Financial Crisis and Female Entrepreneurship:

Evidence from South Korea

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November 1, 2023

Abstract

We document a drastic increase in female-owned manufacturing firms in South Korea after the 1997 financial crisis. During the crisis, a major banking sector reform was conducted, and many underperforming bank branches were forced to close down. Using a geographical variation of bank branch closures during the reform, we show that the banking sector reform resulted in a rise in female entrepreneurship. We present evidence that male-owned firms were preferred by the closed-down bank branches, despite female-owned firms exhibiting lower risks and higher returns. The banking sector reform, although not explicitly aimed at addressing gender disparities, substantially benefited female entrepreneurs by improving efficiency in the financial market.

JEL codes: G28, J16, L26, O53

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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 14.5% of manufacturing firms are owned by female entrepreneurs.[1] 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(a) illustrates the proportion of female-owned establishments out of all newly established non-incorporated manufacturing establishments in South Korea, with at least five workers 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 since 1997, having reached 14% in 1999. It took 15 years for the female share among new entrepreneurs to increase by three percentage points, but it grew by eight percentage points in just three years, starting from 1997. This increase was mainly driven by a drastic increase in female-owned new manufacturing establishments after 1997. This paper aims to investigate the reasons for the prolonged stagnation in the number of new female entrepreneurs, followed by a sudden surge after 1997.

Understanding the trend described above is important for several reasons. First, the manufacturing establishments with at least five workers, which is the focus of this study, accounted for 87% of all manufacturing employment between 1996 and 2005.[2] Therefore, the trend captures the emergence of transformational female entrepreneurs with high growth potential, who play a distinct role in driving economic development compared to those who start businesses for subsistence income (Schoar (2010)).

[1] Source: Enterprise Surveys (http://www.enterprisesurveys.org), World Bank.
[2] Source: Census on Establishments.

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, having reached a level comparable to that of Portugal, Spain, and New Zealand in 1996.[3] Although gender gaps in other economic activities such as education, labor supply, and wages have continuously decreased (section 6.5), 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 fact that this increase occurred over a short period suggests that it was likely driven by changes in gender-specific barriers rather than innate differences, as innate differences are less likely to change significantly within such a short time frame.

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."[4] Concerns about the soundness of financial institutions made it difficult for Korean banks to roll over their short-term foreign liabilities, resulting in a significant number of banks being unable to repay these 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 implements IMF-supported programs. Identifying the inefficient banking sector as the root cause of the crisis, the IMF and the South Korean government conducted

[3]Source: World Bank.

[4]During the same period, many Asian countries experienced a foreign exchange crisis, which is often referred to as the "Asian Financial Crisis."

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 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. Based on market-oriented evaluation criteria, five non-viable banks were forced to close down by the government. The remaining banks were required to downsize their branches and lay off employees to improve their management. 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. This transition was coupled with enhanced lending practices under the supervision of financial regulatory agencies. 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 the end of 1997 and 1998 across counties. Using difference-in-differences methods, we find a significant increase in the number of new female-owned firm and a corresponding decrease in the number of new male-owned firm 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 employees between the end of 1997 and 1998 as an alternative measure of the banking sector reform.

To establish a causal relationship in our empirical findings, we must assume that the trend in female (and male) firm creation would have been the same across counties in the absence of the bank branch changes that occurred in 1998. In normal circumstances, this assumption would be violated because changes in bank branches could be influenced by county-specific factors like local demand shocks that also impact firm creation. However, in 1998, the changes in bank branches were primarily driven by government-led bank-level reform, which aimed to close down troubled banks. The government's decision on which banks to close down was based on market-oriented evaluation criteria rather than local demand shocks.

As the reform mostly targeted the 14 undercapitalized banks, the variation in the bank branch changes in 1998 can be largely attributed to the geographic distribution of the branches belonging to those banks that were subject to the reform. Our empirical specification accounts for time-invariant county-specific factors that could affect banks' location choices. However, if a county's time-varying unobserved factors attracted undercapitalized banks more than others before the reform, and these factors later impacted the creation of female or male firms even in the absence of banking sector reform, our identifying assumption would be violated. To validate our assumption, we examine the pre-trend in female and male firm creation associated with the bank branch changes in 1998 and find strong evidence in support of our parallel trend assumption, particularly for female firm creation.

We strengthen our identification argument by using an additional identification strategy similar to that in Greenstone et al. (2010). During the reform, four local commercial banks with a negative BIS ratio were evaluated for potential charter termination, and eventually, two of them were forced to close down. We focus on counties in provinces where these four banks were primarily located to

identify the impact of the reform. These areas may have similar unobservable characteristics that attracted undercapitalized banks, but only some of them were subject to the intensive reform that terminated charters for local banks. Although the selection criteria for the disapproved banks were not random, the differences among the four banks may be marginal, at least compared to other local banks that met the required 8% BIS ratio. This alternative research design produced consistent results with the main specification, providing further support for the claim that the banking sector reform led to an increase in female entrepreneurship.

To understand the underlying mechanisms behind our empirical findings, we first consider the rational investment strategy of banks based on their beliefs about a government bailout. The bailout possibility may incentivize banks to opt for riskier projects along the risk/return frontier, potentially leading to excessive investment in high-risk, high-return projects. This mechanism may widen the gender gap in credit availability because, in our sample, male-owned firms exhibited higher riskiness, as measured by failure rates, compared to female-owned firms before the reform. However, we find limited evidence to suggest that the primary impact of the banking sector reform on commercial banks was a shift towards lending to safer manufacturing projects. First, we find that the cross-sectional variation in county-wide risk, as measured by failure rates of all establishments or the debt-to-equity ratio available for incorporated establishments, did not change substantially after the reform. Second, we find that counties experiencing more severe banking sector reform did not necessarily exhibit higher firm risk before the reform when the county-wide firm risk is measured by the debt-to-equity ratio.

Instead, we find evidence that the primary impact of the banking sector reform on commercial banks is an overall improvement in efficiency in the lending process. Before the reform, low-productivity incorporated establishments could secure more debts with the same amount of equity in counties that underwent substantial banking sector reform compared to their counterparts in less affected counties. However, this tendency disappeared after the reform. The fact that heavily re-

formed counties exhibited higher leverage ratios for low-productivity firms cannot be rationalized by risk-return trade-offs. This finding suggests that before the reform, banks that were subject to the reform might not have adequately screened borrowing firms, potentially resulting in unnecessary lending of larger amounts of debt to low-productivity firms.

Inefficient pre-reform lending practices may have adversely affected female entrepreneurs, allowing discriminatory factors to influence lending decisions. Consistent with this mechanism, we find evidence of capital misallocation between male- and female-owned firms. Before 1997, female-owned firms demonstrated a higher average revenue product of capital compared to male-owned firms, but this gap declined substantially after the reform. Given the significantly lower failure rate of female-owned firms compared to male-owned firms before the reform, this finding contradicts the first mechanism proposing that banks favored male-owned firms based on rational risk-return trade-offs. Moreover, the above bias toward male-owned firms observed before the reform was more apparent in counties heavily impacted by the banking sector reform. We further demonstrate that gender-specific differences in interest rates, collateral, or firm growth rates could not rationalize the lower revenue product of capital for male-owned firms compared to female-owned firms before the reform.

Anecdotal evidence suggests that female business owners often attempted to secure funding from banks, yet encountered difficulties due to the male-dominated banking culture. We provide evidence that gender-based financial constraints indeed contributed to the capital misallocation between male- and female-owned firms. Before the reform, female-owned firms had significantly more collateral for equivalent machinery investments, especially in counties that underwent more severe reform. However, after the reform, these gender disparities in collateral significantly diminished. Additionally, analyzing service industries characterized by higher self-employment and lesser reliance on external bank capital, we find no significant link between the banking sector reform and female entrepreneurship, suggesting that the surge in female entrepreneurship is mainly driven by sectors requiring substantial external

bank funding.

Reduced gender-based financial constraints are in line with the improvements in lending practices that were implemented across all commercial banks. Prior to the crisis, the loan approval process lacked transparency, and the lending decision typically relied on the amount of collateral and individual bankers' subjective evaluation. For example, branch heads could influence every step of the loan process, including screening, approval, review, and management, and they could freely decide on a large amount of funds at their discretion. Personal networks and solicitation also played a role in the lending process. After the reform, the lending decision became more systematic, with loans being reviewed by multiple loan officers, including specialized loan officers in headquarters.

Our findings demonstrate how an inefficient banking sector can discourage female entrepreneurship by creating an environment where irrational factors affect lending decisions. Over the course of the IMF-supported reform, the government of South Korea and the IMF communicated with a series of Letters of Intent that describe 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. Our results highlight how policies aimed at improving the efficiency of the financial market, 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.

This paper contributes to the literature that investigates 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 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 various 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)) by showing that promoting efficiency in the banking sector can substantially increase transformational female entrepreneurship.

Our paper also relates to the literature discussing the "cleansing effect" of recessions: resources are reallocated from less productive firms to more productive ones during recessions (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 financial crisis can facilitate the reallocation of resources from less productive male-owned firms to more productive female-owned firms.[5]

Finally, our paper adds to the existing literature on gender discrimination in the banking industry. Previous studies show how a lack of competitive pressure in the industry allows banks to discriminate against female employees in terms of hiring and wage compensation (e.g., Ashenfelter and Hannan (1986); Black and Strahan (2001)). In contrast, we demonstrate that a lack of competitive pressure in the banking industry can also lead to discrimination against female entrepreneurs. Our findings align with those of previous studies, highlighting the need for greater competitive pressure in the banking industry to eliminate discrimination against women.[6]

The paper is organized as follows. Section 2 discusses motivating facts about female entrepreneur-

[5]Relatedly, Kerr and Nanda (2009) demonstrate how banking sector reform in the U.S. led to growth in both entrepreneurship and business closures.

[6]Our paper is also broadly related to Goldin and Rouse (2000), who document how blind auditions can make the hiring process more impartial and reduce gender disparities in employment opportunities.

ship 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 workers 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, at the end of each year. To focus on the manufacturing industry, we remove all observations categorized under mining industries.[7]

Although they constitute a small proportion of all establishments in South Korea, manufacturing establishments with at least five workers 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 workers, which are the subject of our study, created 87% of all manufacturing employment between 1996 and 2005 in South Korea.[8] 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).

Since we can only identify the gender of the owners for non-incorporated firms, our main sample consists solely of non-incorporated establishments.[9] Non-incorporated establishments represent 70%

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

[8] Source: Census on Establishments.

[9] We use incorporated establishments to understand the mechanism of our main empirical findings and to conduct

of the total new establishments in the survey. Throughout the paper, the term "firms" refers specifically to non-incorporated manufacturing establishments with at least five workers unless otherwise specified.[10]

In this study, a female-owned firm is defined as an establishment solely owned by one or more females, while a male-owned firm is defined as an establishment solely owned by one or more males. We do not categorize an establishment with both male and female owners as a female-owned firm because 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)).[11]

Figure 1(a) depicts the proportion of female-owned firms among all newly established firms from 1982 to 2005. A new firm is defined as a non-incorporated establishment that was established in the survey year.[12] 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 new entrepreneurs had a remarkable surge since 1997, having reached 14% in 1999. It took 15 years for the female share among entrepreneurs to increase by three percentage points, but it grew by eight percentage points in just three years, starting from 1997.

Figure 1(b) shows the number of newly established female-owned firms from 1982 to 2005. The number of female-owned new firms increased from 51 in 1982 to 281 in 1996. It is worth noting that the number of female-owned new firms in 1997 was similar to those in 1995 and 1996, indicating that

robustness checks.

[10]Using Census on Establishment, which has surveyed establishments with at least one employee since 1996 and includes data on whether a given establishment operates as a single-establishment firm or is part of a multi-establishment entity, we calculate the proportion of single-establishment firms among non-incorporated manufacturing establishments from 1996 to 2005. Remarkably, 99.7% of non-incorporated manufacturing establishments owned by females are single-establishment firms. In fact, 99.6% of all non-incorporated manufacturing establishments operate as single establishments. This finding justifies the interchangeable use of the terms "firm" and "establishment" within the context of non-incorporated establishments in the Mining and Manufacturing Survey.

[11]The proportion of mixed-gender firms in our sample of non-incorporated firms is small, comprising 1.16% during the period of 1990-1997 and 0.65% during 1998-2005. Hence, including or excluding these mixed-gender firms does not significantly affect our findings.

[12]We analyzed the share of female-owned establishments using different denominators, including total new establishments (both incorporated and non-incorporated), and total new incorporated establishments. The pattern is consistent across these denominators. Likewise, the ratio of employment in female-owned establishments within non-incorporated new establishments exhibits a similar pattern.

the sudden increase in the share of female-owned firms among entrants observed in 1997 was due to the unusually low number of male-owned new firms in 1997.[13] However, there was a significant increase in the number of female-owned new firms after 1997. For instance, the number of female-owned new firms was 422 and 715 in 1998 and 1999, respectively, and remained high in the early 2000s. Therefore, the primary driver of the rise in the female share among new entrepreneurs was the significant increase in the number of female-owned new manufacturing establishments after 1997.

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 the industry at the 3-digit level. The results are shown in Figure 2(a). Even after controlling for the industry-fixed effect, the pattern observed in Figure 1(a) 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 for female ownership among all non-incorporated firms, including incumbent firms, with year dummies after controlling for the 3-digit industry fixed effect. The estimation result is shown in Figure 2(b). 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.

While there has been an overall increase in female representation in the labor market along the economic growth, it is important to note that the sudden surge in female entrepreneurship in the manufacturing sector was not a part of this trend. As detailed in section 6.5, female labor force participation rates have increased gradually with economic development and did not experience any

[13]The decrease in the number of male-owned new firms in 1997 could be attributed to changes in business and borrowing conditions that followed a series of bankruptcies among Korean conglomerates in that year.

sudden rise following the crisis.

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 2(b). 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 like textile or clothing products but also in other industries such as 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 Population and Housing Census. Since the census is conducted every five years, we use the data from the 1995 and 2000 censuses to examine the 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. 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."[14] 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-to-equity ratios with low returns on capital 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 intervened 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 declined dramatically by early December 1997, and the Korean won 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.[15] Commercial banks, in particular, held 82.5 percent of all nonperforming

[14]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).

[15]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.

loans among banks and 78 percent among all financial institutions (Ji and Park (1999)). 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.[16]

Previous studies suggest that the poor performance of most commercial banks in South Korea before 1997 was primarily due to their failure to correctly assess the risk associated with loans (e.g., Ubide and Baliño (1999)). This was attributed to the implicit government guarantee of a bailout in case of severe losses.[17] 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 may have led banks to invest in highly risky yet potentially unprofitable projects and may have reduced their incentive to develop screening technology capable of distinguishing between good and bad firms.[18]

The problem was further exacerbated by an ineffective regulatory regime. For instance, the division of regulatory responsibility between the Bank of Korea (BOK) and the Ministry of Finance and Economy (MOFE) resulted in coordination failures in monitoring the corporate governance of commercial banks.[19] Additionally, an informal and close relationship between financial institutions and regulatory organizations prevailed before the financial crisis, and former regulators were often appointed to management positions in financial institutions (Ji and Park (1999)).

[16]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).

[17]See Appendix D for the history of financial institution bailouts in South Korea.

[18]We provide evidence on the pre-crisis state of the banking sector in section 5.

[19]Regulatory responsibility was divided between the Office of Bank Supervision, an internal organization of the Bank of Korea (BOK), which supervised the bank business of commercial banks, and the Ministry of Finance and Economy (MOFE), which oversaw the trust business of commercial banks. Moreover, only MOFE had the authority to grant and revoke bank licenses.

3.2 Banking Sector Reform

The banking sector reform began by consolidating supervisory agencies.[20] 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.[21]

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 8% 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. Accordingly, 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 part of the review, accounting firms conducted a due diligence review of those 12 banks from May 1 to June 8, 1998, using the new loan specification criteria. Table 3 shows the results of the due diligence reviews.[22] The assessment results revealed that 8 out of the 12 banks had a

[20] See Appendix E.1 for details.

[21] 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 substandard 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 new loan specification was officially adopted in June 1998.

[22] The data is sourced from the FSC press releases on July 1, 1998.

negative BIS ratio, meaning their liabilities exceeded their 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, with an average NPL ratio of 30%.[23] After evaluating the rehabilitation plans, the Bank Appraisal Committee concluded that five banks were non-viable and disapproved of their plans. The remaining seven banks' rehabilitation plans were approved under the condition that they follow the government-guided rehabilitation plans.[24]

Based on the evaluation result, the FSC ordered the five banks (Donghwa, Dongnam, Daedong, Chungcheong, Kyungki) to close down immediately, 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 (Kookmin, Korea Housing, Shinhan, Koram, Hana) under the Purchase of Assets and Assumption of Liabilities (P&A) arrangement. All the depositor contracts were transferred to the acquiring banks.[25] The branches of the suspended banks were either closed or merged with the acquiring banks' branches. The board, top managers, and many staff members of the suspended banks were laid off.

Throughout the process, a large amount of public funds was injected into the banking sector. The government purchased the nonperforming loans of the 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 from the remaining banks. To qualify for this government assistance, banks were required to downsize their branches and lay off employees.

[23]The nonperforming loans in Table 3 refer to loans that are overdue by no less than 1 month; in other words, they belong to either the precautionary or substandard and below category according to the new loan classification criteria adopted in 1998.

[24]The reform process drew national attention, and the detailed review process was made public. The review result 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 understanding from the public.

[25]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.

