Fertility and Female Entrepreneurship: Evidence from the One-Child Policy in China

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Abstract

Using the Chinese Health and Nutrition Surveys (CHNS), as well as comprehensive data from the Chinese Business Registry, we document a significant increase in female entrepreneurship following increases in fertility penalties associated with the one-child policy (OCP). A one standard deviation increase in the fines increases the probability of becoming an entrepreneur by 1.3%, which is about 21% of the mean entrepreneurship rate (6.2%) for women. We find the results robust to a number of checks, including alternative approaches to imputing gender of firm owners and using a staggered DID approach in the business registry data. In line with expectations for which groups are likely to be more strongly impacted by the penalties, we find stronger effects for women in the fertile age group (20-40 years), for those who already had children, and for those from the majority ethnic community (using CHNS data), and for those from urban regions and provinces with lower son preference (using business register data). Several pieces of evidence suggest that the entrepreneurship was not a transitional or part-time arrangement.

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"Women hold up half the sky"

– Attributed to Mao Zedong, People's Daily, July 10, 1964

“When women thrive, humanity prospers”

– The Wisdom of Folk

1. Introduction

The representation of women as owners of business start-ups is conspicuously low in many parts of the world (Allen et al., 2008; Thébaud, 2015; Gompers and Wang, 2017; Bosma and Kelley, 2019; Core, 2021). The extent of entrepreneurship by women was low in China as well until the late 1980s. However, starting in the early 1990s, there has been a dramatic surge in the estimated number of firms established by women (Figure 1). By the mid-2000s, the estimated annual number of female-owned startups reached around 1.5 million, constituting over 38% in number and about 27% of the registered capital of all new entrants. While the role of female entrepreneurs in expanding goods varieties, creating new jobs, and fostering gender equality is well documented in the literature (Decker et al., 2014; Koning, Samila and Ferguson, 2021; Chiplunkar and Goldberg, 2023), the key drivers and constraints influencing women’s decision to start a business, particularly in developing countries, remains under-explored.

As illustrated in Figure 1, the sharp increase in female entrepreneurship (left-axis) coincided with an equally stark decline in fertility rate (right-axis) in China, suggesting a potential link between the decline in number of children and female entrepreneurship. In this paper, we leverage China’s one-child policy (OCP), specifically the variation in the financial penalties associated with additional children across provinces and years, as plausibly exogenous drivers of reproductive choices (Huang, Lei, and Sun, 2021), and study the impacts of exposure to fertility restrictions on female entrepreneurship.

Exploiting the temporal and geographic variations in the OCP related financial penalties for an unauthorized birth, we first confirm that higher penalties have a significant negative effect on the fertility rate, consistent with a number of previous studies (Ahn, 1994; McElroy and Yang, 2000; Ebenstein, 2010; Li, Zhang and Zhu, 2005).[2] According data for 2008 from

[2] While there are also studies suggesting that the effects of the OCP on fertility may be moderate or small (Schultz and Zeng, 1995; Feng et al., 2013).

the World Bank Gender Data Portal, Chinese women spent $2.6x$ as much time on unpaid domestic and care work than men compared to $1.7x$ female to male domestic and care work time ratio in the U.S.[3] Therefore the decline in fertility induced by OCP likely had large effects on the time constraints faced by women. While this suggests that reduced fertility could provide greater ability to explore employment and entrepreneurship opportunities, studies have documented how motherhood generates a preference for self-employment, through a desire for greater autonomy and flexibility in terms of work schedule (Hurst and Pugsley, 2011; Thébaud, 2015; Yurdagul, 2017; Bento, Shao and Sohail, 2023). Thus, the net effect of the OCP penalties on female entrepreneurship is an interesting empirical question.

To analyze the impact of the OCP on female entrepreneurship, we first utilize panel data from the China Health and Nutrition Survey (CHNS). This dataset has detailed information about individual demographics and labor market status, and its panel dimension allows for a comparison of entrepreneurial activities of the same person before and after the increases in OCP-related penalties. Consistent with the potential link between reduced fertility and the surge of female-created businesses suggested by Figure 1, we find a significant impact of OCP penalties on entrepreneurship by women in the fertile age range (20-40 years). The economic magnitude of the estimated effect is significant: a one standard deviation increase in penalties increased the propensity for self-employment by 1.3%, which is about 21% of the average entrepreneurship rate of 6.2% for this age group. Because women over the fertile age (i.e., in the 41 to 65 age group) should not be affected by the OCP but could be affected by other policies or local economic shocks incidentally correlated with OCP penalties, this group allows for an interesting placebo test. Indeed, we find that higher OCP penalties have no significant effects on entrepreneurship choice for older (non-fertile) women. [4]

[3] The World Bank's Gender Data Portal (https://genderdata.worldbank.org/). Our own estimates suggest that each additional child increased the number of childcare hours for women in the 20 to 40 year age group by about 5.5 hours per week, whereas additional children had no statistically significant impact on childcare or housework hours for men. Point estimates suggest a negative effect of additional children on men, suggesting stronger specialization in multi-children households.

[4] The richest specifications also include province-year level controls for economic shocks including GDP growth, wage growth, Ln(GDP per capita) and unemployment rate.

As additional checks to rule out confounding effects from contemporaneous shocks, we undertake two additional tests using the CHNS data. One, we examine if effects are weaker for women who are childless, as OCP fines only apply to second and later children. Indeed, we find that the positive effects of the OCP penalties on entrepreneurial activities are larger and statistically significant only for women with children. Two, we exploit the fact that the one-child policy restricted the fertility of majority Han ethnic community but not of minority communities (Zhang, 2017). Consistent with the baseline effects being driven by the OCP, we find no significant effects on the propensity of entrepreneurship for minority women.

Although CHNS is the largest available individual-level survey data with detailed information for the period, given the sample size and low probability of females starting a business it includes only a small number of female entrepreneurs in each survey year. The CHNS also lacks information about the nature of the businesses. To address these shortcomings, we undertake additional analysis using the comprehensive business registry data for China. In order to study female entrepreneurship in this data, we utilize data on 2.5 million observations on names and gender from the Chinese demographic census for 2005, and 20 million observations on names and gender from the online "ngender" data source, to develop an approach to impute a probability that the business owner (i.e., the representative named in the registration) is a female. This allows us to form novel estimates of the aggregate number of female-owned startups at the province-year level. Then, utilizing specifications with province-level fixed effects as well as time-varying province level controls for local economic shocks, we confirm a positive and significant effect of OCP-related financial penalties on the number of female owned enterprises.

This data allows two additional heterogeneity tests that help rule out confounding shocks. One, leveraging the more stringent enforcement of OCP policy in rural areas (Ebenstein, 2010; Zhang, 2017), we examine if effects are stronger in urban areas. The results show that the positive effect of penalties on the number female-owned startups was indeed concentrated in urban areas, with little effect in rural entrepreneurship. Two, we expect stronger effects in regions with more equitable gender norms, where the policy may be more likely to be followed and where women may have faced lower social barriers to entrepreneurship. Consistent with a causal effect for OCP fines, we also find that their impact on female entrepreneurship was larger

in provinces with more equitable gender norms proxied using low male birth ratios (following Jayachandran and Kuziemko (2011) and Sivadasan and Xu (2021).[5]

One relevant question is whether the entry induced by OCP fines is of lower quality than other types of female entrepreneurship. In particular, if the observed increase in entrepreneurship reflects a transitional phase or entry by "reluctant" entrepreneurs due to a lack of outside employment opportunities, the measured impact on propensity for entrepreneurship or number of startups may overstate the effects of the fines relative to normal (i.e. not induced by fertility changes) female entrepreneurship. Several pieces of evidence suggest that business creation induced by strict fertility restrictions are not of poorer quality. One, we find that the switch to self-employment is stronger for more educated women. Two, we find self-employment is associated with higher individual and household level earnings compared to outside work by women in this data period, and this relationship is unaffected by the fines. That is, the self-employment in high fine location-periods has a similar earnings premium relative to outside employment as low fine location-periods. Three, we find that women not only open more individual proprietorships, but also firms with registered capital (albeit not in the high capital group). Four, both for the full sample as well as within the different tiers of registered capital, fertility fines have either a positive or null impact on the survival rate of women-owned startups.

Finally, we explore the effect of OCP penalties on male entrepreneurship, and find positive effects of similar magnitude as that for women. Because we find that increased number of children has significant effects on time use (hours devoted to childcare) only for women and not for men, a main driver of the effect for women is likely the reduction in time and effort constraints from having fewer children, while the effect for men may be driven by a reduction in financial constraints or risk aversion.

Related Literature

This paper contributes to a number of related streams of the literature, as summarized below.

[5] A lower male birth ratio is indicative of weaker gender selection in favor of boys, consistent with social norms with weaker son preference.

We contribute to the literature on the gender gap in entrepreneurship. Previous studies have documented that the gender gap is affected by differences in access to capital (Marlow and Patton, 2005; Gicheva and Link, 2015; Howell and Nanda, 2019; Assenova and Mollick, 2019; Ewens and Townsend, 2020; Hebert, 2023; Calder-Wang and Gompers, 2021); risk aversion (Jianakoplos and Bernasek, 1998; Bönte and Piegeler, 2013; Caliendo, Fossen and Kritikos, 2014), peer effects and professional networks (Markussen and Røed, 2017; Howell and Nanda, 2019), social norms (Bento, Shao and Sohail, 2023), and maternity leave laws (Gottlieb, Townsend and Xu, 2022). Two recent studies are closer to our paper. Exploiting Roe v. Wade, state laws restricting abortion providers, and an index tracking state-level regulation of reproductive care, Zandberg (2021) finds that better access to reproductive healthcare increases women's propensity to become entrepreneurs. Using the liberalization of an emergency contraception pill in Italy, Core (2021) shows that lower maternity risk leads to an increase in probability of younger female founders becoming executives. Consistent with these two studies, we document new evidence for how policies aimed at reducing fertility affect females' decision to become entrepreneurs in a developing country context.

This paper also adds to the literature on the drivers of entrepreneurship (Hurst and Pugsley, 2011; Landier and Thesmar, 2008; Adelino, Schoar and Severino, 2015; Evans and Jovanovic, 1989; Kerr and Nanda, 2009; Schmalz, Sraer and Thesmar, 2017; Levine and Rubinstein, 2017; Hombert et al., 2020; Xu, 2022). By leveraging the variation in fertility penalties associated with the one-child policy, we contribute by documenting evidence that additional children may impose time, effort and financial costs that form a significant barrier to female entrepreneurship.

Our study also relates to the recent literature investigating the impact of parenthood on gender gaps in labor market outcomes (Bertrand, Goldin and Katz, 2010; Angelov, Johansson and Lindahl 2016; Kleven, Landais and Søgaard, 2019; Kleven et al., 2019; Cortés and Pan, 2021; Kleven, Landais and Søgaard, 2021; Andresen and Nix, 2022; Kleven, 2023; Kleven, Landais, and Leite-Mariante, 2023), as well as the literature on the effects of fertility on female labor supply (Rosenzweig and Wolpin, 1980; Bronars and Grogger, 1994; Angrist and Evans, 1998; Agüero and Marks, 2008; Aaronson et al., 2021) and financial distress (Miller, Wherry and Foster, 2023). This literature provides evidence on the importance of child penalties and also explores possible mechanisms, but mainly focus on labor market outcomes such as female

labor supply and wage gap. Our paper complements this strand of literature by focusing on another important choice, the decision by women to start a business.

Finally, this paper also speaks to the literature on the effects of one-child policy in China (Ahn,1994; McElroy and Yang, 2000; Ebenstein, 2010; Li, Zhang and Zhu, 2005; Zhang, 2017; Ebenstein, 2011; Li, Yi and Zhang, 2011). These pioneering studies have documented important effects on fertility, child education, sex ratios, and female labor supply. Exploiting the same variation in OCP related fines as we do, an interesting recent study by Huang, Lei and Sun (2021) documents higher education levels, more white-collar jobs, delayed marriage, and lower fertility rates at adulthood for children whose parents were subject to stricter fertility restrictions. We contribute to the literature by analyzing an important yet under-studied outcome, participation of women in entrepreneurship.

The paper is structured as follows. The next section provides background on China's OCP, and describes how fertility penalties changed over time. Section 3 introduces the data used in this study and provides summary statistics of important variables. Section 4 presents evidence of the effects of the OCP on females' decision to start a business using CHNS dataset. Section 5 provides regression results using business registry dataset. Section 6 examines the nature and quality of entrepreneurship induced by the fines. Section 7 examines impact of fines on male entrepreneurship. Section 8 concludes.

2. Policy Background

The One-Child Policy (OCP), introduced in China in 1979, stands as one of the most ambitious demographic policies in modern history (Ebenstein, 2010; Zhang, 2017).[6] Motivated by concerns over the nation's burgeoning population and the strain it imposed on resources, the Chinese government introduced this policy as a radical measure to curb population growth. The OCP in principle restricted each couple to have only one child. However, in practice its implementation often varied across rural and urban areas, provinces, and ethnicities, which has provided researchers interesting variations to study (Zhang, 2017).

[6] This section draws heavily from Ebenstein (2010) and Zhang (2017).

Through policy notifications in 1982 and 1984, the government effectively granted provincial governments full authority to determine the 'tax rates' (i.e. financial penalties) for exceeding birth quotas. However, until 1989, local governments sensitive to local resistance to the fines either made no changes or lowered fines, as evident in Figure A1. A significant shift in policy happened at the end of 1980s, when local officials began being evaluated based on the enforcement of the one-child policy (with the highest priority) in addition to economic growth and social stability (Birney, 2014). Consequently, local governments in a number of provinces steeply increased the financial penalties.

Following previous studies (Ebenstein, 2010; Huang, Lei and Sun, 2021; García, 2022), we leverage the variations in financial penalties (also called "policy fine" or "fertility fine") across provinces and years to estimate how the one-child policy affects female entrepreneurship. Through a series of tests, Huang, Lei and Sun (2021) show that most significant increases in the policy fines are related to the promotion incentive of provincial governors, and which is arguably exogenously determined by the characteristics of local officials. In Table A2 of the Online Appendix, we confirm this finding, and document that fertility penalties are uncorrelated with other covariates at the province level, including GDP growth, growth of GDP per capita, and employment. To further address potential correlation of policy with economic trends, in our analysis we include controls for local economic conditions, and we undertake placebo tests using non-fertile women and minorities.

