7 show the estimates and their 95% confidence intervals for equations (4) and (5), respectively. Both figures exhibit remarkably similar patterns. First of all, we do not find any pre-trend associated with the number of female-owned new firms that correlates with the reform measure; before 1998, the changes in the number of female-owned new firms from the base year (1996) were not associated with the B.Reform variable. However, the changes in the number of female-owned new firms exhibit a positive and significant association with the reform measure after 1998. Moreover, the impact of the banking sector reform was persistent until 2004.

A less clear pattern is observed for male-owned new firms. We do not see a clear pre-trend associated with the banking sector reform, but at the same time, the number of male-owned new firms tended to be higher in 1993 and 1995 in the counties later hit harder by the banking sector reform. Given the nature of the banking sector reform and resulting changes in bank branches, this pattern suggests that unusually many male-owned new firms were created in 1993 and 1995 in the counties where the 14 undercapitalized banks were mainly located. In section 5.1, we provide evidence that the 14 undercapitalized banks tended to invest in risky businesses before the reform. Taken together, Figures 6(b) and 7(b) suggest that excessive investment in risky male-owned businesses in the early 1990s may have led the 14 undercapitalized banks to have a large number of nonperforming loans before the reform, eventually making them a policy target during the banking sector reform.

5 Understanding Mechanisms

In this section, we explore potential mechanisms that could explain the empirical findings discussed in section 4.

5.1 Banks' Beliefs about Bailout and Excess Investment in Risky Projects

One possible explanation for the gender gap in credit accessibility prior to the financial crisis is related to banks' beliefs about bailouts. In South Korea, bank failures were rare before the crisis, with no banks ever having failed. This led to a widespread belief among banks that the government would protect them from financial risk. Krugman (1999) suggests that banks' belief about the bailout and lack of proper supervision by the government can generate a moral hazard problem for the banks, resulting in excess investment in risky projects. This is because the bailout allows banks to walk away in the bad state but to capture the excess returns in the good states. Previous studies suggest that men tend to take more risks than women in entrepreneurship due to differences in competitiveness or outside option values. Thus, banks may have been more willing to lend to male-owned firms, leading to a credit gap for women-owned firms.[26]

To check whether male-owned firms were indeed riskier than female-owned firms in our sample, we show the failure rate between male-owned and female-owned firms. Specifically, we estimate equation (6) using the Mining and Manufacturing Survey:

$$\text{Failure}_{i,t} = \sum_{t=1982}^{2005} \gamma_t \cdot (\text{Female}_i \cdot I_t) + \tau_t + \tau_d + \epsilon_{i,t}, \tag{6}$$

where t refers to the establishment year (cohort) and $\text{Failure}_{i,t}$ is a dummy for a firm established in year t failed within 3 years.[27] We define a firm as having failed in a given year if it is observed in that year's Mining and Manufacturing Survey, but not observed in the subsequent year's survey.[28] Female_i is a dummy variable for a female-owned firm, and I_t is the cohort dummies. τ_t and τ_d are

[26] For example, Bönte and Piegeler (2013) suggest that women tend to be less inclined towards competitiveness and risk-taking than men. This can result in a difference in risk-taking behavior between female- and male-owned firms. On the other hand, in developing countries where women's outside option value as wage workers is lower than men, female entrepreneurs may operate their businesses more conservatively to avoid becoming wage workers.

[27] We observe a similar pattern when we examine different time windows, such as 1 or 2 years.

[28] The Mining and Manufacturing Survey captures all the manufacturing establishments with at least five employees in South Korea. Therefore, if an establishment is observed in a given year but not in the subsequent year, it is either because the establishment was closed down or because it reduced its employees to below five in the next year.

the cohort and 3-digit industry fixed effects, respectively. $\epsilon_{i,t}$ is the error term. The standard errors are clustered at the industry-cohort level. Note that the average probability of a start-up firm failing within three years in the Mining and Manufacturing Survey was 35% between 1982 and 2002.

Figure 8 shows the estimates for γ_t and their 95% confidence intervals. Between 1982 and 1998, the failure rate of female-owned firms was lower than that of non-female-owned firms. In particular, between 1990 and 1996, female-owned firms' failure rate was significantly lower than non-female-owned firms. Such difference, however, disappeared since 1999.

Banks' investment behavior may be influenced by their beliefs about the likelihood of a government bailout. Specifically, banks that perceive a higher probability of a bailout may invest more in risky projects than those that perceive a lower probability. We show evidence that the 14 undercapitalized banks in early 1998 excessively invested in risky projects before the reform. To this end, we estimate the following equation:

$$\text{Proportion of Failed New Firms}_{c,t} = \beta_0 + \beta_1 \cdot \text{B.Reform}_c + \tau_t + \epsilon_{c,t}. \tag{7}$$

Proportion of Failed New Firms$_{c,t}$ refers to the number of new firms created in year t at county c that failed within 3 years relative to the number of new firms created in year t at county c. τ_t is the cohort fixed effect, and $\epsilon_{c,t}$ is the error term. We estimate equation (7) with two separate samples from the Mining and Manufacturing Survey.

The first sample includes all start-up establishments created before the banking sector reform. The precursor of the financial crisis began in 1997 when many conglomerates went bankrupt, so the business environment could have been different for the 1997 cohort (those who started a business in 1997) than for the previous cohort. For this reason, we focus on firms that started a business between 1992 and 1996. The estimation results are reported in the first column of Table 7, where the estimated β_1 is 0.265 and significant. Compared to the county at the 10th percentile of B.Reform

distribution, the proportion of failed male new firms was about 0.07 points higher in the county at the 90th percentile.

The second sample includes all new firms created between 1999 and 2002, after the banking sector reform. The estimation results are reported in the second column of Table 7. Unlike the first sample, we do not observe any association between the B.Reform variable and the proportion of failed new firms.

To summarize, the areas that were later hit harder by the banking sector reform produced a relatively larger number of failed start-ups before the reform, and this tendency disappeared after the reform. These findings suggest that banks in areas hit harder by the reform were lending to riskier businesses than other banks. Once the business atmosphere changed in 1997, many risky projects failed, and the banks that had lent to high-risk projects became insolvent. They were replaced by banks that managed their portfolios more safely, resulting in changes in banks' portfolio choices toward safer assets. These changes may have favored female entrepreneurs.

5.2 Banks' Irrational Decision

The mechanism explained in section 5.1 is driven by banks' rational decisions based on their beliefs about bailouts. In this subsection, we show that such decisions alone cannot fully explain the low level of female entrepreneurship before the banking sector reform.

We begin by examining whether banks' investment in male-owned firms is driven by a higher outcome when the firms survive, by comparing the average revenue product of capital between surviving male- and female-owned firms. To do so, we estimate equation (8):

$$\ln\left(\frac{\text{Revenue}_{i,t}}{\text{Capital}_{i,t}}\right) = \sum_{t=1982}^{2005} \gamma_t \cdot (\text{Female}_i \cdot I_t) + \text{Controls}_{i,t} + \tau_t + \tau_d + \epsilon_{i,t}. \tag{8}$$

Female_i is a binary variable that equals one if firm i is female-owned, and I_t denotes year dummies.

$\text{Controls}_{i,t}$ include the firm-age fixed effect and the number of employees. τ_t and τ_d represent year and 3-digit industry fixed effects, respectively. $\epsilon_{i,t}$ is the error term. The standard errors are clustered at the industry-year level. Following Kim et al. (2017), we define capital stock as the sum of the total fixed asset values of building structures, machinery, and transport equipment.

Figure 9 displays the estimated γ_t values along with their corresponding 95% confidence intervals. Prior to 1997, the average revenue product of capital for female-owned firms was higher, on average. However, after the banking sector reform, the gender gaps in the average revenue product of capital declined substantially and reached near-zero levels. These findings suggest that banks' preference for male-owned firms may not be justified by their superior performance.

Related, Hsieh and Klenow (2009) showed that the average revenue product of capital is proportional to the marginal revenue product of capital under a Cobb-Douglas production technology, and the dispersion in the average revenue product of capital between male- and female-owned firms within an industry may reflect the misallocation of capital across male- and female-owned firms.[29] Note that commercial banks distribute almost all external funds for small and medium-sized manufacturing enterprises in South Korea. Therefore, combined with the findings from Figure 8, Figure 9 implies that commercial banks did not exploit better investment opportunities that generated higher returns and lower risks.

The banks' irrational decision, to forgo investment opportunities with higher returns and lower risk, was more pronounced in the counties that were later hit harder by the banking sector reform. To show this, we estimate the following equation:

$$\ln\left(\frac{\text{Revenue}_{i,t}}{\text{Capital}_{i,t}}\right) = \gamma_0 \cdot \text{Female}_i \cdot I_{t\leq 1996} + \gamma_1 \cdot \text{Female}_i \cdot I_{t\geq 1999} + \text{Controls}_{i,t} + \tau_t + \tau_d + \epsilon_{i,t}, \quad (9)$$

where $I_{t\leq 1996}$ is a dummy variable for the observations between 1992 and 1996, and $I_{t\geq 1999}$ is a dummy

[29] A similar argument is used in Morazzoni and Sy (2022) and Goraya (2023).

variable for the observations between 1999 and 2005. Other variables are identical to equation (8). We remove the observations in 1997 in which firms' borrowing conditions changed due to a series of bankruptcies of Korean conglomerates. To focus on the effect after the banking sector reform, we also exclude the observations in 1998. The values for γ_0 and γ_1 capture the difference in the average revenue product of capital across male and female entrepreneurs before and after the reform, respectively. We estimate equation (9) for two separate samples. The first sample includes new firms in the counties for which B.Reform is above the median, and the second sample includes new firms from the counties with B.Reform below or equal to the median.

The results are reported in Table 8. The estimated γ_0 is 0.096 and significant at the 5% level for the above-median sample, whereas it is 0.018 and not significant for the below-median sample. Before 1996, the average revenue product of capital for female-owned new firms was higher than that for non-female-owned new firms, especially in those areas that were later hit harder by the banking sector reform. However, the gap in the average revenue product of capital disappeared after the banking sector reform in both samples, as reflected by small and insignificant γ_1 for both samples. The results indicate that the misallocation of capital across male and female entrepreneurs was indeed higher in the counties that were later hit harder by the banking sector reform.

Despite lower returns and higher risk associated with male entrepreneurs, banks may still choose to invest more in them if they charge higher interest rates compared to female entrepreneurs. To test this hypothesis, we examined the Household Consumption Expenditure Survey 1996 in Appendix C, as the Mining and Manufacturing Survey does not provide data on debts and interest payments. Our analysis indicates that there was no significant difference in interest rates based on the gender of entrepreneurs before the financial crisis. However, we found that the accessibility of bank loans was substantially higher for male entrepreneurs compared to their female counterparts before the crisis. This suggests that gender-based differences in access to financing are more likely to stem from

differences in loan approval rates than interest rates.

Overall, we find that banks' rational portfolio choice associated with the bailout probability cannot fully explain the difference in capital returns between male- and female-owned firms before the crisis, particularly in those areas that were later hit harder by the banking sector reform.

Source of Irrationality

What could be the source of banks' irrational investment decisions? We first document banks' poor lending practices before the financial crisis and discuss how such lending practices could further distort banks' investment decisions and widen the gender gap in credit accessibility.

As discussed in Section 3, prior to the crisis, the loan approval process lacked transparency, and the banks often did not have a specialized review body to analyze new and existing loans. News articles have reported many anecdotes of inadequate lending practices before the crisis.[30] For example, branch heads could influence every step of the loan process, including screening, approval, review, and management, and some branch heads could freely decide how to allocate up to 200 billion won (about 200 million USD) at their discretion. Personal networks and solicitation also played a role in the lending process. These lending practices may have worked against female entrepreneurs by creating an environment in which irrational screening processes, such as discrimination, could influence lending decisions. For instance, if a branch head had a prejudice against female entrepreneurs, taste-based discrimination could increase the utility cost of working with female entrepreneurs and widen the gender gap in borrowing.