Table 4 summarizes the changes in the banking sector in 1998.[26] 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 in the number of branches of the five acquiring banks 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 recapitalized or 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 closure of less profitable branches during the reform process was accompanied by improved lending practices overseen by financial supervisory agencies.[27] Before the crisis, the lending decision typically relied on the amount of collateral and individual bankers' subjective evaluation. After the reform, 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. Accordingly, the lending decision authority of bank branches was significantly reduced, and the number of top-ranked managers decreased substantially across all commercial banks.[28] Over the course of the reform, nonperforming loans decreased and banks' profitability improved for all commercial banks.[29]

[26]The data is sourced from the Bank Management Statistics, the website of the Korea Federation of Savings Banks, and Kim (2014).

[27]Improving commercial banks' lending practices was a policy target by the FSC. Detailed changes in the lending practices of each bank were reported by the FSC through press releases. See Appendix E.2 for details.

[28]See Appendix F.4 for details.

[29]In Appendix F.1, we document the decline in nonperforming loans of banks following the reform, and in Appendix F.2, we present the increase in returns on assets (ROA) of banks during the period 1998-2004.

4 Banking Sector Reform and Female Entrepreneurship

In this section, we show evidence that the banking sector reform, which followed the financial crisis, resulted in a rise in female entrepreneurship in the manufacturing industries of South Korea.

4.1 Main Empirical Specification

The Mining and Manufacturing Survey shows that a significant amount of assets and wage bills are required to start a manufacturing establishment.[30] Between 1982 and 1996, the median asset value and median wage bill for new non-incorporated manufacturing establishments were 72 million and 59 million 2015 Korean won, respectively.[31] Given the large amount of funds required from the beginning, many potential start-up owners would need external financing to establish their businesses. 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 in our sample.

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.

Given this proximity between manufacturing firms and bank branches, we use a geographical

[30] The Mining and Manufacturing Survey does not provide data on debts for non-incorporated establishments.

[31] Maintaining the money's value at the 2015 level, 72 million and 59 million Korean won are equivalent to 63,291 and 51,830 USD, respectively. For comparison, according to the Household Consumption Expenditure Survey 1996, the median annual household income and median savings amount are $23,187 and $9,337, respectively, in 2015 USD.

variation of banking sector reform to estimate the reform's impact on female entrepreneurship. To construct a variable that captures the geographic variation in the banking sector reform, we use the Census on Establishments. This survey collects information on 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.[32] As a result, the 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.

We use the 5-digit Korea Administrative District Code to construct a measure that captures the extent of banking sector reform across regions at the county level:[33]

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

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 establishments in county c between 1997 and 1998. We use the change in bank establishments in 1998

[32]The specialized banks include the National Agricultural Cooperative Federation, the National Federation of Fisheries Cooperatives, and the National Livestock Cooperatives Federation.

[33]In South Korea, administrative divisions can be classified into three categories: (1) large-sized areas (Si-Do), (2) medium-sized areas (Si-Gun-Gu), and (3) small-sized areas (Eup-Myeon-Dong). The medium-sized areas, which are comparable to counties in the United States based on their average population, are referred to as counties throughout the paper. The Si-Do areas, on the other hand, are referred to as provinces.

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.

Figure 3(a) shows the geographical variation of the B.Reform$_c$ variable. The areas where five disapproved banks were located experienced a relatively larger decrease in bank establishments. For example, Gyeonggi/Incheon, Chungcheongnam, Gyeongsangbuk, and Gyeongsangnam provinces 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.[34]

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 the 14 undercapitalized banks that failed, recapitalized, or conditionally approved 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.[35] 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.[36] Therefore,

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

[35]The report published by the Office of Bank Supervision (OBS) in September 1998 provides insight into the reduction of bank branches during early 1998 among those that had received conditional approval from the FSC during the reform: "Even among the surviving banks (excluding the 5 closed-down banks), the number of bank branches significantly decreased in the first half of 1998. This reduction was primarily due to a restructuring effort aimed at closing long-standing loss-making and financially weak branches, particularly by banks that received management improvement recommendations during the banking sector reform." Considering that the existing depositor contracts were reassigned to other operational bank branches within the same commercial bank, and given the comparatively proficient management exhibited by these surviving branches, we deduce that the depositor contracts were reallocated to better-managed branches even for surviving banks.

[36]Source: Economic Statistics Yearbook, Bank of Korea.

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.[37]

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 equation:

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

Female (male) new $\text{firm}_{c,t}$ is the number of newly established female-owned (male-owned) firms in county c in each year t. 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. We cluster standard errors at the county level to address possible serial correlation within an area.

To estimate equation (2), we merge the Mining and Manufacturing Survey with the Census on Establishments using the 5-digit Korea Administrative District Code as the county identifier. A new district classification was implemented in the Mining and Manufacturing Survey in 1992, which significantly differed from the previous classification. For this reason, we estimate equation (2) using observations between 1992 and 2005.

4.2 Identification

Before presenting the summary statistics for each variable and estimation results, we discuss the key issues in identification. The main identification assumption in equation (2) is that, in the absence of the banking sector reform, the trend in female (male) firm creation would have been the same across counties. In normal circumstances, this assumption would be violated because the changes

[37] In Appendix B.2, we present the robustness of our finding when accounting for changes in credit availability across counties.

in the number of branches in each county are determined by the headquarters, considering local factors such as local demand shocks, which may also affect female (male) firm creation. However, in 1998, the changes in bank branches were primarily driven by government-led bank-level reform, which aimed to close down troubled banks. As documented in Table 4, five banks that completely ceased operation after the reform accounted for about 70% of the net change in the number of bank branches. As discussed in section 3.2, the government's decision on which banks to close down was based on the capital adequacy ratio and the viability of the rehabilitation plan, which were evaluated at the individual bank level, rather than on local demand factors at the county level. In addition, branch closures among surviving banks were also driven by the reform that forced banks to shut down or merge the troubled bank branches rather than by typical considerations that drive branch opening and closure during normal periods.

While the nationwide reform that drove bank branch closures was unlikely to be influenced by county-specific demand shocks, it is worth noting that the initial distribution of bank branches before the reform was determined by the location choices of each bank. As the reform mostly targeted less profitable banks or branches, the variation in the B.Reform_c variable can be largely attributed to the geographical variation in the composition of the 14 undercapitalized banks' branches that were subject to the reform. Our specification accounts for time-invariant county-specific factors that may have influenced banks' location choices. However, if a county's time-varying unobserved factors attracted undercapitalized banks more than other banks before the reform, and these factors later affected the creation of female or male firms even in the absence of banking sector reform, our identifying assumption would be violated.

To validate our identifying assumption, we utilize data from multiple time periods. In section 4.5, we estimate an event study model to test whether there was a parallel pre-trend in female (male) firm creation associated with the B.Reform_c variable. Our analysis yields robust evidence in support

of our parallel trend assumption, particularly for female firm creation. To further strengthen our identification argument, we employ an additional identification strategy similar to Greenstone et al. (2010) in section 4.6. The estimation results from this alternative research design are consistent with the main empirical specification, further supporting the claim that the banking sector reform caused the rise of female entrepreneurship.

4.3 Estimation Results

Panels 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 between 1992 and 1997. After the reform, however, the average number of female-owned new firms increased from 1 to 2.51 between 1998 and 2005. 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.

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. The top and bottom 10 percentiles of the B.Reform$_c$ measures are 0.223 and -0.074, respectively. Thus, compared to the county at the 10th percentile of B.Reform$_c$, 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$_c$ after the reform. 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.

4.4 Alternative Specification

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 $\text{firm}_{c,d,t}$ is the number of female-owned (male-owned) 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 errors are clustered at the county level.

Note that the observation in equation (2) is at the county-year level, whereas the observation in equation (3) is at the county-industry-year level. In other words, we further divide a county cell for each 2-digit industry and consider the county-industry cell as one unit. 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.

4.5 Event Study Model

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

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

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

Equations (4) and (5) are the same as equations (2) and (3), respectively, except that we replaced the Post$_t$ dummy with a series of year dummies (I_t). For both equations, we cluster the standard errors at the county level. The base year for the analysis is 1997. Thus, $\beta_{s\in\{f,m\},t}$ captures the association between B.Reform$_c$ and the change in the number of female-owned (male-owned) new firms in county c in year t compared to the number of female-owned (male-owned) new firms in county c in 1997.

The first and second rows in Figure 4 display the estimates for $\beta_{s\in\{f,m\},t}$ and their 95% confidence intervals for equations (4) and (5), respectively. The left and right panels in Figure 4 display the results for female- and male-owned new firms, respectively. The estimation results for equations (4) and (5) 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 (Figure 4(a) and 4(c)); before 1998, the changes in the number of female-owned new firms from the base year (1997) were not associated with the B.Reform$_c$ 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. These findings are consistent with the interpretation that female firm creation was in a steady state across all counties before the reform, with the differences between the pre- and post-reform levels being more pronounced for counties where the 14 undercapitalized banks were mainly located.

We do not see a clear pre-trend associated with the banking sector reform for male-owned new firms. However, it is worth noting that 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 (Figure 4(b) and 4(d)). 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 less profitable businesses before the reform. Taken together, Panels (b) and (d) in Figure 4 suggest that excessive investment in less profitable 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.

4.6 Alternative Identification Strategy

As part of the banking sector reform, four local commercial banks with negative BIS ratios were required to submit rehabilitation plans. Among these four banks, only Kangwon and Chungbuk banks had their rehabilitation plans conditionally accepted, while the plans for Chungchong and

Kyungki banks were disapproved. Consequently, the latter two banks were immediately forced to cease operations and replaced by two healthier banks, as shown in Table 4. According to Table 3, the conditionally approved and disapproved banks had similar BIS and NPL ratios. Thus, the differences between the conditionally approved and disapproved banks appear to be marginal.[38]

To identify the causal impacts of the reform, we focus on counties in five provinces where the four undercapitalized local banks operated. These areas share similar unobservable characteristics that attracted undercapitalized banks, but only some of them were subject to the intensive reform that terminated charters for local banks.[39] While the selection criteria for the disapproved banks were not random, as explained in section 3.2, the differences among the four banks may be marginal, especially when compared to other local banks that met the required 8% BIS ratio.[40]

We first show a map of the five provinces where the four undercapitalized local banks were chartered to operate before the reform in Figure 3(b). Kangwon and Chungbuk banks were located in Gangwon and Chungcheongbuk provinces, respectively, while Chungchong and Kyungki banks operated in Chungcheongnam and Gyeonggi/Incheon provinces, respectively. Although all five provinces were affected by the nationwide banking sector reform, the impact of the reform was likely more substantial in provinces where the two disapproved banks, Chungchong and Kyungki banks, were mainly located. Therefore, to capture the impact of banking sector reform, we estimate the following

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

[39]To ensure more comparable characteristics between disapproved and conditionally approved banks, we focus on local commercial banks in our analysis, even though two disapproved nationwide banks (Daedong and Dongnam) were concentrated in two other provinces, Gyeongsangbuk and Gyeongsangnam. For instance, the government's "One Province, One Bank" policy initiated by President Park Chung-hee in 1967 led to the establishment of Chungchong, Kyungki, Kangwon, and Chungbuk banks, all with a longer operating period compared to Daedong and Dongnam, which were established later in 1989. To verify the robustness of our results, we conducted a sensitivity analysis by including the two other provinces (Gyeongsangbuk and Gyeongsangnam) as treatment provinces and found similar results.

[40]This argument is in line with Greenstone et al. (2010). To estimate the impact of a large manufacturing plant opening in a county on the productivity of incumbent plants, they use a comparison between the county that the large plant ultimately chose (the "winner") and the one or two runner-up counties (the "losers"). The losers are counties that have survived a long selection process but ultimately lost the competition to the winner. They make the identifying assumption that the incumbent plants in the losing counties provide a valid counterfactual for the incumbent plants in the winning county.

equation:

$$\text{Female (male) new firm}_{c,t} = \beta_{s\in\{f,m\}} \cdot (\text{Intensive Reform}_c \cdot \text{Post}_t) + \tau_t + \tau_c + \epsilon_{c,t}, \tag{6}$$

where Intensive Reform$_c$ is a dummy variable that takes a value of 1 if a county is located in either Chungcheongnam or Gyeonggi/Incheon provinces. Note that equation (6) is identical to equation (2), except that B.Reform$_c$ is replaced by Intensive Reform$_c$. We limit our estimation sample to counties in Gangwon, Chungcheongbuk, Chungcheongnam, and Gyeonggi/Incheon provinces. The standard errors are clustered at the county level. We also estimated equation (3) by substituting B.Reform$_c$ with Intensive Reform$_c$ to control for the industry fixed effect. The results are similar to those in equation (6), and we omit these results to save space.

The estimation result for equation (6) is presented in Panel C of Table 6. The estimate for β_f is 1.701, indicating that a county in a province where the reform terminated the charters of undercapitalized local banks generated approximately 1.7 more female-owned new firms after the reform than a county in a province where undercapitalized local banks continued to operate. Considering that the average number of female-owned new firms at the county-year level between 1992 and 1997 was one, the magnitude of the treatment effect is substantial. On the other hand, the estimate for β_m is -5.836, suggesting that a county in a "treated" province produced approximately 6 fewer male-owned new firms after the reform than a county in a "control" province.

The identifying assumption in equation (6) is that the trend in female (male) firm creation would have been the same across counties in the five provinces in the absence of the banking sector reform. To support the validity of the identifying assumption, we estimate the event study model presented

in equation (7):

$$\text{Female (male) new firm}_{c,t} = \sum_{t=1992}^{2005} \beta_{s\in\{f,m\},t} \cdot (\text{Intensive Reform}_c \cdot I_t) + \tau_t + \tau_c + \epsilon_{c,t}. \quad (7)$$

Equation (7) is identical to equation (4), except that Intensive Reform$_c$ is used as the reform measure instead of B.Reform$_c$. As with equation (6), we restrict the sample to counties in Gangwon, Chungcheongbuk, Chungcheongnam, and Gyeonggi/Incheon provinces. We also cluster standard errors at the county level.[41]

Panels (e) and (f) in Figure 4 show the estimates for $\beta_{s\in f,m,t}$ and their 95% confidence intervals for equations (7). We do not find any differential pre-trends in the number of female-owned new firms across the treated and control provinces. However, the results indicate that the creation of female-owned new firms was significantly higher in the treated provinces after the reform, and this effect persisted until 2004. On the other hand, the number of male-owned new firms tended to be unusually higher in 1993 and 1995 (relative to 1997) among the counties in the provinces where the two disapproved local commercial banks were mainly located. Overall, the findings support the conclusions drawn from equations (4) and (5).

Although we are cautious about interpreting the negative association between male-owned firm creation and the banking sector reform as causal, we have demonstrated that the identifying assumption for the causal effect of the reform on female-owned firm creation is valid for both research designs. Based on this evidence, we conclude that the banking sector reform resulted in a rise in female entrepreneurship in the manufacturing industries of South Korea.

[41] We found similar results to equation (7) when we estimate equation (5) by substituting B.Reform$_c$ with Intensive Reform$_c$.

5 Understanding Mechanisms

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

5.1 Excess Investment in High-Risk, High-Return Projects

We first consider the rational investment strategy of banks based on their beliefs about a government bailout. The bailout possibility may incentivize banks to opt for riskier projects along the risk/return frontier, potentially leading to excessive investment in high-risk, high-return 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.[42] Thus, the possibility of a bailout could have incentivized banks to lend to male-owned firms, which typically take more risks, resulting in a gender gap in start-up financing.

We first show that male-owned firms were indeed riskier than female-owned firms in our sample by estimating the gender differences in the failure rate between male-owned and female-owned firms. Specifically, we estimate equation (8) using non-incorporated establishments:

$$\text{Failure}_{i,t} = \sum_{t=1982}^{2005} \gamma_t \cdot (\text{Female}_i \cdot I_t) + \tau_t + \tau_d + \epsilon_{i,t}, \tag{8}$$

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. Female_i is a dummy variable for a female-owned firm, and I_t is the cohort dummies. τ_t and τ_d are the cohort and 3-digit industry fixed effects, respectively. $\epsilon_{i,t}$ is the

[42] For example, Bönte and Piegeler (2013) suggest that women tend to be less inclined toward 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 (Karaivanov and Yindok (2022)).

error term. The standard errors are clustered at the industry-cohort level.

Figure 5(a) shows the estimates for γ_t and their 95% confidence intervals. Between 1982 and 1998, the failure rate of female-owned new firms was lower than that of non-female-owned new firms. For instance, between 1990 and 1996, the failure rate of female-owned new firms was 5 to 8 percentage points lower than non-female-owned new firms.

If banking sector reform led to banks investing more in safer firms, thereby explaining the rise of female entrepreneurs due to male firms being generally riskier than female ones, we would anticipate higher firm risk levels before the reform in counties more severely affected by the banking sector reform, followed by a subsequent reduction in risk after the reform in those areas. In the following discussion, we focus on whether there was a significant change in the county-wide risk measure for establishments after the reform, utilizing two metrics from our sample: the start-up failure rate for both non-incorporated and incorporated establishments, as well as the debt-to-equity ratio for incorporated establishments.

First, we assess the probability of start-up failures across counties before the reform to examine whether areas more affected by the reform experienced higher rates of start-up failures before the reform. Specifically, we estimate the following equation:

$$\text{Proportion of failed new est.}_{c,t} = \beta_0 + \beta_1 \cdot \text{B.Reform}_c + \tau_t + \epsilon_{c,t}. \tag{9}$$

Proportion of failed new est.$_{c,t}$ is calculated by dividing the number of new establishments, including both incorporated and non-incorporated, created in year t at county c that failed within 3 years by the total number of new establishments created in year t at county c.[43] We define an establishment 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.[44] τ_t is the cohort fixed effect, and $\epsilon_{c,t}$ is the error term.