Two other features of the implementation provide useful variation, which we use to rule out confounding effects from concurrent policy changes or economic shocks (Zhang, 2017; Ebenstein, 2010). First, the fertility restrictions focused on the Han people, the largest ethnic group in China, which makes up 92 percent of the population[7]. In all provinces, most minorities were allowed to have a second child or faced no restrictions. Second, the government had greater influence on the behavior of urban residents than that of rural residents, as many urban residents worked in state-owned enterprises, and having more than one child could result in the loss of their stable jobs. In contrast, most rural residents received fewer benefits from the government and engaged in agricultural work that generated a strong demand for more children,

[7] There are in total 55 ethnic minority groups in China, and their population accounts for 8 percent of the total population according to the 2010 Census.

especially sons. Consequently, the policy was more strictly enforced in urban areas but less so in rural areas: in practice, urban couples were only allowed to have one child, whereas rural couples were often permitted to have a second child especially if the first child was a girl (which is why it has been called the "one-and-a-half children policy").

3. Data, Variable Construction, and Empirical Specification

3.1 Data Sources & Variable Construction

A primary data source is the China Health and Nutrition Survey (CHNS). This panel data set was collected through the collaboration of the Carolina Population Center at the University of North Carolina at Chapel Hill and the National Institute for Nutrition and Health (NINH, former National Institute of Nutrition and Food Safety) at the Chinese Center for Disease Control and Prevention (CCDC). This data covers nine provinces that vary considerably in their levels of economic development (Guangxi, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Liaoning, and Shandong), in the non-consecutive years starting from the year 1989.[8] Our analyses include six waves in total (1989, 1991, 1993, 1997, 2000 and 2004). In each survey, approximately 3900 households and around 14500 family members were interviewed. CHNS assigns varying weights to counties across different levels of provincial development and income during the sampling process to enhance the representativeness of the dataset.

We supplement the CHNS with comprehensive data on new business formation, using the Business Registry of China. This dataset is maintained by the State Administration of Industry and Commerce (SAIC), and covers the universe of *all* firms established in China since 1949 (over 180 million in total). It provides a number of firm-level variables including dates of establishment and exit (if applicable), primary 4-digit industry classification code, name of the

[8] Most high-quality household survey in China were collected after 2010, for example, the China Family Panel Studies (CFPS) were launched in 2010, while baseline national wave of China Health and Retirement Longitudinal Study (CHARLS) is being fielded in 2011. Since the major changes of the one-child policy occurred in 1980s and 1990s, the CHNS data is the only survey data that meets our needs. The CHNS has also been widely used in the literature and been proved of high quality (Wang, 2012; Wang, 2014)

legal representative, and the amount of registered capital.[9] We focus on the over 25 million firms that were established between 1979 and 2005, and track their survival rate until 2018.

Following the literature, we define an entrepreneur as the legal representative of a firm provided in the business register (e.g., as in Fang et al. (2023)). Unfortunately, the business registry data only provides the names of the entrepreneur, but not their gender. To overcome this limitation, we apply a method of imputing gender based on the last character of the name, following Tang and Zhang (2021).[10]

In particular, we employ a 20% random sample from China's 1% population census in 2005, which includes 2.5 million names and their gender. We supplement this with data from a online source (ngender) if the character is missing in the census data but appears in ngender data..[11] For each Chinese character i, we calculate the probability that it is used in a female name based on our name dataset, using the following simple formula:

$$\text{female}_{\text{prob}_i} = \frac{\text{freq}_{\text{female}_i}}{\text{freq}_{\text{female}_i} + \text{freq}_{\text{male}_i}}, \quad (1)$$

where $\text{freq}_{\text{female}_i}$ ($\text{freq}_{\text{male}_i}$) represents the number of times that character i shows up in the last character of a female (male) name. Table A3 in the appendix lists the twenty characters with the highest (lowest) female probability. For the top twenty most feminine characters, the probability that any of those characters is used in a male name is less than 2%. After we obtain the probability of being female for each legal representative, we aggregate this probability to the province level to get an estimate of the total number of new female entrepreneur firms in each province in a given year. Specifically, the number of female owned firms in province p in year t is estimated as:

$$E[(N_F)_{pt}] = \sum_{j=1}^{N_{pt}} female_prob_j \quad (2)$$

[9] Registered capital is the amount of capital that a company commits to contribute and maintain for its operations. Before 2013, Chinese Company Law required shareholders to put up at least 20% of the total registered capital within 90 days after establishment, with the remaining balance paid within two years.

[10] Chinese firm names usually have one or two characters. When it has two characters, the second one is more informative in terms of gender.

[11] The provider of the "ngender" program employs a raw data set with 20 million real names and genders (obtained from a hotel reservation system) and applies Bayesian statistical techniques to generate predictions for the gender for any Chinese first name. For more details, please check the website: https://github.com/observerss/ngender.

where j indexes the firms in province p in year t and hence varies from 1 to the number of firms registered in province p in year t (N_{pt}). We verify robustness of our main results to using data solely from the census and solely from the ngender dataset.

Finally, a key variable in our analysis is the financial penalty or fine which varies by province-year. We take this data from Ebenstein (2010), who in turn relied on data from Scharping (2003). As discussed in Appendix III of Ebenstein (2010), most of the provinces collected fines from wage earners in the form of regular deductions, which is converted to a present value using a 2% discount rate to yield a measure of the fine in years of income. In particular, the measure reflects how the fines were structured so that it was proportionate to the wage of the person being penalized (with higher wage earners paying higher absolute amounts).

3.2 Summary Statistics

Panel A of Table 1 shows the main characteristics at the individual level using the CHNS data. The probability of a female being self-employed is about 5.2%, while the probability is higher among fertile women (i.e., women aged between 20 and 40), which is about 6.2%. Most fertile women in our sample are married (the proportion is 85.5%), have average age of about 31 years, and have about 7.47 years of education.

Panel B provides summary statistics on key province-level aggregate variables using information from the business registry data. In our sample period, on average, there are 11,754 new firms registered each year in a given province. Panel C provides summary statistics on key variables at the province level. The average financial penalty for excess fertility is about 1.75 times annual income, but exhibits significant variation from 1.21 at 25th percentile to 2.5 at the 75th percentile. Our analysis will exploit the differences in the variation of fines over time within provinces. Figures 2A and 2B present the binscatter between financial penalties and female entrepreneurship, utilizing the CHNS and business registry data respectively. The plot reveals a robust positive association between the two variables. While strongly consistent with a positive impact of fertility fines on female entrepreneurship, to control for potential confounding variables and concurrent shocks, a rigorous empirical analysis is warranted.

3.3 Empirical Specification

We start by illustrating our empirical strategy with the CHNS data. As described earlier, we regress the probability of a female being an entrepreneur against the financial penalties of the one-child policy. More precisely, we estimate:

$$Female_entrep_{it} = \beta_0 + \beta_1 \cdot fine_{pt-1} + X_{it} \cdot \Gamma + G_{pt} \cdot \delta + \alpha_i + \gamma_t + \epsilon_{it} \quad (3)$$

where $Female_entrep_{it}$ is a dummy variable indicating whether female i is an entrepreneur or not in year t; $fine_{pt-1}$ is the financial penalties of one-child policy in province p in year $(t-1)$; as an alternative measure, we also employ the average fine in years $(t-1)$ and $(t-2)$; X_{it} denotes individual-level control variables: married dummy, ln(asset), and years of education; while G_{pt} represents the controls in the province p in year t, including GDP growth rate, wage growth rate, ln(GDP per capita) and unemployment rate. We include both individual (α_i) and year (γ_t) fixed effects in the most rigorous specifications.

For the analyses using the business registry data, we aggregate variables to the province-year level and employ the following equation:

$$\text{Log}(E[(N_F)_{pt}]) = \beta_0 + \beta_1 \cdot fine_{pt-1} + G_{pt} \cdot \delta + \alpha_p + \gamma_t + \epsilon_{pt} \quad (4)$$

where $\text{Log}(E[(N_F)_{pt}])$ is the log of the number of female entrepreneurs in the province p at year t, estimated as described in equation 2; $fine_{pt-1}$ and G_{pt} have the same meaning as in Equation (3). Again, we use both province and year fixed effects in the most rigorous specification.

4. Empirical Results Using CHNS Survey Data

4.1 The Effect of the One-Child Policy on Female Entrepreneurship

Previous studies have documented a negative effect of fertility on female labor supply using different settings in developed countries (Angrist and Evans, 1998; Bronars and Grogger, 1994; Bailey, 2017; Bloom et al., 2009), while the evidence is mixed in countries at low levels of development (Godefroy, 2019; Aaronson et al., 2021). Using Chinese Census data for 1982 and 1990, Zhang (2017) finds positive but statistically insignificant effect of excess fertility on female labor supply, but a negative and significant effect on male labor supply. In this section, we empirically test whether and how one-child policy in China affects female entrepreneurship.

We expect the penalties associated with the one-child policy to affect entrepreneurship decisions through their impact on fertility choices. To establish the latter relation, we first examine the effects of financial penalties associated with the one-child policy on birth rate at the province-year level. We obtained birth rate (per thousand of population) for each province in a given year from the Annals of Statistics (1980-2005). Results in Table 2 show that higher penalties reduce the birth rate significantly. The magnitude is large: for an increase in penalty of one standard deviation (i.e., 1.169), the birth rate decreases by 0.477, which is about 9.62% of the standard deviation.

Table 3 presents the results on female entrepreneurship using the CHNS data. The first four columns use a sub-sample of females aged between 20 and 40, whereas the subsequent two columns utilize females who have already surpassed the fertile age (ages ranging from 41 to 65) as a placebo test. Columns 1 and 2 employ a 1 period lag of the penalty and the average of the lag 1 and 2 periods penalties as the key explanatory variable without adding controls, respectively; while Columns (3) and (4) add person-, family-, and province-level variables. All columns have added individual and year fixed effects, controlling for person-level time-invariant characteristics and macro shocks.

The estimates using different specifications are quite robust, showing that higher penalties increase the probability of a female becoming an entrepreneur. The magnitude is also large. Take the estimate in Column (3) as an example: when the financial penalties rise by one standard deviation, it boosts up the probability of a female being an entrepreneur by 0.014, which is about 23% of the mean level. In the last two columns, when we focus on females who have already surpassed the fertile age (ages ranging from 40 to 65) and should not be affected by the one-child policy, the estimates are quite small and not significant, consistent with a causal effect for OCP related fines through their impact on fertility decisions. Specifically these results suggest results for fertile age women are not driven by concurrent policies or economic shocks that facilitated (female) entrepreneurship in general.

4.2 Placebo Tests using Childless Women and Minorities

As we discussed in Section 2, Huang, Lei and Sun (2021) find a strong correlation between the increases in penalty and incidences of government succession, suggesting that the

promotion incentives of provincial governors could be a main driver of the changes in penalties. However, to further rule out the possibility that ambitious politicians who raised the fines may also have introduced or enhanced other policies to encourage female entrepreneurship, in Panel A of Table 4, we distinguish between two groups of fertile females: those with children and those without. Columns (1) and (2) uses a sub-sample of women who already had children and the last two columns uses a sub-sample of women without children. Since the one-child policy mainly penalizes women who give birth to a second (or later) child, the penalties should have stronger effects on those who already had children, and insignificant effects on childless women.

Consistent with a causal effect of OCP related fines, the effects of penalties on entrepreneurship are larger and statistically significant for women who already have children, while estimates are small and statistically insignificant among those who are childless. These findings suggest no role for other pro-female entrepreneurship policies that may have accompanied increases in one child policy penalties.

As discussed in Section 2, the Han ethnicity making up about 92 percent of the population were subject to the one-child policy, while ethnic minorities are exempt from the strict fertility restriction. Naturally, minority females who are not subject to the financial penalties could serve as a placebo test, as concurrent policies or economic shocks promoting female entrepreneurship would impact minority women as well. In Panel B of Table 4, we categorize fertile women (age between 20 and 40 years) into two groups based on their ethnicity: majority vs. minority. Consistent with a causal effect for penalties, the results show that penalties have effects only on the entrepreneurship propensity of majority females, while effects are small and statistically insignificant among minority females who are exempt from such penalties.

4.3 Related Analysis

In Online Appendix B, we undertake two related analyses. First, in Table B2, we explore the impact of the number of children on weekly hours spend on child care (Columns 1 and 2) and on weekly housework by women in the fertile age (20 to 40). We find that each additional child increases childcare hours by about 5.5 hours (highly statistically significant), while there is lower effect on housework hours. These results suggest that savings in time and effort on childcare could be a channel for the increase in female entrepreneurship. Next in Table B3, we

explore the impact of fines on the propensity of women (ages 20-40) to take up outside employment (distinct from self-employment). We find a positive and significant effect of an increase in fines on the propensity for fertile age women (Cols 1-2), consistent with a number of studies documenting an important effect of fertile on labor force participation. Again, interestingly there is no effect for women above the age of 40 (Cols 3-4), suggesting no role for economic or policy shocks incidentally correlated with the OCP fines.

5. Empirical Results Using Business Registry Data

Although the CHNS dataset has rich information on household and personal characteristics, it lacks detailed information about the businesses. Further, because the CHNS is a sample survey (covering a small fraction of the households in China) and because only a small proportion of females start businesses, the CHNS suffers from limitations associated with small samples. To complement the CHNS analysis and address the small sample limitation, we use data from the business registry, which includes all the businesses registered in China (25 million businesses in our sample period). This data has the limitation of having little information on the demographic characteristics of the entrepreneur. We impute the gender of the entrepreneur as discussed in Section 3.1; we also exploit information on the location, amount of registered capital, and survival that is available from the registry data.

5.1 The Effect of the One-Child Policy on Female Entrepreneurship

We first analyze the effect of fines on female entrepreneurship in Table 5. This analysis is analogous to that using CHNS data in Table 3, but uses the log of the number of female owned business at the province year level as the dependent variable (equation 4). In Columns (1) and (2), we only include province and year fixed effects, while in the last two columns, we have added time-varying control variables at the province level, including GDP growth rate, wage growth, unemployment rate, and the natural logarithm of GDP per capita.