The pervasive gender norm in South Korea may exacerbate this problem. Like many East Asian societies, a male-oriented gender norm has persisted into the 21st century. For instance, using data on intrahousehold time allocation for childcare and housework, Hwang et al. (2019) and Myong

[30] "10 years after the financial crisis: was it a crisis or an opportunity" (November 27th, 2007), CBS News, South Korea.

et al. (2021) found that traditional gender norms still exist in South Korea, which significantly impact various economic decisions such as marriage, fertility, and human capital accumulation. The sociology and demography literature also demonstrates the significant role of social gender norms in East Asian societies ((Greenhalgh, 1985; Qian and Sayer, 2016; Fuwa, 2004; Raymo et al., 2015)). The traditional social expectation for women to be submissive rather than assertive might have contributed to prejudices against women in leadership positions, including female entrepreneurs in South Korea.

5.3 Discussion

Overall, although we cannot rule out the role of the first mechanism, which relies on banks' rational portfolio choices under a bailout belief, the second mechanism is crucial in understanding the low level of female entrepreneurship before the banking sector reform. In particular, the cross-sectional data patterns documented in section 4 cannot be explained by banks' rational behavior alone.

Deep down, both mechanisms share a common root cause. The reason why those closed-down banks could favor male entrepreneurs is because of their belief about a government bailout. The expectation of being bailed out might make some banks run their portfolio inefficiently and make discrimination kick in lending decisions. Our findings demonstrate how an inefficient banking sector that relies on a government bailout can discourage female entrepreneurship either by incentivizing banks to invest in risky businesses or by allowing banks to run their portfolio in a way that irrationally favors male entrepreneurs.

Following the banking sector reform, many banks shifted their portfolio towards safer assets as they updated their beliefs about government bailouts. This shift may have helped female entrepreneurs to access financing and start businesses. Additionally, poorly managed banks that had previously invested in less capable male entrepreneurs were replaced by better-managed banks. This change generated relatively more opportunities for female entrepreneurs in areas that were hit harder by

the reform. Overall, the reform led to a more efficient allocation of credit, which helped to promote gender equality in entrepreneurship.

6 Alternative Explanations

The Korean financial crisis affected the entire society of South Korea, not just the financial market. In this section, we will examine whether other factors can explain the rise of female entrepreneurship in South Korean manufacturing industries.

6.1 Labor Market

Previous studies have documented discrimination by male workers against female employers (Chiplunkar and Goldberg (2021)). In fact, in our sample, the proportion of male workers is lower for female-owned firms compared to non-female-owned firms. For instance, the average share of male workers is 46% in female-owned firms, while it is 67% in non-female-owned firms.

To examine whether there has been a shift in the proportion of male workers since 1997, we estimated equation (10) using data from the Mining and Manufacturing Survey:

$$\frac{\text{Male Workers}_{i,t}}{\text{All Workers}_{i,t}} = \sum_{t=1982}^{2005} \gamma_t \cdot (\text{Female}_i \cdot I_t) + \text{Controls}_{i,t} + \tau_t + \tau_d + \epsilon_{i,t}, \tag{10}$$

where Male Workers$_{i,t}$ and All Workers $_{i,t}$ are the number of male and total workers in firm i in year t. Female$_i$ and I_t are the female firm and year dummies, respectively. Controls$_{i,t}$ include firm-age fixed effect and the number of employees. τ_t and τ_d are the year and 3-digit industry fixed effects, respectively. $\epsilon_{i,t}$ is the error term. The standard errors are clustered at the industry-year level.

Figure 10 depicts the estimated γ_t and 95% confidence interval. The male-worker share in female-owned firms increased during the early 1980s but has not increased dramatically since 1997. The result suggests that changes in the male and female workers' composition in female-owned firms may

not be the main reason for the dramatic increase in the female firm share after 1997.

If male workers discriminate against female owners, female owners may have to pay a higher wage than male owners to attract male workers, resulting in potentially higher wage costs for female-owned firms compared to male-owned firms. To investigate this possibility, we estimate equation (8) by replacing the dependent variable with log wages. $\text{Controls}_{i,t}$ now includes the firm-age fixed effect and the log value of revenue per worker, with the latter serving as a proxy for worker productivity. We report separate estimates for blue-collar and white-collar wages using data from the Mining and Manufacturing Survey.

The estimates for γ_t and their corresponding 95% confidence interval are shown in Figure 11. The gap between male and female entrepreneurs for white-collar workers' wages was observed during the 90s, but this gap did not change during the financial crisis (Panel (a)). For blue-collar workers, the wage for female-owned firms was approximately 1% lower than that for male-owned firms throughout the entire period, and this did not change after 1997 (Panel (b)). Overall, we did not observe a significant change in wages for female entrepreneurs before and after 1997.

6.2 Product Market

During the financial crisis, many firms failed. Such a crisis-driven shock in the product market might create an opportunity for female entrepreneurs to start a business. To check this possibility, we first construct a measure of product market shock using the Mining and Manufacturing Survey:

$$\text{P.Shock}_{c,d} = \ln\Big(\frac{\text{Number of Firms}_{c,d,1997}}{\text{Number of Firms}_{c,d,1998}}\Big).$$

The measure captures the percentage changes in the number of firms at the 2-digit industry level within each county. About 57% of county-industry units experienced a reduction in the total number of firms in 1998. The mean and standard deviation of $\text{P.Shock}_{c,d}$ are 0.15 and 0.43, respectively, which

suggests that the number of firms decreased significantly in 1998. We use this measure to estimate equation (11).

$$\text{Female (male) new firm}_{c,d,t} = \beta_{s\in\{f,m\}} \cdot (\text{P.Shock}_{c,d} \cdot \text{Post}_t) + I_t + \tau_{c,d} + \epsilon_{c,d,t} \tag{11}$$

Note that equation (11) is essentially the same as equation (3), except that we have replaced B.Reform_c with $\text{P.Shock}_{c,d}$.

The results of the estimation are presented in Table 9. The estimated values of β_f and β_m are -0.026 and -0.312, respectively. These estimates suggest that a county-industry unit that experienced a 10% reduction in the total number of firms between 1997 and 1998 generated about 0.003 fewer female-owned new firms and 0.03 fewer male-owned new firms after 1998 than a county-industry unit that experienced no change in the number of firms in 1998.

However, it is worth noting that the P.Shock variable appears to have a relatively small effect on new firm creation, given that the average number of female- and male-owned new firms at the county-industry level between 1998 and 2005 were 0.16 and 0.79, respectively.

More importantly, the estimate for β_f is negative, indicating that markets (industry×county) that hit harder during the financial crisis experienced less creation of female-owned new firms. Therefore, the product-market shock (measured by $\text{P.Shock}_{c,d}$) alone cannot explain the rise of female entrepreneurship after 1998.

6.3 Intermediary Goods Market

The Mining and Manufacturing Survey provides detailed components of production costs, including costs for raw materials. A manufacturing firm needs to buy raw materials from other firms to produce its output. If firms selling raw material goods discriminate against female owners or if search friction for female firms is particularly high due to a lack of networks among female owners, the costs for raw

materials will be higher for female-owned firms than for male-owned firms.

To investigate whether the market for intermediary goods played a significant role in explaining the low level of female entrepreneurship before 1997, we analyze the difference in raw material costs per revenue between female-owned and male-owned firms within a 3-digit industry. To accomplish this, we estimate an equation similar to equation (10), replacing the dependent variable with raw material cost per revenue, denoted as $\left(\frac{\text{Material Cost}_{i,t}}{\text{Revenue}_{i,t}}\right)$. If the gender gap in material cost is responsible for the rapid increase in female entrepreneurship after the financial crisis, then we expect γ_t to be significantly positive prior to the crisis and then drop suddenly after the crisis.

Figure 12 displays the estimation results for γ_t. We find that the gender difference in material cost was not significantly different from zero throughout the 1990s. Therefore, it is less likely that changes in material cost played a primary role in explaining the surge in female entrepreneurship after the financial crisis.

6.4 Joint Labor Supply and Business Transfer within Households

The joint decision of a husband and wife regarding labor supply could affect female entrepreneurship. This mechanism may have a more significant impact on female entrepreneurship than on male entrepreneurship, if the elasticity of labor supply to household income is greater for wives than for husbands. The husband's income decrease, associated with crisis-related layoffs, could encourage labor force participation among wives, and some of these wives may choose to become entrepreneurs instead of workers, thereby increasing the number of female entrepreneurs.

We investigate whether a negative shock to the husband's labor income is associated with an increase in female entrepreneurship using the Social Survey data from 1993 to 2005. The survey provides data on the economic activity status of household members, categorized as working, searching for a job, housework, schooling, and others. We define an individual is unemployed if the economic activity status is searching for a job. For those who are working, the survey provides employment

status, categorized as employer, self-employed, family worker, regular worker, temporary worker, and daily worker. The survey also provides data on the industry of those who are working. We construct a sample of married couples for each year and estimate the following linear probability model to predict how the probability of a wife being an employer in the manufacturing sector changes with the husband's unemployment status for each year:

$$\text{Employer Wife}_{i,t} = \sum_{t=1993}^{2005} \gamma_t \cdot (\text{UE husband}_{i,t} \cdot I_t) + \text{Controls}_{i,t} + \tau_t + \epsilon_{i,t}, \tag{12}$$

where i is a household index and t indicates the year. Employer Wife$_{i,t}$ is a dummy variable that takes a value of one if the wife is an employer in the manufacturing sector. UE husband$_{i,t}$ is a dummy variable that takes a value of one if the husband is unemployed. Controls$_{i,t}$ includes the education and age of both wife and husband. I_t is year dummies, and $\epsilon_{i,t}$ is the error term.

The estimates for γ_t and their 95% confidence intervals are shown in Figure 13. Our findings suggest that there is no significant correlation between the husband's unemployment and the wife's entrepreneurship status in the manufacturing sector across all periods. Additionally, we do not observe any significant change in the relationship following the financial crisis.

Related, a failed entrepreneur may ask his wife to start a new business on his behalf. Although his wife is the official owner of such a business, her husband could be the one who runs the company. However, through discussions with industry personnel, we found that banks have screened such cases. In South Korea, banks have traditionally evaluated the creditworthiness of the husbands of female business owners as a precautionary measure to prevent questionable business transfers from a husband to his wife. If the husband, who had recently experienced business failure, was considered to be the operating owner of his wife's business, banks may have declined to provide a loan.

Moreover, if the rise of female entrepreneurs in South Korea was mainly due to business transfers within households, we would have expected the increase in the number of new female owners to be

temporary because the Korean economy rebounded within one or two years after the IMF intervention. However, as depicted in Figure 2, the number of female-owned new firms continued to rise until 2005. Additionally, if business transfers within households were the primary driving force, we would have seen a larger number of female-owned new firms in areas with a higher number of firm closures during the crisis. However, as demonstrated in section 6.2, the data pattern was actually the opposite. Therefore, the rise of female entrepreneurship in South Korea cannot be fully explained by business transfers within households.

6.5 Changes in Women's Outside Option

The unemployment rate in South Korea averaged 2.4 percentage points between 1990 and 1996. It increased by one percentage point in 1997, rising from 2.1 percentage points in December 1996 to 3.1 percentage points in December 1997. The unemployment rate peaked at 8.2 percentage points in July 1998 due to mass layoffs. Since then, the unemployment rate has gradually decreased, and it returned to its pre-crisis level of 3.1 percentage points in mid-2002.

If the unemployment rate suddenly increased, the value of being a worker may have decreased, which could have increased the relative value of being an entrepreneur. Consequently, if labor market opportunities worsened more for women than for men after the crisis, this change in the outside option could help explain why the number of female entrepreneurs increased.

