

The SOE Reform, Massive Layoff and Private Economy Boom in China[†]

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Abstract

How does the reform of state-owned enterprises (SOEs) contribute to the economic transition within socialist economies? This paper tries to answer this question by investigating the consequences of the SOE reform in 1997 China, which led to more than 28 million SOE workers being dismissed, causing the Massive Layoff. Employing a continuous Difference-in-Differences (DID) design, this study establishes a causal link between the Massive Layoff and the emergence of China's private economy in the late 1990s and early 2000s. Specifically, the Massive Layoff incentivizes entrepreneurship and prompts SOE workers to flow into the private market. Moreover, at the firm level, I find that the Massive Layoff induces a productivity shock to the manufacturing POEs, increasing their labor input, output, and productivity. Overall, this paper suggests that when evaluating the SOE restructuring policy, one should also consider broader implications related to the private economy.

Key words: SOE Reform; Massive Layoff; Private Sector; Firm Performance

I Introduction

The economic transition from the state-owned sector to the private sector is one of the most substantial socioeconomic phenomena in the central-planned economy in the late twentieth century.¹⁾ A classical example of this is seen in China, where the industrial output share of the state-owned sector and collective sector reduced from nearly 100% in 1980 to about 50% by the time China was on the verge of joining the World Trade Organization (WTO). Accompany by the dynamic of industrial output, employment also witnessed a substantial decline (see Figure 1). Such change was mainly contributed by a state-owned enterprise (SOE) reform policy launched in Sep. 1997 —“Keep the large, Let go of the small” (*zhudafangxiao*), which tempted to deal with the overstaffing and inefficiency in SOEs. As for the outcome, the SOE reform dismissed more than 28 million SOE workers, causing the Massive Layoff (*xiagangchao*).²⁾

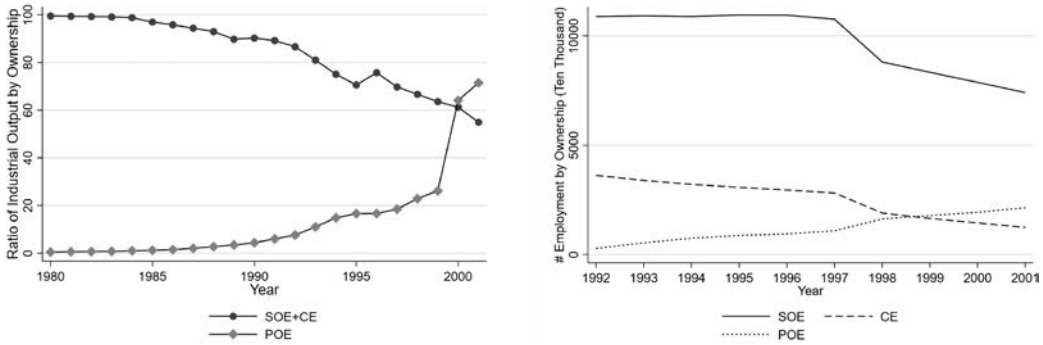
Accompanied by the retreat of the state-owned economy, the private economy has witnessed a

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1) For the general literature review, see Roland (2002).

2) Data from China Labor Statistical Yearbook, 1997–2005, also see Figure 2.



(a) Change of Industrial Output Ratio by Ownership

(b) Change of Employment by Ownership

Figure 1 Industrial Output and Employment by Ownership

Data Source: *China Labor Statistic Yearbook*, Multiple Issues.

substantial expansion in the period of the Massive Layoff. In Figure 1, one can see that the share of private industrial output spurred and finally surpassed the total share of SOE and collective enterprise (CE). Despite industrial output, employment in privately-owned enterprises (POEs) also increased.

In this paper, my objective is to establish a causal relationship between the Massive Layoff and the subsequent economic boom in the private sector during the late 1990s in China. Given the heterogeneous nature of exposure to the Massive Layoff across provinces and industries, I measure the magnitude of the layoff by computing the difference between the number of SOE employees in 2001 and 1996 at the province $\times$ industry level. Two primary outcomes speak for the private economy emergence: the count of POE registrations and the overall employment in POEs. Data on firm registrations is sourced from the National Enterprise Credit Information Publicity System (NECIPS), offering details such as firm name, ownership type, registration year, location, and business scope. To aggregate the data at the province-industry level, Natural Language Processing (NLP) techniques are applied to map the business scope to 14 distinct industry codes for each registration record. For the POE employment, information is extracted from the China Private Enterprise Survey (CPES), a cross-sectional dataset encompassing variables at both the firm and entrepreneur levels. I use the number of employees for each enterprise at the time when they registered to compute the province-industry level employment.

To investigate the causal impact of the Massive Layoff on the private economy, I employ a continuous difference-in-differences (DID) design. This methodology involves comparing observations before and after the implementation of the policy shock, considering variations in exposure to the SOE reform. The identification assumption for the research design is the common trend of the development of the private economy, that is, without the occurrence of the Massive Layoff, the growth of the private economy would have been comparable at the province-industry level. To test this assumption, I estimate the flexible DID specification that estimates the coefficient for every year in the study period. Moreover, I include the province $\times$ year FE to allow for the dynamics of regional macroeconomic conditions. And because the SOE reform primarily targeted firms based

on size, I use the aggregate ratio of SOE employment to POE employment as a control variable to address the potential source of simultaneity.

The estimation results for the DID estimator affirm the presence of a causal link between SOE downsizing and the subsequent growth of the private economy. According to the DID estimator, a 10% increase in the number of laid-off workers is associated with a 0.43%–0.48% increase in the number of POE registrations, as determined using the NECIPS database. Regarding the causal impact on private employment, a 10% rise in the number of laid-off workers corresponds to a 0.71%–0.85% increase in total employment and a 0.41%–0.52% increase at the average level, based on various specifications. To test the validity of my identification assumption, I conducted additional tests, including the examination of the common trend assumption through the estimation of a flexible version of the DID model. The results indicate a noticeable surge after the implementation of the SOE reform, confirming a distinct impact on POE registration and employment. Moreover, the analysis reveals a well-balanced common trend. Additionally, I demonstrate that the main results remain robust when considering different selections of the policy window and variable definitions.

Next, I explore several mechanism to explain the main findings. Firstly, in addition to the Massive Layoff, the SOE reform involved a significant scale of SOE privatization. This privatization has the potential to drive the growth of the private economy by transforming SOEs into POEs and subsequently increasing the number of POEs and their employment. To explore this channel, I categorize POEs into two types and estimate them separately in the main specification: privatized SOEs and native POEs. The former is defined by POEs that were previously SOEs, while the latter means enterprises that were privately-owned at the beginning. The results indicate that while SOE privatization does partially explain the expansion of POE employment, it cannot account for the increase in the establishment of POEs. Secondly, considering that the SOE reform may lead to an influx of labor force into the private sector, one plausible driver for the increase in POE establishments could be the wage shock. However, my analysis does not uncover clear evidence suggesting that SOE restructuring decreases wages in the private market. Moreover, I demonstrate that the private economy boom results from the redistribution of human resources based on the occupational selection of ex-SOE workers. With a higher exposure to the Massive Layoff, more SOE workers opt to initiate their businesses or secure jobs in the private market. The estimated results indicate that when the layoff severity increases by 10%, there are 0.49%–0.57% more POEs established by ex-SOE employees, and approximately 1.2% more workers previously in SOEs transition to working in POEs. Lastly, I investigate the heterogeneous impact of the Massive Layoff across different economic sectors and geographic regions. The findings suggest that the secondary sector generally enjoys more benefits from the SOE reform compared to the tertiary sector. More than that, the Massive Layoff predominantly affects the private economy in the eastern and mid regions, as opposed to the northeastern and western regions. These results may potentially contribute to understanding the mechanisms discussed in existing literature.

Some related questions are also discussed in this paper. First, one would worry that the confounding event, in this setting, the 1997 Asian Financial Crisis, may bias my main results. However, there

is no evidence showing that the financial crisis would affect SOEs and POEs differently in previous literature. If it were to contribute to the downsizing of SOEs, a decrease in private employment would also be expected. However, this scenario is not observed in both my estimated results and the observed data. Besides, I exclude the POE with export behavior and show that the impact of the Massive Layoff exists still. Additionally, since I have discussed the consequence of the Massive Layoff at the aggregate level in the baseline findings, one may wonder if the effect on individual firms should also be observed. To investigate the impact of the SOE retrenchment on the individual firm, I use the China Industrial Enterprise database (CIED) to examine whether the SOE layoffs affect the firm's behaviors. By using the "Shift-Share" IV (SSIV) design, I find the Massive Layoff substantially increases the firm's employees, output, and Y/L ratio. And these results are still valid across different specifications. For the mechanism, the increase in these outcomes may come from the productivity shock brought by the SOE layoffs. Since SOE employees are more educated and experienced, the influx of ex-SOE workers to the private labor market may lead to productivity improvement. To verify the productivity shock, firstly, I show that the output and profit of POEs are positively correlated with the ratio of laid-off employees to total employment. Furthermore, I estimate the firm-level total factor productivity (TFP) by Akerberg et al. (2015) and use it as an outcome variable in the SSIV specification. The 2SLS estimator indicates that a 10% increase in the number of laid-off workers contributes to 0.44%–0.55% improvement in the Hicks-neutral TFP.

My findings mainly contribute to two distinct bodies of literature. One is the research on the economic restructuring policy in the transition economies. Most Existing studies in this area are descriptive and primarily focus on cross-country evidence (Roland, 2002). Whereas in the context of SOE reform in China, existing studies have predominantly focused on the consequences within the state-owned sector, such as productivity and profitability (Berkowitz et al., 2014; Groves et al., 1994; Hsieh and Song, 2015; Jefferson and Su, 2006; Lin et al., 1998), or have employed theoretical frameworks to elucidate broader SOE reform dynamics (Bai et al., 2006; Berkowitz et al., 2014). However, a noticeable gap persists in research examining the impact of SOE reforms on the private economy, particularly with respect to Massive Layoffs (Dougherty et al., 2007; Iyer et al., 2019). Consequently, this paper bridges this gap by providing a comprehensive analysis of the economic restructuring policy's impact, revealing that SOE reforms exhibit significant spillover effects on the private sector.