The results are quite robust, showing that high penalties promote female entrepreneurship, consistent with results using the CHNS dataset in Table 3. The magnitude is also economically significant. Take the coefficient in Column (3) as an example: when the penalties increase by one standard deviation, the number of businesses created by females rises by 8.65%.

5.2 Heterogeneous Effects across Regions

As we describe in Section 2, the one-child policy was more strictly implemented in urban areas, while whereas rural couples were often permitted to have a second child if the first child was a girl (Ebenstein, 2010). Moreover, since most rural families participated in agricultural work and were very poor, it was difficult in practice to levy penalties on these people (Zhang, 2017). Therefore, we expect the penalties to have smaller effects in rural areas. To test this hypothesis, we divide the sample into two groups based on the type of locations where the business was registered: rural vs. urban. Then, for each province, we estimate the number of businesses registered by females in rural and urban areas (per equation 2). Table 6 presents the results. As expected, the impact of penalties on female entrepreneurship predominantly manifested in urban areas, where the enforcement of the one-child policy was stricter while for the rural areas, the impact is small and not statistically different from zero.

Previous studies have shown that social norms around gender are important for a number of choices made by women including about labor supply, marriage, and divorce (Bertrand, Kamenica and Pan, 2015; Jayachandran, 2021; Bursztyn, González and Yanagizawa-Drott, 2020; Bertrand et al., 2021; Bento, Shao and Sohail, 2023). We employ the sex ratio at birth (i.e., the number of males over females at age 0) as a proxy for local gender social norms, similar to the measure of son preference used in Jayachandran and Kuziemko (2011) and Sivadasan and Xu (2021). The idea is that in places with a stronger preference for sons over daughters, which gets reflected in the male birth ratio given widespread prevalence of pre-natal sex selection in China (Ebenstein, 2010), households may be more likely to ignore (or simply pay up) the OCP fines, especially if the first child is a girl. Also, in such places, women may encounter more obstacles or social pressures that inhibit their ability to channel the additional time or resources freed up by lower fertility towards start a business outside the home.[12]

To test this hypothesis, in Columns (5) and (6) of Table 6, we utilize the birth ratio in 1978, while the last two columns use the birth ratio in 2010 as a proxy for local gender norms. The results are robust and consistent showing that the effects of penalties on female

[12] A recent study by Dossi et al. (2021) finds a negative effect of preference for boys on girls' performance in mathematics.

entrepreneurship is more salient in provinces that have more equal social norms to women (i.e., in provinces where weaker son preference manifested in lower male to female sex ratio at birth).

5.3 Robustness Checks and Related Analysis

We undertook a series of robustness checks to using alterative measures for the financial penalties and for identifying the gender of business owner (Appendix Table C1). In the raw data, there are a few province-year observations where fines are stated as amount of monetary value rather than as multiples of annual income. For the baseline analysis, the fines are expressed as multiples of income, using the average income in that province in the same year (per Appendix III of Ebenstein 2010). As a robustness check, in Columns (1) and (2), we exclude these observations. Results are quite robust and coefficients are larger in magnitude relative to the baseline results in Table 5. The last four columns of Table C1 use alternative methods to identify the gender of the business owner in the registry data. For the baseline analysis we combined information on names and gender for 2.5 million observations from the Chinese Census with information 20 million observations from an online source (ngender). We find results are robust to using raw information from Census alone (Columns 3 and 4), and to utilizing information from ngender website alone (Columns 5-6).

Next, as an alternative to using penalties (and changes to penalties) as continuous variables as in the baseline analysis, we define "treatments" based on thresholds for increases in fines, which then allow for a difference-in-differences (DID) approach to analyzing effects in the post-increase (or high fine) regime. Because the increases in fines happened at different points in time across provinces (Appendix Figure A1), we adopt the CSDID approach proposed by Rios-Avila, Sant'Anna and Callaway (2023) to undertake a staggered DID analysis. Event study figures from the CSDID analysis (Figure C1), as well as the CSDID regression analysis results (Table C2) confirm the baseline conclusion, that increase in penalties significantly increase female entrepreneurship. Figure C1 confirms that there was a distinct change in the trajectory of the number of female startups after increases in fines, and that the observed effects are not due to differential pre-existing trends prior to the increase in fines.

6. Nature and Quality of OCP induced Female Entrepreneurship

In this section, we use both the CHNS and business registry data to explore the nature and quality of businesses started by female entrepreneurs, following the increase in fertility fines.

6.1 Differential Effects by Human Capital

In this section, we use CHNS data to investigate whether women with more education respond more strongly to the policy in terms of starting a business. Table 7 presents the results from a specification similar to equation (3), but with an interaction of the fine variable with a dummy for completion of more than 9 years of education. The coefficient on the interaction effect is positive and statistically significant, while the coefficient on the fine variable by itself (which captures effects for less educated women) is small and statistically insignificant, suggesting that the effect of the one-child policy penalties on female entrepreneurship mainly concentrated on females with higher education. This finding aligns with the results of Gottlieb, Townsend and Xu (2022), who observed a stronger impact of Canada's extended job-protected maternity leave on female entrepreneurship among those with a college degree.

6.2 Differential Effects by Factor Intensity of Sectors

We investigate which industries experienced greater entry by female entrepreneurs in response to increase of OCP penalties. We follow Zhang and Sun (2014) to divide all the Chinese industries into three groups: labor intensive, capital intensive, and skill intensive. The industries that belong to each group are listed in Appendix Table A4. We expect industries that are labor and skill-intensive to have lower financial entry barrier, i.e. demand less initial capital, making it relatively easier to enter for women who we expect to be capital constrained. On the other hand, capital-intensive sectors such as mining and manufacturing necessitate substantial initial investments, potentially posing a barrier for many women.

To empirically test this hypothesis, we construct measures of the number of female owned businesses in each of these three groups in each province (per equation 2). Results in Table 8 confirm the conjecture that women are more likely to enter sectors with lower barriers to entry. Specifically, after the increases in penalties, women are more likely to enter labor- and skill-intensive sectors, while there are no significant change in entry into capital-intensive industries.

As a robustness check, we leverage financial information available for public-listed firms and calculate the capital intensity for each industry, and then interact it with our penalty measure. The results presented in Appendix Table C3 are consistent with those in Table 8, showing that females are more likely to start businesses in sectors with less capital intensity.

6.3 Quality of Newly Created Businesses: Earnings, Capital and Survival

In Sections 4 and 5, we document that increase in financial penalties for additional children triggered business creation by women, likely due to time and financial resources freed up from having fewer children. However, there is a concern that females may establish businesses as a temporary transition, or that these entrepreneurs may lack the capability to create successful ventures, and/or they may be "reluctant entrepreneurs" who choose entrepreneurship out of necessity, possibly due to lack of employment opportunities (Banerjee et al., 2015).

To understand whether self-employment was an involuntary choice driven by lack of outside employment choices, in Panel A of Table 9 we examine the earnings impact of self-employment for women in the fertile age range (20-40 years), using the CHNS data, in specifications with individual fixed effects. We find that switching into self-employment is correlated with a greater increase in individual income (Col 1), as well as household total income (Col 3), household per capita income (Col 5), and total household expenses (Col 7). Interactions of the labor market choices with the fine variable do not yield significant coefficients (Cols 2, 4, 6 and 8), suggesting that the pattern of higher earnings for self-employment was also true for province-years with higher fertility penalties. Thus, in this dataset, the evidence suggests that self-employment (even self-employment induced by the fines) is not an inferior option relative to outside employment and in fact yields greater earnings for women. In Panel B of Table 9, we examine how fines impacted the accumulation of assets for fertile age (20-40 years old) women. We find that provinces with higher fines generated more asset accumulation for women in the fertile age range, and the effects were not significantly different for those that opted for self-employment. Together, these results suggest that self-employment was no worse, if not superior, an option to outside employment, in terms earnings and asset accumulation.

Next, we undertake two alternative tests of the quality of female entrepreneurship induced by the fines using the business registry data. First, we utilize the firm survival rate as a measure of business quality. Specifically, we examine the impact of fines on the fraction of newly-created female-owned businesses that survive for 5, 10 and 15 years. Results presented in Panel A of Table 10 show that there is no statistically significant change in survival rates across the different thresholds in high fine relative to low fine regimes. That is, per this analysis, the quality of women-owned startups induced by the fines are no different than others.

Second, we employ the amount of registered capital as a metric for assessing business quality. Specifically, we categorize all businesses within a specific industry in a given province and year into three groups: individual businesses (i.e., sole proprietorships, which usually do not report any amount of registered capital in the business registry), businesses with low (below median for the year) registered capital, and businesses with high (above median for the year) registered capital. Panel B of Table 10 presents the results for the number of each group of businesses. While Columns (1) and (2) show that the increases of penalties induced an increase in number of (likely small scale) individual businesses, the results in Columns (3) and (4) suggest that there was an equally large percentage increase in the number of firms with low amounts of registered capital. It is not surprising to find no increase in number of firms with high amounts of registered capital (in columns 5 and 6), as the marginal new female entrepreneurs may not have access to large amounts of capital.

7. Impact of Fines on Male Entrepreneurship

The primary focus of this paper is on understanding the drivers of female entrepreneurship, particularly to understand the remarkable increase in the estimated number of female-owned businesses in China through the 1990s (Figure 1). While we expect the impact of reduced fertility on entrepreneurship decisions to be more salient for women who typically shoulder the majority of household and childcare responsibilities, the impact of fertility restriction policies can also impact male entrepreneurship. Two potential pathways for this could be reduced risk aversion, and a reduction in financial constraints.[13]

[13] In recent work, da Fonseca and Berubé (2023) find using Canadian data that more children decrease entry into entrepreneurship, consistent with their model of endogenous entrepreneurship where a key

In Table 11, we replicate the baseline results for males (in the 20-40 age range): In Panel A we replicate the Table 3 analysis using CHNS data, and in panel B we replicate the Table 5 analysis using business registry data. We find that the increase in fines impacted male entrepreneurship in a similar manner as it affected female entrepreneurship. The magnitude of the effect is somewhat lower in Panel A using CHNS data (Column 3): a one standard deviation increase in the fine (1.337) increased probability of becoming an entrepreneur for males by 1.47% which corresponds to 15.48% of the mean male entrepreneurship rate of 9.5%. The corresponding effect was 22.58% of the mean for women (Table 3). The estimate in Panel B implies that a one standard deviation increase in the fine (1.169) increased log number of male owned firms by 0.089 log points, which is 3.5% of the standard deviation of log number of male firms across province-years (2.539), which is somewhat larger than the corresponding effect for females in Table 6 (3.24% of the standard deviation). These findings are consistent with Zhang (2017), who documented a strong negative impact of weaker OCP policy enforcement (reflected in a higher excess fertility residual) on male labor supply in China.

We replicated all of the other analysis for males using CHNS data in Appendix D, and using Business Registry Data in Appendix E. Most of the analysis yielded very similar results to what we obtained for females. The cases where we found different results are summarized below:

- The impact of the fine on entrepreneurship probability is not bigger for the more educated males (Table D5), contrasting with the significantly stronger impact on more educated females (Table 7).
- We find no link between number of children and weekly childcare hours for men in the 20-40 age group (Table D8, Cols 1 and 2), which contrasts sharply with the finding of significantly increase in childcare hours with fertility for females in the same age group

channel is that children increase the cost of business failure. The literature has also examined the impact of parenthood (rather than the number of children which is our focus here) on risk attitudes. Love (2010) finds that parents appear more risk averse in their financial decisions compared to non-parents. Other papers find parents are more likely to be opt for jobs with lower risk of injury (DeLeire and Levy, 2004; Grazier and Sloane, 2008). Görlitz and Tamm (2020) find increased risk aversion for parents, though they find no impact of parenthood on risky labor market behavior.

(Table B2, Cols 1 and 2). Thus time savings from reduction in childcare hours is not likely to be a mechanism explaining the increase in male entrepreneurship.

- While we find no impact of fines on entrepreneurship males aged 41-65 show (Table 11 and Appendix Table D3) consistent with the results for females in that age group (Table 3), we find that outside employment increased in response to the fines for males aged 41-65 (Table D6) much more than for males aged 20-40, which is contrary to the pattern for women. (This suggests that outside work participation for males in the younger age group is less influenced by fertility.)

8. Conclusion

Females, who typically bear a greater share of childcare and housework responsibilities, may find the prospect of starting a business more challenging with an increased number of children, adding to their existing household duties as well as increasing financial burdens for the household. This study utilizes variations in the financial penalties associated with China's one-child policy to examine whether a policy aimed at reducing the number of children per household helps facilitate entrepreneurship by women. Combining survey data and business registry information, our analysis documents an increase in prevalence of female entrepreneurs in province-years with stricter fertility restrictions.

To help address alternative explanations for our findings, we conducted a series of placebo tests involving females beyond the fertile age, those without children, from minority groups, and residing in rural regions. All of these tests document significantly larger effects for precisely those sub-samples strongly impacted by the fines, which is inconsistent with alternative mechanisms that would have likely impacted female entrepreneurship more broadly. Notably, these female entrepreneurs tend to enter industries with lower entry costs. Importantly, businesses initiated under fertility restriction policies are not exclusively unincorporated; many are actually incorporated, albeit with moderate registered capital. The impact of fines on entrepreneurship is stronger for educated women, and the survival rate of female startups induced by the fines is no lower than average.

One note of caution in interpreting our findings stems from the results for male entrepreneurship. In particular, we find an increase in entrepreneurship for males as well, so

that the OCP policy did not contribute to an increase the relative proportion of females among startups in China. There is indeed an increase in the share of women startups in the aggregate data; understanding the drivers of this shift is an interesting avenue for future research.

Overall, our findings suggest an important relation between fertility and entrepreneurship decisions and document another dimension to the motherhood penalty.