We used the Economically Active Population Survey to document the gender-specific trend in the employment rate. Figure 14 presents changes in the share of workers (excluding daily workers) in the working-age population aged 15-64 by gender. The share of female workers (solid line) increased steadily over time and did not decrease after the crisis, while the share of male workers (dashed line) did not change much during the 1990s. Consequently, the probability of being a worker for females relative to males increased after the crisis.

To investigate changes in the wage rate for men and women before and after the crisis, we used

the Wage Structure Survey. Figure 15 presents the estimated gender wage gap based on the Mincer regression, controlling for the age and education of workers. The gender wage gap decreased over time and did not change substantially between 1997 and 2000.

Overall, the outside option value for women as workers had gradually increased since the early 1980s and did not decrease after the financial crisis. Therefore, changes in the outside option are less likely to be the main reason for the rise of female entrepreneurs.

6.6 Changes in Women's Characteristics

Suppose there was a sudden change in the characteristics of the female population relative to males after the crisis. In that case, such a trend could also contribute to the rise of female entrepreneurship. To investigate this possibility, we examine changes in educational attainment, cohort effects, and preferences for job characteristics.

Figure 16 documents the trend in educational attainment by gender using data from the Barro & Lee data set.[31] Panel (a) illustrates the total number of enrollees in all post-secondary programs aged 25 and above between 1980 and 2010 by gender. The number of college enrollees has consistently increased since the early 1980s. The growth rate was higher between 1995 and 2000 for both males and females, likely due to the relaxation of the University Enrollment Quota Policy. However, despite the rapid increase in college enrollees after the crisis, the increase was more pronounced for males than for females. Consequently, the ratio of female college enrollees relative to males did not increase between 1995 and 2000. Therefore, the sudden surge in female entrepreneurship after the crisis cannot be attributed solely to an increase in the educational attainment of females relative to the male population.

Panel (b) of Figure 16 presents the college completion rate as measured by the percentage of females who attended a college by age. The data is from the Population and Housing Census. For all

[31] The Barro & Lee data set is from the World Bank.

age groups, the college attendance rate increased gradually over time, and there was no drastic shift in the college attendance rate between 1995 and 2000. Note that the increase in educational attainment is greater for younger age groups. If the rise of new female entrepreneurs after the crisis was driven mainly by highly-educated young cohorts, a sudden increase in the cohort size of the young workers between 1995 and 2000 could explain the rise of female entrepreneurs. However, as shown in Table 2, the share of younger cohorts who became entrepreneurs in the manufacturing sector decreased between 1995 and 2000 for females.

6.7 Demand-Side Factors and Government Policies

Other factors related to demand may also play a role. For instance, shifts in consumer preferences or trade dynamics could affect sectors where women have a comparative advantage. However, the increase in female entrepreneurship after 1997 was observed across all industries. In fact, the rise of female entrepreneurship becomes even more evident when we account for industry-specific effects, as illustrated in Figure 3.

In the 1990s, the expansion of Korean conglomerates made it challenging for small and medium-sized enterprises (SMEs) to sustain their businesses, and the need to enact laws for protecting SMEs emerged. The need to enact laws for promoting female entrepreneurs was discussed in this context, given that both SMEs and female entrepreneurs were considered economically underprivileged relative to Korean conglomerates (Choi (2018)). As a result, the Act on Support for Female-Owned Businesses was enacted in June 1999. The act supports the activities of female firms by providing several female-firm-friendly policies.

Although the act may have helped female entrepreneurship after 2000, we argue that the act is not the main driving force behind the surge of female entrepreneurship. First, while the sudden increase in the female share among new entrepreneurs started in 1997, the act was enacted in the second half of 1999. Second, the act recommends several preferential treatments toward female firms, but often,

such policies were not enforced. For example, the act recommended that government agencies provide preferential treatment to female firms when purchasing needed materials, but this recommendation was not enforced until 2014. Consequently, female firms' share of government-purchased goods was less than 5% until 2014.

7 Conclusion

We document a sudden increase in the creation of female-owned manufacturing establishments in South Korea after the Korean financial crisis of 1997. During the crisis, a major banking sector reform was conducted, and many underperforming bank branches were forced to close down. We found that female-owned new establishments were relatively more likely to be created in areas where a larger share of closed-down bank branches once existed. We considered two mechanisms that could explain this phenomenon. The first mechanism suggests that banks rationally invested in risky projects, expecting a government bailout, which favored male entrepreneurs because they tend to invest in riskier projects than female entrepreneurs. Although we cannot rule out this first mechanism, we show evidence that banks irrationally favored male-owned new firms, especially those closed-down bank branches, although male-owned firms generated higher risks and lower returns than female-owned firms. The banking sector reform helped female entrepreneurs to start a business by making banks invest in safer projects or by replacing bank branches that unfairly favored male entrepreneurs with better-managed ones. Overall, our findings highlight how an inefficient banking system that relies on government bailouts can discourage female entrepreneurs with high growth potential.

Over the course of the IMF-driven reform, the government of South Korea and the IMF communicated with a series of Letters of Intent that describes the policies South Korea intends to implement in the context of its request for financial support from the IMF. The letters do not contain any gender-specific keywords such as "gender," "female," "women," or "discrimination," but instead

describe the specific plans for monetary and fiscal policies and other market-oriented reforms, in particular, the banking sector reform. The incidence of the financial crisis and the subsequent rise of female entrepreneurship in South Korea clearly demonstrates that market-oriented competitive forces in the financial market can substantially remove lending institutions' unequal treatment of female entrepreneurs.

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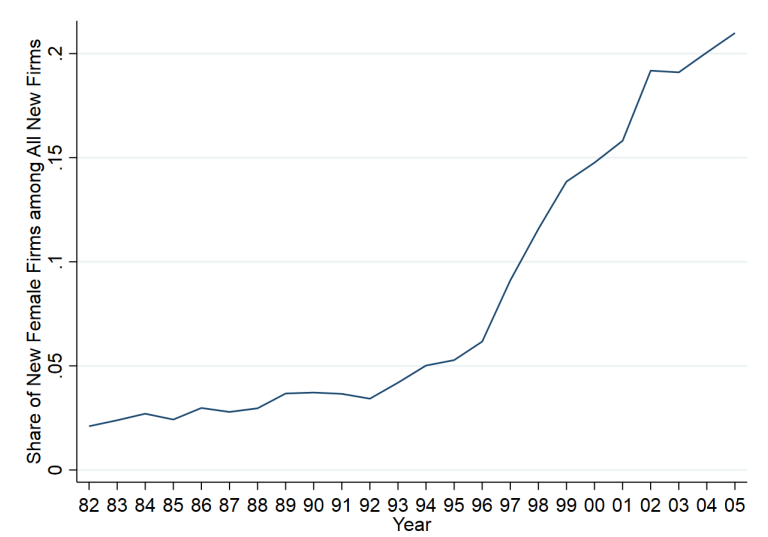
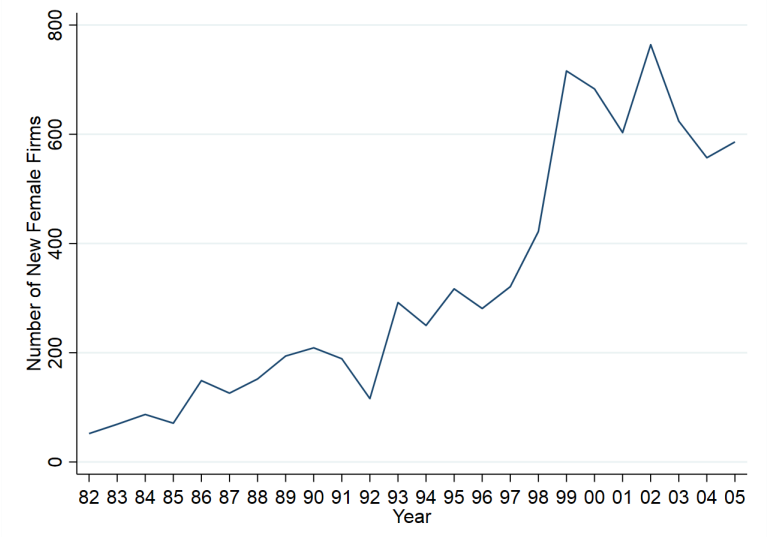
Figures and Tables

Figure 1: Proportion of Female-Owned New Establishments



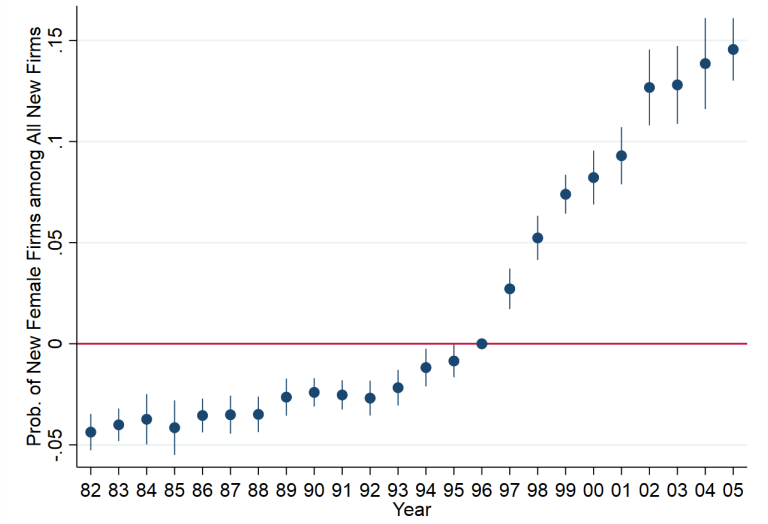
NOTE: This figure displays the proportion of female-owned establishments out of all newly established non-incorporated manufacturing establishments in South Korea with at least five employees. A female-owned establishment is defined as a non-incorporated establishment owned solely by one or more females. Data: Mining and Manufacturing Survey.

Figure 2: Number of Female-Owned New Establishments



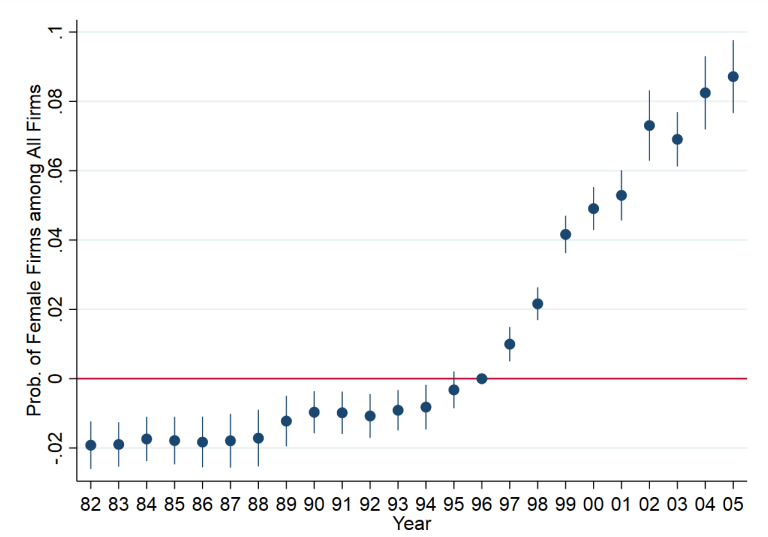
NOTE: This figure displays the number of newly established female-owned non-incorporated establishments in South Korea with at least five employees. A female-owned establishment is defined as a non-incorporated establishment owned solely by one or more females. Data: Mining and Manufacturing Survey.

