# Persistence of Traditional Gender Norms: Evidence from the State-Owned Enterprise Reform in Urban China in the 1990s

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## Abstract

This paper studies the impact of China's state-owned enterprise (SOE) reform—a government policy that liberalized the urban labor market in the 1990s—on gender inequality in employment and earnings. Employing triple differences and instrumental variable strategies, I find that women in prefectures more affected by the SOE reform are negatively affected in labor market outcomes substantially more than men. More importantly, using sex ratios and patriarchal genealogies as proxies for gender-biased norms, I find that the increased gender inequality is almost detected in areas where traditional gender norms persist more strongly.

Keywords: SOE Reform, Gender Inequality, Gender Norms, Transition Economies.
JEL codes: J16, J20, P20, Z10

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# 1   Introduction

Affirmative action policies have been widely used around the world to directly promote gender equality in the labor market (Leonard, 1989; Holzer and Neumark, 2000; Chattopadhyay and Duflo, 2004). Through quotas, a proportion of women can show their qualifications are as good as men's in many previously under-representative occupations (Pande, 2003; Ahern and Dittmar, 2012; Matsa and Miller, 2013). By setting up such policies, policy makers believe that social discriminatory attitudes against women can be changed. More specifically, through a period of strong policy intervention in the market, traditional gender norms, which play a significant role in the persistence of gender inequality, can be changed.

One important implication of this rationale is that this government intervention should only be temporary, not permanent. However, it is difficult to test this hypothesis. First, most existing affirmative action policies are concentrated on a specific occupation, so it is difficult to predict their widespread effects. Second, although we can study the effects of certain affirmative actions on gender norms by, for example, tracking subsequent generations, what we are really interested in understanding is whether gender inequality resulting from gender-biased cultures will improve if such a government intervention is no longer in place. However, without studying the counterfactual—what would happen if the affirmative action policy was abolished—the answer will remain unknown.

This paper helps answer this issue by studying a large-scale labor market reform, known as the state-owned enterprise (SOE) reform, in the socialist regime of China in the 1990s. This reform ended an over 40-year-long affirmative action policy, which assigned jobs for eligible women, in the urban labor market. To understand the effect of the SOE reform, I first document that gender inequality in the labor market outcomes was significantly narrowed due to the nation-wide affirmative action policy before the reform. Then, I show that gender gaps in employment and earnings dramatically increased when the affirmative action policy was unexpectedly and completely abolished.

To identify the casual impact of the reform, I exploit both the time variation and the regional variation in the reform's intensity to create a difference-in-differences estimator. In addition, since I am interested in the differential effect of the reform on women, I exploit the gender variation. Combining the time, geographic, and gender variation results in the final triple differences strategy. Last, relying on a unique historical culture dataset, I evaluate the importance of traditional gender norms in the determination of the increased gender inequality in the post-affirmative action policy period. Specifically, I indirectly test whether the affirmative action policy that lasted for more than 40 decades has changed

the gender-biased social norms.

From the 1950s to the 1990s, strict and extreme regulations aiming to enforce gender equality in the labor market were implemented through a central labor assignment policy in urban China (Meng, 2000). This was the largest scale affirmative action policy under the socialist regime in the history. Each year, the central government assigned job quotas to SOEs in each province, and upon graduation, every urban resident would be assigned a lifetime job with an almost fixed income (Meng, 2000).[1] With a few exceptions, quitting or moving between the firms was not allowed. Due to this policy, the female labor force participation rate reached as high as 90% and the gender wage gap decreased to less than 15%.[2] One of the primary objectives of this labor assignment was to eliminate the centuries-old gender-biased norms. The government believed that this could be achieved by strongly promoting women's economic status in society.

Although the socialist goal of "absolute equality" seemed to have been achieved by a strong government intervention in a short time period, it was not surprising to observe extreme low efficiency in firms' performance. Eventually, in 1997 the central government had to abandon the old policy and announce another policy to privatize, merge, or close most SOEs,[3] and they strategically closed or privatized most firms in the light industry and service sector (Lin et al., 1998; Meng, 2000; Megginson and Netter, 2001; Lin et al., 2001; Hsieh and Song, 2015).[4]

During the SOE reform, over 35 million workers were laid off from 1996 to 2001, and by 2007 about 80% of SOEs were privatized (Meng, 2000; Smyth et al., 2001; Solinger, 2002; Hsieh and Song, 2015).[5] Figure 1 shows that the share of urban workers working for SOEs decreased from nearly 100% in 1988 to less than 40% in 2013. More importantly, women began to disproportionately leave the labor market, and the gender earnings gap soared in

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[1]Generally speaking, there were two types of firms in urban areas during that time: state-owned firms and collective-owned firms. The central government owned state-owned firms, while the local government or local community owned collective-owned firms. I do not distinguish between these two types of firms and instead define both as SOEs.

[2]Author's own calculation from using the China Household Income Survey for 1988 and 1995. The current literature finds that the gender earnings gap was between 7% and 14% in the 1980s, which is smaller than the gap in most OECD countries (Kidd and Meng, 2001). For example, much of the literature suggests that the gap was over 30% in the U.S. in the same time period (Blau and Kahn, 2007, 2016).

[3]China's economic reform started in 1979 in rural areas. Four special economic zones were set up in urban areas in 1980 (all are located in the coastal province of Guangdong), and the central planning system was still working in most parts of urban China until the mid-1990s. The policy is "grasping the big, letting go of the small" (*zhua da fang xiao*).

[4]The government kept the transportation, energy, steel, and the financial sectors still under the state's control.

[5]The term *xiagang* ("step down from the post") was used instead of "being laid off" in China to describe someone being forced to leave their working unit. This was done because in a socialist society, it was politically sensitive to say that someone was laid off.

the process of marketization. By the end of 2007, the female labor force participation rate has decreased to less than 75%, and the gender gap increased from less than 5 percentage points in the 1980s to more than 18 percentage points. Since then, the gender earnings gap has more than tripled.[6]

The SOE reform was one of the most influential social and economic events in the 1990s (Lin et al., 1998, 2001; He et al., 2018). On the one hand, the number of workers who were laid off was unexpectedly large. In fact, many SOEs were still recruiting workers, and the total number of SOE employees peaked in 1995 (Meng, 2000; Cai et al., 2008; Meng, 2012), but the layoff movement swept the whole country over the following six-year period. On the other hand, the phenomenon of women's economic status dropping so fast and gender inequality increasing to a historically high level in such a short time period is rare in most economies. Indeed, women in the U.S. and many other developed countries steadily caught up with their male counterparts during the same time period, but women in China quickly fell behind men (Goldin, 2014; Blau and Kahn, 2016).

The increased gender inequality may suggest gender differences in productivity or preferences, specialization within the households, or even a resurgence of gender discriminatory culture. To explore this further, I first identify the causal impact of the SOE reform on gender inequality in employment and earnings. I then compare the gender gaps before and after the reform and compare the prefectures that are more affected by the massive layoff movement with the less affected ones. Ideally, I would use the actual regional level data of the number of laid off workers to measure the reform intensity; however, these data are not available. I instead manually collect regional-level employment data and calculate the change of the share of workers working in SOEs before and after the reform and use it as a proxy for the reform intensity. To the best of my knowledge, this paper is the first to use this proxy.

Overall, I find that the SOE reform causes an increase in gender inequality in the labor market. The triple differences estimates suggest that a one standard deviation (20%) increase in the reform intensity causes the likelihood of women being employed to decrease by 1.4 percentage points and the gender earnings gap to increase by 3.9%. Since the gender employment gap has increased by 10.5 percentage points in the post-reform period, the reform can explain about 13.3% (1.4/10.5) of the total increase. Similarly, the reform can explain 33% of the total increase in the gender earnings gap.

The first concern of conducting the triple differences analysis is the validity of the par-

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[6]Author's own calculation. Some research finds that the gender earnings gap increased to 14%–20% in the post-reform period compared to approximately 9% in the pre-reform era (Gustafsson and Li, 2000; Shu and Bian, 2003; Whalley and Xing, 2014; Meng, 2012).

allel trend assumption. To test this assumption, I use three different methods. First, I plot the pre-reform gender inequality trend and show that gender gaps in both employment and earnings display almost the same pattern before the SOE reform and the divergence only appears after the reform. Second, I conduct a pseudo-experiment regression analysis, assuming that the reform had happened sometime earlier, and find that there is no significant effect of this fake reform on the gender inequality. Last, I run a permutation test and provide further evidence to support the parallel trend assumption.

Another concern is that the reform intensity, which is the key treated variable, may be endogenous. If unobservables are correlated with both the reform intensity and the error term, the triple differences estimate will be biased. For example, in the process of marketization, if private firms are more likely to enter prefectures where they believe male workers are more productive, the change in the SOE employment share will correlate with the firm entry and the outcome variables. To address this concern, I borrow the idea of a Bartik instrument and construct a Bartik intensity variable, which has two components. The first component is the prefecture-level pre-reform industry composition, and the second one is the national-level industry-specific change in the SOE employment share. I use the variable as an instrument for the reform intensity and conduct the instrumental variables (IV) analysis as a robustness check.

The intuition behind this instrument is straightforward. The SOE reform targeted all state-owned sectors in urban areas, but the pre-determined differential importance of each industry in the economy generated regional variation in the reform intensity. For example, if some areas specialized in cotton production in the pre-reform period and the state-owned cotton industry experienced a large decline in employment nationally, I would expect those areas to have a high reform intensity. The IV estimation produces similar results as the triple differences estimates. Due to the SOE reform, the gender gap in employment increases by 6.9 percentage points and the gender monthly earnings gap increases by 8.4%.[7]

After showing evidence that the SOE reform has caused the gender inequality to increase, I next explore the underlying mechanisms. First, combining the results on the increased gender employment gap and the gender earnings gap, I can rule out the selection hypothesis. To be specific, the labor market selection hypothesis predicts that low productive women will disproportionately leave the labor market when the competition increases and only high productive women stay (Hunt, 2002, 2004). As a result, the gender employment gap may increase but the gender earnings gap will not change. Many

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[7]Due to data limitations, the results of the IV strategy come from analyzing about 46% of the areas covered in the triple difference analysis.

studies on the German reunification find evidence that supports the hypothesis, but the results suggest other possibilities in the context of China (Burda and Hunt, 2001; Danthine and Hunt, 1994; Hunt, 2004).

The second mechanism is that women may disproportionately leave the labor market because of housework specialization. Wives have comparative advantages in doing housework compared to husbands; thus when husbands' earnings increase much faster than wives' earnings, it is a rational choice for wives to leave the labor market and only specialize in housework. If this is true, I should observe that only women from high-income households leave the labor market. However, I find that the increased gender employment gap is not statistically and significantly different between high- and low-income households. Further analysis suggests that the increased male-female employment gap is almost entirely driven by the relatively older (between the ages of 40 and 54) and less-educated (less than high school) groups; this effect is only detected in women. In other words, men, no matter what age or educational attainment, were not affected by the SOE reform. Taking these results together, less demand for lower-skilled female workers could be one reason for the increased gender employment gap.

In terms of the increased gender earnings gap, I first study whether it can be explained by the sorting hypothesis. Studies find that women are more likely to sort into lower-paying jobs, such as teachers or nurses, and one important reason for this is that they are less likely to take risks or competition (Buser et al., 2014; Liu and Zuo, 2019). However, I find that the point estimates only decrease by 4.3% and 13% after I control for occupation or industry, respectively. In other words, more than 80% of the increased gender earnings gap is driven by the within-industry or within-occupation variations.[8] Another possibility for the increased gender earnings gap is that the productivity is significantly and negatively impacted by the presence of children for childbearing-age women. Indeed, I find that the increased gender earnings gap is almost detected among workers who are between 30 and 40 years old, and the presence of child under age 6 can partially explain the increased gender inequality. Nevertheless, a huge amount of the increased gap cannot be explained by these economic factors.

Another possibility is the traditional gender norms that may contribute to the increased gender inequality, but the effect is unclear in this paper's context. On the one hand, many studies suggest that norms are malleable (Jayachandran, 2015; Dahl et al., 2021; Dhar et al., 2022). Since the affirmative action policy had been effective for more

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[8]I also find that women are more likely to sort into private sectors, which were believed to offer lower wages and worse welfare benefits compared with public sectors during that time period (Fang and Lin, 2015; Lyer et al., 2019).

than 40 years, it is reasonable to expect that the social discriminatory attitudes against women may have changed, leading me to not find any effect of traditional gender norms on the increased gender inequality. On the other hand, many other studies find the persistent effect of history on contemporary economic outcomes (Alesina et al., 2013). To explore these two orthogonal hypotheses, I use two different variables to proxy China's long-persisting gender-biased culture. The first one is the sex ratio at birth. A well-documented literature has confirmed the legitimacy of using sex ratios as a proxy for son preference in developing countries (Gupta, 2005; Das Gupta, 2009; Lin et al., 2014; Jayachandran, 2017). Existing studies also suggest that regional variations in sex ratios at birth are associated with the differential intensity of gender norms (Qian, 2008; Alesina et al., 2013). Therefore, to proxy traditional gender-biased culture, I use the 1990 census to calculate the sex ratio of the birth cohorts that were under age 10. I find that the increased gender employment and earnings gaps are almost entirely driven by the high sex ratio (above median) areas. In other words, I do not find any increased gender inequality in low sex ratio areas.

One concern of using contemporary sex ratios at birth as a proxy is that it may be a consequence of the government's intervention before the 1990s rather than a reflection of historical norms. To address this concern, I use another variable—number of genealogies in each prefecture—to capture the prevalence of historical gender norms. As an archive, genealogy documents one's family tree in patriarchal lineage and usually dates back at least 100 years (Zhang, 2020; Chen et al., 2020; Cao et al., 2020). Only men's names appear in the book, linking family members in the past and present. In a society dominated by Confucian values, the number of genealogies indicates the strength of the patriarchal culture in that area (i.e., the more genealogies compiled, the stronger the patriarchal culture) (Wilson, 1995; Liu, 2013).

Because the number of genealogies varies across prefectures, I am able to divide the sample into areas with more genealogies and those with less ones. Interestingly, I find that the effect on the increased gender earnings gap is only significant in high-intensity areas. In addition, for the increased gender employment gap, the point estimate is two times larger in the prefectures with more genealogies than in low-intensity areas, although it is not significant.[9] These results are consistent with the results by using the sex ratio at birth as a proxy for the traditional gender norms. They show that traditional gender-biased norms still play a significant role in the post-reform period. The affirmative action policies that lasted for more than 40 decades have not changed the norms, and once workers and firms were allowed to search and match with each other freely, traditional gender norms

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[9]The insignificance is probably due to the small sample size.

returned and affected women's labor market outcomes.