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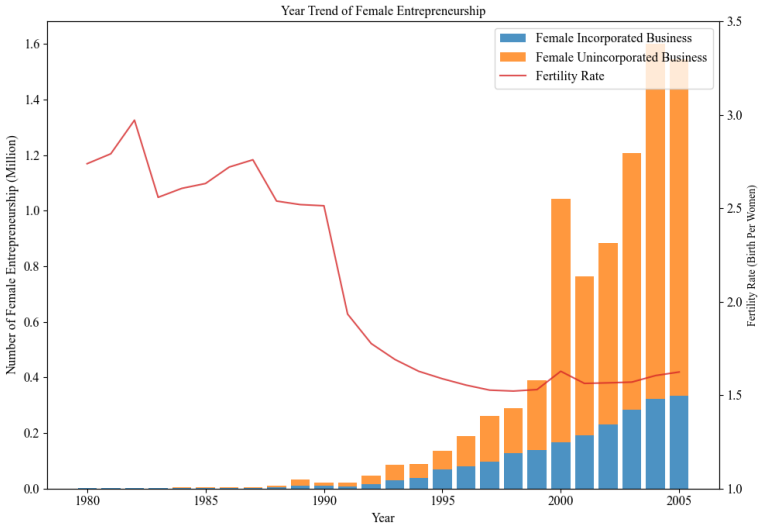


Figure 1. Year Trend of Female Entrepreneurship (1980-2005)

The figure shows the trend of female entrepreneurship from 1980 to 2005 for incorporated business (bottom bar) and unincorporated business (top bar). The histogram shows the number of newly female businesses in millions, and the line plots the fertility rate of birth per women over time in China. The number of female business is estimated by imputing gender for owner names, as explained in Section 3.1.

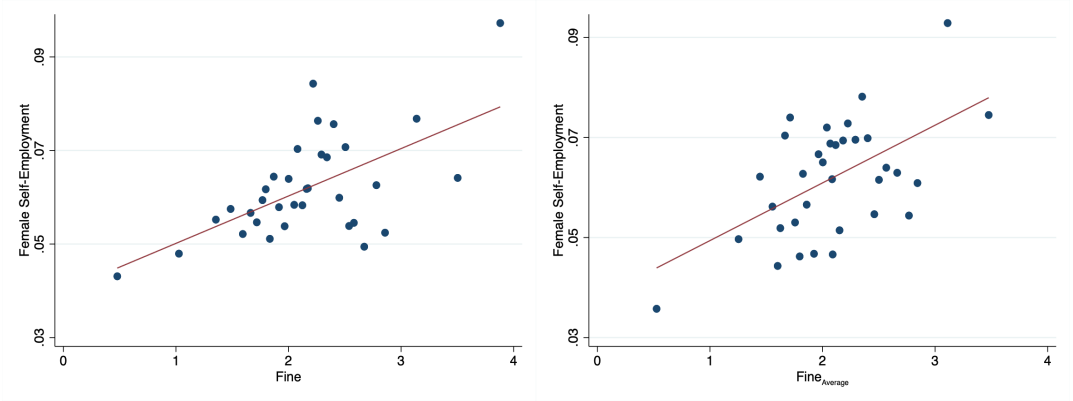


Figure 2A. Fertility Fine and Female Self-Employment (CHNS Data)

This figure shows the binscatter plot of the relationship between fine and self-employment for fertile (ages 20-40) women using individual-level CHNS data. Individual level controls include Marital status, Ln(Assets), and Years of Education, and province-year level controls include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The model also controls for year and individual fixed effects.

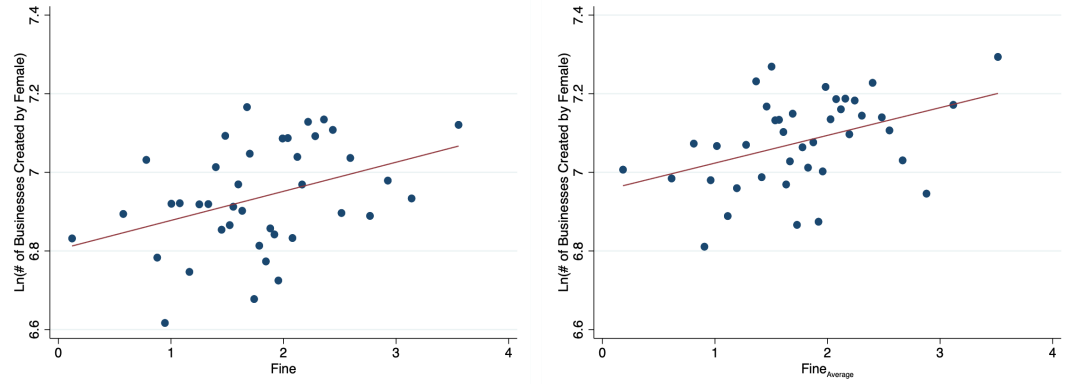


Figure 2B. Fertility Fine and Female Entrepreneurship (Business Registry Data)

This figure shows the binscatter plot of relationship between fertility fine and female entrepreneurship using business registry data aggregated to the province-year level. Province-year level controls include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The model also controls for year and province fixed effects.

Table 1. Summary Statistics

This table provides summary statistics for CHNS data (Panel A), Business Registry data aggregated to the province-year level (Panel B) and province-year level variables (Panel C).

Variables	N	Mean	S.D.	Q1	Q2	Q3
Panel A: CHNS						
Female Self-employment (ages 20-40)	10818	0.062	0.241	0	0	0
Female Self-employment (ages 20-65)	20813	0.052	0.222	0	0	0
Labor Force Participation (ages 20-40)	10818	0.872	0.334	1	1	1
Age	10818	30.916	5.682	26	31	36
Has child Dummy	10818	0.863	0.344	1	1	1
Majority Dummy	10668	0.886	0.318	1	1	1
Married Dummy	10818	0.855	0.352	1	1	1
Years of education	10818	7.467	3.848	5	9	9
Education > 9 years Dummy	10818	0.587	0.492	0	1	1
Ln(Asset)	10818	8.650	1.533	7.682	8.700	9.656
Fine	10818	2.126	1.314	1.211	1.942	2.828
Fine $_{Average}$	10818	2.041	1.239	1.211	1.456	2.828
Panel B: Business Registration Data (aggregated to Province-year)						
FNum (Num of Female-owned firms)	780	11754	24800	131	1055	10054
Ln(FNum)	780	6.936	2.674	4.874	6.961	9.216
Ln(FNum) $_{Labor\text{-}intensive}$	780	6.604	2.772	4.423	6.658	8.95
Ln(FNum) $_{Capital\text{-}intensive}$	780	4.348	2.769	2.412	4.538	6.636
Ln(FNum) $_{Skill\text{-}Intensive}$	780	4.406	2.926	2.412	4.647	6.696
Ln(FNum) $_{Individual}$	780	5.805	3.231	3.325	5.806	8.648
Ln(FNum) $_{Low\ capital}$	780	5.662	2.513	3.72	5.872	7.698
Ln(FNum) $_{High\ capital}$	780	5.227	2.424	3.465	5.411	7.245
Ln(FNum) $_{Unincorporated}$	780	5.858	3.195	3.433	5.821	8.652
Ln(FNum) $_{Incorporated}$	780	6.208	2.438	4.323	6.405	8.205
Ln(MNum) (Num of Male-owned firms)	780	7.663	2.539	5.683	7.729	9.794
%(Survived in 5yr)	780	6.554	2.488	4.652	6.597	8.576
%(Survived in 10yr)	780	6.325	2.351	4.54	6.287	8.226
%(Survived in 15yr)	780	6.115	2.276	4.406	6.035	7.902
Panel C: Province-level Variables						
Fine (ratio to annual income)	780	1.785	1.169	1.211	1.229	2.500
Fine $_{Average}$	750	1.781	1.150	1.211	1.229	2.500
Birth rate (per thousand)	780	16.13	4.960	12.370	16.090	20.040
Unemployment rate	780	2.955	1.401	2.200	3.000	3.700
Ln(GDP per capita)	780	7.838	1.189	6.823	7.893	8.766
GDP growth	780	0.147	0.066	0.098	0.136	0.187
Wage growth	780	0.125	0.065	0.087	0.122	0.154

Table 2. Financial Penalties and Birth Rate

This table provides evidence on the relation between fertility fines and birth rate. The birth rate is obtained from the Annals of Statistics (1980-2005). The *t*-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Birth Rate			
	(1)	(2)	(3)	(4)
Fine	-0.411***		-0.408***	
	(-4.02)		(-3.94)	
Fine $_{Average}$		-0.409***		-0.419***
		(-3.89)		(-3.95)
GDP growth			-6.361***	-7.064***
			(-2.91)	(-3.07)
Wage growth			-0.690	-0.112
			(-0.30)	(-0.05)
Ln(GDP per capita)			-1.857**	-1.984**
			(-2.54)	(-2.43)
Unemployment rate			-0.101	-0.059
			(-1.06)	(-0.51)
Province FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	780	750	780	750
Adjusted R^2	0.834	0.837	0.838	0.841

Table 3. Financial Penalties and Self-Employment (CHNS Data)

This table provides baseline results on the effect of fertility fines on female entrepreneurship using CHNS data. Column (1)-(4) show estimates for fertile (20-40) women and column (3) and (4) apply same regression on 41-65 aged women as a placebo test. The *t*-statistics (reported in parentheses) are based on robust standard errors, which are clustered at province by year level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Female 20-40				Female 41-65	
	(1)	(2)	(3)	(4)	(5)	(6)
Fine	0.009***		0.010***		0.001	
	(2.97)		(2.98)		(0.59)	
Fine $_{Average}$		0.011***		0.012**		0.001
		(2.74)		(2.60)		(0.46)
Married			-0.018	-0.018	-0.002	-0.002
			(-1.11)	(-1.09)	(-0.24)	(-0.24)
Ln(Asset)			0.004	0.003	0.002	0.002
			(1.31)	(1.29)	(1.17)	(1.16)
Years of education			0.005	0.005	0.001	0.001
			(1.47)	(1.50)	(0.51)	(0.51)
GDP growth			-0.147	-0.129	-0.093	-0.091
			(-1.26)	(-1.16)	(-1.33)	(-1.32)
Wage growth			0.026	0.002	-0.081	-0.083
			(0.21)	(0.01)	(-0.83)	(-0.84)
Ln(GDP per capita)			-0.003	-0.004	0.005*	0.005*
			(-0.68)	(-0.78)	(1.74)	(1.71)
Unemployment rate			-0.000	-0.001	0.081***	0.080***
			(-0.01)	(-0.01)	(2.90)	(2.83)
Individual FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	10,818	10,818	10,818	10,818	9,995	9,995
Adjusted R^2	0.320	0.320	0.320	0.319	0.344	0.344

Table 4. Heterogeneous Effects for Parents vs Childless (CHNS Data)

This table demonstrates the placebo tests for the effect of fertility fines on fertile (20-40) women. Panel A shows the effects for women with and without child using CHNS data. Column (1) and (2) use sample of fertile women having child last year, who are exposed to the fertility restriction. Column (3) and (4) restrict the sample to fertile women who were childless (in year t-1), as they are not strongly affected by fertility fine which only apply to those exceeding the one-child maximum. Panel B shows the effects separately for majority and minority women in the fertile age group using CHNS data. Column (1) and (2) look at majority women in the fertile age group, who are constrained by the OCP. Column (3) and (4) limit the sample in minority fertile women, who were not subject to OCP. Controls include Married Dummy, Ln(Asset), Years of education, GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The *t*-statistics (reported in parentheses) are based on robust standard errors, which are clustered at province by year level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Women with and without Child				
	Have Child		Childless	
	(1)	(2)	(3)	(4)
Fine	0.012***		-0.005	
	(3.02)		(-0.52)	
Fine $_{Average}$		0.013**		-0.006
		(2.60)		(-0.49)
Controls	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	9,287	9,287	1,346	1,346
Adjusted R^2	0.331	0.331	0.256	0.256
Panel B. Majority VS. Minority				
	Majority		Minority	
	(1)	(2)	(3)	(4)
Fine	0.012***		-0.008	
	(2.82)		(-1.43)	
Fine $_{Average}$		0.013**		-0.010
		(2.39)		(-1.41)
Controls	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	9,454	9,454	1,214	1,214
Adjusted R^2	0.305	0.305	0.437	0.437

Table 5. Financial Penalties and Female Entrepreneurship (Business Registry Data)

This table shows estimates of the effect of fertility fines on female entrepreneurship using business registry data aggregated to province-year level. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Ln(Number of Businesses Created by Females)			
	(1)	(2)	(3)	(4)
Fine	0.055**		0.074***	
	(2.32)		(3.08)	
$Fine_{Average}$		0.053**		0.070***
		(2.15)		(2.85)
GDP growth			0.918	0.959*
			(1.62)	(1.66)
Wage growth			0.958	0.931
			(1.62)	(1.62)
Ln(GDP per capita)			-0.066***	-0.064***
			(-3.33)	(-2.79)
Unemployment rate			0.182	0.283
			(0.98)	(1.61)
Province FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	780	750	780	750
Adjusted R^2	0.960	0.961	0.960	0.962

Table 6. Heterogeneous Effects by Location (Business Register Data)

Columns (1) to (4) investigate the heterogeneity of the effect of fertility fines on female entrepreneurship in urban and rural areas. Columns (5)-(8) investigates how the effect of fertility fines on female entrepreneurship varies with local male birth ratio (as a proxy for gender norms favoring more gender equality). We aggregate the number of businesses created by females in urban and rural areas of each province, separately in a given year, hence we have over 1,500 observations in the first four columns. Columns (5) and (6) employ dummy for below median male birth ratio in 1978 calculated from 1982 census data, while columns (7) and (8) utilize a dummy for below median male birth ratio in 2010 derived from 2010 census data. Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Ln(# of Businesses Created by Females)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fine×Urban	0.128***		0.128***					
	(4.02)		(4.04)					
$Fine_{Average}$×Urban		0.135***		0.135***				
		(4.14)		(4.15)				
Fine×Low male birth $ratio_{1978}$					0.148***			
					(3.88)			
$Fine_{Average}$×Low male birth $ratio_{1978}$						0.181***		
						(4.68)		
Fine×Low male birth $ratio_{2010}$							0.143***	
							(3.85)	
$Fine_{Average}$×Low male birth $ratio_{2010}$								0.157***
								(4.00)
Fine	0.004				-0.003		-0.009	
	(0.11)				(-0.10)		(-0.30)	
$Fine_{Average}$		-0.003				-0.023		-0.021
		(-0.09)				(-0.77)		(-0.67)
Urban	0.156*	0.133*	0.156*	0.133				
	(1.96)	(1.67)	(1.90)	(1.60)				
Controls	Y	Y	N	N	Y	Y	Y	Y
Province FE	Y	Y	N	N	Y	Y	Y	Y
Year FE	Y	Y	N	N	Y	Y	Y	Y
Province×Year FE	N	N	Y	Y	N	N	N	N
Observations	1,560	1,500	1,560	1,500	780	750	780	750
Adjusted R^2	0.925	0.926	0.929	0.929	0.961	0.963	0.961	0.963