Figure 3: Proportion of Female-Owned New Establishments with Industry Fixed Effect



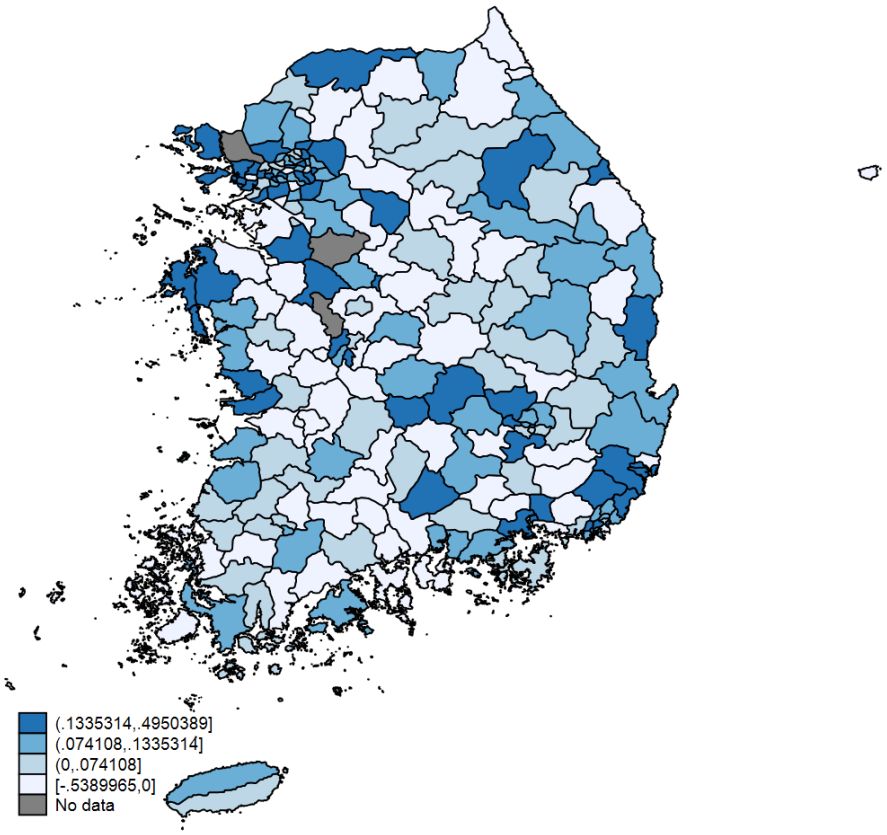
NOTE: The figure shows the estimates and 95% confidence intervals for year dummies derived from a linear probability model that predicts the proportion of female-owned establishments among all newly established non-incorporated manufacturing establishments in South Korea with at least five employees. We control for the 3-digit industry fixed effect, and the standard errors are clustered at the industry-year level. A female-owned establishment is defined as a non-incorporated establishment solely owned by one or more females. The base year for the analysis is 1996. Standard errors are clustered at 3-digit industry×year level. Data: Mining and Manufacturing Survey.

Figure 4: Proportion of Female-Owned Establishments with Industry Fixed Effect



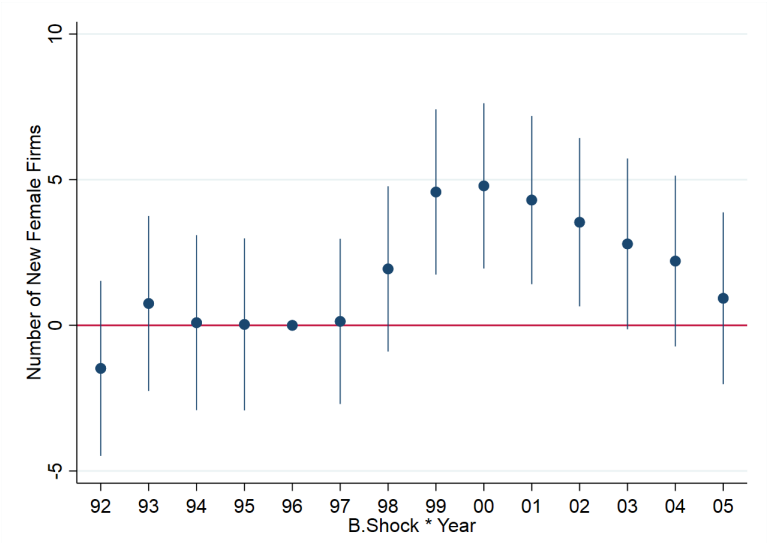
NOTE: The figure shows the estimates and 95% confidence intervals for year dummies derived from a linear probability model that predicts the proportion of female-owned establishments among all established non-incorporated manufacturing establishments in South Korea with at least five employees. We control for the 3-digit industry fixed effect, and the standard errors are clustered at the industry-year level. A female-owned establishment is defined as a non-incorporated establishment solely owned by one or more females. The base year for the analysis is 1996. Standard errors are clustered at the industry-year level. Data: Mining and Manufacturing Survey.

Figure 5: Geographical Variation of Banking Sector Reform

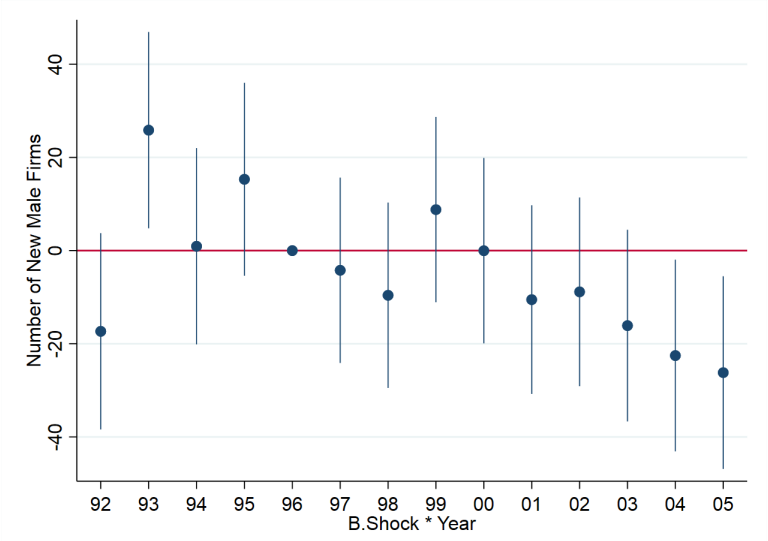


NOTE: The figure shows the banking sector reform across 5-digit administrative districts in South Korea. The measure of banking-sector reform is captured by $\text{B.Reform}_c = \ln\left(\frac{\text{Bank}_{c,1997}}{\text{Bank}_{c,1998}}\right)$, where $\text{Bank}_{c,1997}$ and $\text{Bank}_{c,1998}$ are the total number of bank establishments in county c at the end of 1997 and 1998, respectively. Data on three 5-digit administrative districts are missing: Anseong-si and Gimpo-si, which were created in 1998, and Sejong-si, which was established after 1998. Data: Census on Establishments.

Figure 6: Banking Sector Reform and Female Entrepreneurship



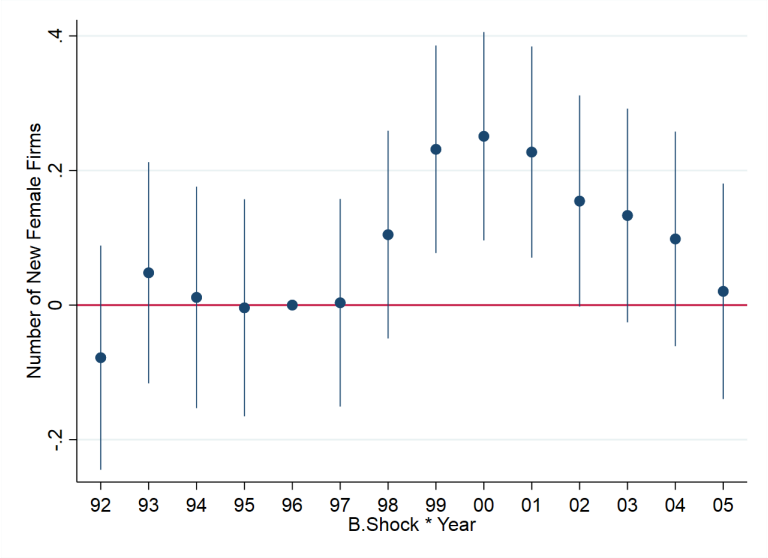
(a) B.Reform and Female-owned New Firm



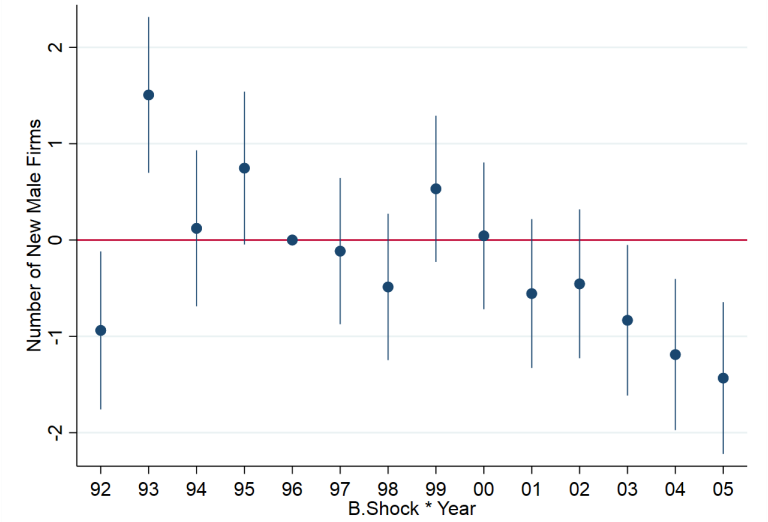
(b) B.Reform and Male-owned New Firm

NOTE: This figure displays the estimates and 95% confidence intervals for equation (4), which examines the effect of the banking sector reform (B.Reform_c) on the number of newly established female-owned establishments (Panel (a)) and the number of newly established male-owned establishments (Panel (b)). $\text{B.Reform}_c = \ln\left(\frac{\text{Bank}_{c,1997}}{\text{Bank}_{c,1998}}\right)$, where $\text{Bank}_{c,1997}$ and $\text{Bank}_{c,1998}$ are the total number of bank establishments in county c at the end of 1997 and 1998, respectively. A female-owned establishment is defined as a non-incorporated establishment solely owned by one or more females, while a male-owned establishment is defined as a non-incorporated establishment solely owned by one or more males. Base year for the analysis is 1996. Data: Mining and Manufacturing Survey, Census on Establishments.