This paper contributes to a large literature that studies the change of gender inequality in China. Most of the existing papers do not discuss the causal relationship between the SOE reform and increased gender gaps. For instance, some studies simply compare the gender earnings gap between the 1980s and 1990s (Gustafsson and Li, 2000; Shu and Bian, 2003; Millimet and Wang, 2006), while others present some descriptive evidence to suggest there might be a link between the reform and the increased gender earnings gap without an identification strategy (Whalley and Xing, 2014; Meng, 2012).[10] To the best of my knowledge, this paper is the first to make progress on better understanding whether the SOE reform has increased gender inequality at the individual level.[11]

The paper also speaks to recent studies on the origins and malleability of traditional gender norms and the impacts of affirmative action policies on gender inequality. In the context of developing countries, a recent paper by Dhar et al. (2018) employs randomized control trials to study the impact of persuasion and discussion on adolescents' gender attitudes in India, and find that such school-based interventions can reshape students' attitudes toward supporting gender equality in a two-year time period. Similarly, several studies find that women from Western and Eastern Germany behave differently even after 40 years of reunification, suggesting that gender norms can be changed by government institutions (Beblo and Goerges, 2015; Lippmann and Senik, 2018; Campa and Serafinelli, 2019; Lippmann et al., 2019). However, another paper by Bertrand et al. (2018) finds that affirmative action policies implemented in several European countries, which increased female representation in top positions in publicly limited companies, had little impact on the major, marital, or fertility decisions of young women.

In addition, this paper's results are consistent with the literature on the persistence of traditional gender norms. Previous studies have used the regional variations of genealogies to proxy for the social capital of ancient China and to study its long-term impact on education and health outcomes (Cao et al., 2020; Chen et al., 2020). This study adds to this area by using genealogy as a proxy for traditional Confucianism, and the findings suggest that over 40 years of enforced gender equality failed to eliminate the influence of

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[10]In addition, several studies use the Oaxaca decomposition method to explore which factors are contributing to the sizable gender earnings gap. They conclude that after controlling for a series of individual characteristics and occupations/ownership/industry, a large part of the gender earnings gap remains unexplained (Bauer et al., 1992; Ni et al., 2005; Li and Dong, 2011; Su and Heshmati, n.d.; Shi et al., 2011).

[11]The most relevant study to this one is by Jenq (2015). The author uses 1990, 2000, and 2005 census data; employing seemingly unrelated regressions; and ordinary least squares (OLS) regressions to study the reform's effect on the aggregate level change of gender gaps in employment. The author calculates the prefectural change in the SOE employment share and the change of female employment share and argues that these are exogenous in China's setting. She finds that female-industry-biased privatization can explain almost 50% of the increase in the employment gender gap.

gender-biased culture in China.

The rest of the paper is organized as follows. In Section 2, I first explain the government's motivation of implementing the labor assignment policy and its contents. I then describe the SOE reform and its social and economic consequences. Section 3 presents the main methodology, including the triple differences strategy and the IV strategy. Section 4 discusses the data source, introduces the main interested outcome variables, and describes how the reform intensity is constructed. Section 5 presents the results. Section 6 discusses possible mechanisms and shows the suggestive evidence of persistence of traditional gender norms. Section 7 concludes.

## 2 Change in Women's Social and Economic Status

Before Mao Zedong's labor assignment affirmative action policy, Chinese women's social and economic status was extremely low. It was largely shaped by the Confucianism. In this section, I first describe this historical root of traditional gender norms. Then, I provide more detail on how women's economic status was strongly promoted by the government from the 1950s to the 1990s. Last, I provide a complete picture of the SOE reform in the 1990s and its consequences.

**Pre-Communist Ruling Period**   Before the Communist Party came to power in 1949, the position of women in marriage, family, and society had been mostly defined by patriarchal Confucianism. This requires women to "obey fathers when young, husbands when married, and adult sons when widowed." In addition, they were generally not allowed to work outside the home (Johnson, 2009). Since Chinese women were fundamentally economically dependent on their patriarchal family, they had lower social and economic status than men.

**Labor Assignment Affirmative Action Policy**   The establishment of a Communist government in 1949 was followed by a series of social, economic, and political experiments under the new regime's Marxist ideas that aimed to create a socialist society and promote women's rights and their position in society (Entwisle and Henderson, 2000). From 1950 to 1990, women's social status in China was strongly shaped by the political approach, and many pervasive reforms that were in favor of gender equality occurred. The 1950 Marriage Law and the 1954 Constitution abolished polygamy, child betrothal, and interference in the remarriage of widows (Meijer, 1971). For the first time, the 1950 Marriage Law legalized equal status for wives and husbands at home and decreed that mar-

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riage should be based on the complete willingness of the two parties. Later, the Anti-Confucianism Cultural Revolution that happened between 1966 and 1976 denied all traditional ideas about women, and the central government used every possible method, including newspaper/TV/radio, school education, and books to propagate Mao's "Women Can Hold Up Half the Sky" ideology.

In addition, starting from 1950s, the Chinese government established a strict central planning system to arrange labor under the ideal of absolute equality (Entwisle and Henderson, 2000). It first implemented labor arrangements and wage rates in urban areas.[12] Each year, the State Ministry of Labor and Personnel assigned employment and wage quotas to each local government. Eventually, the labor quota would reach the educational institutions and the wage quota would be assigned to each state- or collective-owned firms or government departments. When individuals graduated, they would be assigned to a work unit mainly based on their educational attainment and political background.[13] No individual would be allowed to search for a job themselves, and no work unit could choose workers independently (Meng, 2000; Liu and Zhang, 2008). Furthermore, individuals were not allowed to quit or change their jobs except for promotion. These assignments were lifetime jobs with an accurate fixed wage. There were 8 wage levels for factory workers and technicians and 24 levels for administrative and managerial workers, with some variation across regions (Meng, 2000).

The firms' goal was not to maximize profit; instead, they functioned as many independent small societies. They provided workers with employment as well as housing and medical treatment for family members and child care and education for workers' children. China has kept most formal institutions that guaranteed gender equality during that period. No doubt, these socialist policies shrunk the absolute size of the gender gap during this period.(Eichen and Zhang, 1993; Hannum and Xie, 1994; Yang, 1999).

**Post-1990s, SOE Reform Period**   The economic reform started in rural areas with the fastest-growing township enterprises and later with the setup of four special economic zones along the southeastern coast of China.[14] By the mid-1990s, it became obvious to the central government that most SOEs failed to compete with growing private firms because of the lack of incentive schemes for workers and managers (Lin et al., 1998; Lin

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[12]One important reason for this system functioning is that the strict residence registration system, known as *hukou*, almost prohibited any migration between rural and urban areas. Until the late 1980s, China's economy was divided into two mutually exclusive parts.

[13]Generally speaking, one's political background indicates how long they had been in the Communist Party.

[14]Township enterprises are another form of collective-owned enterprise, but the ownership belongs to farmers in the rural areas.

and Tan, 1999; Perkins, 1994). By that time, about half of these SOEs were experiencing losses, and the number of redundant workers was estimated to reach as high as 20%–30% of total workers (Xianguo, 2007). However, the issue of the SOE reform was politically sensitive because lifetime employment and equal pay with equal jobs were regarded as two key characteristics of a socialist society. Data from the National Bureau of Statistics suggest that the SOE employment even peaked at about 109.5 million in 1995. It was not until the 15th Communist Party Congress in September 1997 that the central government announced and endorsed the SOE reform (Frazier, 2006), called the *zhuada fangxiao* ("grasping the big, enlivening the small"). The reform's key component is to keep only a few large strategic sectors under state ownership and merge, privatize, or close most other medium-to-small firms. By the end of 2002, the number of SOE workers fell to 69.2 million, a 36.8% decline compared to 1995.

The most affected sectors were manufacturing, mining, and utilities, which fired 65% employees. The total number of employees in these sectors dropped from 44 million in 1995 to 15.5 million in 2002 (China Labor Statistical Yearbook, 1998, 2003). Since different regions specialized in different industries before the reform, for example, more firms in the manufacturing sector were located in the northeastern part than in the southwest areas, the layoff intensity varied across regions. Another stunning decrease is in the number of firms. The total number of industrial SOEs declined precipitously by 54.7%, from 110,000 in 1997 to 53,489 by late 2000 (China Labor Statistical Yearbook, 1998, 2003).[15]

Within five to six years, the central planning labor arrangement was abolished. After the SOE reform, all firms worked toward the goal of profit maximization and were free to hire or fire workers from the growing labor market. New entrant workers no longer enjoyed the security of non-contract lifetime employment, and their wages were determined by market forces. And although the new SOEs still had some monopolistic power in several specific sectors, they did not bear any other social responsibilities as before (Lee, 2000; Solinger, 2002).

The SOE reform symbolized the end of a special era when women were vigorously protected by the government in the labor market. Although laid off workers were entitled to receive living allowances and unemployment benefits from the government to maintain a minimum living standard, current studies suggest that only about 34% of individuals experiencing job separations between January 1996 and November 2001 were employed again within 12 months of leaving their jobs (Cai et al., 2008). In addition,

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[15]The urban collective firms, which were owned by the local government, were also in the scope of the SOE reform. The shrinking of the collective firms shares a similar pattern with the SOEs. For example, the number of SOE industrial workers fell from 14.9 million in 1995 to 3.8 million in 2002 (China Labor Statistical Yearbook, 1998, 2003).

the absence of anti-discrimination laws carried the potential to disadvantage women in the labor market disproportionately and offers the possibility of a resurgence of gender discrimination culture in China (Cooney, 2006; Lee, 2000; Yao and Xie, 2004).

# 3   Empirical Strategy

Simply comparing post-reform outcomes with pre-reform outcomes cannot produce a causal impact of the SOE reform since the changes in labor market outcomes could be due to multiple reasons other than the reform. Increasing labor force retrenchment in women, for example, could be caused simply by an age demographic shift. Therefore, I rely on both the reform's time shock and the regional variations of its intensity, taking advantage of the fact that the reform's effect varies across regions despite it occurring at the national level. I compare outcomes before and after the reform for individuals from the more affected areas to the less affected areas. In this section, I first show the triple differences strategy and then the IV strategy.

## 3.1   Triple Differences

The key feature of the SOE reform is the massive layoff across the country, which resulted in a dramatic decrease in the number of individuals working in SOEs. Thus, I use the prefectural level change in the SOE employment share as a proxy for the reform intensity. It varies across regions but does not vary with time. Because my objective is to study whether women are affected differently, I estimate a triple differences model as follows:

For individual $i$ in prefecture $p$ in year $t$,

$$Y_{ipt} = \alpha + \beta_1 Female_i \times After_t \times \Delta EmpShare_p + \beta_2 Female_i \times After_t + \beta_3 Female_i +$$
$$+ \beta_4 Female_i \times \Delta EmpShare_p + \beta_5 \Delta EmpShare_p \times After_t + \delta_t + \gamma_p + X'_{ipt} + \varepsilon_{ipt}, \quad (1)$$

where $Y_{ipt}$ is one of the two outcomes: (1) full-time employed (1 or 0) or (2) ln(real monthly earnings). $\Delta EmpShare_p$ is the change in the SOE employment share for prefecture $p$, calculated by using the formula presented in Section 4.2. *Female* and *After* are two indicator dummies, where areas *After* are equal to 1 if it is the post-SOE reform period and vice versa. $X'_{ipt}$ is a vector of individual characteristics including age, age squared, ethnicity, and years of schooling. $\delta_t$ are year fixed effects and are included to control for the common shocks that affected all prefectures, such as the setup of labor laws. $\gamma_p$ are prefecture fixed effects, controlling for the unobservable time-invariant differences across

prefectures. For example, different prefectures may have different preferences in attracting foreign capital, which may be correlated with the change in the employment share and affect the outcome variables. Standard errors are clustered at the prefecture level. To facilitate interpretation, $\Delta EmpShare_p$ has been standardized to have a mean equal to zero and a standard deviation equal to one.

$\beta_1$ is the main coefficient of interest and describes the additional effect. A statistically significant $\beta_1$ suggests that the greater the exposure to the SOE reform, the larger the effect on women relative to men. Essentially, it captures whether the gender gap would change because of greater exposure to the reform. $\beta_2$ is the overall increased gender gap after the reform, and $\beta_3$ is the gender gap before the reform. $\beta_5$ is another coefficient worth noting since it captures the effect of the reform on men.

One important underlying assumption to validate the triple differences strategy is that, had there been no SOE reform, the more affected areas would have had the same trend in the gender gap as less affected areas. In Section 5.2.1, I provide supporting evidence for this assumption. Another major concern about this strategy is that the change in the SOE employment share may be correlated with some unobserved prefectural changes that may affect the outcome variables. To overcome these concerns, I use an IV strategy.

## 3.2   IV Strategy

I develop a Bartik intensity index by using the pre-reform prefectural industrial employment composition and the national industry-specific shock to the SOE employment to instrument the change in the SOE employment share. In this setting, the Bartik intensity index works as a negative labor demand shift.

The IV equation takes the form of the equation represented in Equation 1 above, but the variable of interest is replaced by predicted change in the SOE employment share:

$$Y_{ipt} = \alpha + \beta_1 Female_i \times After_t \times \Delta\widehat{EmpShare}_p + \beta_2 Female_i \times After_t + \beta_3 Female_i +$$
$$+ \beta_4 Female_i \times \Delta\widehat{EmpShare}_p + \beta_5 \Delta\widehat{EmpShare}_p \times After_t + \delta_t + \gamma_p + X'_{ipt} + \varepsilon_{ipt}. \quad (2)$$

The predicted value of $\Delta\widehat{EmpShare}_p$ is generated by the first stage specified as follows:

$$\Delta\widehat{EmpShare}_p = \pi + \pi_1 BartikIntensity_p + \delta_t + X'_{ipt} + \varepsilon_{ipt}. \quad (3)$$

$BartikIntensity_p$ is the prefectural-level instrument that I construct following the formula in Section 4.2. All other elements in these equations are the same as in Equation 1. For

this IV approach to be valid, the instrument must satisfy the exclusion restriction such that conditional on the controls in the models, subsequent trends in the gender gap in interested outcomes would not be correlated with the change in the SOE employment share except for a direct effect of the Bartik intensity index. The Bartik intensity index must also be a strong predictor of the change in the SOE employment share. In Section 4.2, I present evidence to support this hypothesis.