Table 7. Heterogeneous Effects by Human Capital: More vs Less Educated Women (CHNS Data)

This table shows evidence on the effect of fertility fines on self-employment for fertile (20-40) women with high- and low-education using CHNS data. Dummy Education > 9 years is defined as whether having attained education level higher than junior high school. Controls for this table include Married, Ln(Asset), Years of education, GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors, which are clustered at province by year level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Female Self-Employment			
	(1)	(2)	(3)	(4)
Fine× Education > 9 years	0.012***		0.011**	
	(2.75)		(2.67)	
Fine $_{Average}$× Education > 9 years		0.015***		0.014***
		(3.25)		(3.10)
Fine	0.001		0.003	
	(0.41)		(0.61)	
Fine $_{Average}$		0.001		0.002
		(0.31)		(0.51)
Education > 9 years	-0.012	-0.016	-0.033*	-0.038**
	(-0.65)	(-0.87)	(-1.83)	(-2.07)
Controls	N	N	Y	Y
Individual FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	10,818	10,818	10,818	10,818
Adjusted R^2	0.320	0.320	0.321	0.321

Table 8. Heterogeneous Effects: Factor Intensities across Industries (Business Register Data)

This table investigates into the effect of fertility fines on female entrepreneurship in different industries using business registry data. In Panel A, we separate firms into labor-intensive, capital-intensive and skill-intensive industries, and apply interaction terms to check for heterogeneous effects. The base group for the model includes businesses in capital-intensive industries. Each observation in this analysis represents an industry category in a province in a given year. Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Ln(# of Businesses Created by Females)			
	(1)	(2)	(3)	(4)
Fine×Labor Intensive	0.070***		0.070***	
	(2.58)		(3.23)	
Fine×Skill Intensive	0.102***		0.102***	
	(3.54)		(3.80)	
$Fine_{Average}$×Labor Intensive		0.073***		0.073***
		(2.68)		(3.28)
$Fine_{Average}$×Skill Intensive		0.092***		0.092***
		(3.12)		(3.29)
Fine	0.004			
	(0.16)			
$Fine_{Average}$		-0.006		
		(-0.24)		
Labor Intensive Dummy	2.131***	2.148***	2.131***	2.148***
	(30.97)	(31.82)	(38.48)	(38.50)
Skill Intensive Dummy	-0.126	-0.080	-0.126*	-0.080
	(-1.62)	(-1.05)	(-1.88)	(-1.19)
Controls	Y	Y	N	N
Province FE	Y	Y	N	N
Year FE	Y	Y	N	N
Province×Year FE	N	N	Y	Y
Observations	2,340	2,250	2,340	2,250
Adjusted R^2	0.936	0.939	0.957	0.958

Table 9. Self-Employment, Earnings and Assets

Panel A shows the effect of self-employment and outside work on earnings (adjusted for inflation) using CHNS data for women in fertile age (20-40). Column (1)-(2) uses individual annual income while Column (3)-(8) use household level variables. Panel B shows the effect of fertility fine on family assets in the long term for women aged 20-40 using CHNS data. The dependent variable for each column is the Ln(Asset) n years after the penalty. Controls for this table include individual-level variables Married, Ln(Asset) (not included in Panel B), Years of education, and province-level GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors, which are clustered at province by year level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Impact of self-employment and outside employment on earnings								
	Ln(Individual Income)		Ln(HH Income)		Ln(HH Income Per Capita)		Ln(HH Expense)	
Self-Employment	0.717***	0.699***	0.286***	0.375***	0.310***	0.341***	0.443***	0.302
	(7.54)	(3.98)	(4.50)	(3.20)	(4.95)	(2.94)	(4.34)	(1.58)
Outside work	0.305***	0.222	0.173***	0.138	0.174***	0.143	0.138**	0.118
	(3.80)	(1.53)	(3.11)	(1.39)	(3.25)	(1.52)	(2.03)	(1.13)
Fine		-0.061		-0.025		-0.023		-0.005
		(-1.07)		(-0.77)		(-0.72)		(-0.09)
Fine×Self-Employment		0.020		-0.030		-0.008		0.055
		(0.34)		(-0.81)		(-0.21)		(0.71)
Fine×Outside work		0.044		0.018		0.015		0.010
		(0.86)		(0.61)		(0.56)		(0.18)
Observations	9,044	9,044	10,655	10,655	10,655	10,655	7,462	7,462
Adjusted R^2	0.336	0.336	0.410	0.410	0.430	0.430	0.377	0.377
Panel B: Impact of fines on household assets								
Ln(Asset) After	1 year		3 years		5 years		8 years	
Fine	-0.010	-0.019	0.063	0.054	0.079*	0.080*	0.115**	0.117*
	(-0.23)	(-0.42)	(1.56)	(1.28)	(1.90)	(1.85)	(2.03)	(2.01)
Fine×Self-Employment		0.068		0.057		-0.013		-0.014
		(1.12)		(1.05)		(-0.23)		(-0.22)
Self-Employment		-0.037		0.001		0.164		0.162
		(-0.19)		(0.00)		(0.88)		(0.93)
Observations	10,818	10,818	10,818	10,818	10,818	10,818	10,818	10,818
Adjusted R2	0.326	0.327	0.327	0.327	0.327	0.327	0.328	0.328
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y

Table 10. Quality of New Female-Owned Firms: Survival Rate

This analysis uses business registry data. Panel A examines the effect of fertility fines on firm survival for female-owned businesses. We define fraction survived to N years as estimated number of female owned business (per equation 2) among startup firms in the year that survive to N years divided by the estimated number of all female owned startups in the same year. Column (1)-(2), (3)-(4), and (5)-(6) examine survival to 5, 10 and 15 years respectively. Panel B examines the effect of fertility fines on the number of different types (by amount of registered capital) of female-owned businesses. Columns (1−2), (3−4) and (5−6) show the effect on individual business (not reporting capital), for firms with low registered capital (below median for the year), and those with high registered capital, respectively. Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Survival of female-owned businesses to different thresholds						
	%(Survived in 5yr)		%(Survived in 10yr)		%(Survived in 15yr)	
Fine	-0.380		0.350		0.124	
	(-0.77)		(0.66)		(0.24)	
Fine $_{Average}$		-0.518		0.223		-0.072
		(-1.01)		(0.40)		(-0.13)
Controls	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	780	750	780	750	780	750
Adjusted R^2	0.786	0.789	0.831	0.830	0.833	0.829
Panel B: Log number of female-owned businesses by amount of registered capital						
	Ln(# of Individual Business)		Ln(# of Low-Capital Business)		Ln(# of High-Capital Business)	
Fine	0.117***		0.140***		0.002	
	(3.43)		(4.41)		(0.10)	
Fine $_{Average}$		0.111***		0.136***		-0.007
		(3.19)		(4.24)		(-0.28)
Controls	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	780	750	780	750	780	750
Adjusted R^2	0.950	0.951	0.931	0.933	0.953	0.956

Table 11. The Effects of Financial Penalties on Male Entrepreneurship

This table shows the heterogeneous effect of fertility fines on male entrepreneurship using CHNS and business registry data. Specifications (including controls and fixed effects) in each panel are analogous to those used female entrepreneurship in the corresponding table indicated in the panel title. The t-statistics (reported in parentheses) are based on robust standard errors, clustered by province-year for analysis using CHNS data in Panel A. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Male self-employment using CHNS (as in Table 3, Cols 3-6)				
	Male 20-40		Male 41-65	
	(1)	(2)	(3)	(4)
Fine	0.011***		0.003	
	(3.42)		(1.31)	
Fine $_{Average}$		0.012***		0.002
		(3.19)		(0.89)
Controls	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	11,407	11,407	9,898	9,898
Adjusted R^2	0.289	0.289	0.341	0.341
Panel B: Male Entrepreneurship using Business Registry data (as in Table 5, Cols 1-4)				
	Ln(# of Businesses Created by Males)			
	(1)	(2)	(3)	(4)
Fine	0.063***		0.076***	
	(2.81)		(3.35)	
Fine $_{Average}$		0.058**		0.068***
		(2.47)		(2.92)
Controls	N	N	Y	Y
Province FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	780	750	780	750
Adjusted R^2	0.959	0.961	0.96	0.962

Appendix A: Additional Figures and Tables

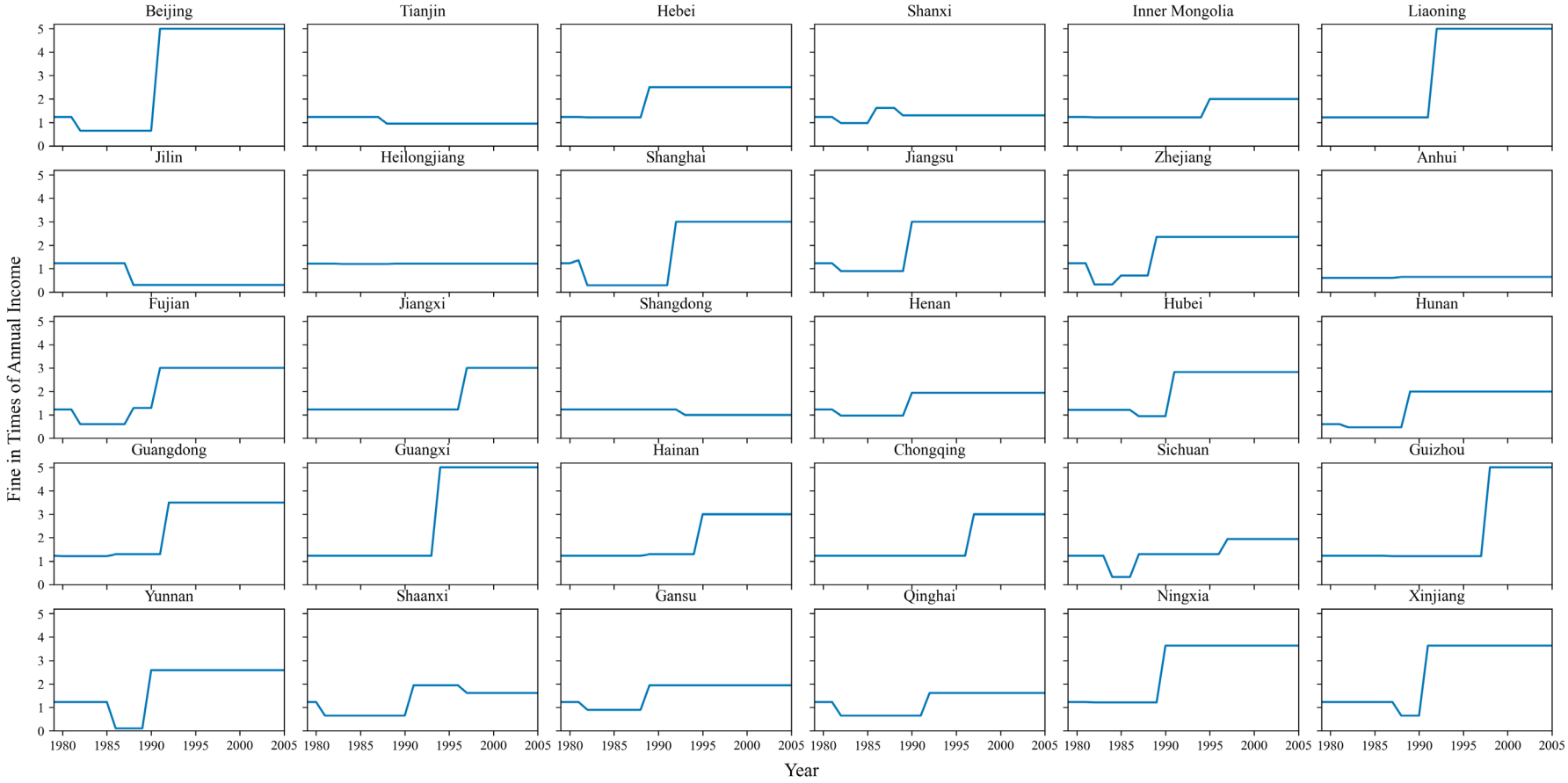


Figure A1. The OCP Fertility Fines over Year by Province

This figure shows the trend in fertility fines for each Chinese province from 1979 to 2005.

Table A1. Variable Definitions

Variable	Definition
Panel A. CHNS	
Self-Employment	Dummy for self-employment, takes 1 if one is non-farm self-employed and takes 0 otherwise
Married	Dummy for marriage status, takes 1 if one is married and takes 0 otherwise
Majority	Dummy for Chinese ethnic majority, takes 1 if one belongs to Han and takes 0 for other minorities
Ln(Asset)	Logarithm of the value of family fixed assets
Years of education	Completed years of formal education in regular school
Education > 9 years	Dummy for high education, takes 1 if one has attained education level higher or equal than primary middle school and takes 0 otherwise
Ln(Income)	Logarithm of annual individual income, inflated to 2015
Ln(HH Income)	Logarithm of annual household income, inflated to 2015
Ln(HH Income Per Capita)	Logarithm of annual household income per capita, inflated to 2015
Ln(HH Expense)	Logarithm of annual household expenditure, inflated to 2015
Panel B. Business Registration	
Ln(Num)	Logarithm of the sum of female probability for newly registered entrepreneurship excluding state-owned enterprises and foreign-owned enterprise, where female probability is induced from the last character of the legal person's name
%(Survived in nyr)	The percentage of newly established businesses that have survived for more than n years
Panel C. Provincial Variables	
Fine	One period lagged fertility fine, measured in times of annual income
$\text{Fine}_{\text{Average}}$	The average of one period lagged and two period lagged fertility fine, measured in times of annual income
GDP growth	Growth of GDP
Wage growth	Growth of wages
Ln(GDP per capita)	Logarithm of GDP per capita
Unemployment rate	Unemployment rate, measured in percentiles
Birth rate	Birth rate, measured in thousandth

Table A2. (Lack of) Correlation of Financial Penalties with Lagged Economic Aggregates

This table shows the relation between fertility fine and other province-level indices. For each variable, we regress fine on the 1-,2-,3-year lagged terms and control for province and year fixed effects. The p value (reported in parentheses) is based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1) Previous 1 Year	(2) Previous 2 Years	(3) Previous 3 Years
GDP growth	-0.236	0.003	0.771
	(0.683)	(0.996)	(0.138)
GDP per capita growth	-0.433	-0.069	0.693
	(0.447)	(0.901)	(0.178)
Population growth	6.003	3.147	1.818
	(0.217)	(0.515)	(0.703)
Wage growth	-0.186	-0.031	0.168
	(0.759)	(0.960)	(0.790)
Employment	-0.070	-0.508	-0.783
	(0.883)	(0.290)	(0.108)
Doctors	-0.092	-0.028	0.056
	(0.602)	(0.882)	(0.775)
Teachers in primary school	0.350	0.360	0.345
	(0.243)	(0.240)	(0.264)
Teachers in secondary school	-0.158	-0.109	-0.071
	(0.313)	(0.584)	(0.727)
Teachers in high school	0.038	0.128	0.266
	(0.880)	(0.620)	(0.311)

Table A3. Last Characters in Chinese Names with Highest and Lowest Female Probability

This table shows the ranking of last characters in Chinese names with highest and lowest female probabilities. Female probability is calculated based on 2005 census data and filled with ngender data if the character is missing in the census.