Furthermore, this study also contributes to the literature on the labor market transition in China, building upon works such as Meng (2000) and Meng (2012), which offer valuable insights into China's labor market transition but do not specifically focus on the Massive Layoff. Many existing studies on the subject adopt a micro-level perspective, exploring how Massive Layoffs affect individuals, particularly the laid-off workers. Various empirical strategies and datasets have been utilized to investigate its impact on urban unemployment (Appleton et al., 2006; Giles et al., 2006), income, precautionary saving (He et al., 2018; Tian et al., 2022), and even individual health (Kong et al., 2019).

Our research aligns closely with the findings of Iyer et al. (2019) and Fang et al. (2023). While Iyer et al. (2019) demonstrated the positive impact of housing reforms in the state sector on private

employment, and Fang et al. (2023) observed that downsizing in SOEs fosters entrepreneurship—a result consistent with my findings—this paper extends these discussions. I investigate more general effects of Massive Layoffs on the private economy, not only exploring its effects on entrepreneurship but also generally examining its impact on the private labor market and the performance of POEs.

The structure of this paper is organized as follows. Section II provides a discussion of the institutional background for the SOE reform in China. Section III describes the data used in this paper. Section IV presents empirical strategy and the baseline results. Section V discuss the mechanism for the main findings. Section VI outlines further investigation to extend my main findings, and Section VII concludes.

II Institutional Background

In this section, I provide institutional information on China economy before and after the SOE reform, and how the private sector evolved during the reform period.

1 China Economy Before The SOE Reform

With the establishment of the communist government, China built a typical central-planned economic system: SOEs account for most of the total output, and the labor market doesn't exist in the conventional sense. After the complement of the communist revolution in the urban area, all the POEs were taken over by the government. Before 1950, POEs made up 55.94% of national industrial output. However, after the 1950s economic revolution, the share of industrial output contributed by POEs dropped to zero, and that of SOEs surged to 90%. This pattern continued before the large-scale privatization in the 1990s (Alesina et al., 2020).

Before the reform and opening up in 1978, all the urban laborers were employed in the state or collective sector. They were assigned by the government and enjoyed lifetime employment, stable wages, and a social welfare system that covered food, housing, pensions, and medical care. Because SOEs were not allowed to dismiss workers, and workers could not move freely, the rigid labor assignment system eventually led to low labor productivity and overstaffing in SOEs (Meng, 2000).³⁾ Although some mild reforms were implemented in the 1980s (Groves et al., 1994), the state-owned sector still suffered low efficiency and heavily relied on government support.

2 The SOE Reform and the Massive Layoff

After the initiation of the “Tour of the South” campaign in 1992, the private sector witnessed an unprecedented large-scale expansion. Annually, post-1992, more than 20,000 POEs were established, as illustrated in Figure 4. This period also marked a significant surge in employment and industrial output in the private sector. The private Labor market has increased from merely 1.6% in 1992 to

3) As pointed by Meng (2000), The increase in population and the rise in labor participation rates have also made it impossible to maintain the full employment object without resulting in overstaffing.

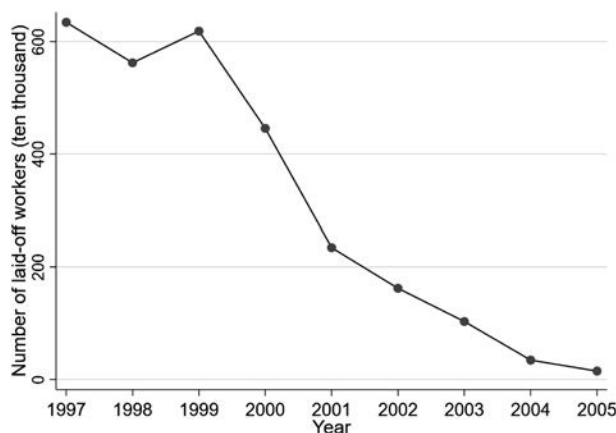


Figure 2 Number of Laid-off Workers by Year

Data Source: *China Labor Statistic Yearbook*, Multiple Issues.

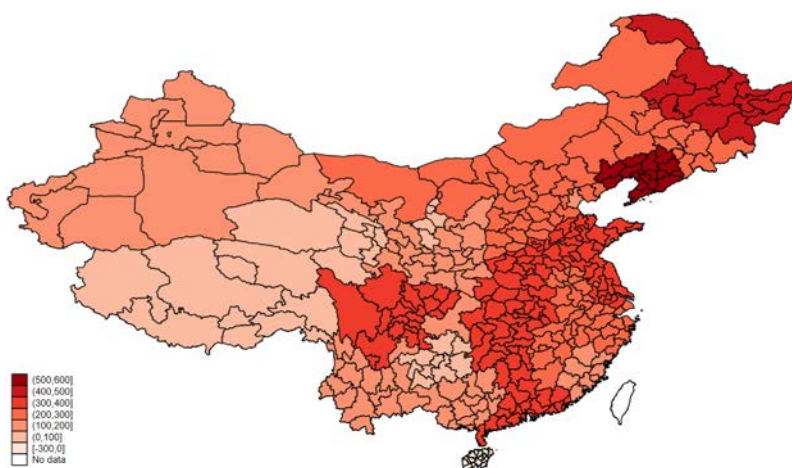


Figure 3 Number of laid-off workers by Provinces

Data Source: *China Statistical Yearbook*, Multiple Issues.

more than 20% in 2001, whereas the ratio of private industrial output emerged from 7.6% in 1992 to 71.4% (see Figure 1).

This remarkable expansion within the private sector intensified market competition and eventually highlighted problems in the state-owned sector. The rigid structure of SOEs, still operating under central planning, hindered their ability to adjust employment strategies in response to changing market conditions. This inflexibility contributed to their declining profitability. By the mid-1990s, approximately 50% of SOEs were reported to be incurring losses (Meng, 2003).

In response to escalating losses in SOEs, the Chinese government embarked on a major restructuring of the state-owned economy. In late 1997, an important policy was introduced: "Keep the large, let go of the small (*zhuadafangxiao*)". This strategy was designed to retain strategically significant SOEs under government control while allowing smaller, unprofitable ones to either go bankrupt or be privatized. This aggressive approach caused widespread layoffs in SOEs, known

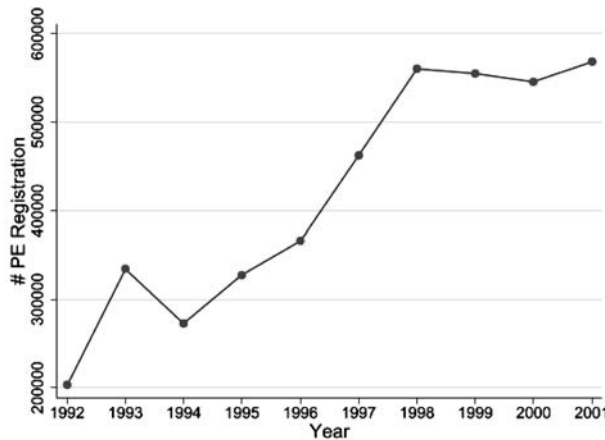


Figure 4 Number of Newly Registered POEs

Data Source: *The National Enterprise Credit Information Publicity System (NECIPS)*.

as the Massive Layoff (*xiagangchao*). Consequently, the lifelong employment system was shaken, leading millions of workers to be laid off post-1997. Official records indicate that from 1997 to 2005, over 28 million workers were laid off (see Figure 2). Figure 3 illustrates the geographical distribution of these Massive Layoffs. One can see that, with the exception of Hainan, every province faced SOE downsizing in the late 1990s, with the northeastern region, a cluster for industrial SOEs, being most severely impacted.

Notably, The SOE restructuring policy implemented was not Pareto-Optimal. Workers laid off from SOEs were distinctly disadvantaged, facing challenges such as long-term unemployment (Giles et al., 2006; Appleton et al., 2006) and significant income or even health shocks (Kong et al., 2019; Tian et al., 2022). As a trade-off, the state-owned sector became more efficient (Bai et al., 2006; Berkowitz et al., 2014; Hsieh and Song, 2015).

3 The Massive Layoff and The Private Economy Boom

As opposed to the SOE downsizing, the private economy witnessed a substantial boom, with a substantial development in both size and productivity (Dougherty et al., 2007). The right panel of Figure 1 and Figure 4 show that in the middle of the 1990s, both private employment and POE establishment enjoyed a significant emergence.

Is the simultaneous occurrence of SOE reform and the growth of the private economy merely a coincidence? One potential link between these two events could be induced. As the primary goal of the SOE reform was to tackle overstaffing, the reform resulted in a significant reduction of the SOE workforce, leading to the Massive Layoff. The laid-off worker may flow into the private sector, potentially transitioning into either entrepreneurial ventures or private employment, which could contribute to the emergence of the private economy. Hence, In this paper, I will present the evidence of the causal relationship between the SOE reform and the private economy boom by investigating the impact of the Massive Layoff on both POE establishment and employment.

III Data

1 The Exposure of The Massive Layoff

I have collected data on SOE employment from the China Statistical Yearbook (CSY), issued by the National Bureau of Statistics (NBS) to obtain exposure to the Massive Layoff that varies across provinces and industries.⁴⁾ The CSY provides detailed data on SOE employment at province $\times$ industry level for the duration of my study period. The exposure of SOE layoffs is determined using the following calculation:

$$Layoff_{pj} = SOEempl_{pj}^{1996} - SOEempl_{pj}^{2001} \quad (1)$$

where p is for province and j is for industry. Given that the large-scale downsizing of SOEs occurred between 1997 and 2001, I have chosen 1996 as the base year and 2001 as the concluding year for measuring the layoff exposure at the province-industry level.⁵⁾ The summary statistics are reported in Table A1.