# 4  Data

In this section, I first introduce the household dataset that I use to measure individuals' labor market outcomes. I then discuss in detail how I construct the relevant treatment variables.

## 4.1  Outcome Variables: China Household Income Project

The data used in this study come from the survey of the China Household Income Project (CHIP): years 1988, 1995, 2002, and 2007. This project, which includes rural and urban households, was designed by the Economics Institute of the Chinese Academy of Social Sciences and a group of international economists. The provinces, number of households, and individuals covered by the project vary across years. In 1988, the research team surveyed 9,009 households with 31,827 individuals living in 10 provinces (Eichen and Zhang, 1993). In 1995, there were 6,931 households and 21,698 individuals in 12 provinces (Li et al., 2008). The 2002 survey covered the same provinces as 1995, including 6,835 households and 20,632 individuals (Li et al., 2008). Sixteen provinces were surveyed in 2007, but only 9 with a total of 14,683 individuals and 5,000 households are available for public use (Luo et al., 2013).

Since the central labor arrangement was implemented in urban areas and the SOE reform mainly targeted firms located in urban areas, I restrict the analysis to individuals who had urban *hukous* (Meng, 2000; Groves et al., 1995; Perkins, 1994). Also, the mandatory retirement age during that time period was 60 for men and 55 for women, so I focus on individuals between the ages of 19 and 54 (Du and Dong, 2009; Giles et al., 2006a). The final dataset in the empirical analysis includes 24,706 households with 52,947 individuals across 14 provinces and 80 prefectures. To the best of my knowledge, this is the only publicly available household survey dataset that covers both before and after the SOE reform period.

The CHIP has detailed information about individuals' demography, work status, and

income. Individuals were surveyed on their age, ethnicity, educational attainment, employment status, work industry, occupation, monthly earnings, and other income-related information.[16] I define employed to be equal to 1 if the individual reports that they currently have a full-time job and 0 otherwise.[17] Monthly earnings are defined as the sum of regular wages, all kinds of bonuses and subsidies, and other income from the primary job.

Table 1 shows the summary statistics of the key outcome variables and individual characteristics. Panel A shows the average labor market outcomes before (1988 and 1995) and after (2001 and 2007) the SOE reform. Monthly earnings were adjusted by the Consumer Price Index to the 2014 year. The real average monthly earnings had increased more than sixfold in the post-SOE period compared with the pre-reform period. This is not surprising since China's economy was growing at an average of 9.91% per year during that period. In contrast, the employment rate declined from over 90% to just about 70% among working-age adults in the sample. Another feature worth noting about the change in the labor market is that very few people were working in the private sector before the reform (about 2%), but this proportion grew to more than 50% after, suggesting the dramatic change in the economy's structure was due to the privatization movement. Panel B compares individual characteristics before and after the reform. It shows that individuals are older and more educated in the post-reform period. Since age and education level could affect labor market outcomes, I include these variables as controls in my analysis.[18]

In addition to the main dataset, I conduct several robustness checks with additional datasets. For example, it is true that the retirement age for women varies across educational attainment and occupations. The youngest age at which women were legally allowed to retire before the reform was 45 (Du and Dong, 2009; Giles et al., 2006b). I thus restrict the study group to age 45, expand it to age 60, and do the same analysis. I conduct

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[16]In 1995 and 2002, individuals were also asked about their work hours per week.

[17]There are eight answers to the survey question, "What is your current employment status?" They are the following: (1) employed (full-time job), (2) waiting for job, (3) unable to work, (4) retired, (5) currently a student, (6) pre-school children, (7) full-time homemaker, and (8) others. In the 2002 survey, there are several additional categories: (1) officially off duty (lixiu), (2) laid off (xiagang), (3) left post (ligang), (4) early retirement, and (5) internal retirement. I group (1), (4), and (5) as "retired" and (2) and (3) as "others."

[18]Not every wave of the surveys asks the working experience question; I define work experience as equal to age – years of schooling – 6. Later in the regression analysis, I only include age and years of schooling as controls due to the multicollinearity issue between years of schooling, working experience, and age. One possible concern is the endogeneity of the years of schooling as it has increased by nearly 15% in the post-reform period (Liu et al., 2013). To address this concern, I use the same specification as in the main analysis to examine the impact of the SOE reform on years of schooling (see Appendix Table A.13 for the results). I do not find significant effects of this reform, although the overall gender gap in years of schooling has significantly decreased in the post-reform period.

another, more important analysis, looking at early retirement as another outcome to shed light on the differential treatment of firms toward men and women in the labor market restructuring process. Many firms forced workers to retire early, and in the literature early retirement is regarded as another form of layoff during that period (Lee, 2000; Solinger, 2002). Studies also suggest that women are more likely than men to be forced to retire early (Lee, 2000; Solinger, 2002; Cai et al., 2008).

## 4.2 SOE Reform Intensity Measurement

I define the reform intensity using the change in the SOE employment share in urban areas. The higher the change in the employment share, the higher the reform intensity. The employment data come from various official statistical publications and publicly available databases. The national and provincial number of SOE workers in each industry and total number of workers in urban areas are collected from the China Labor Statistical Yearbook (1996, 1995, and 2002) and the Comprehensive Statistical Data and Materials on 50 Years of New China. The prefectural number of SOE workers by industry and total number of workers in an urban area are extracted from 14 Provincial Statistical Yearbooks (1995 and 1996) and the China City Statistical Yearbook (1995, 1996, and 2002).

To measure the SOE reform intensity, I collect the total number of workers (*Zhi gong*) and the number of workers in SOE sectors in 80 prefectures (covered by the CHIP dataset) for the years 1995 and 2001. Prefectures, which encompass all metropolitan areas in China, are logical geographic units for defining the local labor market. I calculate the change in the SOE employment share as

$$\Delta \text{ SOE Emp share}_p = \frac{L_{p,t_0}^{SOE}}{L_{p,t_0}} - \frac{L_{p,t}^{SOE}}{L_{p,t}}, \tag{4}$$

where $L_{p,t_0}^{SOE}$ ($L_{p,t}^{SOE}$) is the start (end) of period SOE employment in prefecture $p$ and $L_{p,t_0}$ ($L_{p,t}$) is the start (end) period total employment in prefecture $p$. A positive $\Delta$ SOE Emp share$_p$ suggests that the share of workers working in SOE sectors is decreasing over the years and vice versa.[19]

Panel (a) of Figure 2 shows the regional variation of the SOE reform intensity. The darker the color, the more workers left the public-owned sectors between 1995 and 2001. The average change in the SOE employment share is 0.31 with a standard deviation of 0.12.

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[19]Out of 293 prefectures, 89 were covered in the CHIP. I can identify 80 prefectures due to the change of geocode.

The major concern of using the change in the SOE employment share to measure intensity is that it could be correlated with some unobserved prefectural characteristics that affect labor market outcomes. For instance, the outcome of employment and the local change in the SOE employment share are simultaneously determined. To overcome this endogeneity issue, I collect the pre-reform number of SOE workers in each industry (using the two-digit industry code) at the prefectural level from various provincial statistical yearbooks. By using the pre-reform prefectural industrial composition and the national industry-specific shock to SOE employment caused by the reform, I develop a Bartik intensity index to instrument the prefectural change in the SOE employment share.[20] Due to the data availability and bounded by the CHIP-surveyed prefectures, I compile an employment dataset that covers 37 prefectures across all 14 provinces that have been surveyed in the CHIP. The Bartik intensity index is constructed as follows:

$$\text{Bartik Intensity Index}_p = \sum_{i=1}^{n} \text{SOE Emp share}_{i,p,t_0} \times \Delta \text{ SOE Emp share}_i, \qquad (5)$$

where SOE Emp share$_{i,p,t_0}$ is the start of period SOE employment share in industry $i$ and prefecture $p$. $\Delta$ SOE Emp share$_i$ is the aggregate change in the SOE employment share in industry $i$ between the start and the end period.

Figure A.1 shows histograms of the distribution of the SOE employment share change for all 80 prefectures and for the subsample (37 prefectures) with the available pre-reform industry-specific number of SOE workers. The mean of the subsample is 0.33 with a standard deviation of 0.13, which is marginally larger than the total sample mean (0.31 with a standard deviation of 0.12). Table A.1 shows the summary statistics of the pre-reform share of SOE workers by industry across the 37 prefectures. Manufacturing plays the most important role in the old central labor arrangement system since some regions specialized in light industries while other areas had heavier industries. As previously discussed, light industries were hit the most by the massive layoff during the reform. I report the national industry-specific change in the SOE employment share in Table A.2. Unsurprisingly, manufacturing lost the greatest number of individuals working in SOEs.

Last, Table A.3 summarizes both the change in the SOE employment share and the Bartik intensity index. The mean of the change in the SOE employment share from the subsample is a little bigger compared to the full sample. Figure A.3 shows a simplified bivariate version of the first-stage relationship in the IV approach. It presents a simple scatter plot depicting the relationship between the Bartik intensity index and the change

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[20]The Bartik instrument was first introduced by Bartik (1994) and is used in papers such as David et al. (2013), Card (2009), and Basso and Peri (2015). Goldsmith-Pinkham et al. (2020) provide a through discussion about this instrument's implementation.

in the SOE employment share; the pattern is clearly linear. A bivariate regression between these two variables yields a $t$-statistic of around 4. Given the strength of these relationships, it is not surprising that the data exhibit sufficient power in the first-stage regression; the F-statistic is 12.15.

# 5   Results

## 5.1   Main Results

Before showing the main results, I first document the change of gender gaps in dimensional labor market outcomes (Appendix Table A.4). This exercise not only provides a complete picture of the change of women's economic status in the process of privatization movement but also helps us better understand the importance of the reform's impacts in later analysis. Specifically, I run simple OLS regressions of four outcome variables—employment, early retirement, ln(monthly earnings), and work unit ownership—on the female dummy and some other relevant individual characteristics for before (1988 and 1995) and after (2002 and 2007) the reform periods, separately.

The point estimates of the female dummy show the gender gaps in the two time periods. For example, the results in Panel A suggest that women are 5.6 percentage points less likely to be employed than men in the pre-reform period, with the gap increasing to 15.2 percentage points in the post-reform period. Due to such a dramatic increase in gender inequality, it is not surprising that the female average employment rate has decreased from 89% to 65%, much larger than the decrease in the male employment rate. At the same time, I find that early retirement is much more likely to be detected in women than men in the post-reform period in Panel B. The gender gap in early retirement has increased from 4.7 to 11.4 percentage points. Apparently, this change is almost driven by women because the average rate of early retirement for men did not change that much but did so for women, from 6% to 15%.

Similarly, the gender earnings gap has doubled in the post-reform period even when controlling for observable individual characteristics and time trends. Last, there was no significant difference between men and women in sorting into different types of work units in the pre-reform period. However, women are 7.1 percentage points more likely to sort into the private sector in the post-reform period. This further suggests that the affirmative action policy effectively promoted gender equality in the pre-reform period and market forces or other factors play a role in the determination of gender segregation in the labor market.

Table 2 shows the baseline results using the triple differences strategy. Columns (1) and (2) provide full sample estimates, while columns (3) and (4) show the results by using the subsample. Both samples produce similar results. Overall, I find that the SOE reform is associated with women being less likely to be employed and is associated with an increase in the gender earnings gap. $\beta_2$ across the first two columns suggests that the gender gap increases by 10.5 percentage points in employment after the reform, which is similar to the previous descriptive results. The gender monthly earnings gap also increases 11.8% after the reform.

More importantly, the statistically significant $\beta_1$ across the four columns suggests that women are disproportionately and negatively affected by the reform. In other words, the greater the exposure to the SOE reform, the larger the effect on women relative to men. $\beta_1$ in column (1) shows that a one standard deviation increase in the reform intensity (19% increase in the change in the SOE employment share) is associated with a decrease of 1.4 percentage points in the likelihood of being employed for women relative to men, corresponding to an approximate 2% increase in the gender employment gap. The effect is larger when using the subsample, which is shown in column (3). Overall, the reform can explain 13.3% to 24.5% of the total increase in the employment gap. Columns (2) and (4) show that the reform is associated with a 3.9% to 4.8% increase in the gender earnings gap, explaining about 33% to 36% of the total increase in gender inequality. This increased gender inequality can be driven by the improvement of men's labor market outcomes, the deterioration of women's labor market outcomes, or both. The insignificant $\beta_5$ across all four columns in Table 2 suggests that men are not affected by the reform; that is, only women are negatively impacted.

I present these results by controlling for a series of individual characteristics, prefectural fixed effects, and time fixed effects, thus considering time-invariant unobserved prefectural characteristics and common shocks to all prefectures that could affect the outcomes.[21] These results suggest that women are more likely than men to leave the labor market in the labor market restructuring process. Moreover, for those who are working, women earn much less than men even if they have the same pre-market individual characteristics.

## 5.2 Robustness Check

In this section, I first present results from employing three methods to support the parallel trend assumption. Then, I further discuss some other possible confounding events that

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[21]The results are also robust to including prefecture specific time trends.

happened between 1988 and 2007. Last, I present the results from the IV strategy.

### 5.2.1 Falsification Test

Ideally, the gender gap would show a parallel trend before the SOE reform in more affected and less affected areas. But the reform intensity, which is measured as the change in the SOE employment share, is a continuous variable. Therefore I divide the areas into high-intensity (above mean) areas versus low-intensity areas of change in the employment share, and plot the gender gaps in Figure 3. The figure shows that the gender gap in both employment and earnings in these two areas had clear parallel trends until 1995. After the reform, the gender gap in employment increased much faster in high-intensity areas than in low-intensity areas; it sharply increases in the high-intensity area and significantly decreases in the low-intensity area after 2002.

In addition, I conduct a pseudo-policy evaluation experiment and present the results in Table A.5. The idea is to assume that the SOE reform happened sometime between 1988 and 1995. Hence, I should not find any effects by studying this pseudo-SOE reform. The null results from the table confirm this assumption, and this experiment provides additional evidence to support the validity of using the triple differences strategy.

For the last placebo test, I conduct a permutation test in which I randomly permute treatment variables within the sample. For each permutation, the timing of the SOE reform and the intensity are randomly chosen. Individuals' exposure to different treatment variables are then assigned accordingly.[22] Figure A.5 displays the empirical distributions of the placebo treatment effects on outcome variables from 1,000 permutation tests. The distribution being centered at zero is assuring as these placebo tests are expected to find no impacts. Specifically, in panel A, when I compare the treatment effects that are based on actual exposure, the results show that less than 1% of the time permutation estimates are larger than the estimates of the actual treatment. In panels B and C, the results suggest that none of the 1,000 permutation estimates are larger than the actual treatments' estimates. This result confirms that the effect of the reform is statistically significant.