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

[44] The Mining and Manufacturing Survey captures all the manufacturing establishments with at least five workers in

The coefficient β_1 represents the association between the banking sector reform and the proportion of failed start-ups across counties. We estimate equation (9) 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 estimation results are reported in column (1) of Panel A of Table 7, where the estimated β_1 is 0.186 and significant. Compared to the county at the 10th percentile of B.Reform$_c$ distribution, the proportion of failed new establishments was about 6% higher in the county at the 90th percentile.[45]

The second sample includes all new establishments created between 1998 and 2002, after the banking sector reform. The estimation results are reported in column (2) of Panel A of Table 7. The magnitude of β_1 decreases from 0.186 to 0.159 but remains statistically significant. Therefore, the reform did not alter the overall cross-sectional variation of the start-up failure rate.

As an alternative measure of the riskiness of establishments across counties, we compute the yearly average debt-to-equity ratio for each county, focusing on incorporated establishments. We utilize data for incorporated establishments since equity information is exclusively available for incorporated establishments in our sample, and we calculate debt by subtracting equity from assets.[46] Subsequently, we conduct regression analyses similar to equation (9) for both the pre-reform (1992-1997) and post-reform (1998-2005) periods:

$$\text{Average Debt-to-Equity (D/E) ratio}_{c,t} = \beta_0 + \beta_1 \cdot \text{B.Reform}_c + \tau_t + \epsilon_{c,t} \tag{10}$$

To limit the influence of outliers, we exclude observations from county-years with the top 1% of the average debt-to-equity ratio when estimating this equation.

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.

[45] Note the average probability of a new establishment failing within three years in our sample is 34% between 1982 and 2002.

[46] We exclude observations where incorporated establishments report more equity than assets when computing these county-year averages.

The results are presented in Panel B of Table 7. In contrast to the results of Panel A of Table 7, Panel B of Table 7 indicates that there is no association between the extent of the banking sector reform and county-year-wide average debt-to-equity ratios even before the reform. This finding suggests that banks' lending to firms in counties with more extensive reform did not necessarily exhibit higher risk even before the reform.

In summary, we find mixed evidence regarding whether the riskiness of establishments was greater in counties that experienced more severe banking sector reform before the reform. When examining the start-up failure rate, we find that county-wide risk exposure is greater in counties with more severe banking sector reform. However, when we use the debt-to-equity ratio for incorporated establishments to measure firm risk, we do not observe a significant association between county-wide risk exposure and banking sector reform. Importantly, for both risk measures, the cross-sectional variation in county-wide risk did not change substantially after the reform. Therefore, we have limited evidence to suggest that the primary impact of the banking sector reform on commercial banks was a shift towards lending to safer manufacturing projects.[47]

5.2 Improved Lending Practices and Mitigating Gender-Specific Misallocation

5.2.1 Efficiency in Lending

If the banking sector reform did not significantly push lending towards safer manufacturing projects, what was its impact on commercial banks? We demonstrate in the following discussion that the primary impact of the banking sector reform on commercial banks is an overall improvement in the efficiency of the lending process.

To this end, we delve deeper into the findings in Panel B of Table 7, by computing the average debt-to-equity ratio for each county and year among "low-productivity" incorporated establishments.

[47] Although the substantial increase in consumer loans following the reform has been considered the primary factor contributing to the decrease in riskiness in banks' overall portfolios (Ji and Park (1999)), our findings suggest that banks did not necessarily shift to safer lending practices for manufacturing projects after the reform.

A low-productivity incorporated establishment is defined as one whose average revenue product of capital falls below the 3-digit industry-specific median for each year, encompassing both incorporated and non-incorporated establishments. The average revenue product of capital is calculated by dividing revenue by capital stock. Following Kim et al. (2017), we define capital stock as the sum of the total fixed asset values of building structures, machinery, and transport/other equipment. We then re-estimate equation (10) using this alternative variable as the dependent variable.

The results are presented in Panel C of Table 7. Before the reform, low-productivity incorporated establishments in counties heavily affected by banking sector reform could secure more debts with the same amount of equity compared to their counterparts in less affected counties. However, this tendency disappeared after the reform. The fact that heavily reformed counties exhibited higher leverage ratios for low-productivity firms cannot be rationalized by risk-return trade-offs. Instead, these findings align with the notion that banks in such counties may not have adequately screened borrowing firms, potentially leading to unnecessary lending of larger amounts of debt to low-productivity firms.

Prior to the crisis, the loan approval process lacked transparency, and the lending decision typically relied on the amount of collateral and individual bankers' subjective evaluation. For example, branch heads could influence every step of the loan process, including screening, approval, review, and management, and they could freely decide on a large amount of funds at their discretion. Personal networks and solicitation also played a role in the lending process.[48] As discussed in section 3.2, the banking sector reform replaced nonviable banks with healthier ones, restructured branch operations for profitability, and enhanced lending practices among all surviving banks. Our findings suggest that the reform operated through these margins simultaneously, making the banking sector more efficient and market-oriented, especially those areas hit harder by the reform.[49]

[48] See Appendix E.2 for details

[49] While a concentrated banking sector might raise concerns about potential monopolies that could impede entrepreneurship, the impact of banking sector competition on entrepreneurship remains ambiguous (e.g., Smirlock (1985)). For instance, Petersen and Rajan (1995) argue that higher banking sector concentration can actually foster entrepreneurship. In less competitive banking environments, entrepreneurs may find it easier to secure funding because banks with greater market power are more inclined to invest in information gathering and building borrower relationships. The

5.2.2 Gender-Specific Misallocation

Inefficient pre-reform lending practices may have adversely affected female entrepreneurs, allowing discriminatory factors to influence lending decisions. Ample anecdotal evidence supports unequal treatment by banks towards female entrepreneurs before the crisis (for example, see Appendix C.3). Below, we present evidence of capital misallocation between male and female firms before the crisis and its improvement after 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 better capture the outcomes of surviving firms, we include all non-incorporated firms of different ages, ranging from newly established firms to those that have been in operation for several years. Specifically, we estimate equation (11):

$$\ln\left(\frac{\text{Revenue}_{i,t}}{\text{Capital}_{i,t}}\right) = \sum_{t=1982}^{2005} \gamma_t \cdot (\text{Female}_i \cdot I_t) + \text{Controls}_{i,t} + \tau_t + \tau_d + \epsilon_{i,t}. \tag{11}$$

Female_i is a binary variable that equals one if firm i is a female-owned firm, 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 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 5(b) 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 among surviving

South Korean case appears to support this hypothesis, as demonstrated in Appendix F, where we show that after the reform, both market concentration and several banking sector performance metrics improved.

firms.[50]

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.[51] Note that almost all external funds for small and medium-sized manufacturing enterprises in South Korea were distributed by commercial banks. Hence, the inefficient distribution of loans by banks may be a crucial factor contributing to the misallocation of capital across male- and female-owned firms before the crisis. In section 5.2.3, we provide additional evidence on this point. Overall, combined with the findings from Panel (a) in Figure 5, Panel (b) in Figure 5 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 counties that were later hit harder by the banking sector reform. To show this, we estimate the following equation:

$$\ln\left(\frac{\text{Revenue}_{i,t}}{\text{Capital}_{i,t}}\right) = \gamma_0 \cdot \text{Female}_i \cdot I_{t\leq 1996} + \gamma_1 \cdot \text{Female}_i \cdot I_{t\geq 1999} + \text{Controls}_{i,t} + \tau_t + \tau_d + \epsilon_{i,t}, \quad (12)$$

where $I_{t\leq 1996}$ is a dummy variable for the observations between 1992 and 1996, and $I_{t\geq 1999}$ is a dummy variable for the observations between 1999 and 2005. Other variables are identical to equation (11). 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

[50] We find a similar trajectory of the gender gap when we instead use total factor productivity (TFPR) as an outcome variable on the left-hand side of equation (11). The TFPR measure is calculated based on revenue, adopting the approach introduced by Hsieh and Klenow (2009). This observation underscores the presence of allocative inefficiencies between female- and male-owned firms before the reform, which are then mitigated following the reform.

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

average revenue product of capital across male- and female-owned firms before and after the reform, respectively. We estimate equation (12) for two separate samples. The first sample includes firms in counties for which B.Reform$_c$ is above the median (Column (1)), and the second sample includes firms in counties with B.Reform$_c$ below or equal to the median (Column (2)). The standard errors are clustered at the industry-year level.

The results are reported in Panel A Table 8. The estimated γ_0 is 0.038 and significant at the 1% level for the above-median sample, whereas it is 0.019 and not significant for the below-median sample. Before 1996, the average revenue product of capital for female-owned firms was significantly higher than that for non-female-owned 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 counties that were later hit harder by the banking sector reform.

To assess the robustness of capital misallocation across male and female firms before the reform, we explore whether gender differences in other firm characteristics, aside from the revenue product of capital, could explain the greater credit allocation toward male firms before the crisis.

First, banks' tendency to invest more in male entrepreneurs despite their lower returns and higher risk than female entrepreneurs could still be rational if they can charge higher interest rates for male entrepreneurs than for female entrepreneurs. To test this hypothesis, we examined the Household Consumption Expenditure Survey 1996 in Appendix C.1, 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. On the other hand, we find that the accessibility of bank loans was substantially higher for male entrepreneurs compared to their female counterparts before the crisis. In line with this finding, in

Appendix C.2, we provide evidence that prior to the crisis, female firms generally had lower debt levels, and this gender-based gap narrowed following the reform.

Second, if male firms invest more in assets that can be easily collateralized and sold by the bank, they might be perceived as less risky. In the Mining and Manufacturing Survey, asset value can be divided into four components: land, building structures, machinery, and transport/other assets. On average from 1982 to 2005, land, building structures, and machinery collectively account for the majority of asset values at 16%, 13%, and 48%, respectively. Land and building structures are generally viewed as higher collateral value assets. For instance, in South Korea, they typically represent 80% of the appraised value as collateral, in contrast to machinery, which is usually only considered at 40%.[52] To assess whether male-owned firms allocated more capital to assets with higher collateral value, we modify the outcome variable in equation (11), focusing on three asset components: (1) land, (2) building structures, and (3) other asset types. The results are presented in Figure 6.

Overall, at the 3-digit industry level, we do not observe a significant difference in land and building values between female and non-female firms across the sample period. Surprisingly, during the early 90s, land and building values were even higher for female firms. However, the values of machinery and other assets were notably lower for female firms before the reform, and this disparity was considerably reduced after the reform. Consequently, we conclude that male-owned firms were proportionally investing *less* in assets with higher collateral values before the reform.

Third, a higher anticipated exit rate could be rationalized if the bank foresees faster growth and larger future loan requirements for male-owned firms. To investigate potential differences in the life-cycle growth profiles of female and non-female firms, we modify equation (8). We replace the outcome variable with the logarithmic value of the number of workers in the 4th year, while also incorporating the logarithmic value of initial assets as an additional control variable. The outcomes are presented

[52]Kim, Jaeseung. "When small businesses exhibit strong growth potential, banks lend more easily." The Kyunghyang Shinmun, December 5, 1998.

in Figure 7.[53] With the exception of the year 1982, where the dataset for 4th-year female firms was limited (less than 100 observations), the number of workers in female firms, conditional on survival, is not notably different from that of non-female firms, and in some years (particularly the early 90s), even surpasses that of non-female firms. Consequently, it's less likely that banks are providing more funding to male entrepreneurs with the expectation that male-owned firms will exhibit faster growth and take out larger loans in the future.

5.2.3 Financial Constraints and Gender-Specific Misallocation

Admittedly, we lack loan application data for the banks that ceased operations, preventing us from determining whether the capital misallocation between female and male firms before the reform was due to a discriminatory loan approval process by commercial banks or female entrepreneurs' limited loan applications. Nevertheless, anecdotal evidence suggests that female business owners often attempted to secure funding from banks, yet encountered difficulties due to the male-dominated banking culture. For instance, the Association of Women Small Business Owners highlighted in its 1992 founding declaration: "Our purpose in forming this association is to vigorously advocate for the rights and interests of women-owned businesses, diverging from the male-centric banking culture that historically obtained bank loans through social networking, such as informal gatherings." (Source: Chosun Daily News, November 11, 1992). In Appendix C.3, we include more news articles that vividly illustrate instances of discrimination against women in the banking sector before the reform.

Furthermore, in our sample, we also find supporting evidence that the gender-based collateral requirement gap before the reform was more pronounced in counties heavily impacted by the banking sector reform. In particular, we estimate equation (12) with the combined value of land and building assets (collateral asset) as the dependent variable, including the logarithm of machinery value as an additional control. To limit the influence of outliers, we exclude observations in the top 1% of the

[53] Our findings remain robust if we choose another year to account for growth, such as the 5th or 6th year.

dependent variable when estimating this equation.

The results are reported in Panel B Table 8. The estimated γ_0 is 12.75 and significant at the 1% level for the above-median B.Reform sample, whereas it is 6.93 and not significant for the below-median B.Reform sample.[54] Pre-1996, female-owned firms had significantly higher collateral assets for the same machinery investment, especially in regions heavily affected by the banking sector reform. Post-reform, the gender gap in collateral value diminished across both samples. This finding suggests that gender differences in financial constraints, as measured by collateral requirements, were greater before the reform in counties heavily affected by the banking sector reform, and this difference disappeared after the reform as lending practices improved.

To strengthen our argument regarding gender-specific financial constraints and their role in limiting female entrepreneurship prior to the reform, we conduct a placebo test using service industries, known for higher self-employment rates and lesser dependence on external bank capital (Appendix B.3). As anticipated, we find no significant impact of the banking sector reform on new firm creation in these service sectors, regardless of gender. This suggests that the surge in female entrepreneurship is primarily driven by sectors requiring substantial external bank funding.

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.

[54] Monetary values are in one million Korean won, adjusted to 2015 Korean won. Average collateral asset value is 182 million won in the estimation sample.

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 estimate equation (13) for all non-incorporated establishments in our sample:

$$\frac{\text{Male Workers}_{i,t}}{\text{All Workers}_{i,t}} = \sum_{t=1982}^{2005} \gamma_t \cdot (\text{Female}_i \cdot I_t) + \text{Controls}_{i,t} + \tau_t + \tau_d + \epsilon_{i,t}. \tag{13}$$

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 total workers. 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 8(a) depicts the estimated γ_t and 95% confidence intervals. 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 (13) by replacing the dependent variable with log wages. 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.

The estimates for γ_t and their corresponding 95% confidence intervals are shown in Panels (b) and (c) in Figure 8. The gap between male-owned and female-owned firms for white-collar workers' wages was observed during the 90s, but this gap did not change during the financial crisis (Panel (b)). 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 (c)). Overall, we do 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 data from the Mining and Manufacturing Survey. To better capture the change in the local product market, we include both incorporated and non-incorporated establishments to measure the total number of firms in county c and industry d:

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

The measure captures the percentage changes in the number of firms at the 2-digit industry level within each county.[55] 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 (14).

$$\text{Female (male) new firm}_{c,d,t} = \beta_{s\in\{f,m\}} \cdot (\text{P.Shock}_{c,d} \cdot \text{Post}_t) + I_t + \tau_{c,d} + \epsilon_{c,d,t} \tag{14}$$

[55]The finding remains robust when we use the percentage changes in the number of non-incorporated firms at the 2-digit industry level within each county as an alternative measure.

Note that equation (14) is essentially the same as equation (3), except that we have replaced B.Reform$_c$ with P.Shock$_{c,d}$. The standard errors are clustered at the county-industry level.

The estimation results are presented in Table 9. The estimated values of β_f and β_m are -0.026 and -0.312, respectively, and the p-value is less than 0.01 for both estimates. 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$_{c,d}$ 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 1992 and 1997 were 0.06 and 1.12, respectively.

More importantly, the estimate for β_f is negative, indicating that markets, defined by industry and county cells, that were hit harder during the financial crisis experienced less creation of female-owned new firms. Therefore, the product-market shock (measured by 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 (13), 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 9 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. A decrease in the husband's income, due to crisis-related layoffs, may encourage greater labor force participation among wives. Some of these women may choose entrepreneurship instead of traditional employment, leading to an increase in 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 as 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 between 1993 and 2005 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:

$$\text{Employer Wife}_{i,t} = \sum_{t=1993}^{2005} \gamma_t \cdot (\text{UE husband}_{i,t} \cdot I_t) + \text{Controls}_{i,t} + \tau_t + \epsilon_{i,t}, \tag{15}$$

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 10. 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 two years after the IMF intervention. However, as depicted in Figure 1(b), 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 and Characteristics

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.

Figure 11(a) displays the unemployment rate for males and females based on the data from the OECD. Between 1990 and 1996, the average unemployment rates for males and females were 2.91% and 1.98%, respectively. These numbers increased slightly in 1997 and then peaked at 7.81% for males and 5.65% for females in 1998 due to mass layoffs. Subsequently, the unemployment rates decreased to 3.63% for males and 2.74% for females in 2002, respectively. While the unemployment rates increased temporarily after the crisis, the increase was greater for males than for females. Additionally, in 2002, the gender difference in the unemployment rates was comparable to the pre-crisis level, indicating that the probability of females being unemployed relative to males did not change after the crisis.

Next, we investigate whether the hourly wage changed differently for males and females after the crisis, using data from the Wage Structure Survey. Figure 11(b) presents the estimated gender wage gap based on the Mincer regression, as measured by the difference in log hourly wages between male and female workers, controlling for the age and education of workers. The gender wage gap has decreased over time and did not change substantially between 1997 and 2000.

On the other hand, if there were a sudden change in the characteristics of the female population relative to males after the crisis, such a trend could also contribute to the rise of female entrepreneurship. We first check whether there was a significant change in women's inclination towards working.