2 Firm Registration Data

To examine the impact of the Massive Layoff in the SOE sector on the number of newly registered POEs, I have compiled firm registration data from the National Enterprise Credit Information Publicity System (NECIPS) for the years 1992–2001. The NECIPS database provides detailed information for each firm registration record, including its name, year of registration, registration region, ownership type, and business scope. To aggregate the registration number at the province-industry-year level, I utilize the Natural Language Processing (NLP) method and use AI tool to categorize every firm into 15 distinct industries using their business scope description.⁶⁾

From 1992 to 2001, a total of 507,391 firms were established, and 306,744 POEs were successfully categorized into a distinct industry code. Figure 4 plots the number of new POE registrations each year.

3 POE Employment

The POE employment data is collected from the China Private Enterprise Survey (CPES), a comprehensive and large-scale national cross-sectional sampling survey, that stands as one of the

4) The China Labor Statistical Yearbook (CLSY) offers more precise data regarding how many ex-SOE workers were affected by the Massive Layoff. However, due to its lack of industry-specific data, I utilize SOE employment data provided by CSY for calculating layoffs at the province-industry level.

5) The CLSY documents annual layoff data from 1997 to 2005. However, since the majority of layoffs (approximately 25 million workers, constituting 88% of the total laid-off workforce) occurred between 1997 and 2001, it can be justified to employ SOE employment data from 1996 and 2001 to measure the number of laid-off workers to avoid potential events that may bias the estimation (e.g. China joining WTO).

6) The industry categorization aligns with the older version of the National Economic Industry Classification, which divides firms into 16 distinct industries. Firms associated with the government service industry have been excluded from this analysis, given that the SOE layoffs primarily impacted SOE workers rather than government officials. Consequently, 15 distinct industry codes are utilized.

longest-running in China. Currently, it is managed by several prominent bodies: the United Front Work Department of the CPC Central Committee, the All-China Federation of Industry and Commerce, the State Administration for Market Regulation, the Chinese Academy of Social Sciences, and the China Association for the Study of Private Economy. The CPES is conducted biennially and has been executed 13 times from 1993 to 2018. It provides rich data for both entrepreneurs (e.g. demography, social network, and previous occupation) and firms (e.g. labor input, output, and profit). The CPES data comprises variables at both the registered and survey times for each POE. I employ CPES data from the 1993–2006 waves and collect employment information when POEs were registered. And I aggregate the employee number for POEs that were registered between 1992–2001 to the province $\times$ industry level to examine how the extensive layoffs might have influenced employment within the private sector.⁷⁾ Some additional investigations in Section V are also based on this database.

4 Supplementary Data

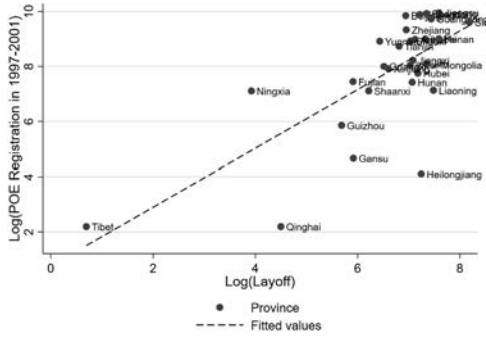
In this study, I have augmented the analysis by integrating additional data to extend the baseline findings. Firstly, to analyze whether the observed baseline outcomes are influenced by wage shocks, I have acquired wage data from the China Labor Statistical Yearbook (CLSY). Secondly, I have employed individual-level data from the China Household Income Project (CHIP) to discuss whether the Massive Layoff incentivizes SOE workers to transition into the private market. Lastly, to show the heterogeneous educational attainment among POE and SOE workers, I collect education data from the China Health and Nutrition Survey (CHNS) database.

Moreover, In Section VI, I employ the China Industrial Enterprise Database (CIED) spanning the period from 1998 to 2001 to explore the impact of SOE downsizing on individual firms. Compiled by the NBS, the CIED represents a national census dataset encompassing all SOE manufacturing firms and non-SOE manufacturing firms with annual sales exceeding 5 million RMB. Although smaller POEs are not included in the CIED, the dataset's sample accounts for over 90% of China's total manufacturing output, providing a comprehensive overview of the industry's landscape during the specified period in the manufacturing sector.

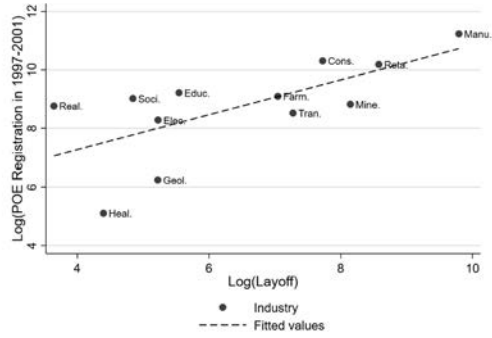
Firms within the CIED report important information such as employment, fixed capital, output, and profit. This rich dataset facilitates an examination of how the extent of the Massive Layoff may impact firms' characteristics, for example, their efficiency and profitability. In analyzing how the Massive Layoff may affect firm behavior, I focus exclusively on private firms that consistently report their information throughout the entire period from 1998 to 2001 to construct a balanced panel data, which consists of 29,728 manufacturing POEs.⁸⁾ The summary statistics of this dataset

7) The selection of wave is based on the data availability. Since there are some significant changes for the CPES in questionnaire design after 2006, only the 1993–2006 waves can be used to conduct the empirical research.

8) Due to the lack of specific layoff data at the manufacturing industry level in the CSY, I adopt a similar approach to (1) by utilizing data from the CIED, with 1998 set as the base year, to measure the SOE layoffs. It's important



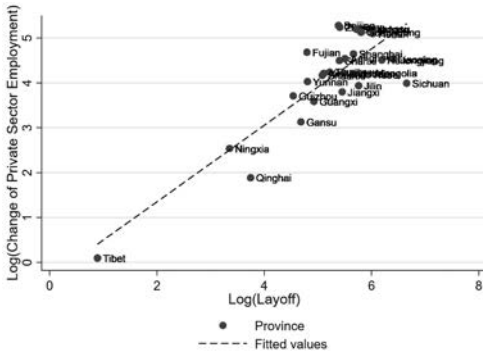
(a) Layoff and Employment by Province



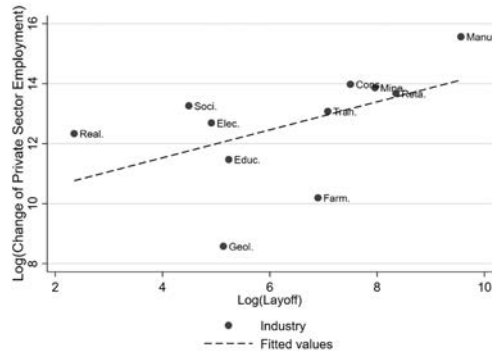
(b) Layoff and Employment by Industry

Figure 5 Correlation Between SOE Layoffs and POE Registration

Notes: The y-axis is the (log) number of POE registrations from 1997–2001, collected from the NECIPS database. The x-axis is the (log) layoff intensity calculated by (1).



(a) Layoff and Employment by Province



(b) Layoff and Employment by Industry

Figure 6 Correlation Between SOE Layoffs and Private Employment

Notes: The y-axis is the (log) change of the private Employment subtracting from 2001 to 1997, collected from the CPES 1993–2002 waves. The x-axis is the (log) layoff intensity calculated by (1).

for both 1998 and 2001 are presented in table A2.

IV Empirical Strategies and Main Results

1 Stylized Facts

Firstly, I summarize the data to explore the correlation between the Massive Layoff and private economic growth. In Figure 5, a positive correlation is evident between the SOE layoffs and the establishment of POEs at both the provincial and industry levels. This observed pattern also extends to the growth in the private labor market, as illustrated in Figure 6. In the subsequent section, I will discuss this correlation and further extrapolate it into causality based on the research design employed.

to note that since the CIED is compiled at the end of each year, this method might not accurately capture the full extent of layoffs that occurred in 1997. However, the period from 1998–2001 still witnesses about 66% of total laid-off workers.

2 Empirical Strategy

The main empirical strategy follows the standard difference-in-differences (DID) strategy but with a continuous measurement of the treatment (i.e. the number of laid-off workers).

The primary variables of interest are the number of POE registrations and the total private employment (both in the log term). The observation is year-province-industry level. Because the Massive Layoff began in 1997, I define the treatment group as those samples observed above 1997, and the control group is those below 1997. Within the treatment group, I compare outcomes with different intensities of layoff. The sample period is 1992–2001 to ensure that no other major events interfere with the estimation. Prior to 1992, the private sector held a negligible role in the Chinese economy. In late 2001, China's accession to the WTO significantly altered economic dynamics and potentially biased my results. Notably, while official figures report layoffs from 1997–2005, approximately 88% of SOE worker dismissals occurred within the selected period (also see Figure 2).

My main estimating equation is written as:

$$Y_{pjt} = \alpha + \beta_1 \text{LogLayoff}_{pj} \times \text{Treat}_t + \beta_2 X_{pj} + \theta_p + \mu_j + \phi_t + \theta_p \times \phi_t + \epsilon_{pjt} \quad (2)$$

where p, j , and t index provinces, industries, and calendar year, respectively. There are two outcome variables in the baseline design: POE registration and POE employment. For POE registration, I use firm registration data. I aggregate firm registration information at the province, industry, and year-of-registration level. For POE employment, I calculate both total and average POE employment also at the same level by aggregating firm-level data. Besides, because the registration year may differ from the year when the survey was conducted, I include survey year FE in my estimation when using CPES data. LogLayoff_{pj} is the exposure to the Massive Layoff in the natural log form that is derived from Equation (1). Table A1 reports summary statistics for the above variables. Treat_t is a dummy indicator variable. It takes a value of 1 for the period 1997–2001, reflecting the post-treatment period when the Massive Layoff began. For the period 1992–1996, it is set to 0, indicating the control period. X_{pj} is a control variable, here is the aggregate employment in the state-owned sector relative to private employment in the year preceding policy implementation-1996 ($X_{pj} = \text{SOEempl}_{pj}^{1996} / \text{POEempl}_{pj}^{1996}$), which I will explain below. The equation also includes various fixed-effects (FEs) that connect closely to my identification assumption. The coefficient of interest in Equation (2) is β_1 , which estimates the impact of the Massive Layoff on POE registration and private employment at the province $\times$ industry level. More specifically, For the treated group, when the number of laid-off workers increases by 1%, outcome variables would increase by $\hat{\beta}_1\%$. When $\hat{\beta}_1$ is positive, it indicates that a specific industry in one province that experiences a higher exposure to the Massive Layoff would witness a greater expansion in the private economy after 1997 relative to before 1997.