### 5.2.2 Access to the World Trade Organization and Migration

One possible confounding event is China's entry into the World Trade Organization in 2001. Due to the significant decrease in import and export tariffs, many foreign companies started to set up firms in different areas. This event may impact the calculation of the

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[22]Permutation tests have recently been used in the following papers: Agarwal et al. (2014), Bloom et al. (2012), and Chetty et al. (2011).

change in the SOE employment share. However, massive layoffs lasted for about six years, and thus I am able to restrict the calculation to the time between 1995 and 2001. Although the change in the SOE employment share cannot perfectly capture the reform intensity since non-SOE firms already grew up even in the 1990s, this restriction will, to a large extent, help relieve the concern of measurement error.

Another potential confounding factor is migration. From 1990 to 2000, millions of people from the rural west part of China migrated to the east to work. Intuitively, the huge inflow and outflow of migrant workers will bias the calculation of the change in the SOE employment share. For example, it is possible that the decrease in the SOE employment share in some areas is driven by the increase in the number of workers in non-SOE sectors instead of the massive layoff. However, due to the strict household registration system *"hukou,"* my definition of urban workers does not include any workers who are not registered officially; as a result, the existence of migrant workers will not affect the measurement of reform intensity.[23] To the extent that there may be any measurement error in the data collection process, I drop those prefectures to which most migrant workers would go during that time period. Appendix Table A.9 presents the results, which are similar to the results before.[24] The table shows that the reform affects women negatively in employment and monthly earnings and women are more likely to retire earlier than men.

### 5.2.3   IV Strategy

Table 3 shows the IV results of the IV strategy. Column (1) presents the first-stage regression results using Equation 3 and suggests a strong positive relationship between the change in the SOE employment share and the Bartik intensity index. Furthermore, by using the Bartik intensity index as an instrument, I find that the SOE reform has increased gender inequality as shown in columns (2) and (3). The magnitude of the point estimates is larger than the triple differences estimation. Specifically, a one standard deviation (20%) increase in the reform intensity causes the gender gap in employment to increase by 6.9 percentage points and the gender monthly earnings gap to increase by 8.4%. Again, all these effects are driven by women, and men are not affected by the reform. Women are more likely to leave the labor market than men and are paid less even if they work. The

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[23]Usually, migrant workers were not entitled to enjoy any of the benefits or rights that belonged to urban residents. In addition, it was almost impossible for them to work in SOEs. They also tended to work part-time jobs and jobs with no contracts, and they are usually not officially registered (Meng and Zhang, 2001).

[24]Most of these migrant workers were working in one particular province, Guangdong, during that time period.

effects are larger in areas with higher reform intensity.

The reduced-form estimation results are presented in Appendix Table A.6, which provides findings consistent with the IV and the triple differences analysis. A one standard deviation increase in the Bartik intensity index is associated with a 3.1 percentage point increase in the gender employment gap and a 3.8% increase in the gender earnings gap. I also find that women are 2.9 percentage points more likely to retire earlier than men if the intensity increases by one standard deviation.

The IV analysis relies only on a partial sample (37 prefectures) due to data limitations, so it is not suitable to compare the precision between the triple differences and the IV estimation. To have a more representative sample, I present all the following results using the OLS regression, but they are robust to using the IV regression.

# 6   Mechanisms

In this section, I explore the possible channels through which women performed worse than men in the labor market. I categorize the channels into two groups. The first one is economic factors, such as housework specialization and job segregation. The second one is the norm factor, for which I provide suggestive evidence on the persistent influence of traditional gender norms.

## 6.1   Economic Factors

First, women disproportionately leaving the labor market could be voluntary or involuntary. According to the U-shaped theory, women's labor force participation follows a U shape along with economic growth (Goldin, 1994, 2006; Gaddis and Klasen, 2014). In a developing country in the process of industrialization—when transitioning from an agricultural-dominant economy to a manufacturing-dominant one, women will leave the labor market to specialize in housework because of their comparative advantage. If this hypothesis is true in my context, I should observe an increased gender gap in employment detected in higher-income households rather than in lower-income ones. Table 4 shows the effects of the SOE reform on the gender gap in employment by different income and education groups. $\beta_1$ across columns (1) and (2) suggests that there is no significant difference between high- and low-income families. Furthermore, the results from columns (3) and (4) show that the increased gender employed gap is almost entirely driven by low-educated groups, which suggests that the demand for low-skilled women may have decreased because of the reform.

Another important reason behind women disproportionately leaving the labor market is that they may need to take care of their children, which used to be covered by the government in the pre-reform period. In the context of China, it is also a tradition for grandmothers to help care for grandchildren (Chen et al., 2000; Zhang et al., 2019). To explore this possibility, I augment a triple differences approach to examine whether the age path of the estimated impact on gender gaps changes as a function of exposure to the SOE reform.

The augmented regression model takes the following form:

$$
Y_{igpt} = \alpha + \sum_{g=1}^{12} \beta_{1g} Female_i \times After_t \times \Delta EmpShare_p \times g + \sum_{g=1}^{12} \beta_{2g} Female_i \times After_t \times g
$$

$$
+ \sum_{g=1}^{12} \beta_{3g} Female_i \times \Delta EmpShare_p \times g + \sum_{g=1}^{12} \beta_{4g} After_t \times \Delta EmpShare_p \times g + \tau_g
$$

$$
+ \beta_5 Female_i + \gamma_p + \delta_t X'_{igpt} + \varepsilon_{igpt},
$$

(6)

where $g$ represents 12 age categories between the ages of 19 and 54. The respective coefficients $\beta_{1g}$ map out the age pattern in the gender gap in response to the reform. $\tau_g$ is age fixed effects, and all other variables in the equation are the same as in Equation 2.

Figure 4 presents the results; for each panel, the x-axis represents 12 age categories. Each point shows the effect on a specific age group with 90% confidence intervals. In panel (a), I find that the effect on employment is almost entirely driven by age between the 43–45, 46–48, 49–51, and 51–54 groups. These women are already beyond childbearing age. As a result, I can rule out the possibility that the existence of children is the reason for women disproportionately leaving the labor market. However, it is true that I cannot rule out the possibility that this group of women leave the labor market because of their family responsibility to take care of their grandchildren.

Second, for women who stay in the labor market, I find that they receive less income than men. More accurately, I find that the increased gender earnings gap is driven by the age groups between 30 and 42, as shown in panel (b) of Figure 4. These prime-age female workers already accumulated years of work experience and may have already finished sorting into certain industries or occupations. In addition, most of them have to bear most of the family responsibilities. In order to explore the importance of these factors, I add a series of controls and present the regression results in Table 5. Column (1) shows the baseline results, while in columns (2) to (6) I add work industries, occupations, the

presence of a pre-school age child, household income, and the work unit ownership as additional control variables one by one.[25]

The literature suggests that women are more likely to sort into lower-paying jobs than men, such as low-skilled service jobs, and as a result, industry or occupation segregation plays an important role in the gender earnings gap (Padavic and Reskin, 2002). To test this idea, I control for industry and occupation in columns (2) and (3) in Table 5 and find that the gender earnings gap decreases by approximately 13% and 4%, respectively.[26] In addition, having children in the household may decrease women's work productivity and thus their salary (Adda et al., 2017). Therefore I control for the presence of pre-school age children and find that it plays a small role in the increased gender earnings gap. Last, many studies find that the reformed SOEs provide better social security than private firms in the first several years of marketization, so I control for work unit ownership in the column (6) and find it can explain about 10% of the increased gap.[27]

One more argument for the increased gender earnings gap is that women may be more likely to work part time. To consider the influence of work hours, I add it as another control and show the results in column (1) in Appendix Table A.10. Column (2) shows the results by controlling for the Chinese Communist Party membership. I also revise my employment definition to include both self-employed workers and full-time workers and show the results in Appendix Table A.11. Overall, I find that work hours explain part of the increased gender earnings gap but Chinese Communist Party membership does not. Including the self-employed workers does not change the results either.

Appendix Tables A.7 and A.8 show additional results by full sample (OLS) and sub-sample (IV), respectively. They show a consistent picture that older and lower-educated women (under age 40) are disproportionately leaving the labor market, while higher-educated women are not affected by the SOE reform.[28] The increased gender earnings gap is driven by the younger cohort (under age 40), and the effect is larger in relatively higher-educated groups than lower-educated ones.

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[25]I do not include marital status as another control because more than 90% of individuals over 30 years are married in the sample.

[26]The CHIP datasets record occupations in following categories: (1) private firm owner, (2) professional worker, (3) officer, (4) skilled blue-collar worker, (5) unskilled blue-collar worker, and (6) others. I indeed find that women are more likely to sort into unskilled blue-collar worker groups. Work industries are coded at the two-digit level; more women than men work in the service industry, such as commerce and real estate.

[27]As an additional analysis, I do find that working women are 2.4 percentage points more likely to sort into private sectors due to the SOE reform, as shown in column (3) of Appendix Table A.10.

[28]Adding the controls of household income and the presence of pre-school age children does not change the results, which are shown in Appendix Table A.12.

## 6.2 Persistence of Traditional Gender Norms

The central government enforced gender equality in the labor market outcomes for over 40 years, but did this enforcement change social discriminatory attitudes toward women once it was lifted? A challenge in answering this question is determining how to properly measure traditional gender norms. In this section, I rely on China's special culture to construct two different proxies and provide some suggestive evidence to shed light on the mechanism of traditional gender norms.

China has a long history of gender discrimination, which is shown by the extremely unbalanced sex ratio at birth (Qian, 2008). This phenomenon is not uncommon in many other Asian countries, such as South Korea and northwest India. I take advantage of the fact that the son preference culture might vary across regions and that, as a result, sex ratios at birth might be different in different places (Jayachandran, 2015). In other words, the sex ratio at birth could be used as a signal to proxy traditional gender norms. Since I do not have access to birth registries, I use 1990 census data to calculate the sex ratio for those cohorts under age 10 in order to proxy for existing gender norms. I then divide the prefectures into high and low sex ratio areas and study whether women are affected differently in these two areas. It is crucial to use pre-reform data because they will rule out the possibility that the variation of the sex ratio is driven by the SOE reform.

Panel (b) of Figure 2 shows the regional distribution of the sex ratio at birth. The deeper color corresponds to the more unbalanced male-to-female sex ratio areas, which shows the greater influence of traditional gender norms. Comparing this with panel (a) in the same figure, we observe that there is a regional variation in the layoff intensity, indicating that gender inequality that also differs across regions, and a cross-regional difference in traditional gender norms.

Table 6 shows the OLS estimation results.[29] First and foremost, I find that for employment and earnings, the effects are almost entirely driven by the high sex ratio areas. For example, $\beta_1$ in column (2) suggests women are less likely to be employed in areas where there is a high sex ratio at birth. A one standard deviation increase in the SOE reform intensity is associated with a 3.4 percentage point increase in the gender employment gap; this effect is not detected in low sex ratio areas. In columns (3) and (4), the results show that a one standard deviation (20%) increase in the SOE reform intensity is associated with an increase of 12% in the gender earnings gap in high sex ratio areas, while a negative but insignificant effect is found in low sex ratio areas.[30]

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[29]The result from the IV estimation is similar.

[30]One concern in using sex ratios to proxy for gender discrimination is that the variation of sex ratios by regions may be driven by the availability of prenatal sex selection technology. However, the ultrasound

Although the sex ratio at birth is a well-established proxy for gender-biased culture in the literature, it may not necessarily represent the historical roots of traditional gender attitudes in the context I study. The major reason is that the Communist Party came to power around the 1950s and the contemporary regional variation in the sex ratio at birth may have been due to the government intervention being uncorrelated with the culture. To proxy for the gender-biased culture before the 1950s, I use a number of genealogies collected at the county level from historical gazetteers. Genealogy records allow one to trace their own family's patriarchal lineages all the way back to ancient Confucian China (Wilson, 1995; Makeham, 2003). Since one core value of Confucianism is that women are less capable and valued less than men, I use the regional variation of genealogy records to proxy for the intensity of traditional gender norms. In other words, areas with more genealogy records have stronger and more persistent gender-biased norms.

Panel (c) of Figure 2 presents the regional variation of genealogy; the darker the color, the more genealogies recorded. Combining panels (a), (b), and (c), we can observe a pattern of high-intensity SOE reform areas consistently matching with areas that demonstrated higher sex ratios at birth as well as higher intensities of genealogies. In other words, visually, more mass layoffs seem to have happened in areas where traditional gender norms persisted more strongly.

Again, I divide the areas I study into two groups: low-genealogy-intensity areas versus high-genealogy-intensity areas. I then investigate the impact of the SOE reform on gender inequality by comparing these two different groups. Table 7 shows the results on employment and earnings, separately. First, I find that the increased gender gaps are almost detected in areas with more genealogies, which is consistent with using the sex ratio at birth as a proxy, although the effects are not as significant. Second, columns (1) and (2) show that the effect on the gender employment gap is twice as large in areas with more genealogies than in areas with fewer, although the difference is not significant.[31] The results from columns (3) and (4) suggest that the gender earnings gap has increased by about 4% and this is almost entirely driven by areas with a high intensity of genealogies. The effect is statistically significant at the 5% level.

In summary, using two different variables to proxy for traditional gender-biased norms, I find consistent results. Increased gender inequality in the labor market outcomes is detected almost entirely in areas where traditional gender norms persist more strongly.

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machine was first introduced to China in the early 1980s, and by 1987, every county had been equipped with six machines, on average (Almond, 2010; Chen et al., 2013). Even if the sex ratio is driven by such a supply-side factor, it may still be a result of different tastes for boys and girls.

[31]The size of the point estimate from IV analysis in the areas with more genealogy records is much larger than in the areas with fewer, and both are significant at the 5% level.

# 7 Conclusions

One of the most noticeable achievements in the past several decades in our society is the promotion of gender equality in almost every aspect of human activity (Goldin, 2014; Bertrand and Duflo, 2017). Recently, researchers have shifted focus to understanding the role of gender norms on the persistent sizable gender gap in politics, high earnings, and high-status occupations (Bertrand et al., 2015, 2016). Many developed countries have implemented various policies to enforce gender equality in some specific occupations, and researchers have also conducted a series of randomized controlled trials in developing countries to cultivate gender equality ideology in children; however, current research does not find consistent, significant, and positive effects from these policies. This paper contributes to this area by studying a unique historical period in China between 1970 and the 1990s in which the central government had been cultivating gender equality ideology in its citizens, setting up laws to ensure gender equality, and, more importantly, implementing a central planning labor arrangement to guarantee an extremely high participation rate among women in the labor force, along with a low gender earnings gap.