	Highest Female Probability		Lowest Female Probability	
Rank	Character	Female Probability	Character	Female Probability
1	娟	0.9972	彪	0.0069
2	媛	0.9963	阶	0.0091
3	娥	0.9959	库	0.0100
4	娇	0.9952	刚	0.0111
5	姐	0.9943	标	0.0124
6	婵	0.9943	岡	0.0133
7	菊	0.9918	广	0.0140
8	妃	0.9906	法	0.0158
9	花	0.9902	财	0.0179
10	翠	0.9898	山	0.0196
11	霞	0.9891	峯	0.0198
12	莉	0.9881	府	0.0200
13	娣	0.9879	勳	0.0202
14	琴	0.9876	钢	0.0204
15	蓉	0.9876	偉	0.0207
16	兰	0.9865	豪	0.0215
17	姑	0.9863	策	0.0217
18	刁	0.9855	振	0.0220
19	梅	0.9855	苟	0.0231
20	丽	0.9836	通	0.0232

Table A4. Definition of Labor-, Capital- and Skill-Intensive Industries

This table shows the definition for labor-, capital- and skill-intensive industries for Panel A of table 10. The definition follows Zhang and Sun (2014).

Category	Industries from Industrial Classification for National Economic Activities
Labor-Intensive	Agriculture, forestry, animal husbandry and fishery, Construction, Wholesale and retail trade, Accommodation and catering, Labor-Intensive manufacturing (Food processing manufacturing, Beverage manufacturing, Tobacco products, Textile, Garment, shoes and hat manufacturing, Leather, fur and feather, Wood processing, Bamboo, rattan, brown and grass products, Furniture manufacturing, Paper products, Printing, Cultural, educational and sporting goods manufacturing, Rubber products manufacturing, Plastic products manufacturing, Non-Metallic mineral products manufacturing, Waste resources and waste materials recycling, crafts and other manufacturing)
Capital-Intensive	Mining, Electricity, heat, gas and water production and supply, Transportation, Storage and postal services, Real estate, Capital-Intensive manufacturing (Petroleum processing, Coking and nuclear fuel processing, Chemical raw materials and chemical products manufacturing, Chemical fiber manufacturing, Ferrous metal smelting and rolling processing, Non-Ferrous metal smelting and rolling processing, Metal products, General equipment manufacturing, Special equipment manufacturing, Transportation equipment manufacturing, Electrical machinery manufacturing)
Skill-Intensive	Modern service industries (Information transmission, software and information technology services, Finance, leasing and business services, Scientific research and technology services, Education, health and social work, Culture, sports and entertainment, Water, environmental and public facilities management, Public administration, Social organizations, International organizations and other services), Technology-intensive manufacturing (Pharmaceuticals manufacturing, Communication equipment, computer and other electronic equipment manufacturing, Instrumentation and machinery manufacturing for cultural and office use)

Appendix B: Additional CHNS Results

Table B1. Additional Summary Statistics

This table provides additional summary statistics for CHNS data (Panel A) and Business Registry data (Panel B).

Variables	N	Mean	S.D.	Q1	Q2	Q3
Panel A: CHNS						
# of Children	10720	1.621	1.083	1	2	2
Ln(Income)	9403	8.204	0.993	7.709	8.277	8.839
Ln(HH Income)	10690	9.469	0.865	8.996	9.523	10.024
Ln(HH Income Per Capita)	10690	8.040	0.867	7.533	8.120	8.606
Ln(HH Expense)	7770	7.847	1.261	7.244	7.940	8.559
Weekly Childcare Hours	3203	19.248	27.774	1	7	24
Weekly Housework Hours	9515	11.977	12.752	2.333	5.500	21
Panel B: Business Registration Data						
Capital Intensity	38419	12.652	0.680	12.165	12.535	13.021
Individual Business						
%(Survived in 5yr)	780	72.723	22.313	55.764	76.63	93.004
%(Survived in 10yr)	780	62.822	26.443	40.582	63.917	86.705
%(Survived in 15yr)	780	52.998	28.307	28.284	49.719	78.144
Low-Capital Business						
%(Survived in 5yr)	780	66.541	24.456	47.649	65.535	89.916
%(Survived in 10yr)	780	52.474	30.149	25.911	43.956	82.297
%(Survived in 15yr)	780	43.534	30.562	17.264	31.890	70.910
High-Capital Business						
%(Survived in 5yr)	780	82.097	16.377	70.708	85.087	97.352
%(Survived in 10yr)	780	72.327	20.677	55.693	69.688	94.204
%(Survived in 15yr)	780	64.33	22.871	46.399	58.607	87.432
Unincorporated Business						
%(Survived in 5yr)	780	72.918	22.176	56.094	76.529	93.149
%(Survived in 10yr)	780	62.917	26.309	40.705	63.171	87.566
%(Survived in 15yr)	780	53.481	28.313	29.315	49.308	79.714
Incorporated Business						
%(Survived in 5yr)	780	72.211	21.606	56.085	72.510	92.749
%(Survived in 10yr)	780	59.745	26.864	36.665	52.668	86.411
%(Survived in 15yr)	780	51.401	27.942	28.307	41.874	77.028

Table B2. Children and Childcare/Housework Time for Females

This table shows evidence on the relationship of the number of children and childcare and housework time for women in the age between 20 and 40 using CHNS data. Column (1) and (2) show the relationship between children and childcare time. Column (3) and (4) show the result for housework time. Controls for this table include Married, Ln(Asset), Years of education, GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors, which are clustered at province by year level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Weekly Childcare Hours		Weekly Housework Hours	
	(1)	(2)	(3)	(4)
# of Children	5.543***	5.422***	0.524	0.508
	(3.36)	(3.27)	(1.42)	(1.38)
Controls	N	Y	N	Y
Individual FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	2,304	2,304	9,059	9,059
Adjusted R^2	0.353	0.351	0.538	0.539

Table B3. Financial Penalties and Female Labor Force Participation

This table shows the effect of fertility fine on female labor participation using CHNS data. Outside work dummy is defined equal to 1 if the respondent has a paid job (not self-employed). Labor force participation dummy is defined as 1 if respondent either has a paid job or is self-employed. Columns (1)-(2) and (5)-(6) show the result for fertile age (20-40) women. Column (3)-(4) and (7)-(8) show the result for women with the age greater than 40 as a placebo test. Controls for this table include Married, Ln(Asset), Years of education, GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors, which are clustered at province by year level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Outside Work				Total Labor Participation			
	Female 20-40		Female 41-65		Female 20-40		Female 41-65	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fine	0.016**		0.016		0.026***		0.016	
	(2.39)		(1.52)		(3.91)		(1.65)	
$Fine_{Average}$		0.020**		0.016		0.032***		0.017
		(2.20)		(1.30)		(3.53)		(1.43)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	10,818	10,818	9,995	9,995	10,818	10,818	9,995	9,995
Adjusted R^2	0.367	0.367	0.491	0.491	0.270	0.270	0.472	0.472

Appendix C. Additional Business Registry Results

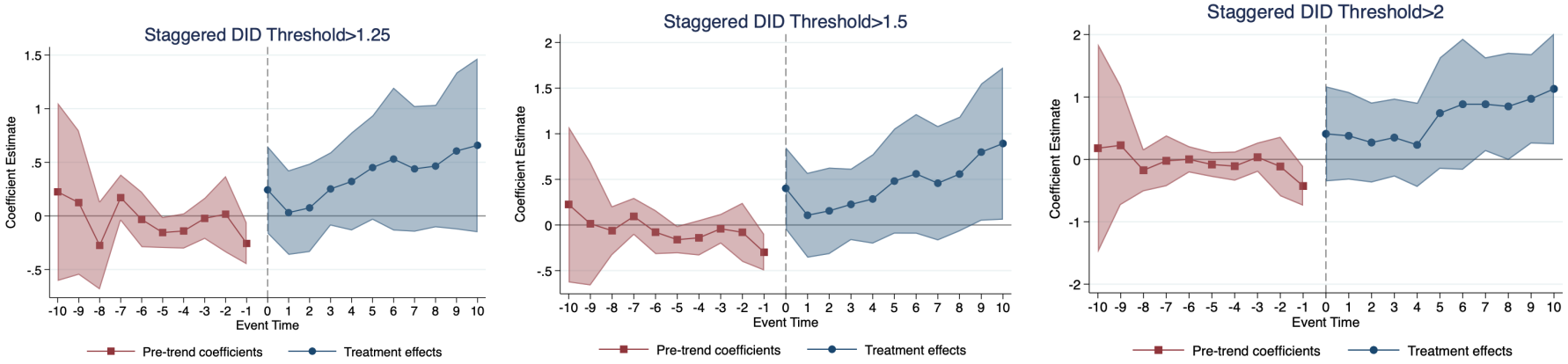


Figure C1. Staggered DID Results Using Alternative Thresholds

The figure shows event study graphs with dependent variable log (number of female businesses) for staggered DID results using the CSDID approach (Rios-Avila, Sant'Anna and Callaway, 2023). The treatment dummy is defined as 1 based on different thresholds for the increase in fertility fine as a proportion of annual income. Specifically, the threshold increase of the fine as a proportion of annual income is 1.25, 1.5 and 2 for each of the three figures from left to right, respectively. The shaded regions indicate the 90% confidence interval.

Table C1. Robustness Checks of Baseline Results

This table shows robustness check for baseline results using business registry data. Column (1) and (2) limit sample in periods when fertility fines were stated officially as times of annual income, excluding converted fines stated as amount of monetary value. Column (3) and (4) use female probability calculated solely from 2005 census data. Column (5) and (6) employ female probability calculated solely from ngender data, an open-source github project. Column (7) and (8) use the percentage of female business over population as dependent variable. Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Consistent Sample		Data from Census2005		Alternative measurement for Number of Female-owned Business		Per Capita Number of Female businesses (Number of female Business/Population)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fine	0.131***		0.075***		0.075***		0.006***	
	(4.24)		(3.10)		(3.13)		(3.51)	
$Fine_{Average}$		0.122***		0.072***		0.071***		0.007***
		(3.87)		(2.88)		(2.88)		(3.72)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	709	679	780	750	780	750	780	750
Adjusted R^2	0.957	0.959	0.960	0.961	0.960	0.962	0.733	0.738

Table C2. Robustness Checks with Staggered DID

This table applies a staggered DID setting with CSDID for baseline results using business registry data. The treated is defined as 1 with an increase of financial penalties more than certain threshold. Column (1) and (2) define the treat group with an increase of 1.25 times of annual income. Column (3) and (4) set the increase threshold to 1.5 times of annual income. Column (5) and (6) consider an increase of more than 2 times annual income as treat group. For estimating method, we consider both doubly robust DID estimator based on stabilized inverse probability weighting (dripw) and inverse probability weighting DID estimator with stabilized weights (stdipw). Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Ln(# of Businesses Created by Females)					
Threshold	Increase > 1.25		Increase > 1.5		Increase > 2	
	(1)	(2)	(3)	(4)	(5)	(6)
ATT	0.503*	0.458*	0.660**	0.695**	0.755*	0.660*
	(1.89)	(1.94)	(2.17)	(2.48)	(1.91)	(1.91)
Method	dripw	stdipw	dripw	stdipw	dripw	stdipw
Controls	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	744	744	750	750	772	772

Table C3. Heterogeneous Effects by Capital Intensities across Industries

This table investigates how industry capital intensity affects the effect of fertility fines on female entrepreneurship using Business Registry data. Industry capital intensity is calculated as the average capital-to-labor ratio for listed firms in 2005 for each industry. Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Ln(# of Businesses Created by Females)			
	(1)	(2)	(3)	(4)
Fine×Capital intensity	-0.073***		-0.070***	
	(-7.06)		(-6.90)	
$Fine_{Average}$×Capital intensity		-0.074***		-0.071***
		(-6.91)		(-6.71)
Fine	0.923***			
	(7.12)			
$Fine_{Average}$		0.933***		
		(6.95)		
Capital Intensity	-0.347***	-0.354***	-0.357***	-0.365***
	(-14.97)	(-14.95)	(-15.60)	(-15.61)
Controls	Y	Y	N	N
Province FE	Y	Y	N	N
Year FE	Y	Y	N	N
Province×Year FE	N	N	Y	Y
Observations	38,419	37,684	38,419	37,684
Adjusted R^2	0.484	0.479	0.493	0.487

Table C4. Business Quality Measured by (Un)incorporated

This table shows evidence on the effect of fertility fines on number of unincorporated (in Cols 1 and 2) and incorporated (in Cols 3 and 4) female-owned businesses using business registry data. Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Ln(# of Unincorporated)		Ln(# of Incorporated)	
	(1)	(2)	(3)	(4)
Fine	0.112***		0.080***	
	(3.44)		(3.13)	
$Fine_{Average}$		0.107***		0.072***
		(3.20)		(2.75)
Controls	Y	Y	Y	Y
Province FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	780	750	780	750
Adjusted R^2	0.952	0.954	0.951	0.953

Table C5. Survival Rate for Individual, Low- and High-Capital Businesses

This table shows evidence on the effect of fertility fines on firm survival for individual, low- and high-capital business using business registry data. Column (1) and (2) show how fine affects the percentage of newly started firms surviving for more than five years. Column (3) and (4) check for the percentage of new firms surviving for more than 10 years. Column (5) and (6) look at the percentage for more than 15 years. Low and high capital groups are separated by the median of registered capital for all firms each year. Panel A shows the results for female-owned individual business. Panel B shows the results for low-capital business while Panel C shows the results for high-capital business. Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	%(Survived for 5yrs)		%(Survived for 10yrs)		%(Survived for 15yrs)	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Survival Ratio for Female-Owned Individual Business						
Fine	0.556		1.747**		1.573**	
	(0.83)		(2.32)		(1.99)	
$Fine_{Average}$		0.598		1.842**		1.615*
		(0.86)		(2.32)		(1.94)
Observations	780	750	780	750	780	750
Adjusted R^2	0.671	0.693	0.720	0.732	0.734	0.744
Panel B. Survival Ratio for Female-Owned Low-Capital Business						
Fine	0.377		1.015*		1.170*	
	(0.70)		(1.75)		(1.96)	
$Fine_{Average}$		0.398		1.082*		1.187*
		(0.70)		(1.78)		(1.95)
Observations	780	750	780	750	780	750
Adjusted R^2	0.766	0.767	0.809	0.807	0.786	0.784
Panel C. Survival Ratio for Female-Owned High-Capital Business						
Fine	-0.947**		-0.149		0.041	
	(-2.51)		(-0.34)		(0.08)	
$Fine_{Average}$		-1.020***		-0.131		-0.035
		(-2.58)		(-0.28)		(-0.06)
Observations	780	750	780	750	780	750
Adjusted R^2	0.778	0.773	0.812	0.804	0.775	0.761
Controls	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y

Appendix D. CHNS Results for Males

Table D1. Summary Statistics for Males

This table provides summary statistics for CHNS data (Panel A), Business Registry data (Panel B) and provincial variables (Panel C).