The identification strategy does not depend on the assumption of random assignment regarding the exposure to the Massive Layoff. Instead, it is based on the hypothesis that, in the absence

of SOE downsizing, the private economy's growth trajectory would have been comparable across different regions and industries. To test this assumption, I estimate a flexible estimating equation that takes the following form:

$$Y_{pjt} = \alpha + \sum_{\tau=1993}^{2001} \beta_{\tau} \text{LogLayoff}_{pj} \times \mathbf{1}(t = \tau) + \beta_2 X_{pj} + \theta_p + \mu_j + \phi_t + \theta_p \times \phi_t + \epsilon_{pjt} \quad (3)$$

where all variables are the same as in Equation (2). Instead of interacting the number of laid-off workers with the treatment dummy, I introduce an interaction term of LogLayoff_{pj} with each year-specific dummy variable. The estimators β_{τ} examine the effect of the Massive Layoff on the two outcomes for a specific time.

There are two key threats to my research design. One is the possibility that time-varying region-specific shocks may correlated with the measurement of the Massive Layoff. I address this concern in two ways. First, I estimate Equation (3) to test the common trend. Second, I interact year FE with regional FE to control for time-varying regional unobservables (e.g. regional economic shift). Another one is the determinant of the severity of SOE layoffs would also affect the private economy. As I explained in Section 2, the initial target of SOE reform aimed to keep large SOEs and let go of small SOEs. Hence the variations in SOE sizes could potentially account for changes in the privately-owned sector. However, due to data limitations, accessing the average size of SOEs is not feasible. To address this issue, I control for the relative size of SOEs compared to POEs at the aggregate regional-industrial level in the base year 1996.

3 The Impact of the Massive Layoff on the Private Sector Expansion

The Massive Layoff in SOE released numerous workers to the private sector. This could plausibly lead to increases in both entrepreneurship and private employment, depending on the occupational selection of these laid-off employees: they might either start their own businesses or secure employment in the private job market. Hence, in this section, I investigate the effect of the Massive Layoff on both outcomes.

3.1 POE Registration

I first estimate the effect of the Massive Layoff on POE Registration each year by estimating Equation (2). The estimation results are reported in Table 1. I use firm registration data (NECIPS) to present the main results, and firm-level data (CPES) is utilized as supplementary evidence to be consistent with the below analysis. Since CPES is a cross-sectional survey data, I include survey year FE in the estimating equation.⁹⁾ Column (1)–(3) present the estimator β_1 in Equation (2) using registration-level data. The estimated results indicate a causal effect of the Massive Layoff

9) Here, the calendar year FE in CPES is controlling for the year of registration. Because, in the CPES data, the survival rate is a possible source of endogeneity, I mainly discuss the result estimated by NECIPS.

Table 1 Effect of the Massive Layoff on POE Establishments

	Log POE Registration					
	NECIPS			CPES		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Loglayoff</i> × <i>Treat</i>	0.048*** (0.014)	0.043*** (0.014)	0.043*** (0.011)	0.029** (0.012)	0.030** (0.013)	0.032** (0.013)
Control	No	Yes	Yes	No	Yes	Yes
Province FE	Yes	Yes	No	Yes	Yes	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Calendar yr. FE	Yes	Yes	No	Yes	Yes	No
Survey yr. FE	No	No	No	Yes	Yes	Yes
Calendar yr. FE × Province FE	No	No	Yes	No	No	Yes
Obs.	2,324	2,109	2,095	3,718	3,636	3,625
R-squared	0.835	0.821	0.927	0.377	0.378	0.421

Notes: This table presents the estimation result on the effect of the massive layoff on POE establishments by equation (2). Observations are at the province-industry-year level. Standard errors in the parentheses are clustered at the province level. *, **, and *** denote significance at 0.10, 0.05, and 0.01 levels, respectively. Yes indicates that the control is included in the estimation, and No vice versa. The outcome for the estimated result is the (log) number of POE registrations. *Loglayoff* is the natural log of the massive layoff intensity, which is calculated by equation (1). The *Treat* indicator variable equals zero for the period 1992–1996, and one for the period 1997–2001. Columns (1)–(3) report estimation results using NECIPS data. Columns (4)–(6) report estimation results using CPES data. The coefficient of *Loglayoff* × *Treat* estimates the effect of the massive layoff on the POE registration. The results indicate that with 1% increase in the intensity of layoff, the number of POE registrations is increased by 0.029%–0.048%.

on POE establishment. According to the full specification result in Column (3) and Column (6), with a 1% increase in the severity of SOE downsizing, the number of POE registrations at the province-industry level would increase by 0.048% and 0.032% on average based on different data sources. The magnitude of this effect is quite substantial. In the NECIPS data, an average of 190 POEs are established at the province-industry level following the SOE reform. Column (3) of our results indicates that, on average, dismissing 1% more SOE workers (approximately 1567 workers) increases the establishment of 8.17 (=sample mean 190 × coefficient 0.043) additional POEs.

3.2 Private Employment

Another key focus is employment in the private sector. I have detailed the results using Equation (2) in Table 2. I use CPES 1993–2006 waves to run the estimation.¹⁰⁾ Here, I aggregate the firm-level data at the year when firms were registered. However, the year when the survey was conducted, which differs from the firm registration year, may also affect the data. Hence I additionally include the survey year to conduct my estimation. Columns (1)–(3) reveal the influence of SOE downsizing on total private employment (log term), while columns (4)–(6) examine its effect on the average employment in POEs (log term). The results overall suggest a positive causal link between SOE

10) While the CLSY data offers aggregate employment figures for SOEs, CEs, and other ownership types, it fails to specifically pinpoint private sector employment. Moreover, data at the year-province-industry level is only accessible post-1995.

Table 2 Effect of the Massive Layoff on POE Employment

	Log Total Employment			Log Average Employment		
	(1)	(2)	(3)	(4)	(5)	(6)
$\text{Loglayoff} \times \text{Treat}$	0.071*** (0.021)	0.081*** (0.022)	0.085*** (0.024)	0.041** (0.017)	0.050*** (0.018)	0.052*** (0.018)
Control	No	Yes	Yes	No	Yes	Yes
Province FE	Yes	Yes	No	Yes	Yes	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Calendar yr. FE	Yes	Yes	No	Yes	Yes	No
Survey yr. FE	No	No	No	Yes	Yes	Yes
Calendar yr. FE $\times$ Province FE	No	No	Yes	No	No	Yes
Obs.	3,679	3,598	3,587	3,679	3,598	3,587
R-squared	0.286	0.297	0.354	0.202	0.206	0.277

Notes: This table presents the estimation result on the effect of the massive layoff on employment for POEs by equation (2) using CPES data. The data has been winsorized at the 99th percentile. Observations are at the province-industry-year level. Standard errors in the parentheses are clustered at the province level. **, and *** denote significance at 0.10, 0.05, and 0.01 levels, respectively. Yes indicates that the control is included in the estimation, and No vice versa. The outcome for the estimated result is the (log) number of total and average employment in the private sector. Loglayoff is the natural log of the massive layoff intensity, which is calculated by equation (1). The Treat indicator variable equals zero for the period 1992–1996, and one for the period 1997–2001. The coefficient of $\text{Loglayoff} \times \text{Treat}$ estimates the effect of the massive layoff on the private employment. The results indicate that a 1% increase in the intensity of layoff results in a 0.071%–0.085% increase in total employment and 0.041%–0.052% increase in average employment at the aggregate level.

layoffs and growth in private-sector employment at both total and average level. Specifically, Columns (3) and (6) show that a 1% increase in the scale of these layoffs corresponds to a 0.043% rise in total private employment and a 0.032% increase in average private employment, which is equivalent to 13.8 (= sample mean 162 $\times$ coefficient 0.043) total employment and 3.2 (= sample mean 61.8 $\times$ coefficient 0.043) average employment in CPES data.

3.3 Test for the Common Trend Assumption

The identification strategy for Equation (2) hinges on the assumption that, without the Massive Layoff implementation, the trend in private economy growth for my treatment group is the same as the control group. To verify the common trend assumption, I employ the flexible version of DID estimation as shown in Equation (3). The estimated vectors of β_τ s reveal the relationship between SOE layoffs and the outcomes across different time periods. If the Massive Layoff boosts the private economy, *ceteris paribus*, one would expect that the estimator $\hat{\beta}_\tau$ s are constant before the happening of SOE reform (e.g. $\hat{\beta}_{1993} \approx \hat{\beta}_{1994} \cdots \approx \hat{\beta}_{1996}$). And the estimator $\hat{\beta}_\tau$ s should be larger after the Massive Layoff compared to the pre-policy periods (that is, $\hat{\beta}_{[1993,1996]} \leq \hat{\beta}_{[1997,2001]}$).

The estimated coefficients are displayed in Table A3. To illustrate the pattern of coefficients, Figure 7 plots these results for each year using the full specification of Equation (3). The estimated $\hat{\beta}_\tau$ are measured relative to the first year of my observations, which is 1992. The NECIPS dataset

is utilized to assess the impact of the Massive Layoff on POE establishments, while the effect on private employment is evaluated using CPES data.

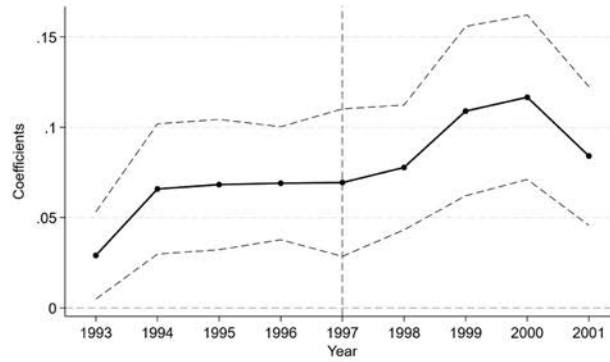
Rather than focusing solely on the magnitude of each coefficient, this study emphasizes their temporal patterns. Figure 7 reveals that, prior to the SOE reform in 1997, coefficients across all outcomes were well-balanced, indicating a stable pre-reform period. Post-reform, however, a distinct spike is visible in all three panels. These findings indicate that the Massive Layoff in 1997 significantly altered the trajectory of private economy expansion. This shift provides robust evidence supporting the validity of the identification strategy employed in this paper. Nevertheless, considering recent literature which suggests that the trial phase of the SOE reform might have commenced as early as 1995 (Kong et al., 2019), I have adjusted the policy window for robustness check to further validate the research design of this study.