Did this 40-year-plus period of strict government intervention change people's attitudes toward the appropriate roles of men and women in society? My research suggests that the answer is no. In this paper I employ both triple-differences and IV strategies to study the causal effects of the SOE reform that occurred in the late 1990s on gender inequality in the labor market. This reform provides a good opportunity to examine whether traditional gender norms still play a role in the post-reform free labor market. The difference-in-differences and IV strategies produce similar results, indicating that the reform disproportionately and negatively affects women. These two methods should be considered as complements to each other since triple differences estimates may have more power by using a larger sample, while IV estimates tend to generate unbiased results.

Both the triple differences and IV estimation results suggest that the increased gender employment gap is more likely a result of the decreased demand for low-skilled female workers rather than due to housework specialization. Occupation segregation and family responsibilities also play some role in the increased gender earnings gap. More importantly, I provide suggestive evidence to shed light on the importance of traditional gender norms in the increased gender gaps. I rely on geographic variation in the sex ratio at birth and patriarchal genealogy records to proxy the strength of gender norms, and the results suggest that gender gaps have increased in areas with high male-to-female sex ratios and areas with more genealogy records.

My analysis is subject to caveats. First, although I can reject several hypotheses that

may explain the increased gender inequality, I could not rule out all possibilities. For example, it is difficult to argue the role of the individual's preference in leaving the labor market with empirical data. Also, due to data limitations, the results from the IV strategy and the difference-in-differences strategy are difficult to compare. Last, I could only provide suggestive evidence on the persistence of traditional gender norms. More research is needed in this direction to test how social norms actually affect women's labor supply decisions.

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# 8 Figures and Tables

Figure 1: Share of Urban Labor Force Working in SOEs
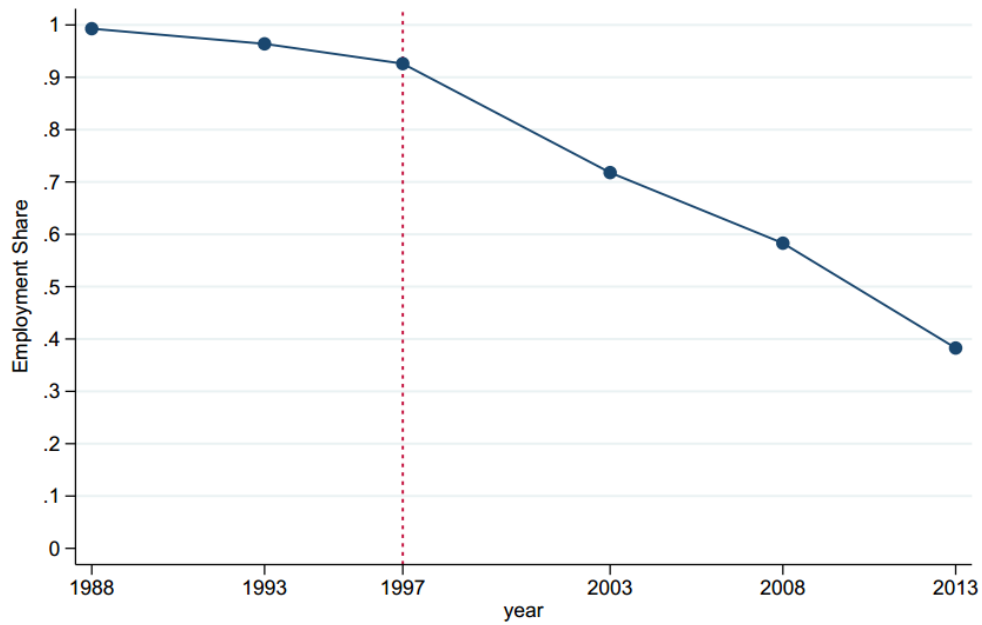


Note: This figure reports the percentage of workers who work in state-owned enterprises (SOEs) from 1988 to 2013 in urban China.
Sources: The data come from the Comprehensive Statistical Data and Materials on 50 Years of New China and the China Statistic Yearbook (2004, 2009, 2014). SOEs include central SOEs, local SOEs, and collective-owned firms in urban areas.

## Figure 2: Regional Variation in Change of SOE Employment Share, Sex Ratio and Genealogy

### (a) Change of SOE Employment Share



Regions not covered
0.003–0.19
0.19–0.296
0.296–0.373
0.373–0.488
0.488–0.648

### (b) Sex Ratios



Regions not covered
0.46–0.48
0.48–0.50
0.50–0.52
0.52–0.54

### (c) Genealogy



Regions not covered
≤ 10000
10000–50000
50000–100000
100000–350000
350000–500000
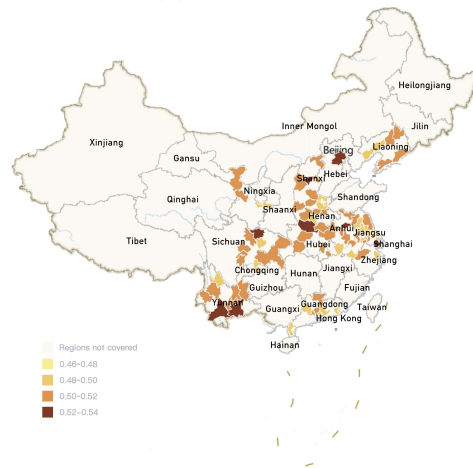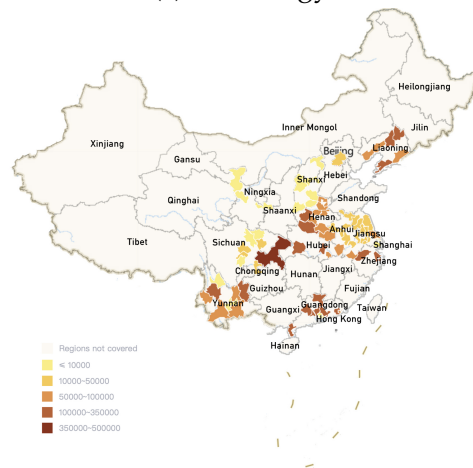
Notes: Figure (a) reports the change in the SOE employment share in each prefecture; the darker the color, the bigger the change. Figure (b) shows the sex ratios of the under age 10 population (number of men/number of women); the darker the color, the higher the number. Figure (c) shows the number of genealogy records in each prefecture; the darker the color, the more genealogies collected in that prefecture.
Sources: (a) The data come from the China Provincial Statistical Yearbook and the China Labor Statistical Yearbook (1996, 2002); the white color refers to regions not covered by the CHIP survey or there are no data available. (b) The data come from the 1990 census. (c) The data come from historical gazetteers.

## Figure 3: Parallel Trend Assumption Test

### (a) Employment
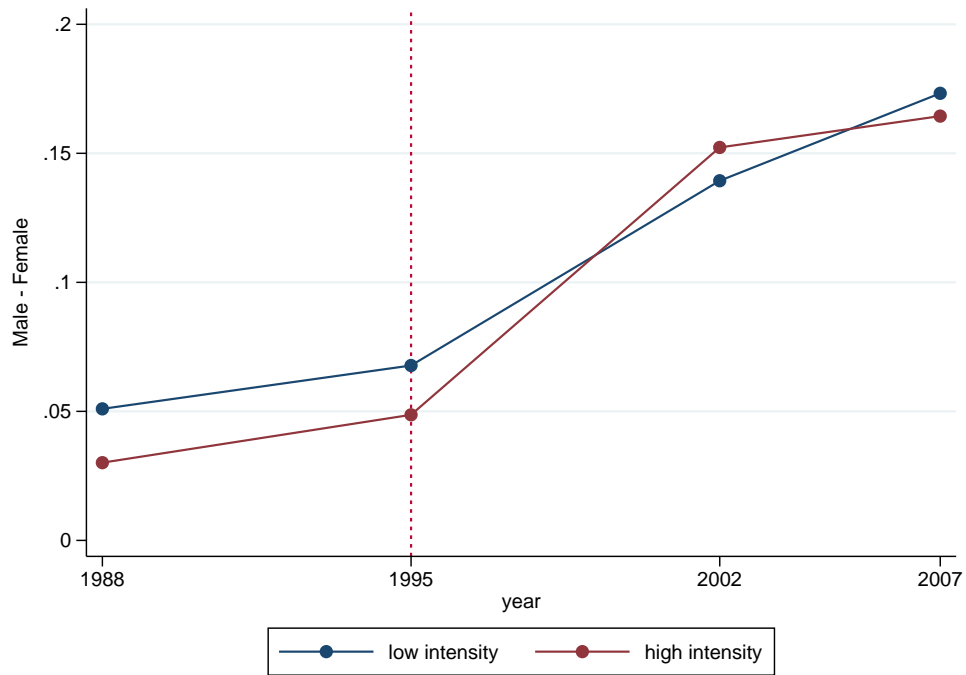


### (b) ln(Monthly Earnings)
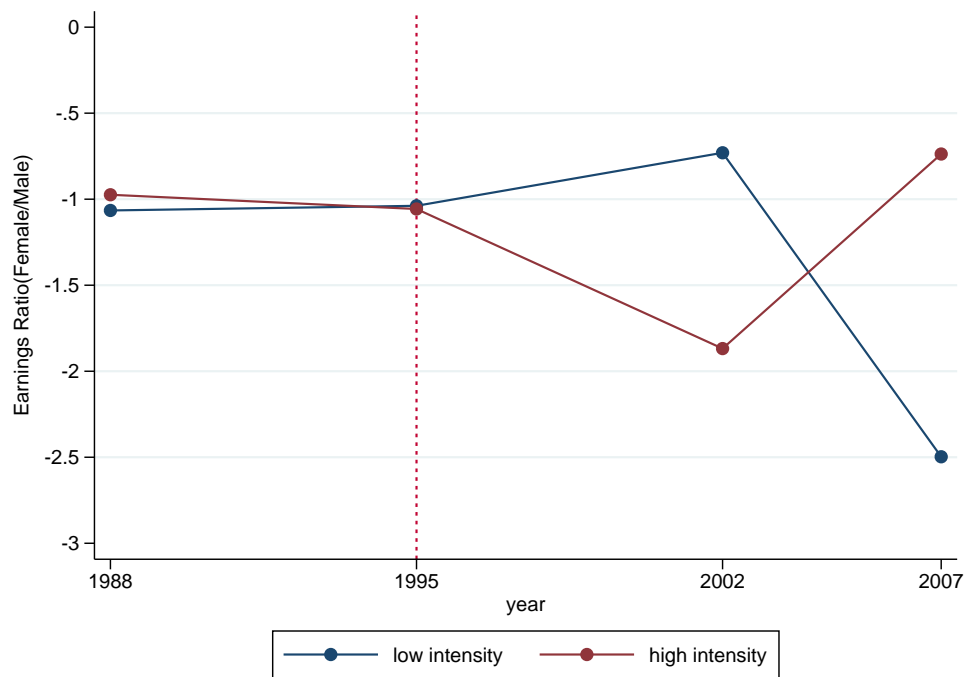


Notes: Figure (a): Each dot represents the difference of residuals between men and women. Figure (b): Each dot represents the ratio of residuals between women and men. The residuals are predicted from the regressions of either one of the two outcomes (employed and ln(monthly earnings)) on age, age squared, years of schooling, ethnicity, prefecture, and year dummies. The sample includes individuals between ages 19 and 54. Figure (b) includes individuals who report they are currently employed full time. Monthly earnings are deflated at the 2014 price level. The mean of the change of the employment share is 0.31. High-intensity areas include prefectures with a change in the SOE employment share above the mean, while the low-intensity areas are those areas with a change in the SOE employment share below the mean.
Sources: Individual-level data are drawn from the CHIP (1988, 1995, 2002, and 2007). Data on the change in the employment share come from the Provincial Statistical Yearbook (1995, 1996) and the China City Statistical Yearbook (1995, 1996, and 2002).

Figure 4: OLS Estimate Coefficients of the Reform's Impacts

(a) Employment
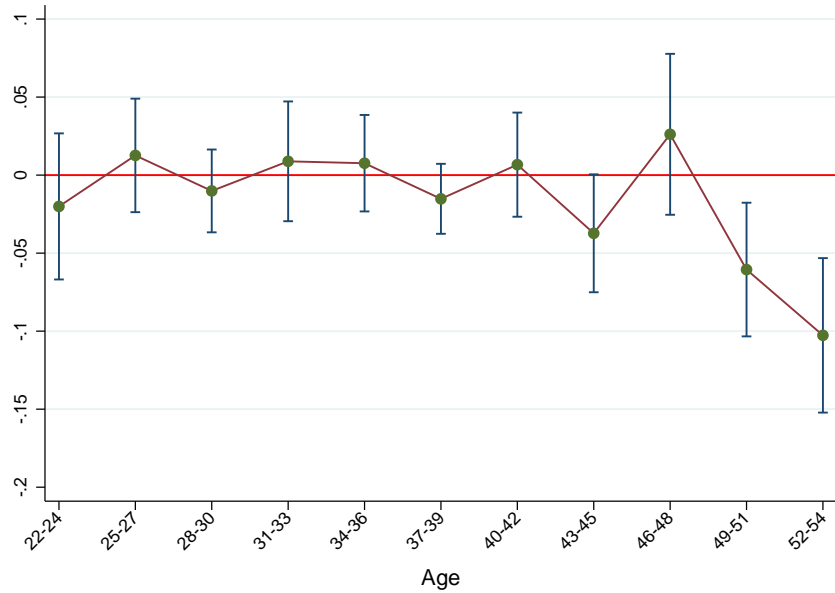


(b) ln(Monthly Earnings)
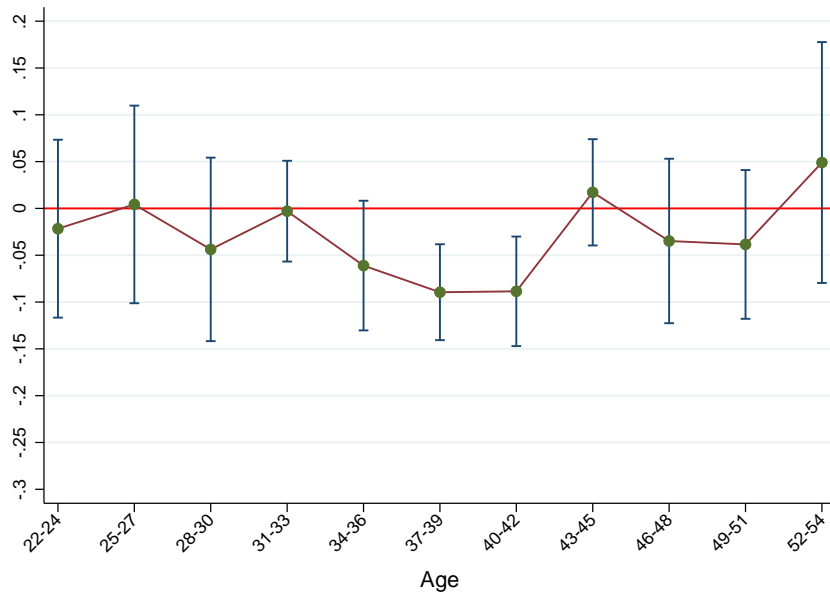


Notes: These figures graph the estimates $\beta_{1g}$ from Equation 6. The outcomes are employment (top) and ln(monthly earnings) (bottom). The dot and bar correspond to the coefficient estimates with 90% confidence intervals.
Sources: Individual-level data are drawn from the CHIP (1988, 1995, 2002, and 2007). Data on the change in the employment share come from the Provincial Statistical Yearbook (1995, 1996) and the China City Statistical Yearbook (1995, 1996, and 2002).