Variables	N	Mean	S.D.	Q1	Q2	Q3
Panel A: CHNS						
Self-employment (20-40)	11407	0.095	0.293	0	0	0
Self-employment (20-65)	21305	0.082	0.274	0	0	0
Labor Participation (20-40)	11407	0.923	0.267	1	1	1
Age	11407	30.259	5.839	25	30	35
Has child	11407	0.727	0.445	0	1	1
Majority	11254	0.875	0.331	1	1	1
Married	11407	0.745	0.436	0	1	1
Years of Education	11407	8.758	3.104	7	9	11
Education > 9 years	11407	0.743	0.437	0	1	1
Ln(Asset)	11407	8.628	1.560	7.626	8.681	9.654
Fine	11407	2.150	1.337	1.211	1.942	2.828
Fine $_{\text{Average}}$	11407	2.070	1.270	1.211	1.456	2.828
Panel B: Business Registration Data						
Num	780	19,826.23	40,627.90	293.816	2,273.54	17,929.00
Ln(Num)	780	7.663	2.539	5.683	7.729	9.794
Ln(Num) $_{\text{Labor-intensive}}$	780	7.267	2.635	5.187	7.353	9.453
Ln(Num) $_{\text{Capital-intensive}}$	780	5.480	2.682	3.606	5.660	7.663
Ln(Num) $_{\text{Skill-Intensive}}$	780	5.180	2.863	3.319	5.427	7.386
Ln(Num) $_{\text{Individual}}$	780	6.324	3.111	4.016	6.232	9.055
Ln(Num) $_{\text{Low capital}}$	780	6.459	2.431	4.436	6.701	8.474
Ln(Num) $_{\text{High capital}}$	780	6.259	2.306	4.581	6.482	8.162
Ln(Num) $_{\text{Uincorporated}}$	780	6.386	3.084	4.105	6.291	9.078
Ln(Num) $_{\text{Incorporated}}$	780	7.099	2.335	5.279	7.297	9.021
%(Survived in 5yr)	780	6.554	2.488	4.652	6.597	8.576
%(Survived in 10yr)	780	6.325	2.351	4.54	6.287	8.226
%(Survived in 15yr)	780	6.115	2.276	4.406	6.035	7.902

Table D2. Additional Summary Statistics for Males

This table provides additional summary statistics for CHNS data (Panel A) and Business Registry data (Panel B).

Variables	N	Mean	S.D.	Q1	Q2	Q3
Panel A: CHNS						
# of Children	11088	1.354	1.111	0	1	2
Ln(Income)	10169	8.389	1.055	7.827	8.462	9.107
Ln(HH Income)	11272	9.477	0.877	8.990	9.530	10.049
Ln(HH Income Per Capita)	11272	8.047	0.874	7.529	8.123	8.617
Ln(HH Expense)	8345	7.852	1.260	7.256	7.943	8.561
Weekly Childcare Hours	1542	11.030	19.393	1	4	14
Weekly Housework Hours	4652	4.904	8.343	0.583	1.750	5.500
Panel B: Business Registration Data						
Individual Business						
%(Survived in 5yr)	780	73.489	21.963	55.814	76.862	94.21
%(Survived in 10yr)	780	63.100	26.461	40.036	61.874	89.34
%(Survived in 15yr)	780	53.422	28.772	27.861	48.076	83.235
Low-Capital Business						
%(Survived in 5yr)	780	66.544	24.096	47.843	65.311	89.668
%(Survived in 10yr)	780	52.109	29.929	25.607	41.83	83.217
%(Survived in 15yr)	780	43.356	30.537	17.153	31.097	71.780
High-Capital Business						
%(Survived in 5yr)	780	81.879	16.353	70.735	85.035	96.769
%(Survived in 10yr)	780	71.614	20.986	54.918	69.110	94.046
%(Survived in 15yr)	780	63.836	22.942	45.868	58.283	85.996
Unincorporated Business						
%(Survived in 5yr)	780	73.637	21.817	56.148	76.396	93.941
%(Survived in 10yr)	780	63.023	26.294	39.96	61.444	88.538
%(Survived in 15yr)	780	53.406	28.553	28.899	47.745	82.452
Incorporated Business						
%(Survived in 5yr)	780	72.722	21.145	56.517	73.466	92.968
%(Survived in 10yr)	780	59.99	26.507	37.142	52.504	87.749
%(Survived in 15yr)	780	51.819	27.693	28.643	42.49	77.925

Table D3. Financial Penalties and Male Self-Employment

This table provides baseline results on the effect of fertility fines on male self-employment using CHNS data. Column (1)-(4) show estimates for men aged 20-40 and column (3) and (4) apply same regression on 41-65 aged men as a placebo test. Controls for this table include Married, Ln(Asset), Years of education, GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The *t*-statistics (reported in parentheses) are based on robust standard errors, which are clustered at province by year level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Male 20-40				Male 41-65	
	(1)	(2)	(3)	(4)	(5)	(6)
Fine	0.012***		0.011***		0.003	
	(3.36)		(3.42)		(1.31)	
Fine $_{Average}$		0.015***		0.012***		0.002
		(3.67)		(3.19)		(0.89)
Controls	N	N	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	11,407	11,407	11,407	11,407	9,898	9,898
Adjusted R^2	0.286	0.286	0.289	0.289	0.341	0.341

Table D4. Placebo Tests for Males

This table demonstrates the placebo tests for the effect of fertility fines on men aged 20-40. Panel A shows the effects for men with and without child using CHNS data. Column (1) and (2) use sample of 20-40 aged men having child last year, who are exposed to the fertility restriction. Column (3) and (4) restrict sample in men aged 20-40 not having child last year, who are not majorly affected by the existence of fertility fine. Panel B shows the effects for majority and minority men aged 20-40 using CHNS data. Column (1) and (2) look at the majority, who are constrained by the OCP. Column (3) and (4) limit the sample in the minorities, who are not subject to OCP. Controls for this table include Married, Ln(Asset), Years of education, GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The *t*-statistics (reported in parentheses) are based on robust standard errors, which are clustered at province by year level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Men with and without Child

	Have Child		No Child	
	(1)	(2)	(3)	(4)
Fine	0.016***		0.004	
	(3.38)		(0.63)	
$Fine_{Average}$		0.020***		0.003
		(3.23)		(0.44)
Controls	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	7,954	7,954	2,623	2,623
Adjusted R^2	0.328	0.328	0.228	0.228

Panel B. Majority VS. Minority

	Majority		Minority	
	(1)	(2)	(3)	(4)
Fine	0.011***		0.003	
	(3.17)		(0.31)	
$Fine_{Average}$		0.014***		0.001
		(3.18)		(0.10)
Controls	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	9,844	9,844	1,410	1,410
Adjusted R^2	0.297	0.297	0.227	0.227

Table D5. Heterogeneous Effects: More vs Less Educated Men (CHNS Data)This table shows evidence on the effect of fertility fines on self-employment for men aged 20-40 with high- and low-education using CHNS data. Dummy Education > 9 years is defined as whether having attained education level higher than junior high school. Controls for this table include Married, Ln(Asset), Years of education, GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors, which are clustered at province by year level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Male Self-Employment			
	(1)	(2)	(3)	(4)
Fine×Education > 9 years	-0.003		-0.005	
	(-0.83)		(-1.22)	
$Fine_{Average}$×Education > 9 years		-0.003		-0.004
		(-0.58)		(-0.96)
Fine	0.014***		0.014***	
	(3.08)		(3.00)	
$Fine_{Average}$		0.016***		0.015***
		(3.04)		(2.82)
Education > 9 years	0.042*	0.040	0.049**	0.047**
	(1.70)	(1.62)	(2.29)	(2.22)
Controls	N	N	Y	Y
Individual FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	11,407	11,407	11,407	11,407
Adjusted R^2	0.286	0.286	0.289	0.289

Table D6. Financial Penalties and Male Labor Force Participation

This table shows the effect of fertility fine on male labor participation using CHNS data. Outside work dummy is defined equal to 1 if the respondent has a paid job (not self-employed). Labor force participation dummy is defined as 1 if respondent either has a paid job or is self-employed. Column (1) and (2) show the result for men aged 20-40. Column (3) and (4) show the result for men with the age greater than 40 as a placebo test. Controls for this table include Married, Ln(Asset), Years of education, GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors, which are clustered at province by year level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Outside Work				Total Labor Participation			
	Male 20-40		Male 41-65		Male 20-40		Male 41-65	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fine	0.002		0.015*		0.012**		0.018**	
	(0.29)		(2.00)		(2.25)		(2.40)	
$Fine_{Average}$		0.004		0.019**		0.016**		0.021**
		(0.56)		(2.11)		(2.37)		(2.34)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	11,407	11,407	9,898	9,898	11,407	11,407	9,898	9,898
Adjusted R^2	0.304	0.304	0.422	0.422	0.196	0.196	0.417	0.417

Table D7. Self-Employment, Earnings and Assets for Males

Panel A shows the effect of working with jobs and self-employment on earnings using CHNS data for men aged 20-40. Self-Employment and Jobs are dummies indicating the status of work. Column (1) uses individual annual income while Column (2)-(4) use household level variables. All dependent variables have been adjusted for inflation. Panel B shows the effect of fertility fine on family assets in the long term for men aged 20-40 using CHNS data. The dependent variable for each column indicates the Ln(Asset) n years after the penalty. Controls for this table include individual-level variables Married, Ln(Asset) (not for Panel B), Years of education, and province-level GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors, which are clustered at province by year level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Panel A: Impact of self-employment and outside employment on earnings				
	Ln(Individual Income)	Ln(HH Income)	Ln(HH Income Per Capita)	Ln(HH Expense)
Self-Employment	0.421***	0.377***	0.388***	0.340***
	(4.20)	(7.38)	(7.59)	(3.46)
Jobs	0.022	0.206***	0.209***	0.047
	(0.20)	(4.35)	(4.39)	(0.76)
Controls	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	9,825	11,236	11,236	8,043
Adjusted R^2	0.351	0.418	0.433	0.384
Panel B: Impact of fines on household assets				
Ln(Asset) After	1 year	3 years	5 years	7 years
Fine	-0.008	0.068*	0.113***	0.107**
	(-0.19)	(1.78)	(2.85)	(2.18)
Controls	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	11,407	11,407	11,407	11,407
Adjusted R2	0.324	0.325	0.326	0.326

Table D8. Children and Childcare/Housework Time for Males

This table shows evidence on the relationship of the number of children and childcare and housework time for men aged 20-40 using CHNS data. Column (1) and (2) show the relationship between children and childcare time. Column (3) and (4) show the result for housework time. Controls for this table include Married Dummy, Ln(Asset), Years of education, GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors, which are clustered at province by year level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Weekly Childcare Hours		Weekly Housework Hours	
	(1)	(2)	(3)	(4)
# of Children	-1.106	-1.899	0.297	0.003
	(-0.75)	(-1.39)	(1.21)	(0.01)
Controls	N	Y	N	Y
Individual FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	619	619	3,373	3,373
Adjusted R^2	0.263	0.263	0.331	0.332

Appendix E. Business Registry Results for Males

Table E1. Financial Penalties and Male Entrepreneurship

This table shows estimates for baseline result of the effect of fertility fines on male entrepreneurship using business registry data. Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Ln(# of Businesses Created by Males)			
	(1)	(2)	(3)	(4)
Fine	0.063***		0.076***	
	(2.81)		(3.35)	
$Fine_{Average}$		0.058**		0.068***
		(2.47)		(2.92)
Controls	N	N	Y	Y
Province FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	780	750	780	750
Adjusted R^2	0.959	0.961	0.960	0.962