Estimation of Equation (3) reveals another key fact: the effects of the Massive Layoff do not intensify over time. As depicted in Figure 7, the initial increase in coefficients is observed during 1998–2000. However, these effects appear to shrink in subsequent periods. This pattern might be attributable to the dynamics of SOE layoffs. The peak period of layoffs occurred immediately following the reform, with the number of laid-off workers in 2001 being double that of 1998 and threefold compared to 1997–2000, as illustrated in Figure 2. This trend could explain the observed decrease in effects post-2000.

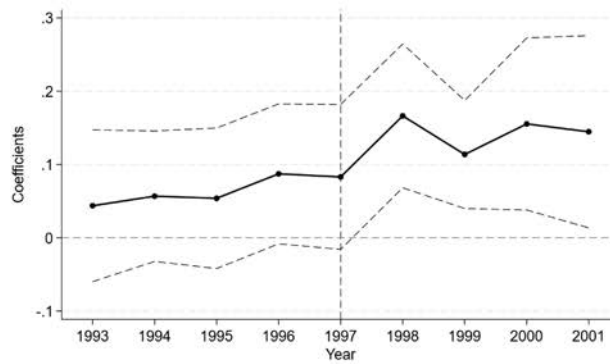
3.4 Robustness Checks

Sensitivity to Policy Window Selection. Despite the national-level consistency in total SOE employment prior to 1997 (see Panel (b) in Figure 1), existing literature suggests that initial trials of SOE reform occurred on a small scale in 1995 and 1996. To confirm that my main results are robust to the chosen policy window, I adjust the measure of the exposure to the Massive Layoff in Equation (1) by shifting the base year from 1996 to 1995 and 1994. Correspondingly, the *Treat* dummy is assigned a value of 1 if the observation year falls one year after the selected base year in the measurement of the treatment's severity. The estimated results are reported in Table A4. Overall, from Table A4, my main results show a mere sensitivity regarding the selection of policy duration both in significance and magnitude of the estimated coefficient.

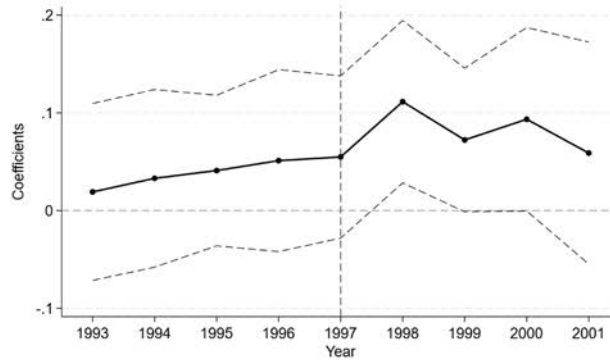
Variable Definition. To check the robustness of my main findings, I adjust the measurement of SOE layoffs and the control variable. In Panel A of Table A5, I re-estimate the Equation (2) using the original measurement of layoff exposure instead of using the log term. In Panel B, I use an alternative definition of layoff exposure: the ratio of laid-off workers to the total SOE employment in 1996. In Panel C, I split the SOE employment ratio into two distinct controls: total SOE and POE employment as of 1996. Collectively, these adjustments confirm the robustness of my primary conclusions against changes in variable definitions.



(a) POE Registration



(b) Total Employment



(c) Average Employment

Figure 7 Pre-policy Trend Test

Notes: This figure presents the results for the pre-trend test by estimating coefficients, $\hat{\beta}_\tau$ from equation (3). The y-axis denotes the magnitude of each coefficient, while the x-axis represents τ values. Panel (a) displays POE registrations' estimated results using NECIPS data. Panels (b) and (c) show, respectively, the estimated impacts on total and average private employment derived from CPES data. The analysis uses 1992 as the base year. All three panels consistently demonstrate the absence of significant pre-policy trends before the massive layoff, and notable spikes are evident in the post-reform periods.

V Mechanism

In this section, I investigate several channels behind the effect of the Massive Layoff on the private economy's emergence. Firstly, I demonstrate that SOE privatization during the reform can explain some of my results, but not all. Secondly, SOE reform led many individuals to seek opportunities in the private sector, causing a significant labor market shift and potentially altering equilibrium wages. Decreased wages could motivate more people to establish businesses due to reduced operational costs. However, my analysis shows that the Massive Layoff had a limited impact on the private sector's equilibrium wage. This could be attributed to a simultaneous increase in both labor demand and supply. Thirdly, I show that the expansion of the private sector is attributed to labor redistribution. The Chinese government released over 28 million SOE employees, who then became entrepreneurs or private laborers. After SOE reform, there was a notable increase in POEs founded by former SOE employees, suggesting that the reform motivated these workers to pursue entrepreneurship. Furthermore, I use individual-level data to illustrate how SOE reform also propelled former state employees into the private labor market. Last, I discuss the heterogeneity of the reform's impact. Different levels of effect on my main outcomes are observed with respect to the economic sectors and geographic regions, which are consistent with findings presented in earlier literature.

1 SOE Privatization

A body of literature has discussed the implications of SOE privatization on the Chinese economy (Bai et al., 2006, 2009; Dougherty et al., 2007; Tong, 2009). In the CPES data 1993-2006 survey wave, among 18,585 POEs, 7,351 firms were originally public firms and experienced privatization. The SOE privatization could potentially explain the emergence of the private economy as privatized SOEs became POEs, and their workers were defined as private workers after privatization.

To investigate whether SOE privatization induces the impact of the Massive Layoff, I re-estimate Equation (2) using CPES data. In this analysis, the sample firms are categorized into two groups: privatized SOEs and native POEs. Privatized SOEs refer to firms that originated as SOEs but later transformed into POEs. In contrast, native POEs are firms that were initially registered as POEs. The outcome variables are the same as those used in my main results. The estimated results are detailed in Table 3.

Column (1) of Table 3 reveals a surprising finding: the Massive Layoff primarily boosts native POE establishment without impacting SOE privatization. Column (1) in Panel A indicates a consistent pattern in SOE privatization, with a balanced number of privatized SOEs in the CPES database across the study periods. Notably, the influence on native POE registration remains significant. Although the estimated coefficient in Column (1) of Panel B is marginally smaller than in Column (6) of Table 1 (0.028 compared to 0.032), it still suggests that SOE privatization alone cannot fully account for the POE establishment surge following the Massive Layoff.

However, Columns (2) and (3) in Table 3 suggest that privatized SOEs partly drive the increase in

Table 3 Effect of the Massive Layoff on the Private Economy: SOE Privatization

	Log POE Registration	Log Total Employment	Log Average Employment
	(1)	(2)	(3)
Panel A: Privatized SOE			
$\text{Loglayoff} \times \text{Treat}$	0.022 (0.029)	0.113** (0.053)	0.094*** (0.032)
Obs.	1,783	1,767	1,767
R-squared	0.422	0.415	0.386
Panel B: Native POE			
$\text{Loglayoff} \times \text{Treat}$	0.028** (0.010)	0.062* (0.031)	0.031 (0.028)
Obs.	2,425	2,386	2,386
R-squared	0.428	0.309	0.250

Notes: This table presents the estimation result on the effect of the massive layoff on the private economy by equation (2) using CPES data. The data has been winsorized at the 99th percentile. Observations are at the province-industry-year level. Standard errors in the parentheses are clustered at the province level. *, **, and *** denote significance at 0.10, 0.05, and 0.01 levels, respectively. The outcomes for the estimated results are the (log) number of POE registrations, total employment, and average employment. *Loglayoff* is the natural log of the massive layoff intensity, which is calculated by equation (1). The *Treat* indicator variable equals zero for the period 1992–1996, and one for the period 1997–2001. The coefficient of $\text{Loglayoff} \times \text{Treat}$ estimates the effect of the massive layoff on the three outcomes. Each POE in the dataset is classified as either a privatized SOE, originally a public firm, or a native POE, a firm that was registered as a POE from its establishment. Panel A displays the estimated results for privatized SOEs, while Panel B presents findings for native POEs.

private employment. Panel A shows a post-SOE reform rise in both total and average employment in privatized SOEs. Whereas Panel B indicates a smaller employment effect of Massive Layoffs on native POEs. These results are straightforward. When SOEs were privatized, their employees would also be identified as working in POEs, thus increasing the aggregate private employment.

2 Wage Shock

Another potential channel for the consequence of the Massive Layoff is the wage shock. The influx of laid-off workers into the private sector likely caused a shift in the equilibrium wage, as the increase of labor supply. This reduction in wages might encourage entrepreneurship by a labor cost decrease. To explore this potential channel, I regress Equation (2) with province-industry level average wages as the dependent variable. The average wage data is collected from the China Statistical Yearbook (CSY), beginning in 1995. To account for inflation, the average wage is adjusted using the fixed price index based on 1992. The findings of this study are detailed in Table 4. The table generally indicates that the coefficient is negative, but only marginally significant after adjusting for province-year fixed effects in Column (3). This finding can be captured by a simple partial equilibrium in the labor market: with simultaneous increases in labor demand and labor supply, the shift of equilibrium wage is determined by the elasticity of the two sides. Since the Massive Layoff not only affects labor supply but also raises the demand through the increase of POE establishment for my previous results, there is an observed increase in employment but stable

Table 4 Effect of the Massive Layoff on the Private Economy: Wage Shock

	Log Average wage		
	(1)	(2)	(3)
<i>Loglayoff</i> × <i>Treat</i>	−0.009 (0.008)	−0.009 (0.008)	−0.013* (0.007)
Control	No	Yes	Yes
Province FE	Yes	Yes	No
Industry FE	Yes	Yes	Yes
Calender yr. FE	Yes	Yes	No
Calender yr. × Province FE FE	No	No	Yes
Obs.	1,846	1,846	1,846
R-squared	0.692	0.718	0.739

Notes: This table reports the estimated impact of massive layoffs on the average wage in China's private labor market, based on data from the China Statistical Yearbook (CSY, various issues). Observations are at the province-industry-year level. Standard errors in the parentheses are clustered at the province level. *, **, and *** denote significance at 0.10, 0.05, and 0.01 levels, respectively. The dependent variable is the logarithm of the average wage, which is adjusted by the fixed price index based on 1992. The variable *Loglayoff* represents the natural logarithm of massive layoff intensity, calculated using equation (1). The *Treat* variable is set to zero for 1995 and 1996, and one for 1997–2001. The interaction term *Loglayoff* × *Treat* assesses the layoffs' effect on market wages. This effect is only statistically significant at the 10% level in Column (3), suggesting a limited impact of SOE reform on private market wages in terms of significance and magnitude.

wages in the post-reform equilibrium (as illustrated by Figure A1).