## Table 1: Summary Statistics of Key Variables: 1988–2007

|  | Before (1988 and 1995) | After (2002 and 2007) |
|---|---|---|
| *Panel A: Selected labor market outcomes* | | |
| Monthly earnings (in year 2014 RMB) | 587.29 | 1823.22 |
|  | (359.72) | (2080.53) |
| Currently employed full time (%) | 0.91 | 0.71 |
|  | (0.28) | (0.46) |
| Retired (%) | 0.04 | 0.09 |
|  | (0.19) | (0.29) |
| Work in private sector | 0.03 | 0.53 |
|  | (0.17) | (0.50) |
| *Panel B: Individual characteristics* | | |
| Female (%) | 0.51 | 0.51 |
|  | (0.50) | (0.50) |
| Age | 36.76 | 38.93 |
|  | (9.74) | (9.89) |
| Minority (%) | 0.04 | 0.03 |
|  | (0.20) | (0.17) |
| Years of schooling | 9.92 | 11.39 |
|  | (2.92) | (3.25) |
| Potential work experience | 21.11 | 21.81 |
|  | (10.29) | (11.27) |
| CCP (%) | 0.21 | 0.24 |
|  | (0.41) | (0.43) |
| Observations | 31,235 | 21,135 |

Note: Unweighted means and standard deviations are presented. Individuals are between ages 19 and 54, and potential work experience is calculated as years of schooling minus age plus 6. CCP refers to the Chinese Communist Party.

Sources: Data are drawn from the CHIP (1988, 1995, 2002, and 2007).

## Table 2: OLS Estimates of the Reform's Impacts

| Dependent variable | All | | Subsample | |
|---|---|---|---|---|
| | Employed | ln(Monthly earnings) | Employed | ln(Monthly earnings) |
| Mean | 0.83 | RMB1068.25 | 0.82 | RMB1294.63 |
| St.dev. | 0.38 | RMB1458.28 | 0.39 | RMB1752.63 |
| | (1) | (2) | (3) | (4) |
| Female $\times$ after $\times$ $\Delta$emp share, $\beta_1$ | -.014** | -.039** | -.024** | -.048*** |
| | (.007) | (.016) | (.012) | (.014) |
| Female $\times$ after, $\beta_2$ | -.105*** | -.118*** | -.098*** | -.132*** |
| | (.009) | (.014) | (.014) | (.019) |
| Female, $\beta_3$ | -.054*** | -.123*** | -.049*** | -.099*** |
| | (.004) | (.010) | (.005) | (.013) |
| Female $\times$ $\Delta$emp share, $\beta_4$ | .015*** | .002 | .010 | -.008 |
| | (.005) | (.019) | (.007) | (.012) |
| After $\times$ $\Delta$emp share, $\beta_5$ | .002 | -.017 | .005 | .034 |
| | (.010) | (.025) | (.016) | (.054) |
| Obs. | 47,522 | 37,829 | 25,450 | 19,427 |
| Number of prefectures | | 80 | | 37 |

Notes: Individuals are between ages 19 and 54. Monthly earnings are deflated at the 2014 year level. Columns (3) and (6) include individuals who report they currently have a full-time job. The subsample includes 37 prefectures with the pre-reform number of SOE workers by industry. All models include age, age squared, years of schooling, ethnic minority, prefecture fixed effects, and year fixed effects. Reported robust standard errors are clustered at the prefecture level. The change in the SOE employment share has been standardized to have a mean equal to 0 and a standard deviation equal to 1. * significant at 10%, ** significant at 5%, *** significant at 1%.

## Table 3: 2SLS Estimates of the Reform's Impacts

| | First stage | IV | |
| --- | --- | --- | --- |
| Dependent variable | Δemp share | Employed | ln(Monthly earnings) |
| Mean | 0.33 | 0.82 | RMB1294.63 |
| St.Dev. | 0.13 | 0.39 | RMB1752.63 |
| | (1) | (2) | (3) |
| Bartik intensity | 0.400*** | | |
| | (0.122) | | |
| Female $\times$ after $\times$ Δemp share, $\beta_1$ | | -0.069** | -0.084* |
| | | (0.028) | (0.044) |
| Female $\times$ after, $\beta_2$ | | -0.082*** | -0.117*** |
| | | (0.016) | (0.019) |
| Female, $\beta_3$ | | -0.050*** | -0.103*** |
| | | (0.005) | (0.011) |
| Female $\times$ Δemp share, $\beta_4$ | | 0.011 | 0.014 |
| | | (0.013) | (0.033) |
| After $\times$ Δemp share, $\beta_5$ | | -0.038 | -0.016 |
| | | (0.039) | (0.093) |
| F-statistics | 12.15 | | |
| p-value | 0.00 | | |
| Obs. | 25,502 | 25450 | 19,427 |

Notes: Individuals are between ages 19 and 54. Monthly earnings are deflated at the 2014 year price level. Column (3) includes individuals who report they currently have a full-time job. The subsample includes 37 prefectures with the pre-reform number of SOE workers by industry. Column (1) includes age, age squared, years of schooling, ethnic minority, and year fixed effects. Columns (2) and (3) include age, age squared, years of schooling, ethnic minority, prefecture fixed effects, and year fixed effects. Reported robust standard errors are clustered at the prefecture level. The change in the SOE employment share has been standardized to have a mean equal to 0 and a standard deviation equal to 1. The Bartik intensity has been standardized to have a mean equal to 0 and a standard deviation equal to 1. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 4: Estimates of the Reform's Impact on Employment, by Household Income and Education Attainment

|  | High | Low | Edu>=High School | Edu<High School |
|---|---|---|---|---|
|  | (1) | (2) | (3) | (4) |
| Female $\times$ after $\times$ $\Delta$emp share, $\beta_1$ | -.014 | -.014** | .010 | -.049*** |
|  | (.010) | (.007) | (.008) | (.013) |
| Female $\times$ after, $\beta_2$ | -.066*** | -.130*** | -.089*** | -.181*** |
|  | (.012) | (.010) | (.009) | (.015) |
| Female $\times$ $\Delta$emp share, $\beta_3$ | .008 | .017*** | .0001 | .035*** |
|  | (.006) | (.006) | (.004) | (.009) |
| After $\times$ $\Delta$emp share, $\beta_4$ | .017 | -.009 | -.003 | .005 |
|  | (.015) | (.009) | (.009) | (.022) |
| Female, $\beta_4$ | -.039*** | -.061*** | -.012*** | -.104*** |
|  | (.004) | (.005) | (.003) | (.007) |
| Obs. | 19,255 | 28,267 | 29,032 | 18,490 |

Notes: Individuals are between ages 19 and 54. All regressions include age, age squared, years of schooling, ethnic minority, year fixed effects, prefecture fixed effects, and prefecture-specific time trends. Reported robust standard errors are clustered at the prefecture level. The change in the SOE employment share has been standardized to have a mean equal to 0 and a standard deviation equal to 1. The high-income group includes households with a monthly income above the mean (**), while the low-income group includes households with a monthly income below the mean. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 5: OLS Estimates of the Impact of SOE Reform on Monthly Earnings (young cohort, age<=40), additional controls

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Female × after × Δemp share, $\beta_1$ | -.046*** | -.040*** | -.044*** | -.043** | -.038** | -.041** | -.030** |
| | (.015) | (.015) | (.015) | (.017) | (.015) | (.016) | (.013) |
| Female × after, $\beta_2$ | -.122*** | -.120*** | -.108*** | -.047** | -.068*** | -.076*** | -.138*** |
| | (.019) | (.018) | (.019) | (.023) | (.018) | (.023) | (.016) |
| Female, $\beta_3$ | -.093*** | -.089*** | -.088*** | -.118*** | -.123*** | -.114*** | -.091*** |
| | (.010) | (.010) | (.011) | (.012) | (.011) | (.011) | (.010) |
| Industry | | Yes | | | | | Yes |
| Occupation | | | Yes | | | | Yes |
| Child under age 6 | | | | Yes | | | Yes |
| Household income | | | | | Yes | | Yes |
| Work in private sector | | | | | | Yes | Yes |
| Adj. R-squared | 0.6192 | 0.6292 | 0.6303 | 0.6130 | 0.6756 | 0.6950 | 0.6987 |
| Obs. | 22603 | 22,338 | 22,351 | 22,603 | 22,601 | 22,141 | 21,802 |

Notes: Monthly earnings are deflated at the 2014 price level. Samples include individuals who report that they currently have a full-time job. All models include age, age squared, years of schooling, ethnic minority, year fixed effects, prefecture fixed effects, and prefectural-specific time trends. Reported robust standard errors are clustered at the prefecture level. The change in the SOE employment share has been standardized to have a mean equal to 0 and a standard deviation equal to 1. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 6: Estimates of the Reform's Impact, by Intensity of Male-to-Female Sex Ratios

| | Employment | | ln(Monthly earnings) | |
| --- | --- | --- | --- | --- |
| | Low | High | Low | High |
| | (1) | (2) | (3) | (4) |
| Female $\times$ after $\times$ $\Delta$emp share, $\beta_1$ | -.008 | -.034** | -.007 | -.067*** |
| | (.009) | (.015) | (.018) | (.013) |
| Female $\times$ after, $\beta_2$ | -.103*** | -.106*** | -.093*** | -.111*** |
| | (.012) | (.015) | (.018) | (.018) |
| Female, $\beta_3$ | -.051*** | -.045*** | -.127*** | -.117*** |
| | (.005) | (.005) | (.014) | (.011) |
| Obs. | 22,032 | 23,076 | 19,881 | 16,918 |

Notes: Individuals are between ages 19 and 54. The first two columns include the full sample. Columns (3) and (4) include individuals who report they currently have a full-time job. Monthly earnings are deflated at the 1988 price level. Low refers to a low male-to-female sex ratio at birth; high refers to a high male-to-female sex ratio at birth. All models include age, age squared, years of schooling, ethnic minority, working industries, year fixed effects, prefecture fixed effects, and prefecture-specific time trends. The sex ratio at birth is calculated by using the 1990 census and is restricted to individuals under age 10. The mean of the sex ratio at birth is 1.09 with a standard deviation of 0.06. Reported robust standard errors are clustered at the prefecture level. The change in the SOE employment share has been standardized to have a mean equal to 0 and a standard deviation equal to 1. The Bartik intensity has been standardized to have a mean equal to 0 and a standard deviation equal to 1. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 7: Estimates of the Reform's Impact, by Intensity of Genealogy

| | Employment | | ln(Monthly earnings) | |
|---|---|---|---|---|
| | Low | High | Low | High |
| | (1) | (2) | (3) | (4) |
| Female×after×Δemp share, $\beta_1$ | -.007 | -.014 | -.022 | -.039** |
| | (.005) | (.021) | (.020) | (.019) |
| Female×after, $\beta_1$ | -.115*** | -.098*** | -.120*** | -.089*** |
| | (.011) | (.014) | (.021) | (.019) |
| Female, $\beta_3$ | -.046*** | -.062*** | -.095*** | -.147*** |
| | (.005) | (.005) | (.010) | (.015) |
| Obs. | 21,784 | 24,026 | 17,830 | 19,672 |

Notes: Individuals are between ages 19 and 54. The first two columns include the full sample. Columns (3) and (4) include individuals who report they currently have full-time job. Monthly earnings are deflated at the 1988 price level. Low refers to prefectures with a lower number of genealogies recorded in county historical gazetteers (mean: 20,400 with st. dev 17.82); high refers to prefectures with a higher number of genealogy (mean: 152,550 with st. dev 152.55). All models include age, age squared, years of schooling, ethnic minority, year fixed effects, and prefecture fixed effects. Reported robust standard errors are clustered at the prefecture level. The change in the SOE employment share has been standardized to have a mean equal to 0 and a standard deviation equal to 1. * significant at 10%, ** significant at 5%, *** significant at 1%.

# 9 Appendix

Figure A.1: Change of SOE employment share

(a) All        (b) Subsample
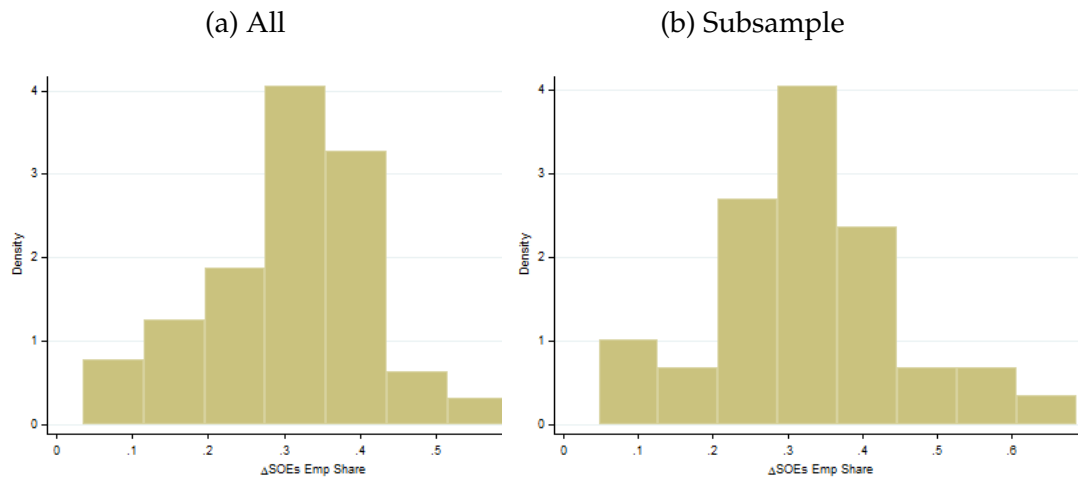


Notes: Bin width: 0.08. Figure (a): the sample includes all 80 prefectures, and the mean is 0.31 with a standard deviation of 0.12. Figure (b): the sample includes 37 prefectures with the pre-reform number of SOE workers by industry; the mean is 0.33 with a standard deviation of 0.13. Δ SOEs Emp share is calculated by following Equation 4. SOEs include the central SOE, the local SOE, and the collective-owned firms in urban areas.
Sources: The data come from Provincial Statistical Yearbook (1995, 1996), China City Statistical Yearbook (1995, 1996, and 2002), and China Labor Statistical Yearbook (1996, 2002).