Figure 11(c) documents the labor force participation rates of the working-age population aged 15-64 for males and females, using data from the OECD. While the labor force participation rate for males (dotted line) was relatively stable at around 80% since 1980, the female labor force participation rate (solid line) increased gradually from 46.3% in 1980 to 51.9% in 1996. We do not find a sudden change in the trend of the female labor force participation rate after the crisis. Accordingly, the gender gap in the labor force participation rate (dashed line) decreased gradually since 1980 and did not present a sudden change after the crisis.

Figure 11(d) documents the total number of enrollees in all post-secondary programs aged 25 and above between 1980 and 2010 by gender using data from the Barro & Lee data set.[56] 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.

Finally, we also explore whether changes in risk aversion might offer an alternative account for the surge in female entrepreneurs. To investigate the trend of risk aversion, we utilize data from the Social Survey. In both the 1995 and 1998 Social Surveys, respondents were asked the question: "What do you consider the most crucial factor when choosing a career?" They could select from options like reputation, stability, salary, self-fulfillment, future career prospects, or others. We used their answers to track how men's and women's job preferences were changing. We find a shift towards greater value placed on job stability following the crisis. The percentage of females aged 15 or older who prioritize job stability increased from 31% to 43% between 1995 and 1998, while the corresponding

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

figure for males rose from 31% to 41%. The trends remain similar when we shift to different age groups. Given that entrepreneurship is often associated with lower stability, this finding suggests that a sudden change in women's preferences after the financial crisis is unlikely to have driven an increase in female entrepreneurship.

6.6 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 2(a).

In the 1990s, the expansion of Korean conglomerates made it challenging for small and medium-sized enterprises to sustain their businesses, and the need to enact laws to protect them emerged. The need to enact laws for promoting female entrepreneurs was discussed in this context, given that both small and medium-sized enterprises 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 (Choi (2018)).

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. Using the geographical variation of bank branch closures during the reform at the county level, we show that the banking sector reform resulted in a rise in female entrepreneurship. We present evidence demonstrating that the allocation of funds between male and female firms was less efficient before the reform, particularly in areas with a higher concentration of closed-down bank branches during the reform. We show that replacing nonviable banks with healthier counterparts, reorganizing branches among surviving banks based on branch profitability, and enhancing the lending practices of surviving commercial banks collectively led to expanded opportunities for female entrepreneurs. Overall, our findings highlight that the banking sector reform in South Korea played a significant role in promoting female entrepreneurship by enhancing efficiency in the financial sector. In essence, our research offers robust empirical evidence that supports Becker's fundamental idea (Becker (1957)): enhancing efficiency and market-oriented forces within the financial sector is the largely effective strategy for advancing female entrepreneurship by eradicating gender-based discrimination against female entrepreneurs.

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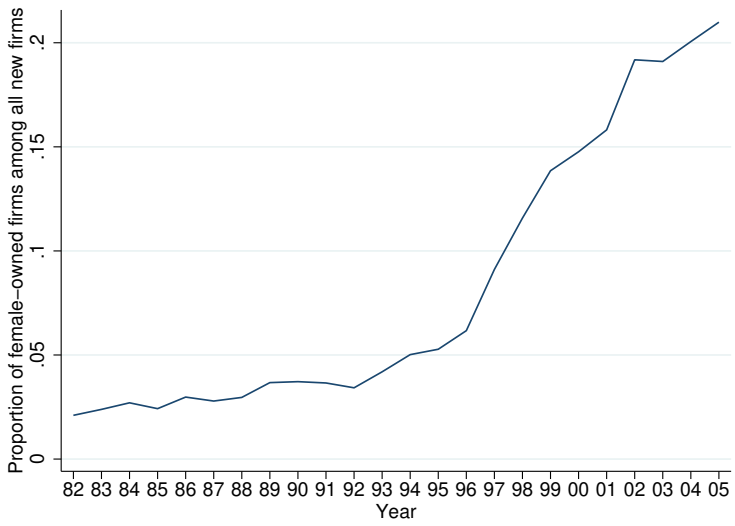
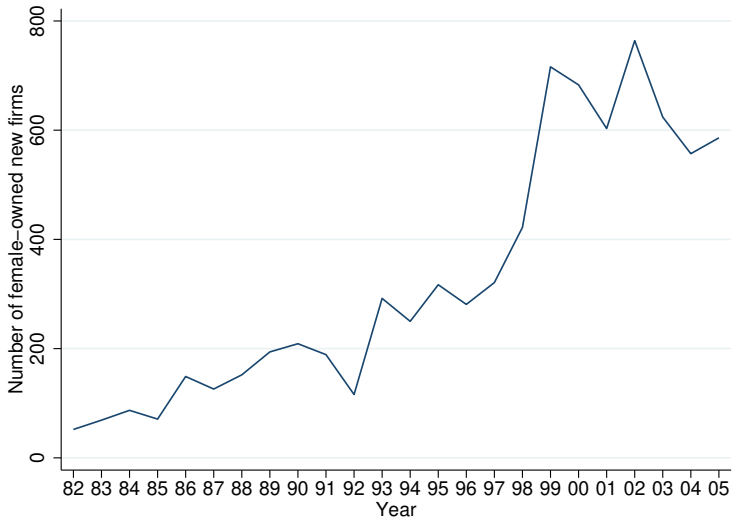
Figures and Tables

Figure 1: Evolution of Female Entrepreneurship in South Korean Manufacturing Sector



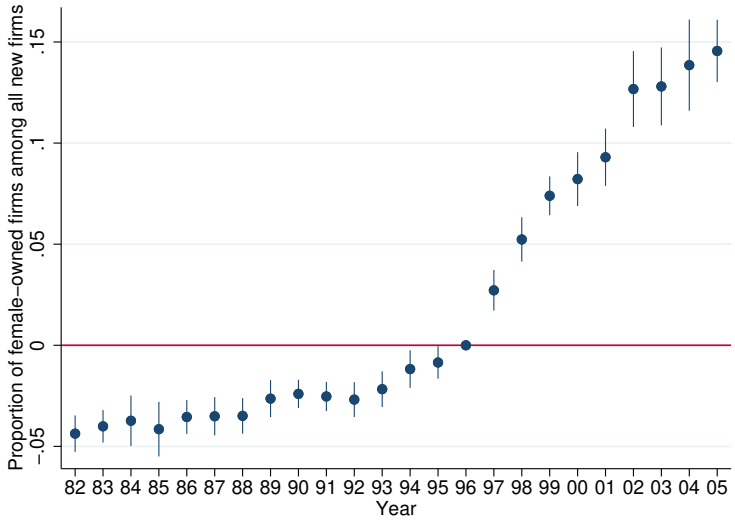
(a) Proportion of Female-Owned New Establishments



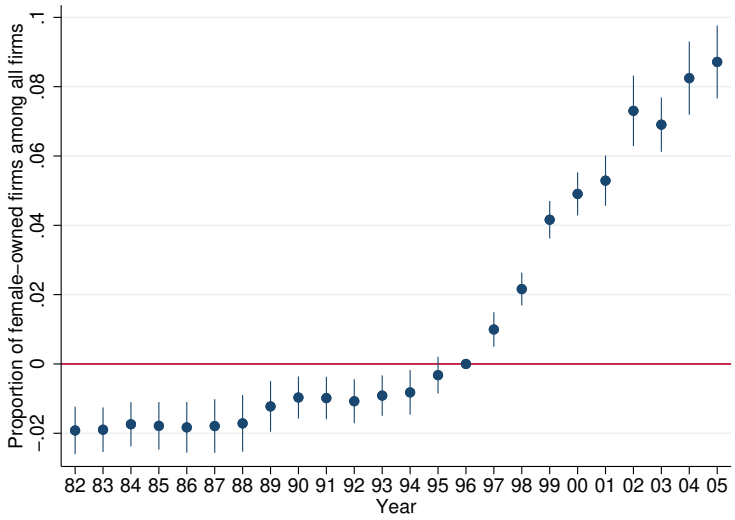
(b) Number of Female-Owned New Establishments

NOTE: Panel (a) displays the proportion of female-owned firms, out of all newly established firms. Panel (b) displays the number of newly established female-owned firms. A female-owned firm is defined as an establishment solely owned by one or more females. The analyses in Panels (a) and (b) are based on a sample of newly established non-incorporated manufacturing establishments in South Korea with at least five workers. Data: Mining and Manufacturing Survey.

Figure 2: Proportion of Female-Owned Establishments with Industry Fixed Effect



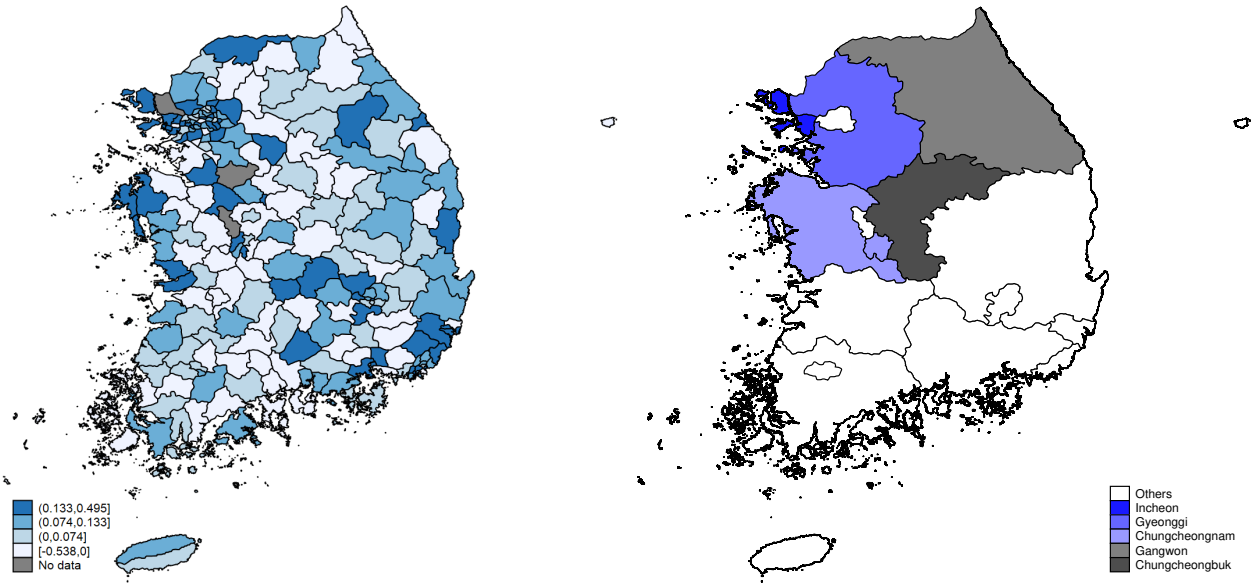
(a) New Establishments



(b) All Establishments

NOTE: Panel (a) displays the estimates and 95% confidence intervals for year dummies derived from a linear probability model that predicts the proportion of female-owned firms among all newly established firms controlling for the 3-digit industry fixed effect. A female-owned firm is defined as an establishment solely owned by one or more females. The sample for Panel (a) consists of newly established non-incorporated manufacturing establishments in South Korea with at least five workers. Panel (b) displays the estimates and 95% confidence intervals for year dummies derived from a linear probability model that predicts the proportion of female-owned firms among all firms, controlling for the 3-digit industry fixed effect. The sample for Panel (b) consists of all the non-incorporated manufacturing establishments in South Korea with at least five workers. The base year for the analysis is 1996. The standard errors in Panels (a) and (b) are clustered at the industry-year level. Data: Mining and Manufacturing Survey.

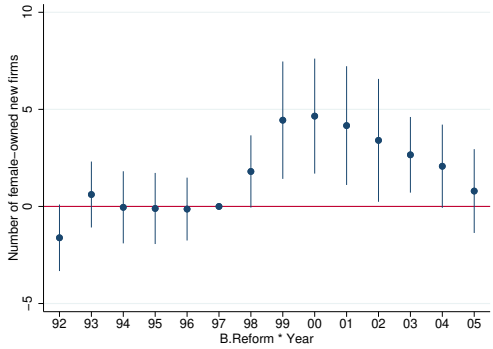
Figure 3: Geographical Variation of Banking Sector Reform



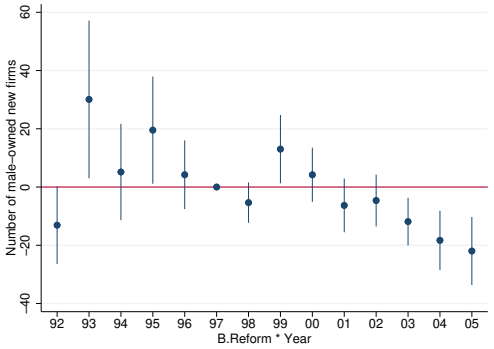
(a) Geographical Distribution of B.Reform$_c$ (b) Five Provinces with Undercapitalized Local Banks

NOTE: Panel (a) shows the extent of banking sector reform across 5-digit administrative districts in South Korea. The extent of banking sector reform is measured 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. Panel (b) highlights the five provinces where the four undercapitalized local banks were located. Kangwon and Chungbuk banks were located in Gangwon and Chungcheongbuk provinces, respectively, while Chungchong and Kyungki banks operated in Chungcheongnam and Gyeonggi/Incheon provinces, respectively. Although all five provinces were affected by the nationwide banking sector reform, the impact of the reform was more substantial in the provinces colored in blue and light blue, where the two disapproved banks, Chungchong and Kyungki banks, were mainly located.

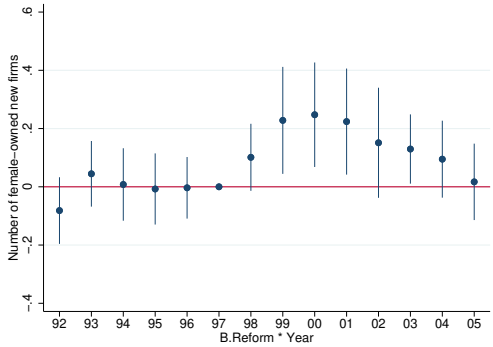
Figure 4: Banking Sector Reform and Female Entrepreneurship: Event Study Model



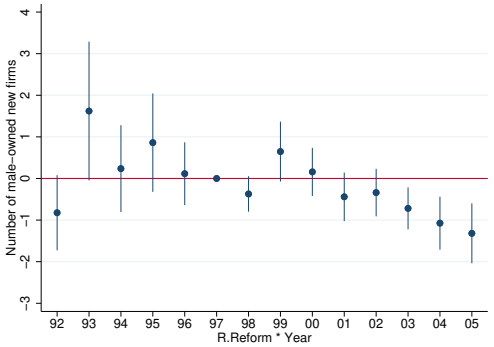
(a) B.Reform$_c$ and Female-Owned New Firms



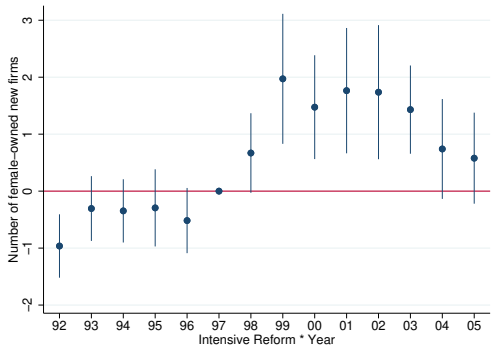
(b) B.Reform$_c$ and Male-Owned New Firms



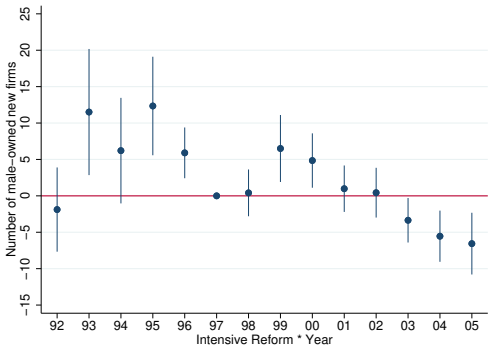
(c) B.Reform$_c$ and Female-Owned New Firms with Industry Fixed Effect



(d) B.Reform$_c$ and Male-Owned New Firms with Industry Fixed Effect



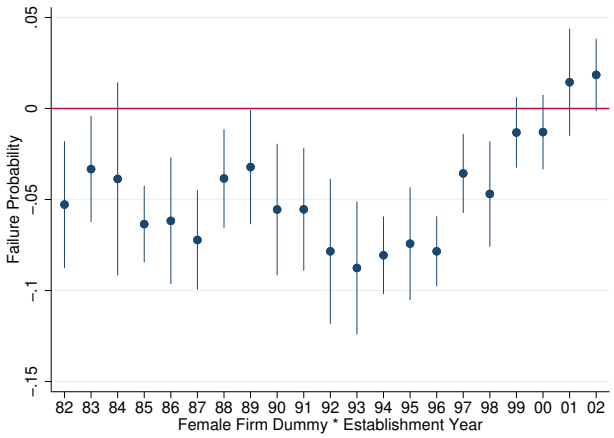
(e) Intensive Reform$_c$ and Female-Owned New Firms



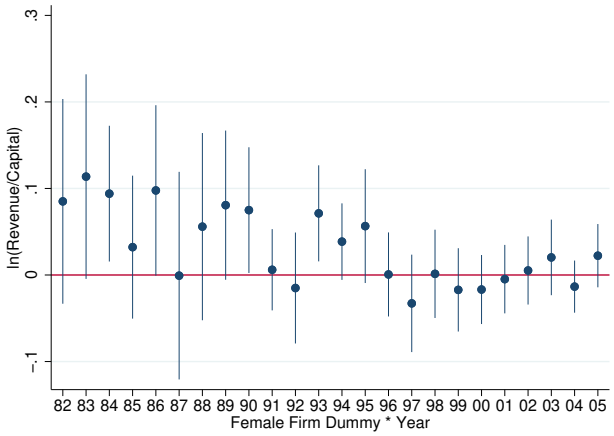
(f) Intensive Reform$_c$ and Male-Owned New Firms

NOTE: Panels (a) and (b) present the estimates and corresponding 95% confidence intervals for equation (4), which investigates the effect of B.Reform$_c$ on the number of newly established female- and male-owned firms in a county. Panels (c) and (d) show the estimates and corresponding 95% confidence intervals for equation (5), which analyzes the effect of B.Reform$_c$ on the number of newly established female- and male-owned firms in a county-industry (2-digit) cell. Panels (e) and (f) present the estimates and corresponding 95% confidence intervals for equation (7), which investigates the effect of Intensive Reform$_c$ on the number of newly established female- and male-owned firms in a county. Intensive Reform$_c$ is a dummy variable that takes a value of 1 if a county is in either Chungcheongnam or Gyeonggi/Incheon provinces. Panels (e) and (f) only include observations from counties in Gangwon, Chungcheongbuk, Chungcheongnam, and Gyeonggi/Incheon provinces. The standard errors in all panels are clustered at the county level. Data: Mining and Manufacturing Survey, Census on Establishments.