3 Occupational Transition for SOE Workers

Here, I show that the impact of the Massive Layoffs on the private economy in my analysis is mainly due to labor redistribution. It's expected that higher layoff intensities lead to more POEs being established by laid-off workers. To verify this, I utilized entrepreneur-level data from the CPES to pinpoint POEs started by ex-SOE employees. However, I cannot precisely determine if these entrepreneurs were laid off, so the findings primarily indicate whether the massive layoffs encourage SOE workers to leave the state sector (regardless of their willingness) and initiate businesses. The results are detailed in Table 5. Building on Section 1, in Panel B of Table 5, I exclude privatized SOEs to isolate the effect of SOE privatization. The findings in Columns (1)–(3) indicate that an increase in SOE downsizing severity correlates with more SOE workers entering the market and launching their own businesses. Therefore, the surge in POE establishments due to the massive layoffs likely stems from the push it gives SOE workers to turn into entrepreneurs, whether through direct dismissal or other means.

The rise in layoff severity may also encourage a shift in the labor force from SOEs to the private sector. To demonstrate this, I regress the number of POE workers formerly employed in SOEs (hereafter referred to as 'transitional workers') on the number of lai-off workers with several controls. I use data from the 1999 and 2002 waves of the China Household Income Project (CHIP), a cross-sectional dataset that provides detailed occupational information. This enables the identification of the number of transitional workers at the province and industry levels. The regression

Table 5 Effect of the Massive Layoff on POE Establishment: Occupational Transition (Entrepreneurship)

	Log POE Registration		
	(1)	(2)	(3)
Panel A: POE Established By Ex-SOE Workers			
$\text{Loglayoff} \times \text{Treat}$	0.049*** (0.013)	0.053*** (0.013)	0.057*** (0.013)
Obs.	3,718	3,636	3,625
R-squared	0.294	0.299	0.353
Panel B: POE Established By Ex-SOE Workers, Exclude Privatized SOE			
$\text{Loglayoff} \times \text{Treat}$	0.038*** (0.009)	0.040*** (0.009)	0.045*** (0.009)
Obs.	3,718	3,636	3,625
R-squared	0.298	0.301	0.346
Control	No	Yes	Yes
Province FE	Yes	Yes	No
Industry FE	Yes	Yes	Yes
Calendar yr. FE	Yes	Yes	No
Survey yr. FE	Yes	Yes	Yes
Calendar yr. FE $\times$ Province FE	No	No	Yes

Notes: This table presents the estimated impact of massive layoffs on the Establishment of POEs by ex-SOE workers, using province-industry-year level data. Standard errors, clustered at the province level, are shown in parentheses. Significance levels of 0.10, 0.05, and 0.01 are marked with *, **, and ***, respectively. The dependent variable is the logarithm of POE registrations. *Loglayoff* indicates the natural logarithm of layoff intensity, as defined in equation (1). The *Treat* variable is 0 for 1992–1996 and 1 for 1997–2001. The interaction term $\text{Loglayoff} \times \text{Treat}$ measures the effect of layoffs on motivating SOE workers to pursue entrepreneurship. Findings imply that SOE restructuring, irrespective of layoff status, encourages ex-SOE workers to start businesses.

results are shown in Table A6. Although the data limits the ability to compare the increase in transitional workers pre- and post-SOE reform, Table A6 still reveals a positive correlation between the extent of SOE downsizing and the number of transitional workers at the province-industry level. This result partly explains why the massive layoff partially drove the increase in private-sector employment.

4 Heterogeneity Analysis

Heterogeneous Industrial Effects. In this paragraph, I investigate the heterogeneous effect of the Massive Layoff at the industry level. 14 distinct industries, excluding farming and government services, are classified into secondary and tertiary sectors.¹¹⁾ In Table 6, the effects of SOE layoffs across different industries are analyzed. It shows that the reform impacts both sectors for POE

11) Specifically, the secondary sector includes mining, manufacturing, electricity, and construction, while the rest are grouped under the tertiary sector. Agricultural industry and government services are dropped in this setting.

Table 6 Effect of the Massive Layoff on the Private Economy: Heterogeneity (Economic Sector)

	Secondary Sector			Tertiary Sector		
	Log POE Registration	Log Total Employment	Log Average Employment	Log POE Registration	Log Total Employment	Log Average Employment
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Loglayoff</i> × <i>Treat</i>	0.068*** (0.018)	0.159** (0.073)	0.126** (0.053)	0.046*** (0.013)	0.068* (0.040)	0.014 (0.035)
Obs.	812	1,461	1,461	1,063	1,754	1,754
R-squared	0.964	0.418	0.302	0.916	0.306	0.256

Notes: This table reports the heterogeneous effect of the Massive Layoff across different economic sectors. Observations are at the province-industry-year level. Standard errors are clustered at the province level. *, **, and *** denote significance at 0.10, 0.05, and 0.01 levels, respectively. The variable *Loglayoff* represents the natural log of massive layoff intensity, calculated using equation (1). The dummy variable *Treat* is set to 1 for samples observed one year post the base year, and 0 for samples observed below the base year. The analysis is split between the secondary sector (Columns 1–3) and the tertiary sector (Columns 4–6). Results indicate the secondary sector's higher sensitivity to state-owned enterprise (SOE) reform compared to the tertiary sector.

Table 7 Effect of the Massive Layoff on the Private Economy: Heterogeneity (Geographic Region)

	Log POE Registration				Log Total Employment				Log Average Employment			
	Northeast	East	Mid	West	Northeast	East	Mid	West	Northeast	East	Mid	West
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<i>Loglayoff</i> × <i>Treat</i>	0.042 (0.020)	0.035*** (0.010)	0.021 (0.013)	0.060* (0.032)	0.073 (0.156)	0.111*** (0.028)	0.159*** (0.034)	−0.035 (0.042)	0.046 (0.113)	0.070*** (0.019)	0.108*** (0.023)	−0.026 (0.041)
Obs.	230	797	460	608	323	1,705	705	850	323	1,705	705	850
R-squared	0.929	0.933	0.935	0.917	0.388	0.415	0.319	0.333	0.322	0.279	0.289	0.309

Notes: This table presents the varied impact of Massive Layoffs across China's geographical regions, using province-industry-year level data. Standard errors are clustered at the province level. *, **, and *** denote significance at 0.10, 0.05, and 0.01 levels, respectively. The variable *Loglayoff* represents the natural log of massive layoff intensity, calculated using equation (1). The dummy variable *Treat* is set to 1 for samples observed one year post 1997, and 0 for samples observed below 1997. This table reports the estimated coefficient using equation (2) with different sample sizes based on the geographic location. The results reveal a significant increase in POE establishments in eastern provinces, while the increase in western provinces is less pronounced. The eastern and middle regions show a substantial expansion in the private labor market, contrasting with insignificant results in other regions.

registration, with the secondary sector being more significantly affected. Notably, the secondary sector experienced labor market expansion post-Massive Layoff, unlike the tertiary sector. These findings imply that workers laid off from the secondary sector are more likely to move to the private sector. In contrast, those from tertiary SOEs face greater challenges in finding new jobs, potentially contributing to long-term unemployment following SOE downsizing as discussed by existing literature (Appleton et al., 2006; Giles et al., 2006).

Heterogeneous Regional Effects. The Massive Layoff likely has varying impacts across geographic regions, influenced by the industry policy designed around geographic characteristics. To illustrate this geographic heterogeneity, I have divided China's 32 provinces into four regions: Northeast, East, Mid, and West. This categorization is used to re-estimate my main specification for each region separately.¹²⁾ Table 7 shows that the Eastern provinces experienced the most significant

12) The Northeastern region, known for its concentration of heavy industry, includes Heilongjiang, Jilin, and

boost from the SOE reform. The Mid provinces saw a notable expansion only in their private labor markets due to this reform. However, the impact of the reform on other regions is less clear. This result is consistent with Appleton et al. (2006), who find retrenched workers in Liaoning (Northeastern province) and Sichuan (Western province) are less likely to be re-employed than in other provinces, especially than Jiangsu (Eastern province).

VI Discussions

In this section, I discuss two objects that are closely related to the main targets in this paper. One is the potential confounding event: The 1997 Asian Financial Crisis. Another one is the implications of the Massive Layoff at the firm level.