Figure A.2: Workers' age distribution
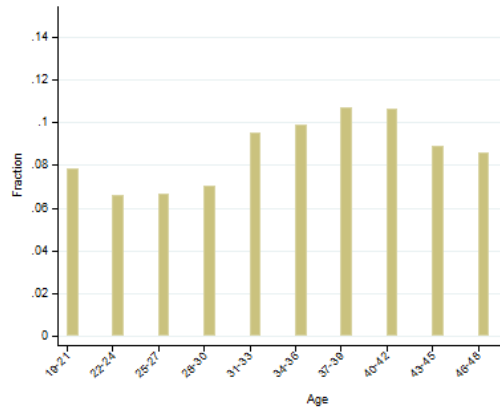
(a) Before (1988 and 1995)          (b) After (2002 and 2007)
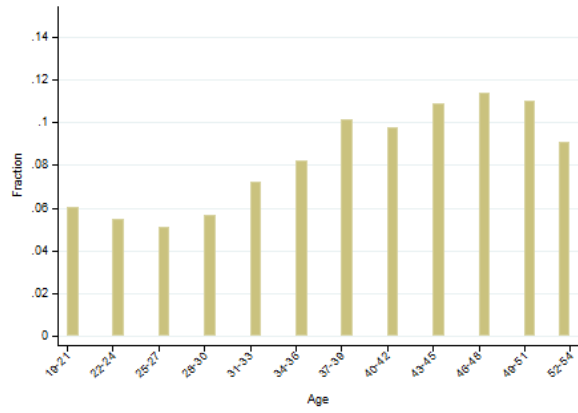


Notes: Bin width: 0.25. These figures show the percentage of workers for 12 age groups from 18 to 54.
Sources: The data come from the CHIP 1988, 1995, 2002, and 2007.

Figure A.3: Relationship between Bartik Shift-share Intensity Index and Change of SOE Employment Share
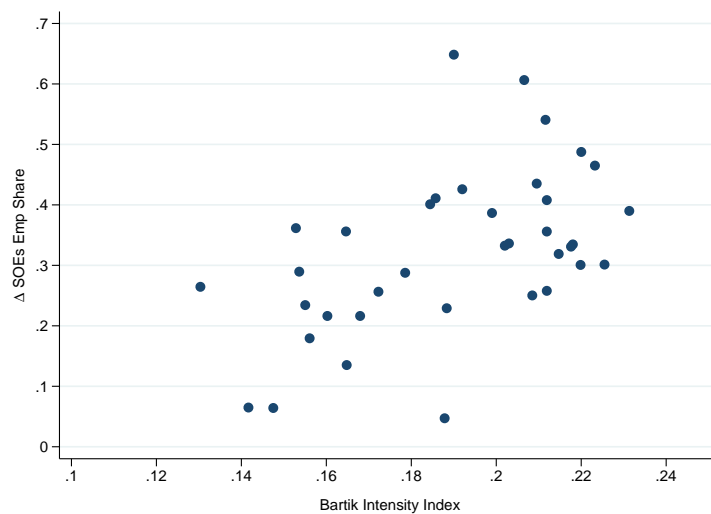


Notes: Bartik Intensity Index$_p$ and $\Delta$ SOE Emp share are calculated by following Equation 5 and Equation 6, respectively.
Sources: The data come from the Provincial Statistical Yearbook (1995, 1996), the China City Statistical Yearbook (1995, 1996, and 2002), and the China Labor Statistical Yearbook (1996, 2002).

Figure A.4: Robustness check: OLS estimate coefficients of the impacts of SOE reform, drop 2007

(a) Employment
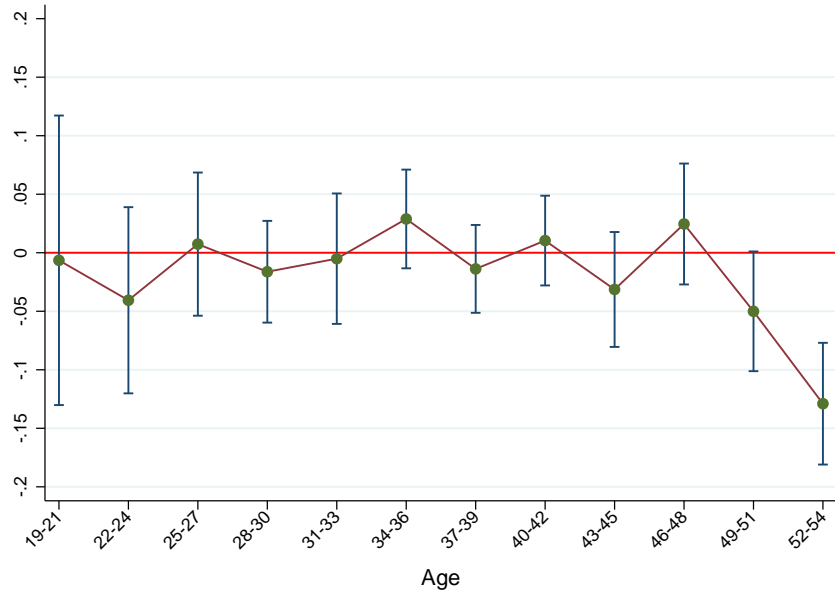


(b) ln(Monthly Earnings)
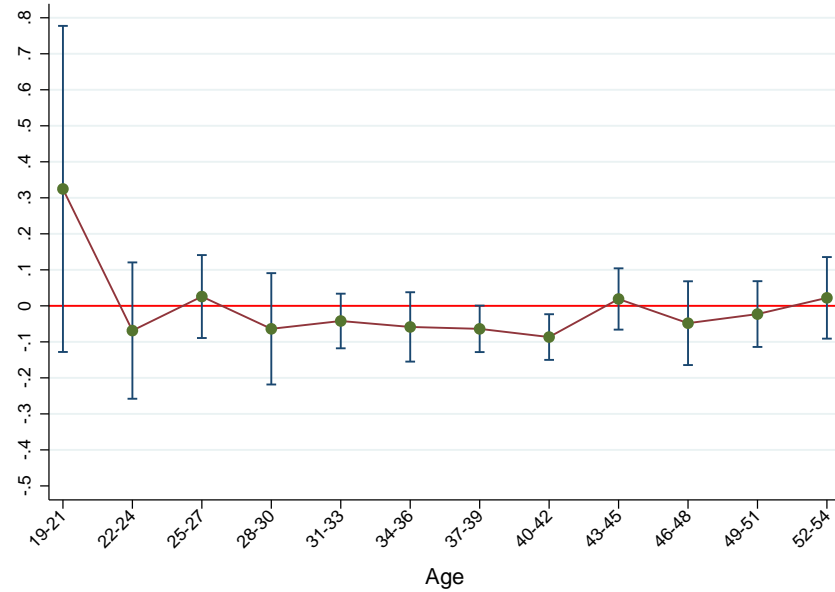


Notes: These figures graph the estimates $\beta_{1g}$ from Equation 6. The outcomes are employment (top) and ln(monthly earnings) (bottom). The dot and the bar correspond to the coefficient estimates with 90% confidence intervals.

Sources: Individual-level data are drawn from the CHIP (1988, 1995, 2002, and 2007). Data come from the Provincial Statistical Yearbook (1995, 1996) and the China City Statistical Yearbook (1995, 1996, and 2002).

Figure A.5: Permutation Test Results, Coefficient of (female*after*Δ SOE emp share $\beta_1$)

(a) Employment



(b) Monthly Earnings



Notes: I assigned placebo treatments in randomly selected years and prefectures drawn without replacement. The histogram displays the coefficient estimates of a triple interaction term: female, after, and Δ SOE Emp share from 1,000 permutations. The vertical line shows the estimates of the actual treatment effect. Female and after are two dummy variables. Δ SOE Emp share is calculated by following the Equation 4. Panel A shows that 1 out of the 1,000 permutation estimates (absolute value) is greater than the actual treatment's estimates, while panel B shows that 0 out of the 1,000 permutation estimates (absolute value) are greater than the actual treatment's estimates.

## Table A.1: Prefectural Pre-reform Share of SOE Workers, by Industry

| Industry | Mean | St.Dev. | Min | Max |
|---|---|---|---|---|
| Mining | 0.018 | 0.026 | 0.001 | 0.117 |
| Manufacturing | 0.418 | 0.086 | 0.233 | 0.542 |
| Electricity, Gas and Water Production and Supply | 0.015 | 0.006 | 0.008 | 0.032 |
| Construction | 0.057 | 0.025 | 0.031 | 0.135 |
| Transport, Storage and Communications | 0.050 | 0.018 | 0.021 | 0.116 |
| Wholesale and Retail Trade, Restaurants | 0.133 | 0.032 | 0.065 | 0.209 |
| Financial Intermediation and Insurance | 0.018 | 0.005 | 0.006 | 0.209 |
| Real Estate Activities | 0.006 | 0.005 | 0.001 | 0.029 |
| Social Services | 0.032 | 0.020 | 0.010 | 0.099 |
| Scientific Research and Polytechnical Services | 0.014 | 0.016 | 0.002 | 0.073 |

Notes: This table shows the percent of SOE workers in ten 2–digit industries in 1995 in urban China. Pre–reform share of SOE workers = (number of SOE workers in industry i at a given prefecture $p_{1995}$/ total number of workers in prefecture area $p_{1995}$) in the urban areas.

Sources: Data for 37 prefectures comes from Provincial Statistical Yearbook 1996, 1995.

Table A.2: National Change of SOE Employment Share, by Industry

| Industry | Δ SOE Employment Share |
|---|---|
| Mining | 0.202 |
| Manufacturing | 0.334 |
| Electricity, Gas and Water Production and Supply | 0.126 |
| Construction | 0.190 |
| Geological Prospecting and Water Conservancy | 0.004 |
| Transport, Storage and Communications | 0.089 |
| Wholesale and Retail Trade, Restaurants | 0.170 |
| Financial Intermediation and Insurance | 0.096 |
| Real Estate Activities | 0.211 |
| Social Services | 0.122 |
| Scientific Research and Polytechnical Services | 0.070 |

Notes: This table shows the national level change of SOE employment share in ten 2–digit industries from 1995 to 2001 in urban China. Δ SOE emp share at the national level = (national number of SOE workers in industry $i_{1995}$ / total number of workers in industry $i_{1995}$) - (national number of SOE workers in industry $i_{2001}$ / total number of workers in industry $i_{2001}$).

Sources: Data comes from China Statistical Yearbook (1996, 2002).

Table A.3: Change of SOE Employment Share and Bartik Shift–share Intensity Index

| | ΔSOE Emp Share$_p$ | | Bartik Intensity Index$_p$ |
| | All | Subsample | Subsample |
| --- | --- | --- | --- |
| Mean | 0.31 | 0.33 | 0.19 |
| St.Dev. | 0.12 | 0.13 | 0.03 |
| Min | 0.04 | 0.05 | 0.13 |
| Max | 0.65 | 0.65 | 0.23 |
| Number of prefectures | 80 | 37 | 37 |

Notes: This table shows the summary statistics of change of employment share and Bartik intensity index. The change of employment share and the Bartik intensity index are calculated by following the Equations 4 and 5, separately.
Sources: Data come from Provincial Statistical Yearbook (1995, 1996), and China City Statistical Yearbook (1995, 1996, and 2002).

## Table A.4: Gender gaps in the labor market

|  | Before | After |
|---|---|---|
|  | 1988 and 1995 | 2002 and 2007 |
| *Panel A: Employed* | | |
| Female | -.056*** | -.152*** |
|  | (.004) | (.009) |
| Male mean | 0.96 | 0.83 |
| Female mean | 0.89 | 0.65 |
| Obs. | 29693 | 20709 |
| *Panel B: Retired* | | |
| Female | .047*** | .114*** |
|  | (.003) | (.008) |
| Male mean | 0.01 | 0.03 |
| Female mean | 0.06 | 0.15 |
| Obs. | 29813 | 20709 |
| *Panel C: ln(Monthly earnings)* | | |
| Female | -.121*** | -.225*** |
|  | (.009) | (.015) |
| Male mean | 634.17 | 2113.47 |
| Female mean | 539.45 | 1513.63 |
| Obs. | 26483 | 14508 |
| *Panel D: Work in private sectors* | | |
| Female | .002 | .071*** |
|  | (.002) | (.009) |
| Male mean | 0.02 | 0.49 |
| Female mean | 0.02 | 0.57 |
| Obs. | 28093 | 14407 |

Notes: Sample includes all individuals between age 19 and 54. Monthly earnings are deflated at the 2014 price level. Robust standard errors are clustered at the prefecture level. Regression controls for age, age squared, years of schooling, ethnicity, prefecture, and year dummies. Panel C include those individuals who report they currently have a full-time job. * significant at 10%, ** significant at 5%, *** significant at 1%.