Figure 7: Banking Sector Reform and Female Entrepreneurship with Industry Fixed Effect



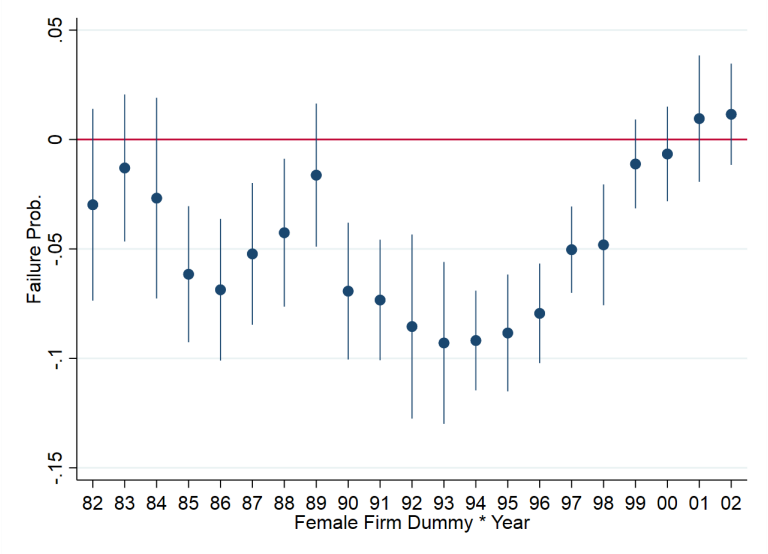
(a) B.Reform and Female-owned New Firm (Industry FE)



(b) B.Reform and Male-owned New Firm (Industry FE)

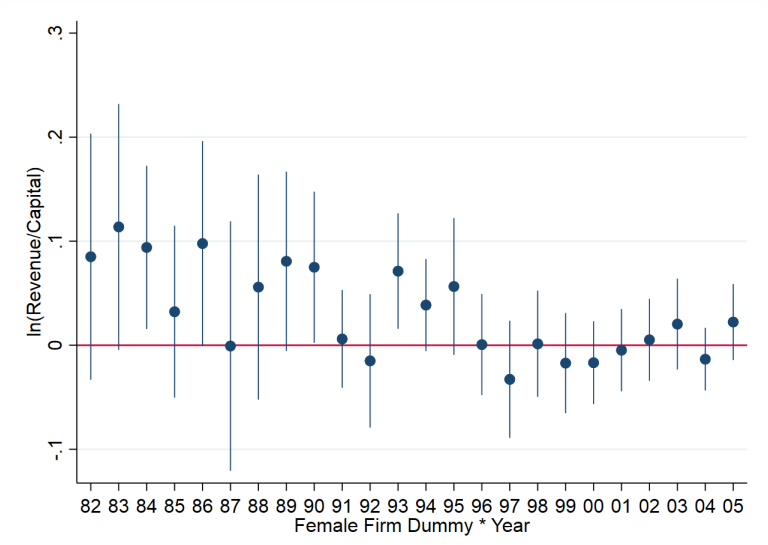
NOTE: This figure shows the estimates and 95% confidence intervals for equation (5), which examines the effect of banking sector reform (B.Reform$_c$) on the number of newly established female-owned establishments (Panel (a)) and the number of newly established male-owned establishments (Panel (b)) after controlling for a 2-digit industry fixed effect. B.Reform$_c = \ln\left(\frac{\text{Bank}_{c,1997}}{\text{Bank}_{c,1998}}\right)$, where Bank$_{c,1997}$ and Bank$_{c,1998}$ are the total number of bank establishments in county c at the end of 1997 and 1998, respectively. A female-owned establishment is defined as a non-incorporated establishment solely owned by one or more females, while a male-owned establishment is defined as a non-incorporated establishment solely owned by one or more males. Base year for the analysis is 1996. Standard errors are clustered at the county-year level. Data: Mining and Manufacturing Survey, Census on Establishments.

Figure 8: Gender Gap in Failure Probability



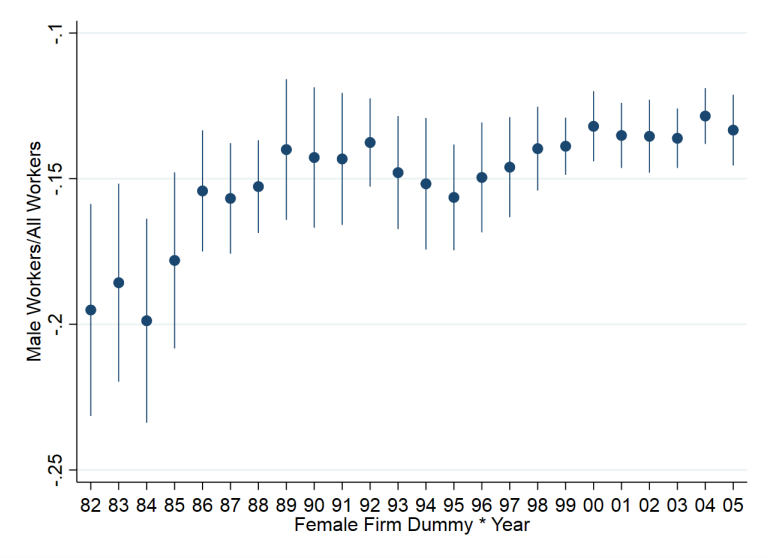
NOTE: This figure shows the estimates and 95% confidence intervals for the variables "Female Dummy × Starting Year Dummies" in equation (6). The estimates capture the difference in the three-year failure probability between non-incorporated establishments owned by females and those not owned by females, while controlling for starting-year cohort dummies and 3-digit industry fixed effects. Standard errors are clustered at the industry-cohort level. The estimates Data: Mining and Manufacturing Survey.

Figure 9: Gender Gap in Revenue Product of Capital



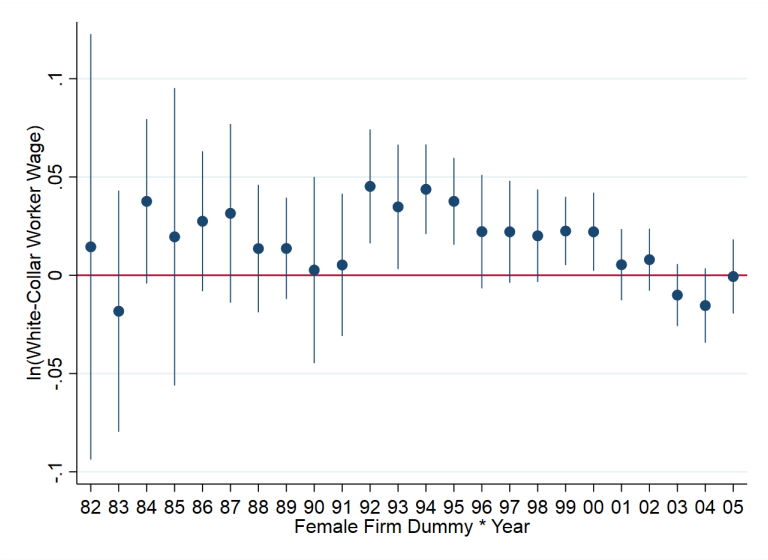
NOTE: This figure shows the estimates and 95% confidence intervals for the variables "Female Dummy × Year Dummies" in equation (8). The estimates capture the annual percentage difference in revenue product of capital between non-incorporated establishments owned by females and those not owned by females, while controlling for year dummies and 3-digit industry fixed effects. Standard errors are clustered at the industry-year level. Data: Mining and Manufacturing Survey.

Figure 10: Gender Gap in the Male Employment

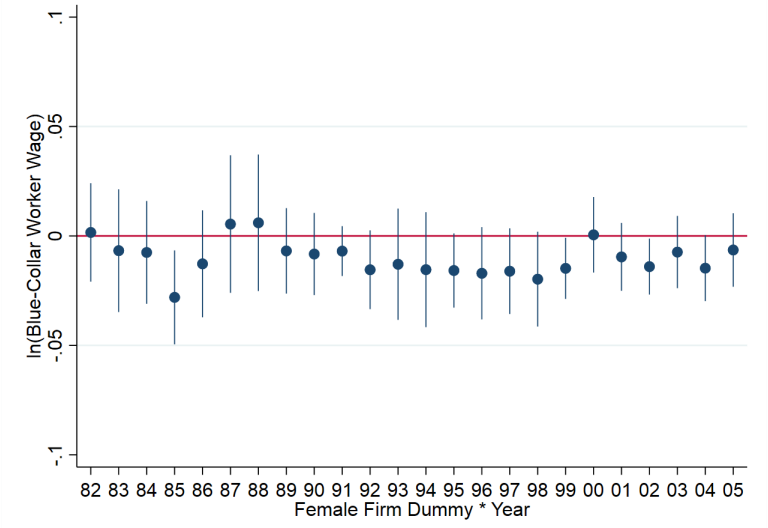


NOTE: This figure displays the estimates and 95% confidence intervals for the variables "Female Dummy × Year Dummies" in equation (10). The estimates capture the difference in male-worker share between female-owned and non-female-owned non-incorporated establishments for each year. Standard errors are clustered at the industry-year level. Data: Mining and Manufacturing Survey.

Figure 11: Gender Gap in Log Worker Wage



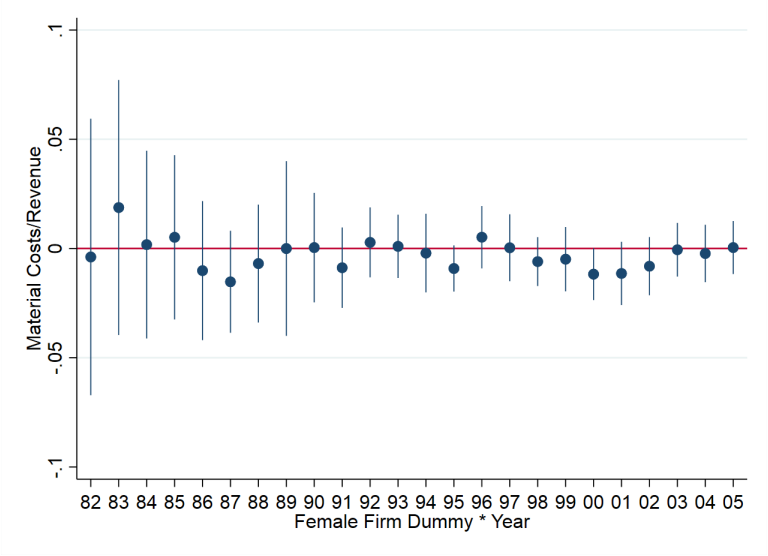
(a) White-Collar Worker



(b) Blue-Collar Worker

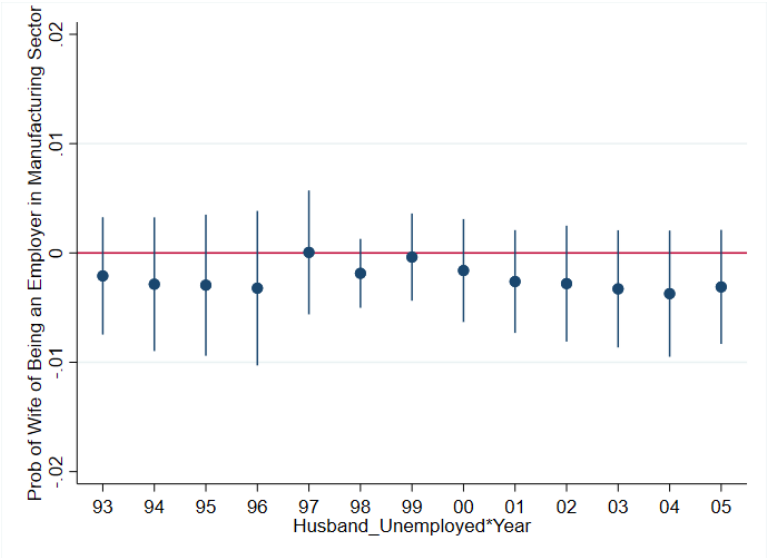
This figure shows the estimates and 95% confidence intervals for the variables "Female Dummy × Year Dummies" in equation (10), with log wages for white-collar and blue-collar workers as dependent variables. The estimates capture the difference in log wages between female-owned and non-female-owned non-incorporated firms for each year and worker type. Standard errors are clustered at the industry-year level. Data: Mining and Manufacturing Survey.

Figure 12: Gender Gap in Material Costs



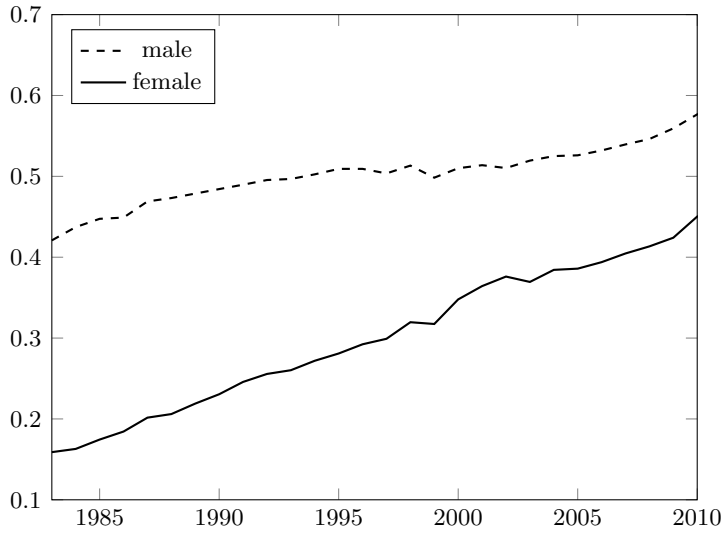
NOTE: This figure displays the estimates and 95% confidence intervals for the variables "Female Dummy × Year Dummies" in equation (10), with material cost share in revenues as the dependent variable. The estimates capture the difference in material cost share in revenues between female-owned and non-female-owned non-incorporated firms for each year. Standard errors are clustered at the industry-year level. Data: Mining and Manufacturing Survey.