Figure 5: Gender Gaps in Failure Probability and Average Revenue Product of Capital



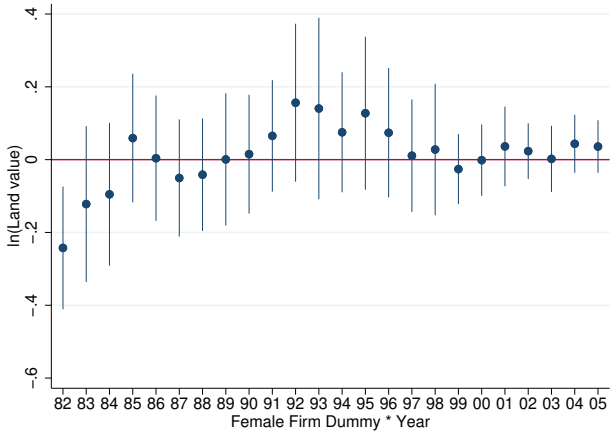
(a) Gender Gap in Failure Probability



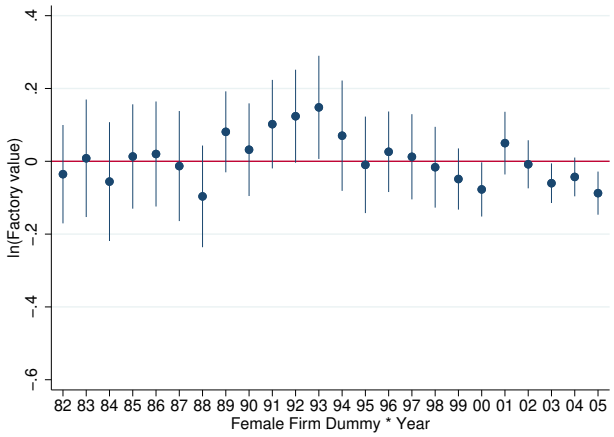
(b) Gender Gap in Average Revenue Product of Capital

NOTE: Panel (a) shows the estimates and 95% confidence intervals for the variables "Female Dummy × Establishment Year Dummies" in equation (8). The estimates capture the difference in the probability of failure within three years after establishment between female-owned firms and non-female-owned firms, while controlling for cohort dummies and the 3-digit industry fixed effect. Panel (b) shows the estimates and 95% confidence intervals for the variables "Female Dummy × Year Dummies" in equation (11). The estimates capture the percentage difference in the average revenue product of capital between female-owned firms and non-female-owned firms, while controlling for the firm-age fixed effect, the number of employees, and the year and 3-digit industry fixed effects. A female-owned firm is defined as an establishment solely owned by one or more females. The sample for Panels (a) and (b) consists of all the non-incorporated manufacturing establishments in South Korea with at least five workers. The standard errors are clustered at the industry-cohort level in Panel (a) and at the industry-year level in Panel (b). Data: Mining and Manufacturing Survey.

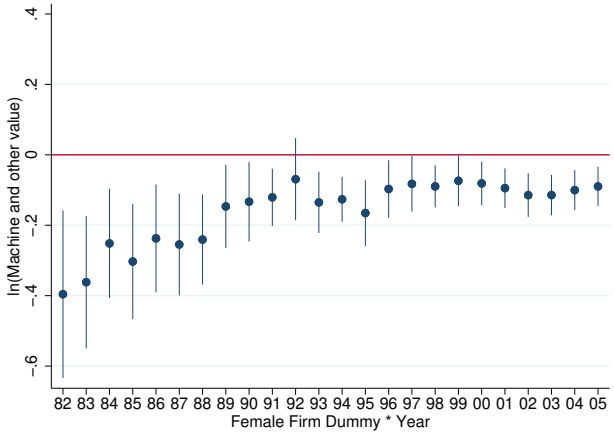
Figure 6: Gender Gap in Different Types of Assets



(a) Gender Gap in Land



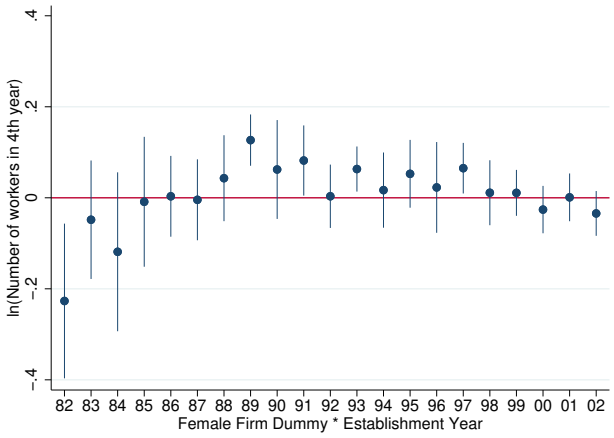
(b) Gender Gap in Building



(c) Gender Gap in Machines and Other Assets

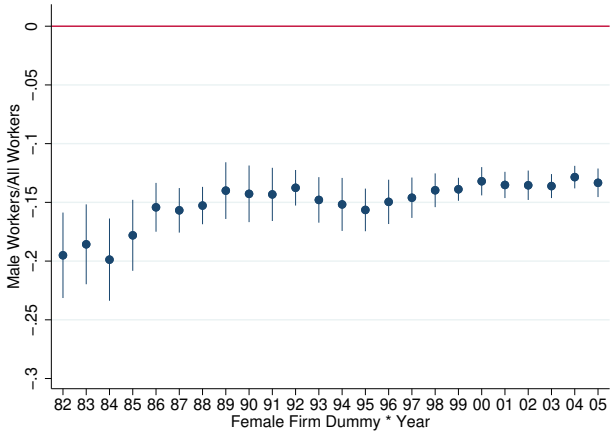
NOTE: These figures display the estimates and 95% confidence intervals for the "Female Dummy × Year Dummies" variables in equation (11). The dependent variables are replaced with three types of log asset values. These estimates indicate the percentage difference in asset values between female-owned and non-female-owned firms, while controlling for firm age, the number of employees, and the year and 3-digit industry fixed effects. The sample consists of all the non-incorporated manufacturing establishments in South Korea with at least five workers. The standard errors are clustered at the industry-year level. Data: Mining and Manufacturing Survey.

Figure 7: Gender Gap in the 4th Year Employment

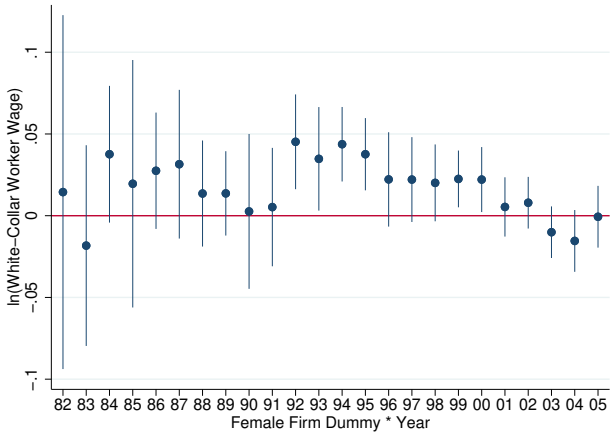


NOTE: This figure presents the estimates and 95% confidence intervals for the variable "Female Dummy × Establishment Year Dummies" in equation (8). In this analysis, the dependent variable is the logarithmic value of the number of workers in the 4th year after establishment, and we include the logarithmic value of initial assets as an additional control variable. These estimates capture the difference in the number of workers in the 4th year after establishment between female-owned and non-female-owned firms, while controlling for cohort dummies, the 3-digit industry fixed effect, and log asset value. The sample consists of all the non-incorporated and incorporated manufacturing establishments in South Korea with at least five workers. Standard errors are clustered at the industry-cohort level. Data: Mining and Manufacturing Survey.

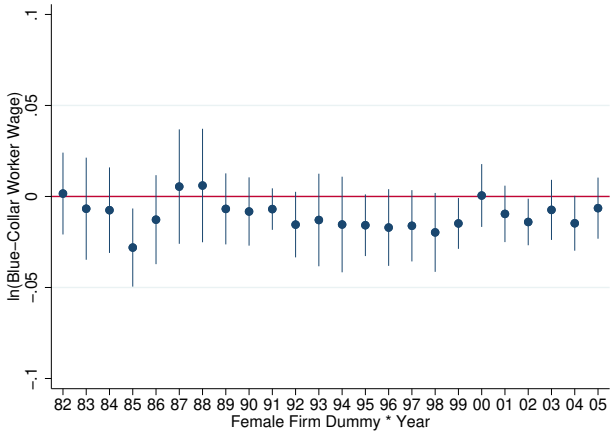
Figure 8: Gender Gap in Male Employment and Log Worker Wage



(a) Gender Gap in Male Employment



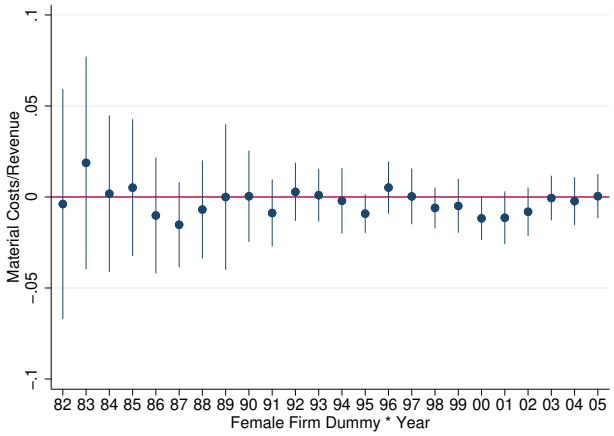
(b) Gender Gap in Log Wage for White-Collar Workers



(c) Gender Gap in Log Wage for Blue-Collar Workers

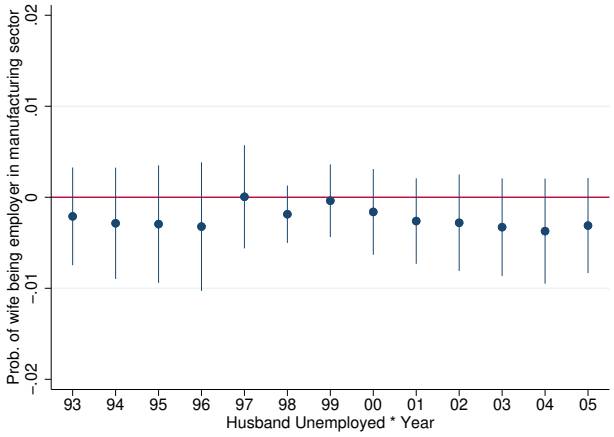
NOTE: Panel (a) displays the estimates and 95% confidence intervals for the variables "Female Dummy × Year Dummies" in equation (13). The estimates capture the difference in the proportion of male workers between female-owned and non-female-owned firms, controlling for the firm-age fixed effect, the number of employees, and the year and 3-digit industry fixed effects. Panels (b) and (c) show the estimates and 95% confidence intervals for the variables "Female Dummy × Year Dummies" in equation (13), 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 firms for each worker type, controlling for the firm-age fixed effect, the log value of revenue per worker, and the year and 3-digit industry fixed effects. The sample consists of all the non-incorporated manufacturing establishments in South Korea with at least five workers. The standard errors are clustered at the industry-year level. Data: Mining and Manufacturing Survey.

Figure 9: Gender Gap in Material Costs



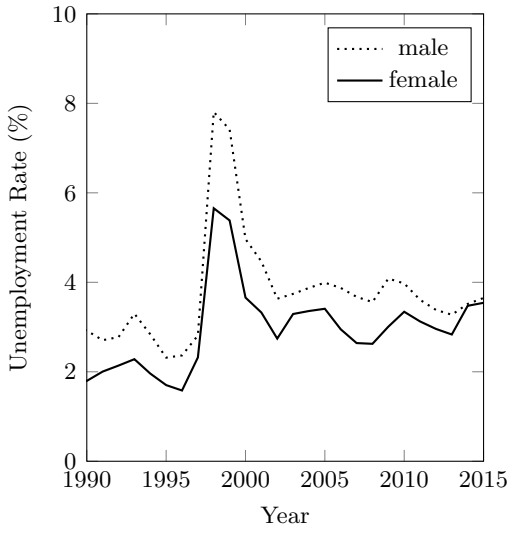
NOTE: This figure displays the estimates and 95% confidence intervals for the variables "Female Dummy × Year Dummies" in equation (13), with material cost share in revenues as the dependent variable. The estimates capture the difference in material cost share in revenues between female-owned and non-female-owned firms, controlling for the firm-age fixed effect, the number of employees, and the year and 3-digit industry fixed effects. A female-owned firm is defined as an establishment solely owned by one or more females. The sample consists of all the non-incorporated manufacturing establishments in South Korea with at least five workers. The standard errors are clustered at the industry-year level. Data: Mining and Manufacturing Survey.

Figure 10: Correlation between Husband's Unemployment and Wife's Entrepreneurship

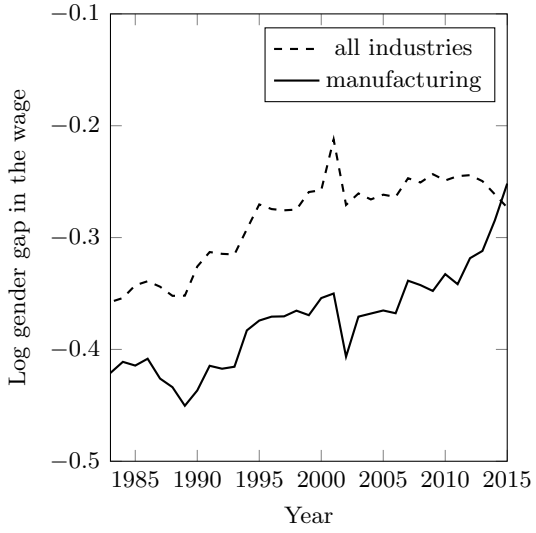


NOTE: The figure plots the estimates and 95% confidence intervals for the variables "Unemployed Husband Dummy × Year Dummies" in equation (15). The equation estimates a linear probability model that predicts how the probability of a wife being an employer in the manufacturing sector changes with her husband's unemployment status for each year, controlling for the education and age of both the wife and husband. The sample consists of married couples. Data: Social Survey 1993-2005.

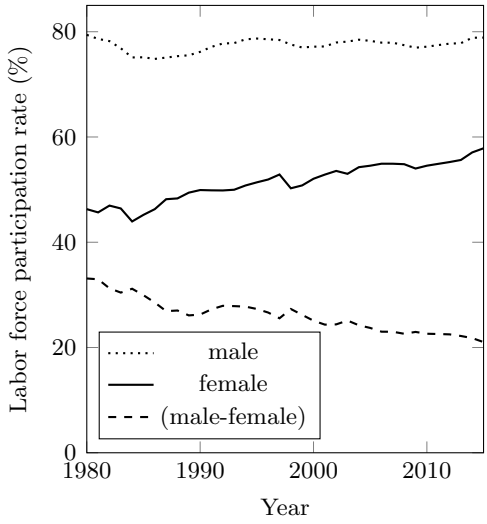
Figure 11: Gender Gaps in Unemployment, Wage, Labor Force Participation, and College Education



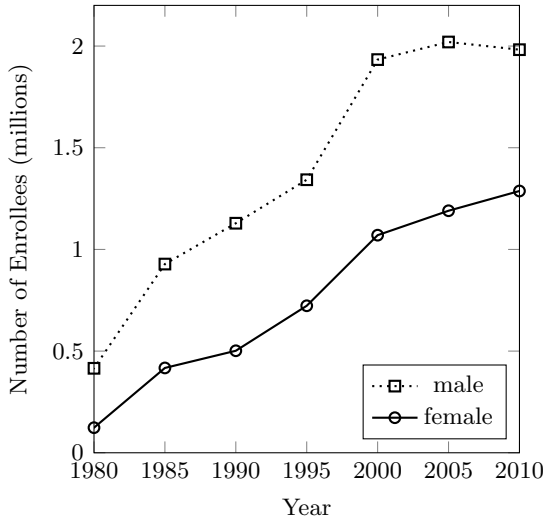
(a) Unemployment Rate



(b) Gender Wage Gap Estimated from Mincer Regression



(c) Labor Force Participation Rate



(d) Total Enrollment in Post-Secondary Education Programs

NOTE: Panel (a) displays the unemployment rate for the working-age population. The dotted line represents the rate for males, while the solid line represents the rate for females. Panel (b) illustrates the gender wage gap estimated from the Mincer regression, which measures the difference in log hourly wage between male and female workers while controlling for education, age, and age squared. The dashed line represents the estimated gender wage gap across all industries, while the solid line shows the gender wage gap among workers in the manufacturing sector. Panel (c) displays the labor force participation rate for the working-age population. The dotted line represents the rate for males, while the solid line represents the rate for females. The dashed line indicates the difference in the labor force participation rate between males and females. Panel (d) displays the total number of enrollees in all post-secondary programs among the population aged 25 and above, broken down by gender. Data: (a) OECD, (b) Wage Structure Survey, (c) OECD, (d) Barro & Lee data set from the World Bank.