Table E2. Heterogeneous Effects across Urban and Rural Areas

Columns (1) to (4) investigate the heterogeneity of the effect of fertility fines on male entrepreneurship in urban and rural areas. Columns (5)-(8) investigates how the effect of fertility fines on female entrepreneurship varies with local male birth ratio (as a proxy for gender norms favoring more gender equality). We aggregate the number of businesses created by females in urban and rural areas of each province, separately in a given year, hence we have over 1,500 observations in the first four columns. Columns (5) and (6) employ dummy for below median male birth ratio in 1978 calculated from 1982 census data, while columns (7) and (8) utilize a dummy for below median male birth ratio in 2010 derived from 2010 census data. Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Ln(# of Businesses Created by Males)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fine×Urban	0.135***		0.135***					
	(4.54)		(4.42)					
$Fine_{Average}$×Urban		0.142***		0.142***				
		(4.64)		(4.52)				
Fine×Low male birth ratio $_{1978}$					0.136***			
					(3.71)			
$Fine_{Average}$×Low male birth ratio $_{1978}$						0.166***		
						(4.52)		
Fine×Low male birth ratio $_{2010}$							0.137***	
							(3.89)	
$Fine_{Average}$×Low male birth ratio$_{2010}$								0.158***
								(4.28)
Fine	0.003				0.006		-0.003	
	(0.08)				(0.20)		(-0.11)	
Fine $_{Average}$		-0.001				-0.017		-0.024
		(-0.03)				(-0.61)		(-0.81)
Urban	0.010	-0.006	0.010	-0.006				
	(0.14)	(-0.08)	(0.13)	(-0.08)				
Controls	Y	Y	N	N	Y	Y	Y	Y
Province FE	Y	Y	N	N	Y	Y	Y	Y
Year FE	Y	Y	N	N	Y	Y	Y	Y
Province×Year FE	N	N	Y	Y	780	750	780	750
Observations	1,560	1,500	1,560	1,500	0.961	0.963	0.961	0.963
Adjusted R^2	0.928	0.929	0.933	0.932	Y	Y	Y	Y

Table E3. Heterogeneous Effects across Industries

This table investigates into the effect of fertility fines on male entrepreneurship in different industries using business registry data. In Panel A, we separate firms into labor-intensive, capital-intensive and technology-intensive industries, and apply an interaction term to see the heterogeneous effect. The base group for the model includes businesses in capital-intensive industries. In Panel B, we investigate into how industry capital intensity affects the effect of fertility fines on male entrepreneurship using Business Registry data. Industry capital intensity is calculated as the average capital-to-labor ratio for listed firms in 2005 for each industry. Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Ln(# of Businesses Created by Males)			
	(1)	(2)	(3)	(4)
Panel A. Labor-, Capital- and Skill-Intensive Industries				
Fine×Labor Intensive	0.068***		0.068***	
	(2.59)		(3.31)	
Fine×Skill Intensive	0.116***		0.116***	
	(4.02)		(4.34)	
$Fine_{Average}$×Labor Intensive		0.070***		0.070***
		(2.68)		(3.32)
$Fine_{Average}$×Skill Intensive		0.100***		0.100***
		(3.45)		(3.63)
Fine	0.020			
	(0.78)			
$Fine_{Average}$		0.005		
		(0.19)		
Labor Intensive Dummy	1.665***	1.683***	1.665***	1.683***
	(25.08)	(26.05)	(31.01)	(31.67)
Skill Intensive Dummy	-0.507***	-0.439***	-0.507***	-0.439***
	(-6.54)	(-5.84)	(-7.80)	(-6.78)
Controls	Y	Y	N	N
Province FE	Y	Y	N	N
Year FE	Y	Y	N	N
Province×Year FE	N	N	Y	Y
Observations	2,340	2,250	2,340	2,250
Adjusted R^2	0.929	0.934	0.954	0.956
Panel B. Industries with Different Capital Intensities				
Fine×Capital intensity	-0.081***		-0.079***	

	(-9.24)		(-9.07)	
$Fine_{Average}$×Capital intensity		-0.082***		-0.080***
		(-9.01)		(-8.83)
Fine	1.038***			
	(9.41)			
$Fine_{Average}$		1.048***		
		(9.14)		
Capital Intensity	-0.302***	-0.308***	-0.312***	-0.318***
	(-15.77)	(-15.66)	(-16.58)	(-16.47)
Controls	Y	Y	N	N
Province FE	Y	Y	N	N
Year FE	Y	Y	N	N
Province×Year FE	N	N	Y	Y
Observations	38,417	37,683	38,417	37,683
Adjusted R^2	0.509	0.503	0.519	0.513

Table E4. Quality of New Male-Owned Firms: Survival Rate and Registered Capital

This analysis uses business registry data. Panel A examines the effect of fertility fines on firm survival for male-owned businesses. We define fraction survived to N years as estimated number of male owned business (calculated as total – female number per equation 2) among startup firms in the year that survive to N years divided by the estimated number of all male owned startups in the year. Column (1)-(2), (3)-(4), and (5)-(6) examine survival to 5, 10 and 15 years respectively. Panel B examines the effect of fertility fines on the number of different types (by amount of registered capital) of male-owned businesses. Column (1)-(2), (3)-(4) and (5)-(6) show the effect on individual business (not reporting capital), for firms with low registered capital (below median for the year), and those with high registered capital respectively. Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Survival to different thresholds						
	%(Survived in 5yr)		%(Survived in 10yr)		%(Survived in 15yr)	
Fine	-0.979**		-0.256		-0.261	
	(-2.08)		(-0.48)		(-0.50)	
Fine $_{Average}$		-1.190**		-0.310		-0.437
		(-2.45)		(-0.56)		(-0.81)
Controls	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	780	750	780	750	780	750
Adjusted R^2	0.801	0.809	0.841	0.840	0.841	0.836
Panel B: Amount of registered capital						
	Ln(# of Individual Business)		Ln(# of Low-Capital Business)		Ln(# of High-Capital Business)	
Fine	0.139***		0.143***		0.010	
	(4.39)		(4.76)		(0.43)	
Fine $_{Average}$		0.139***		0.138***		-0.006
		(4.24)		(4.51)		(-0.26)
Controls	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	780	750	780	750	780	750
Adjusted R^2	0.951	0.953	0.935	0.937	0.950	0.954

Table E5. Business Quality Measured by (Un)incorporated

This table shows evidence on the effect of fertility fines on unincorporated and incorporated male business using business registry data. Column (1) and (2) show the effect of fine on unincorporated male business. Column (3) and (4) look at incorporated male business. Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Ln(# of Male Unincorporated)		Ln(# of Male Incorporated)	
	(1)	(2)	(3)	(4)
Fine	0.133***		0.080***	
	(4.29)		(3.28)	
$Fine_{Average}$		0.133***		0.067***
		(4.14)		(2.72)
Controls	Y	Y	Y	Y
Province FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	780	750	780	750
Adjusted R^2	0.953	0.955	0.952	0.955

Table E6. Survival Rate for Individual, Low- and High-Capital Male Business

This table shows evidence on the effect of fertility fines on male firm survival for individual, low- and high-capital business using business registry data. Column (1) and (2) show how fine affects the percentage of newly started firms surviving for more than five years. Column (3) and (4) check for the percentage of new firms surviving for more than 10 years. Column (5) and (6) look at the percentage for more than 15 years. Low and high capital groups are separated by the median of registered capital for all firms each year. Panel A shows the results for female-owned individual business. Panel B shows the results for low-capital business while Panel C shows the results for high-capital business. Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	%(Survived in 5yr)		%(Survived in 10yr)		%(Survived in 15yr)	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Survival Ratio for Male-Owned Individual Business						
Fine	-0.573		0.604		0.496	
	(-0.88)		(0.80)		(0.66)	
$Fine_{Average}$		-0.507		0.659		0.483
		(-0.75)		(0.83)		(0.61)
Controls	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	780	750	780	750	780	750
Adjusted R^2	0.696	0.715	0.743	0.751	0.772	0.776
Panel B. Survival Ratio for Male-Owned Low-Capital Business						
Fine	-0.457		0.369		0.683	
	(-0.88)		(0.62)		(1.16)	
$Fine_{Average}$		-0.518		0.499		0.760
		(-0.95)		(0.82)		(1.26)
Controls	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	780	750	780	750	780	750
Adjusted R^2	0.786	0.786	0.817	0.813	0.802	0.794
Panel C. Survival Ratio for Male-Owned High-Capital Business						
Fine	-0.857**		-0.007		0.186	
	(-2.28)		(-0.02)		(0.38)	
$Fine_{Average}$		-0.852**		0.250		0.250
		(-2.19)		(0.55)		(0.49)

Controls	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	780	750	780	750	780	750
Adjusted R^2	0.794	0.796	0.830	0.824	0.822	0.810

Table E7. Survival Rate for Unincorporated and Incorporated Male Business

This table shows evidence on the effect of fertility fines on firm survival for unincorporated and incorporated business using business registry data. Column (1) and (2) show how fine affects the percentage of newly started firms surviving for more than five years. Column (3) and (4) check for the percentage of new firms surviving for more than 10 years. Column (5) and (6) look at the percentage for more than 15 years. Panel A shows the results for unincorporated business while Panel B shows the results for incorporated business. Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	%(Survived in 5yr)		%(Survived in 10yr)		%(Survived in 15yr)	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Survival Ratio for Male-Owned Unincorporated Business						
Fine	-0.843		0.542		0.450	
	(-1.29)		(0.72)		(0.60)	
$Fine_{Average}$		-0.757		0.619		0.458
		(-1.12)		(0.79)		(0.58)
Controls	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	780	750	780	750	780	750
Adjusted R^2	0.700	0.719	0.747	0.755	0.774	0.778
Panel B. Survival Ratio for Male-Owned Incorporated Business						
Fine	-0.961**		-0.395		-0.217	
	(-2.24)		(-0.77)		(-0.41)	
$Fine_{Average}$		-1.043**		-0.298		-0.239
		(-2.32)		(-0.56)		(-0.44)
Controls	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	780	750	780	750	780	750
Adjusted R^2	0.800	0.800	0.841	0.836	0.831	0.822

Table E8. Robustness Checks of Baseline Business Registry Results for Males

This table shows robustness check for male baseline results using business registry data. Column (1) and (2) limit sample in periods when fertility fines were stated officially as times of annual income, excluding converted fines stated as amount of monetary value. Column (3) and (4) use female probability calculated solely from 2005 census data. Column (5) and (6) employ female probability calculated solely from ngender data, an open-source github project. Column (7) and (8) use the percentage of female business over population as dependent variable. Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Consistent Sample		Census		Ngender		%(# of Business/Population)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fine	0.122***		0.077***		0.076***		0.010***	
	(4.20)		(3.39)		(3.34)		(3.43)	
$Fine_{Average}$		0.105***		0.069***		0.069***		0.011***
		(3.51)		(2.94)		(2.92)		(3.66)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	709	679	780	750	780	750	780	750
Adjusted R^2	0.956	0.959	0.960	0.962	0.960	0.962	0.737	0.744

Table E9. Robustness Checks with Staggered DID for Males

This table applies a staggered DID setting with CSDID for male baseline results using business registry data. The treated is defined as 1 with an increase of financial penalties more than certain threshold. Column (1) and (2) define the treat group with an increase of 1.25 times of annual income. Column (3) and (4) set the increase threshold to 1.5 times of annual income. Column (5) and (6) consider an increase of more than 2 times annual income as treat group. For estimating method, we consider both doubly robust DID estimator based on stabilized inverse probability weighting (dripw) and inverse probability weighting DID estimator with stabilized weights (stdipw). Controls for this table include GDP growth, Wage growth, Ln(GDP per capita) and Unemployment rate. The t-statistics (reported in parentheses) are based on robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Ln(# of Businesses Created by Males)					
Threshold	Increase > 1.25		Increase > 1.5		Increase > 2	
	(1)	(2)	(3)	(4)	(5)	(6)
ATT	0.423*	0.393*	0.589**	0.654**	0.649**	0.564*
	(1.66)	(1.75)	(2.09)	(2.48)	(1.98)	(1.92)
Method	dripw	stdipw	dripw	stdipw	dripw	stdipw
Controls	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	744	744	750	750	772	772

Appendix F. Historical Background on the One-Child Policy[14]

In the beginning of 1980s, the Secretariat of the Central Committee called for legal, economic, and administrative policies in favor of one-child families. On March 6, 1980, during the 17th session of the Standing Committee of the Fifth National People's Congress, a decision was made to establish the State Family Planning Commission of the People's Republic of China (Chen 2015). On November 30, 1981, the "Government Work Report" during the Fourth Session of the Fifth National People's Congress stated: "Restraining the size of the population and improving its quality is our population policy." During the 12th National Congress of the Communist Party of China in September 1982, it was affirmed that "implementing family planning is a fundamental national policy of our country." In the same month, the Constitution of the People's Republic of China, adopted by the National People's Congress, explicitly stipulated that "the state promotes family planning to ensure that the growth of the population corresponds with the plans for economic and social development" and "both husband and wife have the obligation to practice family planning" (Chen, 2015; Huang, Lei, and Sun, 2021).

However, in 1984, the central party leadership recognized unprecedented difficulties in implementing the strict family planning policy. Many rural families, particularly those with only one girl, strongly resisted the policy. In response to these pressures, on April 13, the central leadership issued Document No. 7, titled 'Report on the Family Planning Situation.' Drawing on the experience of 'opening a small mouth to block a large one' in Shandong Province, the policy was adjusted to allow for a more lenient approach in rural areas, specifically permitting the birth of a second child under certain circumstances. Many local governments interpreted this shift as an indication that the central government was placing less emphasis on the policy, leading to a notable increase in China's fertility rates from 1984 to 1986. In response to this trend, the State Council reaffirmed the one-child policy in 1986 and reintroduced stringent measures nationwide from 1986 to 1990. Subsequently, after 1990, the one-child policy was implemented in a stable fashion.

Imposing financial penalties for unauthorized births played a pivotal role in curbing fertility rates. Acknowledging the varied demographic and socioeconomic landscapes across China, the central government introduced Document 11 in February 1982, granting local authorities the autonomy to tailor policies according to their specific circumstances. Subsequently, in 1984, the central government issued Document 7, granting provincial governments full authority to determine the 'tax rates' for exceeding birth quotas (Huang, Lei, and Sun, 2021). Given that local governments were more sensitive to the implications for social stability than the central government, there was limited incentive for them to implement high penalty rates. The years 1979–89 witnessed few changes in the penalty rates, other than in a few places where they were lowered by local officials. A major shift happened at the end of 1980s, when local officials were evaluated based on the enforcement of the one-child policy (with the highest priority) in addition to economic growth and social stability (Birney, 2014). After that, the one-child policy was retightened across the while country. In 2000, the fertility rate in China was as low as 1.22 according to the fifth census, much lower than the global average of 2.7.

[14] This appendix draws from various online sources including Wikipedia, as well as from Chen (2015), Zhang (2017), and Scharping (2003)