1 The 1997 Asian Financial Crisis

In this section, I explore an alternative narrative that challenges the main results' interpretation. The 1997 Asian Financial Crisis, originating in Thailand, rapidly impacted key economies across Asia and globally. Although the crisis did not directly hit China, its major export markets suffered significantly (Park et al., 2010). This led to reduced international demand, posing a crisis for China, one of the world's largest exporters (Wang, 1999). Moreover, the literature indicates that the financial crisis exacerbated SOEs' struggles in China, potentially contributing to the Massive Layoff (He et al., 2018; Tian et al., 2022). There are three key reasons supporting my argument that the Asian Financial Crisis should not be considered the primary driver of my main findings. Firstly, my analysis incorporates year-province FE to account for macroeconomic dynamics, potentially encompassing the crisis' impact. As Tables 1 and 2 demonstrate, results remain consistent even after adjusting for year-province FE, indicating the robustness of my findings against the crisis' influence. Secondly, while the crisis, perceived as a negative shock, reduced international demand, both SOEs and POEs should be negatively affected. If the effect of the financial crisis is behind the scenes, we should observe recessions in both sectors. That is, the exposure to the Massive Layoff should be negatively correlated with the growth of the private economy, which is, however, rejected by the real data and the main findings in this paper. If there is no conclusive evidence to state that the financial crisis disproportionately impacted SOEs and POEs, then it should not play a major role in my findings. Last, in the next section, I discuss the impact of the Massive Layoff at the firm level, where I find that SOE layoffs raise the employment and overall performances of industrial POEs. To specifically isolate this effect from the 1997 Asian Financial Crisis, I have excluded firms engaged in exporting from the analysis. The continued observation of a positive impact, even after this exclusion, further confirms the robustness of my results, independent of the

Liaoning. The Mid region comprises Shanxi, Henan, Anhui, Hubei, Jiangxi, and Hunan. The Western region encompasses Chongqing, Sichuan, Shaanxi, Yunnan, Guizhou, Guangxi, Tibet, Inner Mongolia, Xinjiang, Qinghai, Gansu, and Ningxia. All remaining provinces fall under the Eastern region, which is the most economically advanced region after the economic reform.

Table 8 Effect of the Massive Layoff on Manufacturing POEs

	$\Delta\text{Log Employment}$	$\Delta\text{Log Output}$	$\Delta\text{Log K/L ratio}$	$\Delta\text{Log Y/L ratio}$	$\Delta\text{Profit Margin}$
	(1)	(2)	(3)	(4)	(5)
Panel A: Exogeneity of "Share"					
Share	0.130	0.050	−0.023	−0.056	−0.109
	(0.080)	(0.131)	(0.140)	(0.066)	(0.128)
Obs.	29,728	29,728	29,728	29,728	29,728
Panel B: Full Sample					
$\hat{\beta}_{2SLS}$	0.062**	0.094***	−0.001	0.031**	0.013
	(0.025)	(0.031)	(0.031)	(0.013)	(0.013)
F-stats. (first stage)	50.95	50.95	55.95	55.95	55.95
Obs.	29,080	29,080	29,080	29,080	29,080
Panel C: Full Sample: Manufacturing Industry FE					
$\hat{\beta}_{2SLS}$	0.066**	0.104***	0.004	0.037**	0.011
	(0.027)	(0.037)	(0.036)	(0.016)	(0.015)
F-stats. (first stage)	42.69	42.69	42.69	42.69	42.69
Obs.	29,080	29,080	29,080	29,080	29,080
Panel D: Exclude Export POEs					
$\hat{\beta}_{2SLS}$	0.067***	0.100***	−0.008	0.033***	0.007
	(0.023)	(0.026)	(0.030)	(0.012)	(0.014)
F-stats. (first stage)	57.86	57.86	57.86	57.86	57.86
Obs.	21,385	21,385	21,385	21,385	21,385
Panel E: Exclude State-Invested POEs					
$\hat{\beta}_{2SLS}$	0.051**	0.081***	0.000	0.026*	0.008
	(0.023)	(0.029)	(0.038)	(0.014)	(0.012)
F-stats. (first stage)	44.77	44.77	44.77	44.77	44.77
Obs.	23,688	23,688	23,688	23,688	23,688

Notes: This table presents the 2SLS estimation result of (2) using CIED data. The data has been winsorized at the 99th percentile. Standard errors in the parentheses are clustered at the province level. The outcome for the estimated result is the change in the (log) employment, (log) gross output, (log) K/L ratio, (log) Y/L ratio, and profit margin. The K/L ratio and Y/L ratio are calculated by fixed capital and output divided by employment, respectively. Profit margin is the ratio of profit to the output. Panel A presents the result of endogeneity testing for the "Share"; Panel B reports the baseline results; results within the manufacturing industry are displayed in Panel C; Panel D and Panel E estimate using different samples.

effects of the Financial Crisis (see Table 8).

2 The Impact of the Massive Layoff on POEs

The effects of the Massive Layoff on the growth of the private economy have been examined in previous empirical investigations. The remaining question is could we observe its effects on the micro level? In this section, I use firm-level panel data: the China Industrial Enterprise Data (CIED), and combine it with the "Shift-Share" Instrument variable (SSIV) design to answer this question.

For the data, the CIED data is an unbalanced panel data started in 1998, so we cannot directly identify the effect of SOE reform by using my previous specification. Moreover, as the dataset exclusively comprises industrial enterprises, it necessitates a different approach for measuring layoff severity compared to the method used in Equation (1). To adapt to this dataset, I have

classified these manufacturing firms into 45 distinct manufacturing industries. The exposure to the SOE layoffs is then measured by calculating the change in total employment in SOEs at both the province and manufacturing industry levels from 1998 to 2001.¹³⁾ To estimate the effect of the Massive Layoff on POEs, I construct the following regression equation:

$$\Delta Y_{ipj} = Y_{2001,ipj} - Y_{1998,ipj} = \alpha + \beta \text{Loglayoff}_{pj} + \epsilon_{ipj} \quad (4)$$

where i, p, j index firm, province, and manufacturing industry, respectively. The primary outcome variables here are the log-term employment, (gross) output, Capital-Labor ratio (K/L ratio), and Output-Labor ratio (Y/L ratio) in 2001 subtracting 1998. Because the firm's profit contains negative numbers, I use the profit margin (that is, profit divided by output) to capture the change in profitability for POEs. To be consistent with the previous analysis, the price is adjusted to the 1992 fixed price index. The explanatory variable is the (log) number of laid-off workers from 1998 to 2001, at province and manufacturing industry levels. The sample contains all POEs in the CIED and I keep those that have observations in all four years (1998-2001) to construct a balanced panel. β is the estimator with interest, which captures the effect of the Massive Layoff on POEs' behaviors.

In this equation, since I cannot control for the time-varying regional shocks that may correlate with the severity of SOE layoffs and affect the outcome variables (e.g. Change in the market conditions), I construct an SSIV design to address the concern for endogeneity. The SSIV is constructed by:

$$\text{SSIV}_p = \sum_j \frac{\text{SOEempl}_{pj}^{1998}}{\text{SOEempl}_p^{1998}} \times (\text{SOEempl}_j^{1998} - \text{SOEempl}_j^{2001}) \quad (5)$$

where $\text{SOEempl}_{1998,pj}$ is the number of SOE workers in 1998 in province p and manufacturing industry j . $\text{SOEempl}_{1998,p}$ and $\text{SOEempl}_{1998,j}$ are the SOE total employment in province p and manufacturing industry j , respectively. The first term of the right-hand side captures the “share” of each industry in the regional SOE employment. The second term is the “shock”, which measures the exposure to the Massive Layoff at the manufacturing industry level. As suggested by recent discussions on the identification assumptions of SSIV (Adao et al., 2019; Borusyak et al., 2022; Goldsmith-Pinkham et al., 2020), the SSIV design can be justified if either the “share” (i.e. manufacturing industry structure) or the “shift” (i.e. the exposure to the Massive Layoff) are exogenous to the outcomes. Here, because the variation of the exposure to the Massive Layoff is essentially from the local economic conditions, Instead of looking at the shock at the manufacturing industry level, the validity of my SSIV approach relies on the assumption that the regional manufacturing structure is exogenous to the main outcomes. To test such an assumption, I regress outcome variables on the “share”. Table 8 reports the overall results for the 2SLS estimator using SSIV ($\hat{\beta}_{2SLS}$).

13) This measurement might underestimate the total number of laid-off workers, considering that the reform took place in 1997. Nevertheless, since the number of workers laid off from 1998 to 2001 represents 66% of the total layoffs in SOEs (from Figure 2), this approach remains valid for assessing the scale of the Massive Layoff.

2.1 Firm Characteristics

Firstly, I report the test for the exogeneity of the share in SSIV. Panel A in Table 8 generally indicates that my main outcomes do not correlate with the share, which supports the identification assumption for SSIV. Furthermore, as discussed by Goldsmith-Pinkham et al. (2020), the SSIV design is also valid provided there are no other shocks correlated with the regional manufacturing structure. To the best of my knowledge, two major events occurred in the late 1990s in China: SOE restructuring and the Asian Financial Crisis. To demonstrate that the Asian Financial Crisis does not affect my findings, Panel D presents an analysis where I exclude export POEs with a custom record by merging the custom data with the CIED. The results show that similar findings are observable for domestic POEs, implying that firms less affected by international market shocks still undergo significant impacts from SOE retrenchment. This further validates the SSIV design. In Panel E, I exclude POEs that are invested by the State, which can be seen as similar to privatized SOEs. While the impact on employee numbers shows a smaller magnitude (0.051 v.s. 0.062), the evidence still suggests a reform-driven expansion in the private sector.

For POE employment, one can see that the Massive Layoff stimulates private employment even at the firm level. With a 10% higher exposure to the Massive Layoff, POEs would witness about a 0.51%–0.67% increase in their labor inputs across various specifications, which is consistent with my baseline results. For the output, a 10% increase in the layoff severity causes about a 0.81%–1.04% increase in the gross output. For the K/L ratio, some negative effects are observed in the estimation results, but they are small in both statistical significance and magnitude. This result suggests that the expansion in POEs is, at least less likely to be labor-biased. This result could also be interpreted as proof of the mechanism. If the Massive Layoff sharply decreases the market wage, the K/L ratio would go downward because POEs are likely to input more labor to substitute capital. Besides, the increase in the Y/L ratio led by the Massive Layoff is shown in Table 8. Specifically, 10% more laid-off workers are causally associated with 0.26%–0.37% higher Y/L ratio. This result may potentially be associated with the labor productivity increase, which I will explore in the next section. For the firm's profitability, although I find a positive impact on the profit margin, the coefficient is not significant.

In sum, the Massive Layoff increases the labor input, output, and Y/L ratio from my estimation. However, The question that remains unanswered is: what is the underlying source of this notable shift? In this paper, I will discuss one important channel: productivity shock.