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 newly established female-owned firms, classified according to 2-digit KSIC2000 industry codes, for the five-year periods before (1992-1996) and after (1997-2001) the financial crisis. A female-owned firm is defined as an establishment solely owned by one or more females. The analysis is based on a sample of newly established non-incorporated manufacturing firms in South Korea with at least five employees. Data: Mining and Manufacturing Survey.

Table 2: Characteristics of Female Employers in Manufacturing Sector

	(1) 1995	(2) 2000	(3) Difference
College	0.22	0.21	-0.008
	[0.42]	[0.41]	(-0.22)
Married	0.75	0.75	-0.005
	[0.43]	[0.43]	(-0.13)
Single	0.065	0.077	0.012
	[0.25]	[0.27]	(0.54)
Divorced	0.035	0.062	0.027
	[0.18]	[0.24]	(1.46)
Widowed	0.15	0.11	-0.035
	[0.36]	[0.32]	(-1.22)
Age	41.6	42.2	0.61
	[8.67]	[7.70]	(0.88)
Share of Age 25-34	0.19	0.16	-0.038
	[0.40]	[0.36]	(-1.18)
Share of Age 35-44	0.48	0.46	-0.012
	[0.50]	[0.50]	(-0.27)
Share of Age 45-54	0.23	0.31	0.08
	[0.42]	[0.46]	(2.01)
Share of Age 55-65	0.10	0.07	-0.03
	[0.29]	[0.25]	(-1.18)

NOTE: This table presents the characteristics of female employers in the manufacturing sector aged 25-65 for the years 1995 and 2000. The standard deviation is reported 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 (%)
Nationwide Commercial Banks				
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
Peace	6,517	-1.57	603	12.9
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
Local Commercial Banks				
Chungbuk	2,487	-5.52	801	28.5
Kangwon	2,969	-16.0	1,034	45.8
Chungchong	3,770	-5.97	1,620	36.3
Kyungki	7,240	-9.61	2,862	49.0
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. The nonperforming loans in this table refer to loans that are overdue by no less than 1 month. 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
		△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
		▽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
		△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
		▽0.33				
Panel C						
B.Reform$_c$		0.08	0.13	-0.54	0.66	244
Positive B.Reform$_c$		0.72	0.45	0	1	244

NOTE: This table shows the summary statistics for the variables in equations (2) and (3). Panel A documents summary statistics for the number of female-owned and male-owned new firms at the county level, while Panel B documents the corresponding statistics at the county-industry level (2-digit). A female-owned firm is defined as an establishment solely owned by one or more females, while a male-owned firm is defined as an establishment solely owned by one or more males. The number of newly established female- and male-owned firms is calculated based on a sample of all newly established non-incorporated manufacturing establishments in South Korea with at least five workers. Panel C documents the summary statistics for the banking sector reform measure at the county level, where $\text{B.Reform}_c = \ln\left(\frac{\text{Bank}_{c,1997}}{\text{Bank}_{c,1998}}\right)$ and $\text{Bank}_{c,1997}$ and $\text{Bank}_{c,1998}$ are the total number of bank establishments in county c at the end of 1997 and 1998, respectively. The top and bottom 10 percentiles of the B.Reform_c measures are 0.223 and -0.074, respectively. Positive B.Reform is the dummy variable that takes a value of one if B.Reform is positive. The sample consists of all the non-incorporated manufacturing establishments in South Korea with at least five workers. Data: Mining and Manufacturing Survey (Panels A and B), Census on Establishments (Panel C).

Table 6: Banking Sector Reform and Female Entrepreneurship

	Panel A		Panel B		Panel C	
	(1)	(2)	(1)	(2)	(1)	(2)
VARIABLES	Female-owned new firms	Male-owned new firms	Female-owned new firms	Male-owned new firms	Female-owned new firms	Male-owned new firms
B.Reform$_c$	3.265***	-12.844**	0.159**	-0.696**		
$\times$Post$_t$	(1.101)	(5.561)	(0.067)	(0.342)		
Intensive Reform$_c$					1.701***	-5.836***
$\times$Post$_t$					(0.368)	(2.013)
Year FE	Y	Y	Y	Y	Y	Y
County FE	Y	Y			Y	Y
County-Ind. FE			Y	Y		
Observations	3,288	3,288	51,645	51,645	1,380	1,380
R-squared	0.660	0.701	0.531	0.675	0.725	0.779

NOTE: Panel A presents the estimation results for equation (2), which investigates the effect of B.Reform$_c$ on the number of newly established female- and male-owned firms in a county. Panel B displays the estimation results for equation (3), which analyzes the effect of B.Reform$_c$ on the number of newly established female- and male-owned firms in a county-industry (2-digit) cell. Panel C displays the estimation results for equation (6), which captures the effect of Intensive Reform$_c$ on the number of newly established female- and male-owned firms in a county. Intensive Reform$_c$ is a dummy variable that takes a value of 1 if a county is in either Chungcheongnam or Gyeonggi/Incheon provinces. Panel C only includes observations from counties in Gangwon, Chungcheongbuk, Chungcheongnam, and Gyeonggi/Incheon provinces. A female-owned firm is defined as an establishment solely owned by one or more females, while a male-owned new firm is defined as an establishment solely owned by one or more males. The number of newly established female- and male-owned firms is calculated based on a sample of all newly established non-incorporated manufacturing establishments in South Korea with at least five workers. For all panels, the standard errors (in parentheses) are clustered at the county level. p<0.01, ** p<0.05, * p<0.1. Data: Mining and Manufacturing Survey, Census on Establishments. Sample Period: 1992-2005.

Table 7: Banking Sector Reform and Riskiness of Establishments

	Panel A		Panel B		Panel C	
	(1)	(2)	(1)	(2)	(1)	(2)
VARIABLES	Proportion of failed new est.	Proportion of failed new est.	Average D/E ratio (for all inc. est.)	Average D/E ratio	Average D/E ratio (for low-prod. inc. est.)	Average D/E ratio
B.Reform$_c$	0.186***	0.159***	0.376	-0.520	1.870***	0.808
	(0.047)	(0.049)	(0.511)	(0.496)	(0.704)	(0.632)
(Est.)Year	1992-1997	1998-2002	1992-1997	1998-2005	1992-1997	1998-2005
(Est.)Year FE	Y	Y	Y	Y	Y	Y
Observations	1,322	1,140	1,354	1,876	1,340	1,863
R-squared	0.031	0.179	0.019	0.032	0.025	0.036

NOTE: Panel A presents the estimation results for equation (9), which analyzes the relationship between the banking sector reform (B.Reform$_c$) and the proportion of failed new establishments in a county. The proportion of failed new establishments is defined as the number of new establishments, including both incorporated and non-incorporated, created in year t in a county that failed within 3 years, divided by the total number of new establishments created in year t in that county. Establishment year fixed effects are included. Panel B and C display the estimation results for equation (10), examining the yearly average debt-to-equity ratio within a county concerning the B.Reform variable. In Panel B, the "Average debt-to-asset (D/E) ratio" represents the average debt-to-asset ratio for each county and year across all incorporated establishments. In Panel C, we calculate the average debt-to-asset ratio for each county and year among low-productivity incorporated establishments. A "low-productivity" incorporated establishment is one with an average revenue product of capital below the 3-digit industry-specific median for each year, encompassing both incorporated and non-incorporated establishments. For Panels B and C, year-fixed effects are included. The sample for Panel A consists of all newly established non-incorporated and incorporated manufacturing establishments in South Korea with at least five workers. The sample for Panels B and C consists of all the incorporated manufacturing establishments in South Korea with at least five workers. The standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data sources: Mining and Manufacturing Survey, Census on Establishments. Sample Period: 1992-2005.

Table 8: Banking Sector Reform and Revenue Product of Capital

	Panel A		Panel B	
	(1)	(2)	(1)	(2)
VARIABLES	$\ln\left(\frac{\text{Revenue}}{\text{Capital}}\right)$	$\ln\left(\frac{\text{Revenue}}{\text{Capital}}\right)$	Collateral	Collateral
Female-Owned Firm×(Year≤1996)	0.038***	0.019	12.75***	6.923
	(0.014)	(0.018)	(3.672)	(6.237)
Female-Owned Firm×(Year≥1999)	0.002	0.012	-1.561	-1.993
	(0.009)	(0.012)	(2.151)	(3.196)
Industry FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Other Controls	Y	Y	Y	Y
Counties with above median B.Reform$_c$	Y		Y	
Counties with below median B.Reform$_c$		Y		Y
Observations	535,596	227,330	499,527	211,053
R-squared	0.134	0.163	0.219	0.238

NOTE: Panel A shows the estimation results for equation (12), which captures the percentage difference in the average revenue product of capital of female-owned and non-female-owned firms before and after the financial crisis. In addition to the year and 3-digit industry fixed effects, we include the number of workers and the firm-age fixed effect as additional control variables. Panel B presents the estimation results for equation (12), utilizing the combined value of land and building assets (Collateral) as the dependent variable and including the logarithm of machinery value as an additional control variable. Column (1) presents the estimation results for firms located in counties with above-median B.Reform$_c$, while Column (2) presents the results for firms located in counties with below-median B.Reform$_c$. A female-owned firm is defined as an establishment solely owned by one or more females. The sample consists of all the non-incorporated manufacturing establishments in South Korea with at least five workers. The standard errors are clustered at the industry×year level. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data: Mining and Manufacturing Survey, Census on Establishments. Sample Period: 1992-2005.

Table 9: Product Market Shock and Female Entrepreneurship

VARIABLES	(1) Female-owned new firms	(2) Male-owned new firms
$\text{P.Shock}_{c,d} \times \text{Post}_t$	-0.026***	-0.312***
	(0.007)	(0.054)
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 (14), which show the effects of $\text{P.Shock}_{c,d}$ on the number of female- and male-owned new firms in a county-industry (2-digit) cell. The extent of product market shock is measured by $\text{P.Shock}_{c,d} = \ln\left(\frac{\text{Number of Firms}_{c,d,1997}}{\text{Number of Firms}_{c,d,1998}}\right)$, where $\text{Number of Firms}_{c,d,1997}$ and $\text{Number of Firms}_{c,d,1998}$ are the total number of establishments, including both incorporated and non-incorporated, in 2-digit industry d at county c at the end of 1997 and 1998, respectively. A female-owned firm is defined as an establishment solely owned by one or more females, and a male-owned firm is defined as an establishment solely owned by one or more males. The number of newly established female- and male-owned firms is calculated based on a sample of all newly established non-incorporated manufacturing establishments in South Korea with at least five workers. The standard errors (in parentheses) are clustered at the county×industry level. *** p<0.01, ** p<0.05, * p<0.1. Data: Mining and Manufacturing Survey. Sample Period: 1992-2005.

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, an annual establishment-level survey covering all establishments with at least five workers in the Mining and Manufacturing industry. The survey has been conducted since 1967 and continues to the present day. The Statistics of Korea provides licensed remote access to the survey data starting from 1982 and onward. In 2006, the sample selection criteria changed from establishments with at least five workers to those with at least ten. Therefore, to maintain consistency in our analysis, we focus on the sample periods from 1982 to 2005.

All variables used in this paper and sourced from this survey were collected at the establishment level. An establishment is defined as an entity or a part of an entity that independently conducts a single or primary industrial activity at a specific physical location. As discussed in Footnote 10, 99.6% of all non-incorporated manufacturing establishments operate as single establishments. Each establishment is assigned a unique identification number which is used to track the births and closures of businesses.

The dataset 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, location, establishment year, revenue, capital, intermediary input costs, the separate number of male and female workers, and the number of white- and blue-collar workers. Furthermore,

it provides the total wage bills for white- and blue-collar workers, allowing us to calculate separate wages for each group. Variables that capture the firm's annual performance, such as revenue, assets, and costs, were calculated as of December 31st. The administrative area classification consists of three levels: major classification (Si-Do), intermediate classification (Si-Gun-Gu), and minor classification (Up-Myon-Dong). The unit of analysis of the paper is at the intermediate classification (Si-Gun-Gu) and is considered as a "county."

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.[57] Unlike the Mining and Manufacturing Survey, the census provides only basic information about each establishment, such as its industry, location, and number of employees. The survey also includes data on whether an establishment operates as a single-establishment firm or is part of a multi-establishment entity.

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, 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,

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

and occupation.

A.4 Social Survey

To study joint labor supply within households and changes in women's job preferences, we use the Social Survey. The Social Survey is an annual survey conducted across approximately 33,000 households, designed to gather insights into social concerns related to quality of life, living standards, and societal shifts. They gather information about individuals aged 15 and above in each household. In both the 1995 and 1998 Social Surveys, respondents were asked the question: "What do you consider the most crucial factor when choosing a career?" They could select from options like reputation, stability, salary, self-fulfillment, future career prospects, or others. We use their answers to track how men's and women's job preferences were changing. The survey also collects information on each household member, including their employment status, occupation, and industry of the current job. Since the survey provides 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 Wage Structure Survey

To track the evolution of the gender wage gap, we utilize the Wage Structure Survey 1983-2015, which is a nationally representative dataset that surveys approximately 530,000 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.6 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 information on Korean commercial banks, including their financial position, profit and loss, and the number of bank branches.

B Robustness Check

B.1 Alternative Measure for the Banking Sector Reform

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 employees 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 observe that 81% of counties experienced a decrease in the number of bank employees. 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 B1. The findings are consistent with those generated by the B.Reform_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 the top and bottom panels in Figure B1, respectively, 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 employees in 1998.

B.2 Changes in Credit Supply Across Counties

In this section, we assess how accounting for shifts in county-wide credit supply affects our main findings. To account for changes in credit availability across counties, we utilize debt data from incorporated establishments. Specifically, we construct a variable denoted as "Total Debt$_{c,t}$," representing the aggregate debt amount among incorporated establishments within county c for year t. Although the precise total debt figures for each county and year remain unknown, Total Debt$_{c,t}$ serves as a proxy to capture the broader shifts in regional credit supply over time.

Subsequently, we replicate the findings in Table 6 by incorporating the Total Debt$_{c,t}$ variable. The resulting estimation outcomes are illustrated in Table B2. Notably, even after accounting for this proxy of regional credit supply variations, our primary conclusions remain unchanged, further indicating the robustness of our results.

B.3 The Impact of Banking Sector Reform on Female Entrepreneurship in the Service Sector

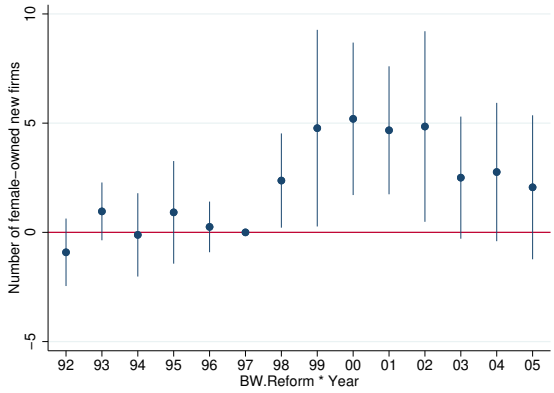
In this section, we conduct a placebo test to assess the impact of banking sector reform on the growth of female entrepreneurs, with a focus on industries characterized by higher self-employment rates and lower reliance on external bank capital. We utilize Census on Establishment data to track the number of male and female firms at the year-county level. Since census data became available in 1996, the pre-reform period covers two years (1996-1997).

We calculate the number of new establishments, categorized either as retail services (including

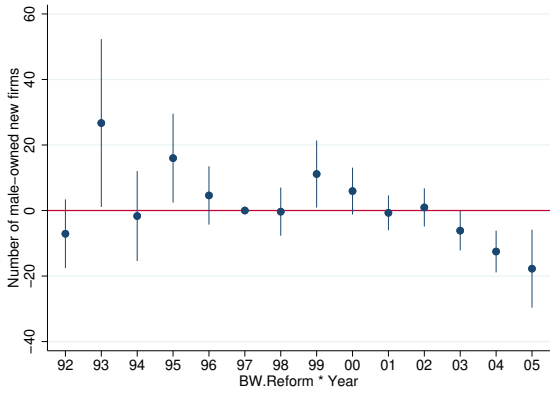
convenience stores and similar retail outlets under KSIC 510) or other services (including beauty services, laundromats, and dry cleaners under KSIC 930), at the year-county level. One significant observation is that even prior to the reform, the number of female new firms exceeded that of male new firms at the county level in the service sector mentioned above. For instance, the average count of female new firms (an establishment solely owned by one or more females) in year-county data before the reform (1996-1997) is 250, while the corresponding figure for male new firms (an establishment solely owned by one or more males) is 220. After the reform (1998-2005), these numbers changed to 316 and 279, respectively.

We estimate equation (3), replacing the outcome variable with data from female and male new firms in the service industries. The results are presented in Table B3. Notably, we do not observe any significant impact of the banking sector reform on the number of new firms in these service sectors, irrespective of gender. We also conducted estimations using log outcome variables, yielding similar results. Our findings suggest that the increase in female entrepreneurship is primarily driven by sectors requiring substantial capital and predominantly financed by banks.