Figure 13: Correlation between Husband's Unemployment and Wife's Entrepreneurship



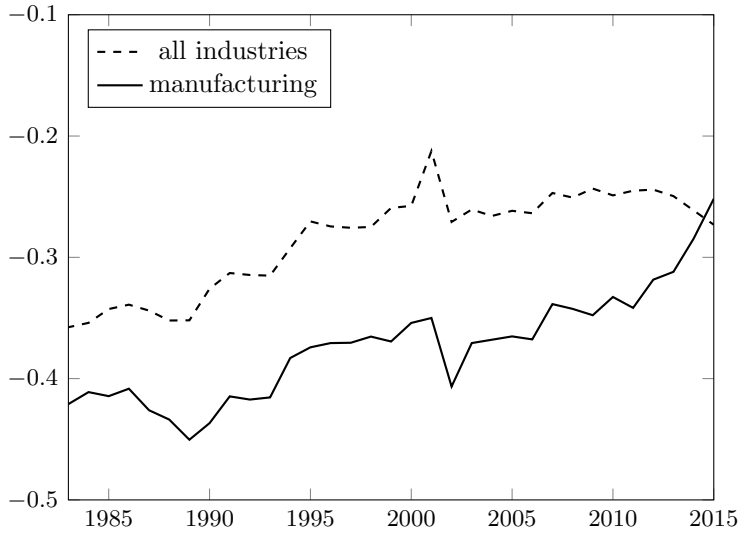
NOTE: The figure plots the estimated coefficients and 95% confidence intervals for the variables "Unemployed Husband Dummy × Year Dummies" in equation (12). The equation estimates the linear probability model, which predicts how the probability of a wife being employed in the manufacturing sector changes with her husband's unemployment status for each year. The sample comprises married couples. Data: Social Survey 1993-2005.

Figure 14: Proportion of Workers in the Working-Age Population



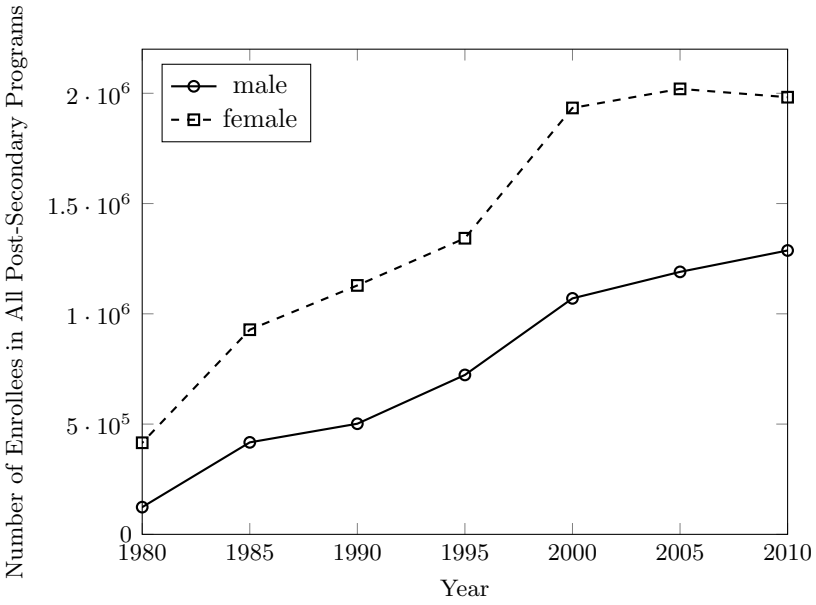
NOTE: This figure displays the proportion of male (dotted line) and female (solid line) workers within the working-age population aged 15-64. Data: Economically Active Population Survey.

Figure 15: Gender Wage Gap Estimated from Mincer Regression

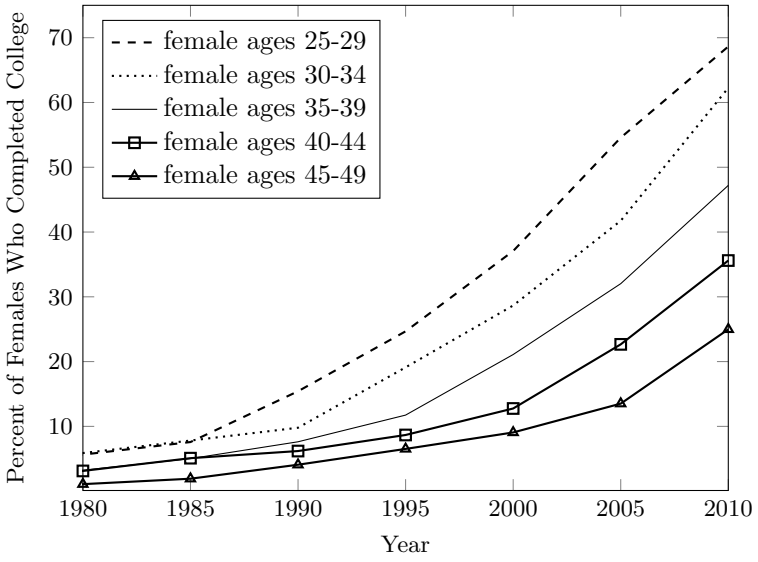


NOTE: The figure illustrates the gender wage gap estimated from the Mincer regression, which measures the difference in log hourly wage between male and female full-time workers while controlling for education, age, and age squared. The dashed line represents the overall gender wage gap across all industries, while the solid line shows the gender wage gap among workers in the manufacturing sector. Data: Wage Structure Survey 1983-2015.

Figure 16: Trends in Educational Attainment over Time



(a) Total Enrollment in Post-Secondary Education Programs



(b) Percent of Women who Have Attained a College Degree

NOTE: This figure illustrates changes in educational attainment in South Korea. Panel (a) displays the total number of enrollees in all post-secondary programs among the population aged 25 and above, broken down by gender. Panel (b) shows the proportion of females who have completed college, by age group. Data: (a) Barro & Lee data set from the World Bank, (b) Population and Housing Census.

Table 1: Composition of Industries among Female-Owned New Firms

KSIC2000 Code	Industry	New Female Firms (No.) 1992−1996	1997−2001	Difference	% Change
15	Food products and beverage	93	191	98	105.4
17	Textile	143	294	151	105.6
18	Wearing apparel and fur articles	353	752	399	113.0
19	Leather products, luggage, handbags, and footwear	86	158	72	83.7
20	Wood products except furniture;	19	49	30	157.9
21	Pulp, paper and paper products	33	61	28	84.8
22	Publishing, printing and reproduction of recorded media	44	102	58	131.8
24	Chemical products	17	25	8	47.1
25	Rubber and plastic products	51	110	59	115.7
26	Glass and non-metallic products	27	41	14	51.9
27	Basic metals	10	31	21	210.0
28	Fabricated metal products except machinery and equipment	83	212	129	155.4
29	Machinery and equipment	81	205	124	153.1
30	Office, accounting and computing machine	24	23	-1	-4.2
31	Electrical machine	46	79	33	71.7
32	Radio, TV and communication machine	24	90	66	275.0
33	Medical, precision, optical device and watch products	12	34	22	183.3
34	Motor vehicles and trailers	27	65	38	140.7
35	Other transport equipment	5	15	10	200.0
36	Furniture	69	193	124	179.7
37	Recycling	3	13	10	333.3

NOTE: This table displays the number of new establishments owned by females in the Mining and Manufacturing Survey, classified according to 2-digit KSIC2000 industry codes, for the five-year periods before (1992-1996) and after (1997-2001) the financial crisis. Data: Mining and Manufacturing Survey.

Table 2: Characteristics of Female Employers in Manufacturing Sector

	(1) 1995	(2) 2000	(3) Difference
College	0.22 [0.42]	0.21 [0.41]	-0.008 (-0.22)
Married	0.75 [0.43]	0.75 [0.43]	-0.005 (-0.13)
Single	0.065 [0.25]	0.077 [0.27]	0.012 (0.54)
Divorced	0.035 [0.18]	0.062 [0.24]	0.027 (1.46)
Widowed	0.15 [0.36]	0.11 [0.32]	-0.035 (-1.22)
Age	41.6 [8.67]	42.2 [7.70]	0.61 (0.88)
Share of Age 25-34	0.20 [0.40]	0.16 [0.36]	-0.038 (-1.18)
Share of Age 35-44	0.48 [0.50]	0.46 [0.50]	-0.012 (-0.27)
Share of Age 45-54	0.23 [0.42]	0.31 [0.46]	0.08 (2.01)
Share of Age 55-65	0.10 [0.29]	0.07 [0.25]	-0.03 (-1.18)

NOTE: This table presents the characteristics of female employers in the manufacturing sector for the years 1995 and 2000. The standard deviation is indicated in square brackets in columns (1) and (2). Column (3) records the difference in the values between the two years. The t-values for the differences are enclosed in parentheses. Data: Population and Housing Census 1995 and 2000.

Table 3: Results of Due Diligence Reviews on 12 Undercapitalized Banks (As of March 1998)

	Asset (Won, billion)	BIS ratio (%)	NPL (Won, billion)	NPL Ratio (%)
Chohung	44,280	1.49	6,926	19.2
Commercial	38,004	1.81	7,249	24.3
Hanil	43,508	4.53	6,772	20.2
Korea Exchange	47,174	2.13	10,792	28.6
Chungchong	3,770	-5.97	1,620	36.3
Kyungki	7,240	-9.61	2,862	49.0
Donghwa	9,556	-3.72	2,255	28.5
Dongnam	7,115	-5.81	1,118	20.9
Daedong	5,564	-6.75	1,735	34.1
Peace	6,517	-1.57	603	12.9
Kangwon	2,969	-16.0	1,034	45.8
Chungbuk	2,487	-5.52	801	28.5
Total	218,184		43,767	

NOTE: The table displays the outcomes of the due diligence evaluations conducted on 12 undercapitalized banks during the banking sector reform. The term NPL refers to the value of nonperforming loans, while the NPL Ratio indicates the ratio of nonperforming loans to the total loan values. Despite having the second-highest NPL ratio, Kangwon Bank could evade liquidation by proposing a voluntary merger with Hyundai Merchant Bank, which was approved by the Bank Appraisal Committee. Source: FSC Press releases, 1 July 1998.