Sources: Data come from CHIP (1988, 1995, 2002, 2007)

## Table A.5: Placebo test: 1988 and 1995

| Dependent Variable | Employed (1) | ln( Monthly earnings) (2) |
|---|---|---|
| pseuFemale $\times$ after $\times$ $\Delta$emp share, $\beta_1$ | -.006 (.008) | -.013 (.022) |
| pseuFemale $\times$ after, $\beta_2$ | -.015* (.008) | -.035** (.016) |
| Female, $\beta_3$ | -.050*** (.004) | -.113*** (.011) |
| Female $\times$ $\Delta$emp share | .018*** (.005) | .004 (.022) |
| pseuAfter $\times$ $\Delta$emp share | .001 (.006) | .021 (.031) |
| Obs. | 27374 | 24074 |

Notes: I assume that the SOE reform happened some time between 1988 and 1995. Thus, 1995 would be pseudo–after year. I run the same regression as Equation 1 and present the results. Sample includes all individuals between ages 19 and 54. Column (2) includes those individuals who report they currently have a full–time job. Monthly earnings are deflated at the 2014 price level. Robust standard errors are clustered at the prefecture level. All models control for age, age squared, years of schooling, ethnicity, prefecture, and year dummies. Change of SOE employment share has been standardized to have mean equal to 0 and standard deviation equal to 1. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A.6: Reduced form estimates of the impacts of SOE reform

| | Employed | Retired | ln(Monthly earnings) |
|---|---|---|---|
| | (1) | (2) | (3) |
| Female $\times$ after $\times$ Bartik intensity, $b_1$ | -.031*** | .029*** | -.038** |
| | (.011) | (.009) | (.019) |
| Female $\times$ after, $b_2$ | -.105*** | .064*** | -.119*** |
| | (.010) | (.009) | (.018) |
| Female, $b_3$ | -.049*** | .059*** | -.097*** |
| | (.006) | (.004) | (.011) |
| Female $\times$ Bartik intensity, $b_4$ | .004 | -.003 | .010 |
| | (.006) | (.005) | (.011) |
| After $\times$ Bartik intensity, $b_5$ | -.013 | .005 | .0004 |
| | (.008) | (.005) | (.037) |
| Obs. | 25450 | 25494 | 19265 |

Notes: Sample includes all individuals between ages 19 and 54. Monthly earnings are deflated at the 1988 price level. All regressions control for age, age squared, years of schooling, working experience, working experience squared, ethnicity, prefecture dummies, year dummies, and prefecture specific time trend. Column(3) include individuals who report they currently have a full–time job and also control for working industries. Bartik intensity has been standardized to have mean equal to 0 and standard deviation equal to 1. * significant at 10%, ** significant at 5%, *** significant at 1%.

## Table A.7: OLS estimates of the impacts of SOE reform, by demographic group (full sample)

| Dependent Variable | Age<=40 | | | Age>40 | | |
|---|---|---|---|---|---|---|
| | Employed | Retired | ln(Monthly earnings) | Employed | Retired | ln(Monthly earnings) |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| *Panel A: Pooled* | | | | | | |
| Female $\times$ after $\times$ $\Delta$emp share, $\beta_1$ | -.002 (.007) | .0007 (.001) | -.039*** (.015) | -.035*** (.014) | .029*** (.007) | -.019 (.027) |
| Female $\times$ after, $\beta_2$ | -.058*** (.008) | -.0009 (.002) | -.122*** (.019) | -.120*** (.015) | .095*** (.013) | -.097*** (.024) |
| Female, $\beta_3$ | .005 (.004) | .0009 (.0007) | -.089*** (.010) | -.142*** (.007) | .130*** (.007) | -.169*** (.015) |
| Obs. | 27096 | 27166 | 22338 | 20426 | 20481 | 15023 |
| *Panel B: Edu< High School* | | | | | | |
| Female $\times$ after $\times$ $\Delta$emp share, $\beta_1$ | -.015 (.015) | -.0008 (.004) | -.061** (.024) | -.044*** (.016) | .035*** (.011) | -.037 (.035) |
| Female $\times$ after, $\beta_2$ | -.076*** (.015) | -.0006 (.004) | -.158*** (.030) | -.125*** (.017) | .098*** (.017) | -.068** (.029) |
| Female, $\beta_3$ | -.004 (.004) | .0006 (.0008) | -.107*** (.011) | -.188*** (.009) | .164*** (.010) | -.217*** (.022) |
| Obs. | 15097 | 15161 | 12864 | 13389 | 13443 | 9182 |
| *Panel C: Edu>= High School* | | | | | | |
| Female $\times$ after $\times$ $\Delta$emp share, $\beta_1$ | .003 (.008) | .001 (.002) | -.032* (.018) | -.004 (.010) | .012 (.008) | .010 (.025) |
| Female $\times$ after, $\beta_2$ | -.049*** (.011) | -.002 (.002) | -.115*** (.022) | -.107*** (.015) | .105*** (.010) | -.144*** (.031) |
| Female, $\beta_3$ | .017** (.008) | .002 (.002) | -.059*** (.016) | -.061*** (.010) | .060*** (.009) | -.090*** (.010) |
| Obs. | 11999 | 12005 | 9474 | 7037 | 7038 | 5841 |

Notes: Individuals are between ages 19 and 54. Each model also includes age, age squared, years of schooling, ethnic minority, year fixed effects, prefecture fixed effects, and prefecture specific time trend. Column (3) and column(6) include those individuals who report they currently have a full-time job and also control for working industry. Reported robust standard errors are clustered at the prefecture level. Change of SOE employment share has been standardized to have mean equal to 0 and standard deviation equal to 1. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A.8: 2sls estimates of the impacts of SOE reform, by demographic group (Subsample)

| | Age<=40 | | | Age>40 | | |
|---|---|---|---|---|---|---|
| Dependent Variable | Employed | Retired | ln(Monthly earnings) | Employed | Retired | ln(Monthly earnings) |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| *Panel A: Pooled* | | | | | | |
| Female × after × Δemp share, $\beta_1$ | -.013 (.030) | .001 (.004) | -.201** (.101) | -.121*** (.045) | .119** (.050) | .009 (.075) |
| Female × after, $\beta_2$ | -.052*** (.019) | -.003 (.003) | -.099** (.042) | -.079*** (.025) | .059** (.025) | -.135*** (.030) |
| Female, $\beta_3$ | .015*** (.005) | .002*** (.0007) | -.076*** (.015) | -.142*** (.009) | .138*** (.010) | -.133*** (.017) |
| Obs. | 13935 | 13954 | 11228 | 11515 | 11540 | 8199 |
| *Panel B: Edu< High School* | | | | | | |
| Female × after × Δemp share, $\beta_1$ | .007 (.046) | .002 (.009) | -.308* (.168) | -.147*** (.055) | .145** (.064) | .010 (.084) |
| Female × after, $\beta_2$ | -.091*** (.029) | -.002 (.004) | -.120* (.062) | -.076** (.033) | .053 (.032) | -.094** (.045) |
| Female, $\beta_3$ | .007 (.006) | .002** (.0008) | -.087*** (.015) | -.193*** (.014) | .179*** (.015) | -.164*** (.027) |
| Obs. | 7154 | 7172 | 6109 | 7296 | 7320 | 4798 |
| *Panel C: Edu>= High School* | | | | | | |
| Female × after × Δemp share, $\beta_1$ | -.027 (.028) | -.002 (.005) | -.198** (.095) | -.058 (.049) | .057 (.039) | -.003 (.089) |
| Female × after, $\beta_2$ | -.039* (.021) | -.004 (.003) | -.101** (.043) | -.088*** (.025) | .093*** (.018) | -.185*** (.029) |
| Female, $\beta_3$ | -.008 (.013) | .003 (.004) | .113** (.048) | -.012 (.027) | .002 (.025) | -.003 (.031) |
| Obs. | 6781 | 6782 | 5119 | 4219 | 4220 | 3401 |

Notes: Individuals are between ages 19 and 54. Each model also includes age, age squared, years of schooling, ethnic minority, year fixed effects, prefecture fixed effects, and prefecture specific time trend. Column (3) and column(6) include those individuals who report they currently have a full–time job and also control for working industry. Reported robust standard errors are clustered at the prefecture level. Change of SOE employment share has been standardized to have mean equal to 0 and standard deviation equal to 1. Bartik intensity has been standardized to have mean equal to 0 and standard deviation equal to 1. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A.9: Estimates of the impacts of SOE reform, drop Guangdong province

| Dependent variable | OLS | | | IV | | |
|---|---|---|---|---|---|---|
| | Employed | Retired | ln(Monthly earnings) | Employed | Retired | ln(Monthly earnings) |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Female $\times$ after $\times$ $\Delta$emp share, $\beta_1$ | -.016** | .015*** | -.039** | -.063** | .061** | -.074* |
| | (.007) | (.004) | (.017) | (.027) | (.026) | (.041) |
| Female $\times$ after, $\beta_2$ | -.110*** | .064*** | -.116*** | -.082*** | .047*** | -.121*** |
| | (.010) | (.008) | (.016) | (.017) | (.015) | (.018) |
| Female, $\beta_3$ | -.054*** | .052*** | -.125*** | -.053*** | .061*** | -.101*** |
| | (.004) | (.003) | (.011) | (.005) | (.005) | (.013) |
| Obs. | 42098 | 42203 | 33367 | 22249 | 22288 | 16824 |

Notes: Individuals are between ages 19 and 54. Monthly earnings are deflated at the 2014 year level. column (3) includes individuals who report they currently have a full–time job. All models include age, age squared, years of schooling, ethnic minority, prefecture fixed effects, year fixed effects, and prefecture specific time trend. Reported robust standard errors are clustered at the prefecture level. Change of SOE employment share has been standardized to have mean equal to 0 and standard deviation equal to 1. Batik intensity has been standardized to have mean equal to 0 and standard deviation equal to 1. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A.10: OLS Estimates of the impacts of SOE reform (young cohort, age<=40)

| Dependent variable | ln(Monthly earnings) | | Work in private sectors |
|---|---|---|---|
| | (1) | (2) | (3) |
| Female $\times$ after $\times$ $\Delta$emp share, $\beta_1$ | -.041** | -.048* | .024*** |
| | (.017) | (.026) | (.006) |
| Female $\times$ after, $\beta_2$ | -.121*** | -.088*** | .005 |
| | (.023) | (.026) | (.010) |
| Female, $\beta_3$ | -.094*** | -.080*** | -.004* |
| | (.016) | (.010) | (.002) |
| Weekly work hours | Yes | | |
| Communist party membership | | Yes | |
| Obs. | 12962 | 19502 | 21306 |

Notes: Individuals are between ages 19 and 40 who report they currently have a full–time job. Monthly earnings are deflated at the 2014 year level. Column (1) uses 1995 and 2002 waves to run the regression because only these two waves provide the information of weekly work hours. Result in Column (2) is produced by using 1988, 1995, and 2002 waves and I do not include 2007 wave because it does not provide the information of CCP membership. All models include age, age squared, years of schooling, ethnic minority, prefecture fixed effects, year fixed effects. Column (2) includes prefecture specific time trend. Reported robust standard errors are clustered at the prefecture level. Change of SOE employment share has been standardized to have mean equal to 0 and standard deviation equal to 1. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A.11: OLS Estimates of the impacts of SOE reform (full sample), alternative definition of employment

| Dependent variable | Employed | ln(Monthly earnings) |
|---|---|---|
| | (1) | (2) |
| Female $\times$ after $\times$ $\Delta$emp share, $\beta_1$ | -.017** | -.037** |
| | (.007) | (.017) |
| Female $\times$ after, $\beta_2$ | -.115*** | -.121*** |
| | (.009) | (.014) |
| Female, $\beta_3$ | -.060*** | -.122*** |
| | (.003) | (.010) |
| Female $\times$ $\Delta$emp share, $\beta_4$ | .014*** | .004 |
| | (.005) | (.020) |
| After $\times$ $\Delta$emp share, $\beta_5$ | .005 | -.011 |
| | (.011) | (.027) |
| Obs. | 47661 | 38754 |

Notes: Individuals are between ages 19 and 54. Monthly earnings are deflated at the 2014 year level. Employed equals to 1 if individuals report they currently have a full time job or self–employed, and 0 otherwise. Column(2) includes individuals who report they currently have a full–time job or are self–employed. All models include age, age squared, years of schooling, ethnic minority, prefecture fixed effects, and year fixed effects. Column (2) includes prefecture specific time trend. Reported robust standard errors are clustered at the prefecture level. Change of SOE employment share has been standardized to have mean equal to 0 and standard deviation equal to 1. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A.12: DID Estimates of the impacts of SOE reform on employment and early retirement (old cohort, age >=40), additional controls

| Dependent variable | Employed | | | | Retired | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Female × after × Δemp share, $\beta_1$ | -.036** | -.034** | -.035** | -.034** | .030*** | .029*** | .030*** | .029*** |
| | (.014) | (.014) | (.014) | (.014) | (.008) | (.008) | (.008) | (.008) |
| Female × after, $\beta_2$ | -.123*** | -.119*** | -.123*** | -.120*** | .092*** | .090*** | .092*** | .090*** |
| | (.015) | (.015) | (.015) | (.015) | (.013) | (.013) | (.013) | (.013) |
| Female, $\beta_3$ | -.130*** | -.131*** | -.130*** | -.131*** | .120*** | .120*** | .120*** | .120*** |
| | (.006) | (.006) | (.006) | (.006) | (.006) | (.006) | (.006) | (.006) |
| Household income | | Yes | | Yes | | Yes | | Yes |
| Child under age 6 | | | Yes | Yes | | | Yes | Yes |
| Adj. R-squared | 0.2663 | 0.2724 | 0.2671 | 0.2734 | 0.2540 | 0.2583 | 0.2541 | 0.2586 |
| Obs. | 22069 | 22062 | 22069 | 22062 | 22126 | 22119 | 22126 | 22119 |

Notes: Individuals are between ages 40 and 54. All models include age, age squared, years of schooling, ethnic minority, prefecture fixed effects, year fixed effects and prefecture specific time trend. Reported robust standard errors are clustered at the prefecture level. Change of SOE employment share has been standardized to have mean equal to 0 and standard deviation equal to 1. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A.13: Estimates of the impacts of SOE reform on Years of Schooling

|  | OLS | IV |
|---|---|---|
|  | (1) | (2) |
| Female× after × Δemp share, $\beta_1$ | -.015 | .155 |
|  | (.050) | (.243) |
| Female× after, $\beta_2$ | .350*** | .399*** |
|  | (.056) | (.093) |
| Female, $\beta_3$ | -.923*** | -.904*** |
|  | (.056) | (.096) |
| Female× Δemp share, $\beta_4$ | .010 | -.144 |
|  | (.040) | (.292) |
| After× Δemp share, $\beta_5$ | .106 | .028 |
|  | (.076) | (.350) |
| Obs. | 45949 | 24766 |

Notes: Individuals are between age 19 and 54. Column (2) includes those 37 prefectures with pre–reform number of SOE workers by industry. All models include age, age squared, ethnic minority, prefecture fixed effects, and year fixed effects. Reported robust standard errors are clustered at the prefecture level. Change of SOE employment share has been standardized to have mean equal to 0 and standard deviation equal to 1. * significant at 10%, ** significant at 5%, *** significant at 1%.