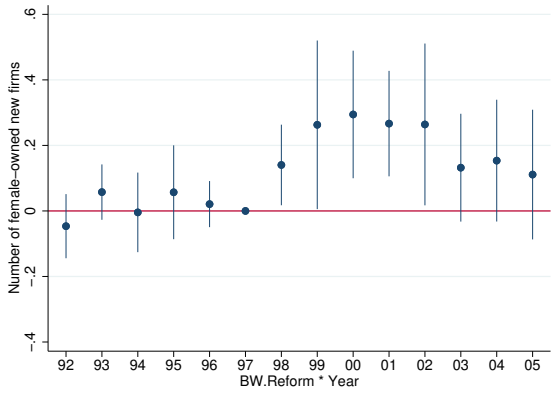
Figure B1: Banking Sector Reform and Female Entrepreneurship: Robustness Check



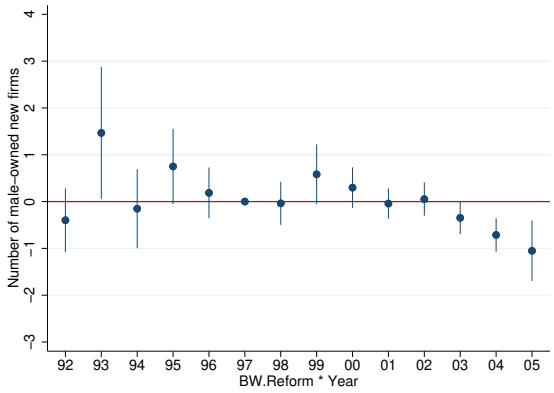
(a) BW.Reform$_c$ and Female-owned New Firms



(b) BW.Reform$_c$ and Male-owned New Firms



(c) BW.Reform$_c$ and Female-owned New Firms with Industry Fixed Effect



(d) BW.Reform$_c$ and Male-owned New Firms with Industry Fixed Effect

NOTE: Panels (a) and (b) display the estimates and 95% confidence intervals for equation (4), with replacing B.Reform$_c$ with BW.Reform$_c$. The estimates capture the effect of BW.Reform$_c$ on the number of female-owned new firms (Panel (a)) and male-owned new firms (Panel (b)) in a county. BW.Reform$_c = \ln\left(\frac{\text{Bank Worker}_{c,1997}}{\text{Bank Worker}_{c,1998}}\right)$, 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. Panels (c) and (d) display the estimates and 95% confidence intervals for equation (5), with replacing B.Reform$_c$ with BW.Reform$_c$. The estimates capture the effect of the banking sector reform as measured by BW.Reform$_c$ on the number of newly established female- and male-owned establishments in a county-industry (2-digit) cell. A female-owned firm is defined as an establishment solely owned by one or more females, while a male-owned firm is defined as an establishment solely owned by one or more males. The number of newly established female- and male-owned firms is calculated based on a sample of all newly established non-incorporated manufacturing establishments in South Korea with at least five workers. The standard errors in all panels are clustered at the county level. Data: Mining and Manufacturing Survey, Census on Establishments.

Table B1: Banking Sector Reform and Female Entrepreneurship: Alternative Measure

	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
BW.Reform$_c$× Post$_t$	3.487**	-8.374*	0.191**	-0.432
	(1.482)	(4.570)	(0.085)	(0.263)
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	0.664	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.Reform$_c = \ln\left(\frac{\text{Bank Worker}_{c,1997}}{\text{Bank Worker}_{c,1998}}\right)$, 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 and B are the estimation results for equation (2) and (3), respectively, with this alternative measure. A female-owned firm is defined as an establishment solely owned by one or more females, while a male-owned new firm is defined as an establishment solely owned by one or more males. The number of newly established female- and male-owned firms in a county (Panel A) and in a county-industry (2-digit) cell (Panel B) is calculated based on a sample of all newly established non-incorporated manufacturing establishments in South Korea with at least five workers. For both panels, the standard errors (in parentheses) are clustered at the county level. *** p<0.01, ** p<0.05, * p<0.1. Data: Mining and Manufacturing Survey, Census on Establishments. Sample Period: 1992-2005.

Table B2: Controlling for Regional Changes in Credit Supply

	Panel A		Panel B		Panel C	
	(1)	(2)	(1)	(2)	(1)	(2)
VARIABLES	Female-owned new firms	Male-owned new firms	Female-owned new firms	Male-owned new firms	Female-owned new firms	Male-owned new firms
B.Reform$_c$	3.319***	-11.65**	0.164**	-0.627*		
$\times$Post$_t$	(1.059)	(5.919)	(0.064)	(0.356)		
Intensive Reform$_c$					1.651***	-6.574***
$\times$Post$_t$					(0.341)	(1.760)
Total Debt$_{c,t}$/1000	0.002***	0.0324***	0.0001***	0.0017***	0.002***	0.0206***
	(0.0005)	(0.007)	(2.52e-05)	(0.0004)	(0.0006)	(0.007)
Year FE	Y	Y	Y	Y	Y	Y
County FE	Y	Y			Y	Y
County-Ind. FE			Y	Y		
Observations	3,259	3,259	51,543	51,543	1,372	1,372
R-squared	0.672	0.747	0.532	0.682	0.737	0.802

NOTE: This table replicates Table (6) with the inclusion of an additional control variable, "Total Debt$_{c,t}$," which represents the aggregate debt amount among incorporated establishments within county c for year t. *** p<0.01, ** p<0.05, * p<0.1. Data: Mining and Manufacturing Survey, Census on Establishments. Sample Period: 1992-2005.

Table B3: Banking Sector Reform and Female Entrepreneurship: Service Sector

	(1)	(2)
VARIABLES	Female-owned new firms	Male-owned new firms
B.Reform$_c\times$ Post$_t$	87.93	68.13
	(88.95)	(65.53)
Year FE	Y	Y
County FE	Y	Y
Observations	2,395	2,395
R-squared	0.912	0.920

NOTE: This table displays the results of equation (2), examining the impact of the B.Reform variable on the number of newly established female- and male-owned firms in a county-year. The dependent variable represents data calculated from female and male new firms in retail services (including convenience stores and similar retail outlets under KSIC 510) or other services (including beauty services, laundromats, and dry cleaners under KSIC 930). A female-owned firm is defined as an establishment solely owned by one or more females, while a male-owned new firm is defined as an establishment solely owned by one or more males. The standard errors (in parentheses) are clustered at the county level. Data: Mining and Manufacturing Survey, Census on Establishments. Sample Period: 1996-2005.

C Gender Difference in Borrowing Before the Financial Crisis

In this section, we present additional evidence to suggest gender-based discrimination within the banking sector prior to the financial crisis.

C.1 Gender Differences in Interest Rates and Bank Borrowing

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 1996.

The survey 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 survey does not specify the purpose of the debt, whether it's for business or otherwise. 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 rates 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 relied solely on bank loans paid 0.4 percentage points lower interest rates than those who borrowed 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 than their female counterparts. By comparison, the probability of having a bank loan was 19 percentage points higher for households that owned their house than 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 than for 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.

C.2 Female Worker Share and Debt Amounts

To further validate the evidence presented in the previous section (Appendix C.1), we utilize data for incorporated establishments from the Mining and Manufacturing Survey, which includes information on debt. Since the gender of the owner cannot be directly observed for incorporated establishments, we classify them based on an observable characteristic that exhibits clear gender differences. One particularly distinctive characteristic of female-owned firms is their consistently higher proportion of female workers, persisting across both pre- and post-reform periods (Figure 8(a)). Given this significant gender difference, we proceed to examine whether incorporated establishments with more female workers (thus more likely to be female-owned firms) exhibited lower levels of debt prior to the crisis, and whether such a gap was reduced following the reform. In the regression, we include the log value of assets and the year fixed effect as control variables.

The results are presented in the first column of Table C2. It is evident that establishments that were incorporated and had a higher proportion of female workers exhibited significantly lower levels of debt before the crisis. However, this disparity notably decreased after the reform, aligning with our hypothesis. Throughout the entire sample period, the average proportion of female workers was 0.54 for female-owned firms and 0.33 for non-female firms. Assuming that the proportion of female workers is the same for non-incorporated and incorporated establishments conditional on the gender of the owner, the estimate suggests that female-owned incorporated establishments carried 42 million Korean won less in debt compared to their non-female counterparts (-200.8$\times$(0.54-0.33)). In the second column of Table C1, we include 3-digit industry fixed effects and firm-age fixed effects as additional control variables and obtain consistent results.

C.3 Media Coverage on Gender Bias in Banking Sector

There are several news articles highlighting gender disparities in credit availability as a significant obstacle for female entrepreneurs prior to the crisis. In this section, we provide a summary of some of these articles.

> [1] The Korean Association of Women Small Business Owners was established on November 3, 1992. In their founding declaration, they stated, "Our purpose in forming this association is to vigorously advocate for the rights and interests of women-owned businesses, diverging from the male-centric banking culture that historically obtained bank loans through social networking, such as informal gatherings." They have expressed their founding purpose and plan to implement mutual financial loans for women entrepreneurs in the future. (Source: Chosun, November 11, 1992)
>
> [2] An overbearing and abrasive woman – these two descriptors, deeply rooted in the Confucian gender order that still lingers in our society, symbolize the struggles that aspiring female entrepreneurs must endure in their pursuit of business success. Stories like "I had to have my husband co-sign for a loan at banks" or "Who told you to call a female accountant?" upon visiting the tax office illustrate experiences of women aiming to become economic players. (Source: Hangyureh. July 07, 1997)
>
> [3] What challenges do female business leaders face in the corporate world? In our society, many significant decisions are still often made in informal settings such as meals or social gatherings, and the same regulations are applied differently based on familiarity. For female business leaders who are not accustomed to this, it's a harsh reality that they can't easily dismiss the fear of facing disadvantages. There are even cases where, despite having strong collateral and solid business plans, financial institutions demand spousal guarantees solely because the business owner is a woman. While policy institutions claim they will rectify such disadvantages if identified, the reality for businesses that must continue their operations is that they can't openly reveal these issues. (Source: Maeil Business, July 09, 1998)

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 has a bank debt. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data: Household Consumption Expenditure Survey 1996.

Table C2: Female Worker Share and Debt Levels in Incorporated Establishments

VARIABLES	(1) Debt	(2) Debt
Female Worker Share	-200.8***	-679.9***
	(59.68)	(111.7)
Female Worker Share × (Year≥1998)	541.4***	617.4***
	(68.83)	(111.4)
ln(Asset)	2,532***	2,491***
	(116.0)	(36.03)
Year FE	Y	Y
Firm-age FE		Y
3-digit industry FE		Y
Observations	411,381	411,313
R-squared	0.445	0.461

Note: This table presents the association between the proportion of female workers and debt levels within incorporated establishments both before (1982-1997) and after (1998-2005) the reform. All monetary values are expressed in one million Korean won, adjusted to 2015 Korean won using the CPI. The standard errors are clustered at the year level in column (1) and at the industry-year level in column (2). *** p<0.01, ** p<0.05, * p<0.1. Data: Mining and Manufacturing Survey. Sample Period: 1982-2005.

(Appendix for Online Publication)

D Bailouts for Financial Institutions Before the Financial Crisis

The bailouts for financial institutions were executed through the Special Loan Facility of the Bank of Korea. This system enabled the Bank of Korea to provide financial assistance to relevant financial institutions under highly favorable terms, encompassing repayment conditions and loan amounts, especially during times marked by severe issues involving insolvent companies that necessitated the rationalization or consolidation of these entities.[58]

Between 1972 and 1983, bailouts totaling 129.9 billion Korean won were carried out in five instances, targeting four financial institutions. Subsequently, from 1985 to 1987, bailouts were executed on a larger scale, amounting to a total of 1.72 trillion won: 300 billion Korean won in 1985, 684.3 billion Korean won in 1986, and 737.8 billion Korean won in 1987.[59] In 1992, a bailout was initiated for three major investment trust companies. These firms had collectively borrowed 2.77 trillion Korean won from banks to purchase stocks as part of government efforts to bolster the securities market. However, due to ongoing stock price declines following a market crash, they incurred substantial losses. Consequently, in August 1992, these three companies were provided with loans totaling 2.9 trillion Korean won to offer financial assistance.

Due to the history of financial institution bailouts, many came to believe that these institutions operated with an implicit guarantee of government support. For example, the editorial of Maeil Economic Review on July 29, 1997, stated:

[58] This section provides a concise overview of financial institution bailouts, sourced from the Encyclopedia of Korean Culture.

[59] It's worth noting that South Korea's nominal GDP in 1985 was approximately 88 trillion Korean won.

> In the case of foreign countries, if the financial institutions' stability deteriorates to the extent it has in our country, financial crises are likely to occur. However, in our country, there is a belief that the government will not allow the insolvency of financial institutions, especially commercial banks, no matter what happens, so there is no hint of instability. Without this belief, even minor negative rumors could trigger cases like deposit withdrawals, leading to a chain reaction of insolvency in financial institutions. However, due to this belief, there is a growing sense of complacency among financial institutions, the government, and the public regarding the stability of banks.

Similarly, in describing the implicit government bailout guarantee before the financial crisis, Ji and Park (1999) noted:

> In particular, moral hazard of the implicit government guarantee was so severe as to be an important source of the financial crisis. Commercial and merchant banks have long operated under the guarantee, although it is not legally codified. Few believed that the government would allow the banks to fail. The guarantee encouraged domestic financial institutions to borrow more funds abroad and invest in riskier projects than they otherwise would, confident that the government would bail them out if they incurred serious losses.

E Institutional Change During the Reform

In this section, we discuss the institutional changes during the banking sector reform following the financial crisis.

E.1 Establishment of Financial Supervisory Organizations

On December 31, 1997, the "Act on the Establishment of Financial Supervisory Organizations" was officially enacted. Subsequently, the Financial Supervisory Commission (FSC) was founded in April 1998, followed by the establishment of the Financial Supervisory Service (FSS) in January 1999. The FSC of South Korea serves as the regulatory and managerial entity for the financial market. It determines and oversees the nation's financial policies, promotes fair competition, and facilitates

cooperation among financial institutions. On the other hand, the FSS was established to maintain the stability of the financial system and enhance the soundness and transparency of financial institutions. The FSS monitors the financial conditions of institutions and formulates and implements regulatory and supervisory policies.

Both institutions collaborate in managing regulations, supervision, and policies pertaining to financial institutions. The FSC primarily formulates comprehensive financial policies and oversees market structures to promote the stability and development of the financial system, whereas the FSS performs supervision and regulatory roles, monitoring the operational conditions of financial institutions.

E.2 Credit Practices Implemented during Banking Sector Reform

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. The lending decision typically relied on the amount of collateral and individual bankers' subjective evaluation. News articles have reported many anecdotes of inadequate lending practices before the crisis.[60] For example, branch heads could influence every step of the loan process, including screening, approval, review, and management, and they could freely decide on a large amount of funds at their discretion.[61] Personal networks and solicitation also played a role in the lending process.

During the reform, the focus was on upgrading credit practices to reduce nonperforming loans and boost financial institutions' competitiveness. The FSC and FSS took the lead in guiding financial institutions towards better management and innovative credit practices. In May 1998, the FSC set the direction for credit practices innovation in banks and guided the formulation of self-implemented plans for commercial banks. The Credit Practices Innovation Team was subsequently established

[60] "10 years after the financial crisis: was it a crisis or an opportunity," CBS News (November 27th, 2007)

[61] Although the intention behind granting a significant level of autonomy to bank branch heads was to promote relationship lending between branches and local borrowers, in some cases, it may have resulted in poor lending practices.

within the FSS on January 11, 1999, to promote and implement credit practices innovation across all commercial banks. Table E1 summarizes the credit practice innovations that the FSC and FSS requested banks to implement. Data was obtained from the FSS press release dated May 4, 2001, titled "Financial Company Credit Policy Innovation Progress (as of the end of December 2000)."

The key aspects of credit practice innovation include strengthening credit evaluation (introducing credit rating systems, shifting from collateral-based to credit-focused lending, ensuring transparency in borrowers' finances, enhancing transparency through credit evaluation committees), improving post-management (enhancing credit monitoring, early warning systems for nonperforming loans), and streamlining credit operations (centralizing branch structure, creating credit specialist roles, and establishing credit information systems). As seen in Table E1, most commercial banks had implemented the required policies by the end of 2000.

As a result, many banks shifted to using computer-based credit rating systems to determine interest rates, which factored in parameters like cash flow, debt ratio, industry risk, and future financial prospects for corporate clients. This marked a departure from the traditional practice of securing loans through bank managers or personal connections, rendering the old method obsolete.[62]

Changes in the organizational structure were also implemented, including the establishment of a centralized system for loan approval and the increased authority of specialized evaluators in decision-making. This centralized credit evaluation system substantially curtailed the discretion of bank branch managers in lending. Corporate loan assessments were carried out independently by a distinct organization comprising specialized evaluators. Bank managers, who had previously been indirectly involved in corporate loan assessments, could no longer override loan denials or exert influence on loans. Consequently, the lending authority of bank branches was markedly diminished, with branches solely responsible for executing decisions from specialized evaluators.[63]

[62] "Computerized Credit Assessment Spreading: Elimination of Unauthorized Loan Solicitations," Dong-A Ilbo (1998, December 24)

[63] See Appendix E.3 for details.

E.3 Media Coverage on Lending Practices

An article titled "The Branch Manager's Loan Authority Disappears," Maeil Economy Review (1998, September 7) is presented below. In summary, the article illustrates how changes in the organizational structure, such as the implementation of a centralized system for loan approval and the increased authority of specialized evaluators in decision-making, have significantly reduced the discretion of bank branch managers in lending. The article also emphasizes that the likelihood of corporate loan decisions being influenced by individual judgment or pressure from higher-ups has diminished, as the screening process relies solely on specialized evaluators who base their decisions on financial conditions and creditworthiness.