Table 4: Number of Bank Branches

Reform Status	Nationwide Commercial Banks	Number of Bank Branches End 1997	Number of Bank Branches End 1998	Difference
Recapitalized by govt.	Korea First	413	339	-74
	Seoul	357	291	- 66
Disapproved	Donghwa	138	0	-138
	Dongnam	119	0	- 119
	Daedong	107	0	-107
Conditionally Approved	Chohung	485	421	-64
	Commercial	513	446	-67
	Hanil	478	421	-57
	Korea Exchange	400	326	-74
	Peace	108	87	-21
BIS>8%	Kookmin (P&A with Daedong)	511	546	35
	Korea Housing (P&A with Dongnam)	499	545	46
	Shinhan (P&A with Donghwa)	223	247	24
	Koram (P&A with Kyungki)	122	218	96
	Hana (P&A with Chungchong)	110	173	63
	Boram	99	104	5
	Local Commercial Banks			
Disapproved	Chungchong	120	0	-120
	Kyungki	194	0	-194
Conditionally Approved	Kangwon	70	64	- 6
	Chungbuk	73	59	-14
BIS>8%	Daegu	207	190	- 17
	Pusan	195	188	- 7
	Kwangju	147	135	-12
	Jeju	46	40	- 6
	Jeonbuk	85	63	-22
	Kyongnam	168	153	- 15
	Other Types of Banks			
	Savings Banks	341	312	-29
	Merchant Banks	84	36	-48
Total		6,412	5,404	-1,008

NOTE: This table shows the number of bank branches categorized by different bank types at the year-end of 1997 and 1998. The reform status column refers to the outcome of the commercial bank reform in 1998. P&A stands for Purchase of Assets and Assumption of Liabilities arrangement. The number of commercial bank branches is sourced from the Bank Management Statistics 1996-1999, while the number of savings bank branches is obtained from the website of the Korea Federation of Savings Banks. The number of merchant banks branches is from Kim (2014).

Table 5: Summary Statistics

		Mean	Std.	Min	Max	Obs
Panel A: County level						
Female-owned new firms	1992-1997	1.00	1.86	0	18	1,566
Female-owned new firms	1998-2005	2.51	4.16	0	31	1,973
		$\triangle$1.51				
Male-owned new firms	1992-1997	17.45	29.44	0	310	1,566
Male-owned new firms	1998-2005	12.59	21.43	0	177	1,973
		$\triangledown$4.86				
Panel B: County-industry level						
Female-owned new firms	1992-1997	0.06	0.35	0	13	24,287
Female-owned new firms	1998-2005	0.16	0.74	0	26	31,128
		$\triangle$0.10				
Male-owned new firms	1992-1997	1.12	4.07	0	142	24,287
Male-owned new firms	1998-2005	0.79	3.06	0	100	31,128
		$\triangledown$0.33				
Panel C						
B.Reform		0.08	0.13	-0.54	0.66	244
Positive B.Reform		0.72	0.45	0	1	244

NOTE: This table shows the summary statistics for the main regression equations (equations 2 and 3). $\text{B.Reform}_c = \ln\left(\frac{\text{Bank}_{c,1997}}{\text{Bank}_{c,1998}}\right)$, where $\text{Bank}_{c,1997}$ and $\text{Bank}_{c,1998}$ are the total number of bank establishments in county c at the end of 1997 and 1998, respectively. Positive B.Reform is the dummy variable that takes a value of one if B.Reform is positive. A female-owned firm is defined as a non-incorporated establishment solely owned by one or more females, while a male-owned firm is defined as a non-incorporated establishment solely owned by one or more males. Data: Census on Establishments.

Table 6: Banking Sector Reform and Female Entrepreneurship

	Panel A		Panel B	
	(1)	(2)	(1)	(2)
VARIABLES	Female-owned new firms	Male-owned new firms	Female-owned new firms	Male-owned new firms
B.Reform× Post	3.265***	-12.844***	0.159***	-0.696***
	(0.581)	(4.089)	(0.0331)	(0.209)
Year FE	Y	Y	Y	Y
County FE	Y	Y		
County-Industry FE			Y	Y
Observations	3,288	3,288	51,645	51,645
R-squared	0.660	0.701	0.531	0.675

NOTE: This table presents the effects of the banking sector reform (B.Reform) on the number of newly established non-incorporated establishments owned by females and males, respectively. Panel (a) displays the estimation results for Equation (2), while Panel (b) shows the estimation results for Equation (3). A female-owned firm is defined as a non-incorporated establishment solely owned by one or more females, while a male-owned firm is defined as a non-incorporated establishment solely owned by one or more males. Standard errors for Panel (b) are clustered at the county-year level. Data: Mining and Manufacturing Survey and Census on Establishments.

Table 7: Banking Sector Reform and Failed New Firms

	(1)	(2)
VARIABLES	Proportion of Failed New Firms	Proportion of Failed New Firms
B.Reform	0.265***	0.080
	(0.065)	(0.060)
Starting Year	1992-1996	1999-2002
Starting Year FE	Y	Y
Observations	1,041	834
R-squared	0.035	0.179

NOTE: This table presents the estimation results for Equation (7), which analyzes the relationship between the banking sector reform (B.Reform) and the proportion of failed new firms among all non-incorporated establishments within a county. The proportion of failed new firms is defined as the number of new non-incorporated establishments created in year t in a county that failed within 3 years, divided by the total number of new non-incorporated establishments created in year t in that county. Data: Mining and Manufacturing Survey and Census of Establishments.

Table 8: Banking Sector Reform and Revenue Product of Capital Among New Firms

VARIABLES	(1) $\ln\left(\frac{\text{Revenue}}{\text{Capital}}\right)$	(2) $\ln\left(\frac{\text{Revenue}}{\text{Capital}}\right)$
Female-Owned Firm×(Year≤1996)	0.096**	0.018
	(0.046)	(0.072)
Female-Owned Firm×(Year≥1999)	-0.035	-0.026
	(0.022)	(0.047)
Industry FE	Y	Y
Year FE	Y	Y
Counties with above median B.Reform	Y	
Counties with below median B.Reform		Y
Observations	36,064	15,549
R-squared	0.11	0.16

NOTE: This table shows the estimation results for equation (9), which captures the percentage difference in revenue product of capital of female-owned and non-female-owned newly established non-incorporated establishments before and after the financial crisis. Column (1) shows the estimation results for the sample of observations in counties with above-median B.Reform, while column (2) shows the results for the sample of observations in counties with below-median B.Reform. We include the number of workers in the initial year as an additional control variable. A female-owned firm is defined as a non-incorporated establishment solely owned by one or more females. The standard errors are clustered at the 3-digit industry×year level. Data: Mining and Manufacturing Survey and Census of Establishments.

Table 9: Product Market Shock and Female Entrepreneurship

VARIABLES	(1) Female-owned new firms	(2) Male-owned new firms
P.Shock×(Year≥1998)	-0.026***	-0.312***
	(0.01)	(0.05)
Year FE	Y	Y
County-Industry FE	Y	Y
Observations	45,913	45,913
R-squared	0.530	0.676

Note: This table shows the estimation results for equation (11). The estimates show the effects of $\text{P.Shock}_{c,d}$ on the number of female/male new firms. $\text{P.Shock}_{c,d} = \ln\left(\frac{\text{Number of Firms}_{c,d,1997}}{\text{Number of Firms}_{c,d,1998}}\right)$, where $\text{Number of Firms}_{c,d,1997}$ and $\text{Number of Firms}_{c,d,1998}$ are the total firms in the 2-digit industry d at county c at the end of 1997 and 1998, respectively. A female-owned firm is defined as a non-incorporated establishment solely owned by one or more females, while a male-owned firm is defined as a non-incorporated establishment solely owned by one or more males. The standard errors are clustered at the 2-digit industry×year level. Data: Mining and Manufacturing Survey.

Appendix

A Data

In this section, we explain the data sources used for this study.

A.1 Mining and Manufacturing Survey

Our main dataset is the Mining and Manufacturing Survey in South Korea, which is an annual establishment-level survey that covers all establishments with at least five employees in the Mining and Manufacturing industry. The survey has been conducted every year since 1982 and continues to the present day. However, in 2006, the sample selection criteria changed from establishments with at least five employees to establishments with at least ten employees. Therefore, to maintain consistency in our analysis, we focus on the sample periods from 1982 to 2005.

The dataset we use contains rich information on manufacturing establishments, including ownership structure. Notably, it provides gender information for all owners of non-incorporated firms from 1982 onwards. In addition to ownership data, the survey also includes information on a firm's industry category, establishment year, revenue, capital, intermediary input costs, and the separate number of male and female workers, as well as the number of white- and blue-collar workers. Furthermore, it provides the total wage bills for both white- and blue-collar workers.

A.2 Census on Establishments

To capture the changes in the banking sector during the Korean financial crisis, we use the census on establishments. Starting in 1996, the census covers all establishments with one or more employees conducting business (or having conducted business) in Korea as of December 31 of each year.[32] Unlike the Mining and Manufacturing Survey, the census provides only basic information about each

[32]The survey was officially launched in 1994, but most variables are missing for 1994 and 1995.

establishment, such as its industry, location, and number of employees.

A.3 Population and Housing Census

The Mining and Manufacturing Survey provides limited information on the characteristics of entrepreneurs, with only gender being available. To document the characteristics of entrepreneurs before and after the crisis, we use the two percent sample of the Population and Housing Census for 1995 and 2000. This survey is a nationally representative sample of all Korean and foreign residents residing within Korean territory and their residences, providing comprehensive data to understand the size, distribution, and structure of the population and housing. The survey includes data on key demographic and socioeconomic variables, such as gender, age, education, marital status, employment status, industry, and occupation.

A.4 Social Survey

To examine the impact of joint labor supply within households, we use the Social Survey, which is an annual cross-sectional survey of approximately 18,000 sample households. The survey collects information on each household member aged 13 and over, including their employment status, occupation, and 2-digit industry of the current job. Since the survey captures the relationship with the household head, we can obtain detailed employment information for both husbands and wives at the time of the survey.

A.5 Economically Active Population Survey

To examine the gender-specific trend in the employment rate, we use the Economically Active Population Survey, which is a nationally representative annual survey of approximately 30,000 households. The survey collects data on key variables, such as education, age, employment status, working hours, occupation, and industry, for each household member aged 15 and older.

A.6 Wage Structure Survey

To track the evolution of the gender wage gap, we utilize the Economically Active Population Survey, which is a nationally representative dataset that surveys approximately 3,400 firms with at least ten workers annually. The survey collects data on key variables, such as education, age, gender, wage, working hours, industry, and occupation of employees. This enables us to estimate the Mincerian regression model, which controls for education, age, and industry, to document the gender gap in hourly wage.

A.7 Bank Management Statistics

To document the branches of commercial banks between 1997 and 1998, we utilize the Bank Management Statistics 1996-1999 published by the Financial Supervisory Service of Korea. This dataset provides essential information on Korean commercial banks, including their financial position, profit and loss, and the number of bank branches.

B Robustness Check

In this section, we develop an alternative measure for the banking sector reform to verify the robustness of our main results. Specifically, we utilize the percentage change in workers employed in bank establishments to capture the banking sector reform across counties:

$$\text{BW.Reform}_c = \ln\Big(\frac{\text{Bank Worker}_{c,1997}}{\text{Bank Worker}_{c,1998}}\Big),$$

where $\text{Bank Worker}_{c,1997}$ and $\text{Bank Worker}_{c,1998}$ are the numbers of bank workers in county c at the end of 1997 and 1998, respectively.

The mean and standard deviation of BW.Reform_c are 0.125 and 0.18, respectively, and we ob-

serve that 81% of counties experienced a decrease in the number of bank workers. These values are consistent with those obtained from the B.Reform$_c$ measure.

We utilize this newly constructed measure to estimate equations (2) and 3. The resulting estimates are presented in Table 6. The findings are consistent with those generated by the B.Shock$_c$ measure. Specifically, we find that the estimate for β_f is 3.487, indicating that a county that experienced a 10% decrease in the number of bank branches between 1997 and 1998 had approximately 0.35 more female-owned new firms after the reform than a county with no change in bank branches.

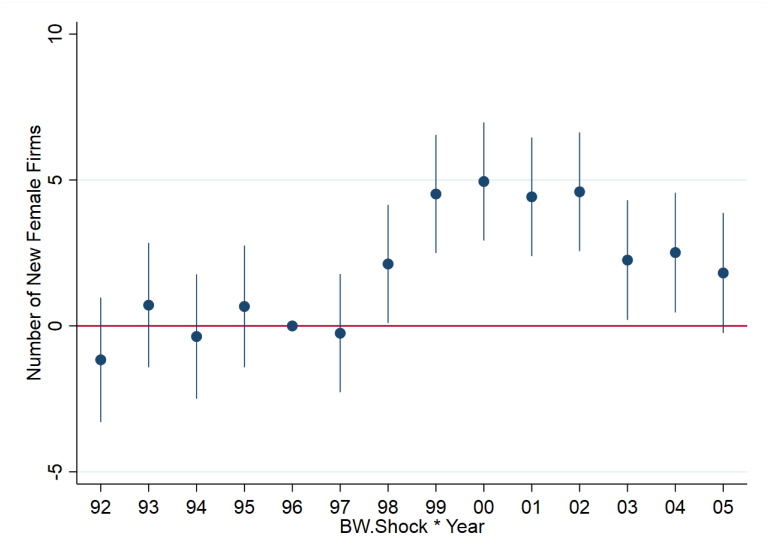
We proceed by estimating equations (4) and 5 using BW.Reform$_c$ instead of B.Reform$_c$. The results are displayed in Figures B1 and B2, which illustrate the estimates and their 95% confidence intervals. We observe that the estimation outcomes are highly consistent with those generated by the B.Reform$_c$ variable. Notably, there is no evidence of a pre-existing trend for the number of female-owned new firms, while the pattern for male-owned new firms is less clear. Overall, our main empirical findings remain robust to the alternative measure that utilizes the percentage change in bank workers in 1998.

Table B1: Banking Sector Reform and Female Entrepreneurship: Robustness Check

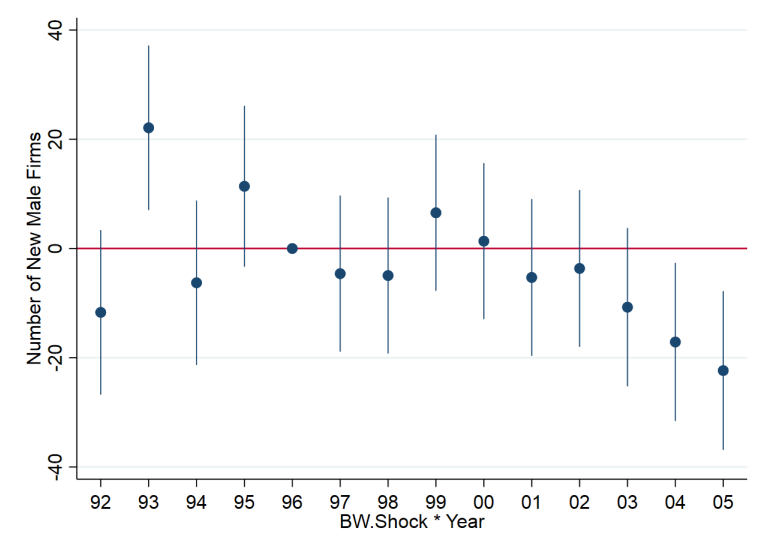
	Panel A		Panel B	
	(1)	(2)	(1)	(2)
VARIABLES	Female new firm	Male new firm	Female new firm	Male new firm
BW.Reform× Post	3.487***	-8.374***	0.191***	-0.432***
	(0.413)	(2.929)	(0.0227)	(0.112)
Year FE	Y	Y	Y	Y
County FE	Y	Y		
County-Industry FE			Y	Y
Observations	3,288	3,288	51,631	51,631
R-squared	0.664	0.700	0.531	0.675

NOTE: This table shows the effects of the banking sector reform on the number of female and male-owned new firms using an alternative measure. BW.Shock$_c = \ln\left(\frac{\text{Bank Worker}_{c,1997}}{\text{Bank Worker}_{c,1998}}\right)$, where Bank Worker$_{c,1997}$ and Bank Worker$_{c,1998}$ are the total bank employees in county c at the end of 1997 and 1998, respectively. Panel (a) is the estimation result for equation (2). Panel (b) is the estimation result for equation (3). The standard errors are clustered at the county-year level for Panel (b). Data: Mining and Manufacturing Survey, Census on Establishments.

Figure B1: Banking-Sector Shock and Female Entrepreneurship: Robustness Check



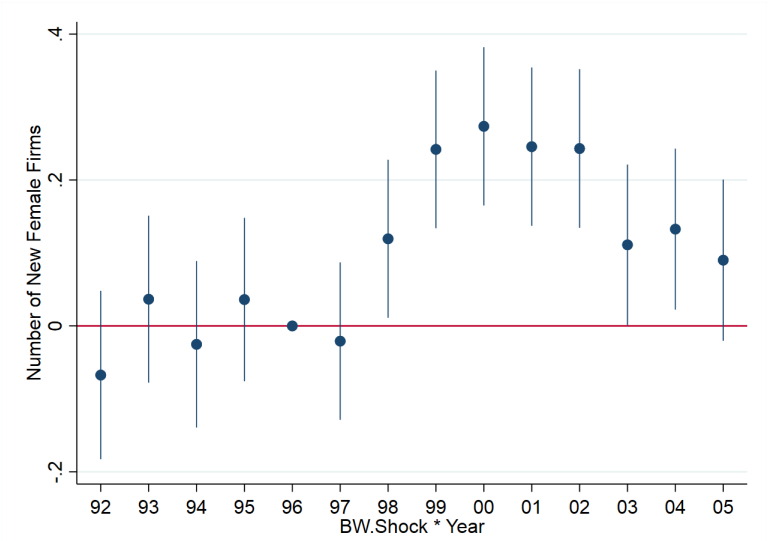
(a) BW.Shock and Female New Firm



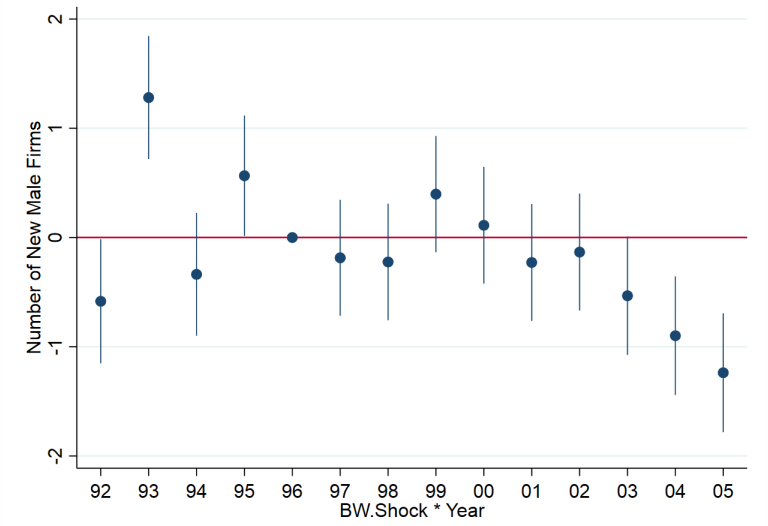
(b) BW.Shock and Male New Firm

NOTE: This figure shows the estimates and 95% confidence intervals for equation (4), except that we replace B.Shock$_c$ with BW.Shock$_c$. The estimates capture the effect of BW.Shock$_c$ on the number of new female firms (Panel (a)) and new male firms (Panel (b)). BW.Shock$_c = \ln\left(\frac{\text{Bank Worker}_{c,1997}}{\text{Bank Worker}_{c,1998}}\right)$, where Bank Worker$_{c,1997}$ and Bank Worker$_{c,1998}$ are the total bank employees in county c at the end of 1997 and 1998, respectively. Data: Mining and Manufacturing Survey, Census on Establishments.

Figure B2: Banking-Sector Shock and Female Entrepreneurship (Industry FE): Robustness Check



(a) BW.Shock and Female New Firm



(b) BW.Shock and Male New Firm

NOTE: This figure shows the estimates and 95% confidence intervals for equation (5), except that we replace B.Shock_c with BW.Shock_c. The estimates capture the effect of BW.Shock_c on the number of new female firms (Panel (a)) and new male firms (Panel (b)). $\text{BW.Shock}_c = \ln\left(\frac{\text{Bank Worker}_{c,1997}}{\text{Bank Worker}_{c,1998}}\right)$, where $\text{Bank Worker}_{c,1997}$ and $\text{Bank Worker}_{c,1998}$ are the total bank employees in county c at the end of 1997 and 1998, respectively. Data: Mining and Manufacturing Survey, Census on Establishments.

C Gender Difference in Borrowing Before the Financial Crisis

The Mining and Manufacturing Survey does not provide data on the indebtedness of non-incorporated establishments. To analyze differences in access to commercial banks and interest rates between male and female entrepreneurs, we use the Household Consumption Expenditure Survey.

The Household Consumption Expenditure Survey was conducted in 1996 and collected data on detailed consumption expenditures, income, debts, and savings from a sample of 30,000 representative households. One of the expenditure categories included in the survey was monthly interest payments, which we use to calculate the interest rate. In addition, the survey provides information on the total amount of debts, the amount of debts from commercial banks, household ownership of a house, and the gender and industry of the household head. The household head is defined as the main earner in the household.

We restrict our sample to households whose head is either self-employed, an employer, or an incorporated employer. Since the observations for employers and incorporated employers are too small, we include self-employed households in our analysis. Whereas the debt is the outstanding amount, the interest expense is recorded only for the previous month. As a result, some entrepreneurs whose outstanding debt is positive did not pay interest in the month of the interview. We drop these observations from our analysis.

The interest rate is calculated as the monthly interest payment divided by the outstanding debt amounts. To limit the influence of outliers, we drop observations with the bottom and top 5% of interest rates. The mean and median interest rate of the final sample are 1.8% and 1.2%, respectively. To investigate whether the interest rates for male and female entrepreneurs are different, we estimate a linear regression model of the interest rate on the gender of the household head, a dummy variable for having a house, and the ratio of bank debts out of all debts.

The first column of Table C1 displays the estimation results for the interest rate, which is measured

in percent (%). The results indicate that households with their own house paid 0.3 percentage points lower interest rates than those without. Similarly, households that solely relied on bank loans paid 0.4 percentage points lower interest rates compared to those borrowing from non-banking sources. Notably, the gender of entrepreneurs did not have a significant impact on the interest rate.

To investigate whether there were differences in the accessibility of bank loans between male and female entrepreneurs, we estimated a linear probability model that regressed the probability of having a bank loan on the gender of the household head and a dummy variable for having a house. The results are presented in the second column of Table C1. The findings indicate that the probability of having a bank loan was 16 percentage points higher for male entrepreneurs compared to their female counterparts. By comparison, the probability of having a bank loan was 19 percentage points higher for households that owned their house compared to renters. These results suggest that the magnitude of the gender difference in access to bank loans is comparable to that of the difference associated with housing ownership.

In summary, our analysis indicates that there was no significant difference in interest rates based on the gender of entrepreneurs before the financial crisis. However, our findings reveal that the accessibility of bank loans was substantially higher for male entrepreneurs compared to female entrepreneurs before the crisis. This suggests that gender-based differences in access to financing before the crisis are more likely to stem from differences in loan approval rates than interest rates.

Table C1: Gender Difference in Borrowing

VARIABLES	(1) Interest Rate (%)	(2) Positive Bank Debt
Male Entrepreneur	-0.0346	0.160***
	(0.214)	(0.0551)
Own House	-0.305**	0.191***
	(0.126)	(0.0318)
Bank Debt Share	-0.383***	
	(0.143)	
Constant	2.187***	0.353***
	(0.218)	(0.0557)
Industry FE	Y	Y
Observations	963	963
R-squared	0.030	0.059

NOTE: The table shows the difference in the interest rate and the probability of having a bank loan between male and female entrepreneurs in 1996. "Positive Bank Debt" is a dummy variable that takes a value one if a household haves a bank debt. Data: Household Consumption Expenditure Survey 1996 and 2001. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1