> The branch manager's loan authority was eliminated, with credit decisions now made by the bank headquarters' credit review team. Credit limits were also differentiated, allowing for limits of up to 40 times.
>
> The bank's loan practices are changing. Until now, bank managers who were indirectly involved in corporate loan evaluations will no longer be able to reverse loan denials by loan officers or influence loans. The lending decision authority of bank branches is also significantly reduced. Instead, corporate loan assessments are now independently carried out by a separate organization composed of specialized evaluators. Branches only execute these decisions. Some banks are ensuring the inclusion of opinions from foreigners or external experts. Particularly, banks are categorizing all transactional companies based on financial conditions and creditworthiness, and are introducing differentiated credit limits at branch levels, up to a maximum of 40 times, according to these categories. Evaluators and branch managers will only determine loan eligibility and decide on loan amounts based on predetermined credit ratings.

The possibility of distorting corporate loan decisions through individual judgment or pressure from higher-ups is decreasing. Starting next month, Shinhan Bank will implement the "Corporate Credit Risk Management System," which assigns credit ratings to all transactional companies and sets loan limits based on these ratings. This system eliminates the discretion of branch managers, credit department heads, or executives in loan decisions, and instead establishes loan limits based on the company's credit rating. Furthermore, it significantly reduces the authority of branch managers, credit department heads, and executives, ensuring that at least two specialized evaluators are involved in the decision-making process. Especially, all transactional companies are divided into 8 grades based on credit and financial status, and branch credit limits are differentiated from a minimum of 50 million won to a maximum of 2 billion won. Previously, loan eligibility and amounts were left to the discretion of branch managers without such differentiation. Branch managers will no longer have the authority to decide on personal loans either.

Last month, Korean First Bank established a separate "Credit Evaluation Committee" alongside the existing Loan Committee. The Credit Evaluation Committee consists of specialized evaluators, including department heads, and its decisions are directly approved by the Chief Executive Officer (CEO) without going through department heads and executive directors. However, the CEO, as the approver, is not allowed to overturn or request a reevaluation of loan decisions made by the Credit Evaluation Committee, essentially preventing both the bank manager and the CEO from intervening in loan decisions.

Chohung Bank plans to abolish the loan approval authority of bank branches and instead have credit assessments done by regional Credit Centers. The bank also intends to appoint foreigners and external experts as members of the Standing Board of Directors and the Credit Evaluation Committee, and for loans above a certain threshold, external experts' opinions must be consulted.

Table E1: Progress in Credit Practices Innovation as of End of 2000

Credit practices	# banks Implemented
Introduction of credit rating system[a]	21
Enhancing transparency in the credit approval process[b]	22
Strengthening credit monitoring system[c]	21
Moving away from collateral-centric credit practices[d]	21
Ensuring transparency in borrowers' financial condition[e]	22
Implementation of early warning system for non-performing loans[f]	20
Centralization of branch organizational structure[g]	19
Credit counseling based on marketing concepts[h]	22
Pursuing credit specialist job classification system[i]	13
Establishment of credit information system[j]	13
Total number of commercial banks as of end of 2000	22

NOTE: This table provides an overview of the common credit practice innovations that the FSC and FSS required banks to implement, along with the number of commercial banks that had implemented each credit practice by the end of 2000. [a]:adopting an advanced evaluation system to replace the existing comprehensive company credit rating system for assessing borrower's creditworthiness. [b]:Introducing credit evaluation committees, maintaining records of evaluation opinions and credit approval decisions, [c]:Credit monitoring by corporate analysis divisions, adjustments to credit rating through regular or ad-hoc monitoring, implementation of measures aligned with loan review results, [d]:Linking with the credit rating system to implement differentiated credit treatment based on credit ratings, [e]:Requiring debt status reports, imposing sanctions for non-submission of non-performing loan data, [f]:Selecting potential non-performing loan companies, appointing dedicated managers, and strengthening management for companies showing signs of potential non-performance, [g]:Specialization of branches into credit dedicated branches or receiving dedicated branches, [h]:Credit counseling by specialized personnel, record management of counseling contents, and reflecting the counseling in credit decisions. [i]:Training of credit specialists, evaluation, remuneration, and improvement of related systems for credit specialist job roles including credit evaluation and corporate analysis tasks, [j]:Computerization of industry and company information databases, development of comprehensive credit information system including credit line management. The data was sourced from the press release by the FSS on May 4, 2001, titled "Financial Company Credit Policy Innovation Progress (as of the end of December 2000)."

F Profitability of Banking Sector

In this section, we present how the efficiency and profitability of commercial banks in South Korea changed before and after the banking sector reform.

F.1 Nonperforming Loans

Table F1 presents changes in the amount of nonperforming loans and their proportion relative to the total credit, based on the Bank Management Statistics. The Bank Management Statistics of South Korea provides information about the operational and financial activities of banks within the country, collected by the Bank of Korea and the Financial Supervisory Service.

In this table, "nonperforming loans" (NPL) refer to loans that belong to the substandard and below category adopted in June 1998, which are overdue by no less than 3 months. Due to a significant change in the classification of NPLs within the Bank Management Statistics between 1998 and 1999, we report NPL data from 1999 onward.

Panel A of Table F1 documents that the total amount of nonperforming loans (NPLs) among all commercial banks decreased from 44.7 trillion Korean won in 1999 to 12.6 trillion Korean won in 2001, representing approximately one-third of the initial amount. The proportion of NPLs is the ratio of NPLs to the total credit, where the total credit comprises bank account credit, trust account credit, and comprehensive account credit. The percentage of NPLs among all commercial banks decreased from 13.6% in 1999 to 3.3% in 2001.

Panel B of Table F1 documents the shifts in the share of NPLs among various banks. The decline in the NPL share is particularly noticeable for Chohung, Hanbit,[64] and Korea First, which were categorized as undercapitalized in 1998 and exhibited higher NPL shares in 1999. In 1999, the NPL shares for Chohung, Hanbit, and Korea First were 10.8%, 11.0%, and 18.5% respectively, which

[64]Commercial Bank and Hanil Bank merged to establish Hanbit Bank in July 1998, which was later renamed Woori Bank in 2002.

substantially dropped to 4.0%, 2.0%, and 1.6% respectively by 2002. Notably, even healthier banks experienced a decrease in NPL shares. Kookmin Bank and Shinhan Bank, with NPL shares of 6.4% and 4.5% respectively in 1999, saw decreases to 1.9% and 0.7% respectively by 2001. It's worth noting that the standard deviation of NPL shares among commercial banks reduced from 3.63% in 1999 to 0.80% in 2001. This indicates that the banking sector reform not only enhanced risk management for individual commercial banks but also narrowed the performance disparities among them.

F.2 Return on Assets of Commercial Banks

The reported value of assets by each bank before the reform is frequently considered to be distorted (Ji and Park (1999)). Therefore, we present the Return on Assets (ROA) of commercial banks from 1998, which is after the reform.

Table F2 presents the ROA of commercial banks for the years 1998 and 2004 based on data from the Bank Management Statistics. The ROA is calculated by dividing the net profit for the period by bank account asset balance, which is one of the key metrics to examine banks' profitability. The profitability of commercial banks, as measured by the ROA, underwent significant improvement after 1998. The mean ROAs for all commercial banks rose from -5.10 in 1998 to 0.56 in 2001. The enhancement in ROAs after the reform period is more evident among distressed banks. For instance, Chohung, Hanbit, and Korea First Bank witnessed their ROAs improve from -5.32%, -5.08%, and -9.05% in 1998 to 1.05%, 1.06%, and 0.86% respectively in 2001. Notably, this improvement extended beyond troubled banks and was also observed in relatively healthier institutions. For instance, Kookmin and Shinhan banks reported ROAs of 0.17% and 0.19% in 1998, respectively, which rose to 0.76% and 0.70% in 2001. In summary, the profitability of commercial banks experienced substantial growth following the banking sector reform.

F.3 Ranking of Korean Banks in the Global Top 1000 Banks

Table F3 documents the ranking of Korean banks in the Global Top 1000 Banks published in the Banker. T1, or Tier 1 Capital, is a bank's core, stable capital. It comprises common shares, retained earnings, and other comprehensive income, minus deductions required by regulators. It's the highest quality capital, capable of absorbing losses and offering a buffer during financial stress. Regulatory bodies like the Basel Committee on Banking Supervision use T1 Capital to gauge a bank's strength and resilience against economic challenges. Columns (1) and (6) document the ranking of the bank among Global 1000 banks with respect to its T1 at the end of 1997 and at the end of 2002, respectively. Columns (2) and (7) document the ranking for total assets. Columns (4)-(5) and (9)-(10) present the amount of T1 and total assets of each bank at the end of 1997 and at the end of 2002, respectively. The unit is billion dollars.

Overall, we observed a substantial increase in the rankings of Korean banks between 1997 and 2002. For example, in 1997, Kookmin Bank was ranked 323rd in terms of Tier 1 capital and 219th in terms of total assets. By 2002, its ranking had significantly improved to 60th and 73rd, respectively. Notably, Pusan Bank also demonstrated remarkable improvement in its rankings. In 1997, Pusan Bank held the 766th rank in terms of Tier 1 capital and the 632nd rank in terms of total assets. By 2002, its rankings had significantly risen to 438th and 375th, respectively.

F.4 Changes in Employment of Senior Bank Managers in Commercial Banks

Table F4 presents the employee count according to their ranks measured at the end of each year. Panel A displays the count for all commercial banks, while Panel B presents the count specifically for Shinhan Bank, one of the healthiest banks prior to the crisis. Given that changes in the ranking system for four banks started from 2002, we report data up to 2001.

Panel A illustrates a notable decline in the count of executives and top-ranked managers across

all commercial banks since 1997. For example, the number of permanent executive officers decreased from 229 in 1997 to 71 in 2001, marking a reduction of one-fourth. Similarly, the count of managers at rank 1 decreased from 2,506 in 1997 to 593 in 2001. The decrease in employee numbers over time was particularly significant in higher-ranking positions. This is especially evident considering that the number of employees at ranks 3 and 4 has remained relatively unchanged since 1998.

The decrease in the number of top-ranked bank managers following the crisis cannot be solely attributed to the significant layoffs that occurred in distressed banks in 1998. As shown in Panel B, similar trends were observed in the employment changes at relatively healthier banks before the crisis, such as Shinhan Bank. Although the scale of the change was smaller, the count of rank 1 managers decreased from 110 in 1997 to 82 in 2001.

Table F1: Changes in Nonperforming Loans

	Year			
	1999	2000	2001	2002
A. Commercial Banks Total				
Sum (Trillion won)	44.6	32.0	12.6	11.3
Share (%)	13.6	8.8	3.3	2.4
B. Share of nonperforming loans by bank (%)				
Chohung	16.5	10.2	3.3	3.8
Hanbit[a]	16.5	14.0	2.1	2.2
Korea First	29.9	10.4	10.5	2.2
Seoul	19.4	19.8	2.4	NA
Korea Exchange	18.0	10.3	3.6	2.9
Kookmin	11.3	7.0	3.6	2.9
Korea Housing	7.4	5.1	NA	NA
Shinhan	6.9	4.0	2.4	1.4
Koram	13.7	9.0	2.7	1.1
Hana	8.6	5.6	2.4	1.7
Peace	18.0	14.1	NA	NA
Daegu	11.8	8.7	3.7	2.3
Pusan	7.6	6.7	3.7	2.2
Kwangju	7.2	6.8	2.7	2.1
Jeju	18.9	15.6	2.8	2.6
Jeonbuk	11.8	8.2	5.0	1.7
Kyongnam	9.4	13.7	3.2	2.0

NOTE: The table provides information on the amount and percentage of nonperforming loans within commercial banks in South Korea. Due to a significant change in the classification of NPLs within the Bank Management Statistics between 1998 and 1999, we have reported NPL data from 1999 onward to enhance coherence in our measures. The non-performing loan in this table refer to loans that are overdue by no less than 3 months. [a]:Commercial Bank and Hanil Bank merged to establish Hanbit Bank in July 1998, which was later renamed Woori Bank in 2002. Data: Bank Management Statistics.

Table F2: Return on Asset (ROA) of Commercial Banks (%)

Year	98	99	00	01	02	03	04
National Banks							
Chohung	-5.32	-1.86	0.22	1.05	-1.00	-1.53	0.43
Hanbit	-5.08	-3.15	-4.46	1.06	1.00	1.43	1.92
Korea First	-9.05	-3.50	1.19	0.86	0.35	-0.04	0.28
Hanil	-4.83	NA	NA	NA	NA	NA	NA
Seoul	-9.67	-11.45	-2.64	0.51	NA	NA	NA
Korea Exchange	-2.02	-1.97	-0.94	0.49	0.22	-0.37	0.83
Kookmin	0.17	0.17	0.97	0.76	0.81	-0.52	0.30
Korea Housing	-0.70	1.06	0.95	NA	NA	NA	NA
Shinhan	0.19	0.32	0.86	0.70	1.05	0.71	1.15
Koram	0.37	0.26	-1.63	0.69	NA	NA	NA
Hana	0.82	0.55	0.06	0.80	0.65	0.69	1.66
Boram	-4.55	NA	NA	NA	NA	NA	NA
Peace	-7.18	-1.20	-1.42	NA	NA	NA	NA
Local Banks							
Daegu	-5.09	0.30	0.13	0.23	0.88	0.67	0.70
Pusan	-4.97	0.05	0.10	0.42	1.09	0.79	0.81
Kwangju	-5.53	-1.49	-2.22	1.07	1.00	0.67	0.81
Jeju	-10.20	0.50	-1.65	0.09	0.81	0.28	0.37
Jeobuk	-6.65	-0.02	0.20	-1.15	0.17	1.14	0.83
Kangwon	-11.43	NA	NA	NA	NA	NA	NA
Kyungnam	-5.74	0.13	-4.09	0.88	0.89	0.80	0.98
Chungbuk	-10.62	NA	NA	NA	NA	NA	NA

NOTE: The table documents the return on assets (ROA) of each bank during 1998-2004. The ROA is calculated by dividing the net profit for the period by bank account asset balance. Data: Bank Management Statistics.

Table F3: Changes in the Ranking of Commercial banks in the Global Top 1000 Banks

End of 1997					End of 2002				
Ranking		Name	T1	Asset	Ranking		Name	T1	Asset
T1	Asset				T1	Asset			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
237	170	Korea Exchange	12.4	396.9	60	73	Kookmin	77.4	1445.8
263	306	Shinhan	11.1	172.5	119	104	Woori[a]	31.7	753.3
267	284	Hanil	10.6	191.5	156	119	Hana	23.4	639.8
323	215	Kookmin	8.9	277.1	185	129	Chohung	19.3	558.1
324	219	Commercial	8.9	271.5	207	133	Korea Exchange	16.2	545.7
423	261	Korea Housing	6.4	219.8	277	236	Korea First	11.7	271.7
528	478	Daegu	4.8	86.3	282	205	Koram	11.6	317.2
567	272	Seoul	4.3	202.7	438	375	Pusan	6.7	136.8
578	474	Hana	4.1	88.6	456	354	Daegu	6.3	146.9
655	683	Boram	3.3	48.0					
684	848	Kangwon	3.1	29.3					
700	622	Koram	3.0	56.4					
766	632	Pusan	2.6	54.5					
816	563	Dongwha	2.3	66.9					
818	707	Kyungnam	2.3	45.1					
861	812	Kwangju	2.1	34.0					
870	754	Kyungki	2.0	40.0					

NOTE: The table documents the ranking of Korean banks in the Global Top 1000 Banks published in the Banker. T1, or Tier 1 Capital, is a bank's core, stable capital. It comprises common shares, retained earnings, and other comprehensive income, minus deductions required by regulators. It's the highest quality capital, capable of absorbing losses and offering a buffer during financial stress. Regulatory bodies like the Basel Committee on Banking Supervision use T1 Capital to gauge a bank's strength and resilience against economic challenges. Columns (1) and (6) document the ranking of the bank among Global 1000 banks with respect to its T1 at the end of 1997 and at the end of 2002, respectively. Columns (2) and (7) document the ranking for total assets. Columns (4)-(5) and (9)-(10) present the amount of T1 and total assets of each bank at the end of 1997 and at the end of 2002, respectively, and the unit is billion dollars. [a]:Commercial Bank and Hanil Bank merged to establish Hanbit Bank in July 1998, which was later renamed Woori Bank in 2002. Source: The Banker.

Table F4: Changes in Employment at Commercial Banks

Year	Executive		Managers					Bank clerk
	Permanent executive	Non-executive director	Rank 1	Rank 2	Rank 3	Rank 4	Sum	
A. All commercial banks								
1997	229	272	2,506	5,221	8,523	25,493	41,743	64,715
1998	142	203	1,250	3,120	6,481	20,835	31,686	42,135
1999	82	151	946	2,640	6,569	22,940	33,095	40,078
2000	72	163	763	2,299	6,458	22,335	31,855	37,202
2001	71	112	593	2,718	6,456	22,857	32,624	68,012
B. Shinhan Bank								
1997	10	31	110	172	340	1,015	1,637	2,968
1998	10	32	93	152	382	1,100	1,727	2,764
1999	4	33	89	165	411	1,107	1,772	2,592
2000	4	34	88	139	438	1,177	1,842	2,435
2001	3	6	82	129	475	1,400	2,086	2,280

NOTE: Panel A presents the employee count in all commercial banks according to their ranks. Panel B presents the employee count in Shinhan Bank according to their ranks. We provide data up to 2001, as the ranking system underwent changes for four banks starting from 2002. Data: Bank Management Statistics.