2.2 Productivity

In this section, I discuss the productivity shock to POEs that comes from the SOE reform. The source of shock mainly comes from job displacement in this scenario. Previous studies have shown that job displacement affects economic efficiency, particularly productivity (see Kletzer (1998) for a literature review). Before the reform, the Chinese government assigned highly educated workers (college or university graduates) to SOEs, leading to a mismatch in employer-employee compatibility and lower SOE productivity. Additionally, high-skill laborers were predominantly employed in

SOEs, leaving POEs with workers mostly from rural areas or with less education.

The 1997 SOE reform, however, triggered significant changes. The Massive Layoff during the reform displaced numerous experienced and educated workers, who then sought employment in the private sector. As shown in Tables 2 and A6, the private labor market expanded post-reform, partly due to the influx of former SOE workers.

The migration of workers resulting from the SOE reform potentially enhanced the labor quality in POEs. Data from the China Health and Nutrition Survey (CHNS) reveals an evolving trend in educational attainment within the workforce. Initially, the average education level in the private sector lagged significantly behind that in SOEs. However, following the reform, this educational disparity began to close. By 2020, the data shows that the average educational attainment of workers in POEs had overtaken that in SOEs (see Figure A2). This trend provides insight into the redistribution of the labor force post-SOE reform, suggesting a potential shift towards a more skilled workforce in the private sector.

Does the labor redistribution caused by the Massive Layoff induce POE productivity growth? Firstly, I provide a primitive investigation to unveil the source of the productivity shock. Ideally, if laid-off workers are more efficient, firms that hire more ex-SOE workers would enjoy higher production efficiency. To test such an inquiry, I regress the output and profit on the ratio of ex-SOE employees to the total employment by specification (7). The regression results are reported in Table A7. These results indicate that a 10% increase in the ratio of ex-SOE workers is correlated with a 0.74 % increase in output and a 0.9% increase in profit, which partly shows the productivity shock is correlated with the ex-SOE labor force.

Now, to quantify the productivity gain of POEs from the SOE reform, I re-run the regression Equation (4) with SSIV using total factor productivity (TFP) as the outcome variable. To measure firm-level productivity, a simple OLS is potentially biased because there are determinants of production that are unobserved to the econometrician but observed by the firm, which gives rise to the endogeneity problem. To address this issue, two major methods are built: the OP (Olley and Pakes, 1996) and LP (Levinsohn and Petrin, 2003) methods. These two methods use a similar idea: under certain assumptions, one can use labor input (in OP) or material input (in LP) as a proxy for the unobservable productivity shocks to correct the endogenous issue in the production function estimation. However, Akerberg et al. (2015) suggests that the efficiency of estimation of these two methods may suffer from the functional dependence problem and the ACF method they build allows for more general underlying data generating processes. Hence, I use the ACF approach to estimate the following the log version Cobb-Douglas production function:

$$Output_{ipjt} = \alpha + \beta_k Capital_{ipjt} + \beta_l Labor_{ipjt} + \omega_{ipjt} + \epsilon_{ipjt} \quad (6)$$

where i, p, j , and t index firm, province, manufacturing industry, and year, respectively. Following the suggestion by Akerberg et al. (2015), value-added output is utilized as the primary metric. ω_{ipjt} denotes a productivity shock, which, while unobservable to researchers, can be anticipated or observed by the firms themselves. This discrepancy in observability is the root of the endogenous

Table 9 Effect of the Massive Layoff on POE's Productivity

	$\Delta \text{Log TFP Estimated By Akerberg et al. (2015)}$			
	Full Sample (1)	Include Industry FE (2)	Exclude Export POE (3)	Exclude State-Invested POE (4)
$\hat{\beta}_{2SLS}$	0.048*** (0.017)	0.055*** (0.017)	0.048*** (0.016)	0.044*** (0.017)
F-stats. (first stage)	49.87	244.03	313.27	203.21
Obs.	28,528	28,528	20,899	23,285

Notes: Standard errors are clustered at the province level. The outcome variable is the change in the (log) TFP estimated by the ACF approach (Akerberg et al., 2015). The instrument variable is given by (5). For the detail specification, see (4).

issue in our model. And ϵ_{ipjt} represents random shocks that are unobservable to firms. Once β_k and β_l are estimated, the POE's Hicks-neutral TFP can be calculated by subtracting the POE's predicted output from its actual output. Table A8 reports the estimation result for Equation (6). For the estimation, I employ the same 2SLS estimator as outlined earlier to evaluate the impact of Massive Layoffs on the productivity of POEs. The findings of this analysis are detailed in Table 9. Specifically, Columns (1)–(3) of Table 9 presents the estimated coefficients, using varied sample selections akin to those employed in Table 8.

Interestingly, these results indicate an improvement in the productivity of POEs following SOE reform. Overall, a 10% increase in the number of laid-off workers would bring a 0.44–0.55% productivity premium. This observation is particularly noteworthy as the existing literature predominantly concentrates on productivity enhancements within SOEs themselves. The implication here is that the reforms may have broader impacts across different sectors of the economy, extending beyond the direct scope of SOEs.

VII Conclusion

In the late twentieth century, several central-planning economies began transitioning to market-oriented systems. A notable example is China, where the private economy started to emerge in the 1990s, especially following significant developments in 1997. Also in September of that year, the Chinese government initiated a SOE reform policy to address overstaffing in the state sector, leading to massive layoffs of SOE workers. While existing literature primarily focuses on the consequences of these layoffs on the state-owned sector, their impact on the private economy has not been extensively studied. In this paper, the main research target is to build a causal relationship between the Massive Layoff and private economic growth in the late 1990s and early 2000s in China, by focusing on the expansions of POE establishment and the private labor market.

Utilizing firm registration data from the official website and employment data from the CPES, I apply a continuous DID design to investigate whether the Massive Layoff boosts firm registration and employment. This involves measuring the exposure to the SOE layoff at the province-industry

level and comparing post-policy outcomes with pre-policy conditions. The research design is based on the assumption that, with the absence of SOE downsizing, the growth trajectory of the private economy would have been similar across different regions and industries. The DID results indicate that a higher exposure to the Massive Layoff leads to an increase in POE establishment and private employment. By estimating the flexible DID estimator, the trend for the growth of the private appears well-balanced. Besides, several potential threats to these findings have been considered. Robustness checks further validate the main findings, allowing for variations in policy window selection and variable definition. In this paper, the impact of SOE reform is interpreted through several scenarios. First, I find that SOE privatization contributes to private employment, but not to POE registration. Second, the channel through factor price shock is less clear. Third, the Massive Layoff leads to significant labor redistribution, pushing former SOE workers into the private market as entrepreneurs or private employees. Additionally, I discuss the heterogeneous impact of SOE restructuring across economic sectors and geographic regions, finding these results consistent with previous literature.

Furthermore, this paper expands upon the baseline results by addressing related questions. One of the key considerations is the potential confounding effect of the Asian Financial Crisis. However, the nature of the Massive Layoff suggests that this crisis could not significantly influence the core findings of this study. Besides, the firm-level investigation also shows that even for domestic POEs (that are hardly affected by the international market shock), the SOE reform shock still exists. Another important aspect is the impact at the firm level. To investigate the effect of the Massive Layoff on the characteristics of POEs, I utilize data from manufacturing firms and employ an SSIV design. The findings indicate that employment, output, and Y/L ratio have increased as a result of the Massive Layoff. And such impacts may come from the productivity growth led by the labor restructuring.

The primary conclusion of this research is that the restructuring of the state-owned sector has several positive implications for the private economy. This paper, however, primarily concentrates on the reform policy in China. More evidence is required to fully understand the dynamics of structural change in economies transitioning from central planning to a private-oriented market. Although this paper builds a causal relationship between the SOE layoffs and the private market, to fully understand the implications of SOE reform counterfactually, one should describe the dynamics of general equilibrium. Overall, this paper contributes to a broader comprehension of the effects of SOE reforms, but it also highlights the necessity for further investigation of the implications of SOE reform from a more general perspective.

VIII Appendix

A.1 Tables and Figures

Table A1 Summary Statistics

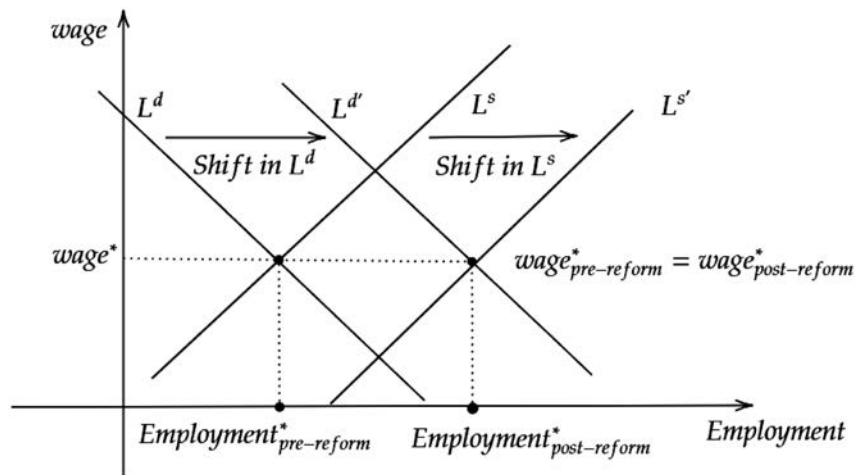
	Obs.	Mean	Std.Dev.	Median	Q10	Q90
<i>LogLayoff</i>	3,718	2.010	1.796	2.350	-.402	4.295
Log (# New POE Registration)	3,047	3.334	1.710	3.466	.693	5.421
Log (Total POE Employment)	4,244	3.643	1.427	3.466	1.946	5.635
Log (Average POE Employment)	4,244	3.183	1.151	3.045	1.791	4.762

Notes: This table displays the summary statistics for the treated variable *LogLayoff*, collected from CSY data, and outcome variables Log (# POE Registration) from NECIPS data, Log (Total POE Employment), and Log (Average POE Employment) from CPES data.

Table A2 Summary Statistics for the CIED Data

	Mean	Std.Dev.	Statistics				
			Q1%	Q25%	Q50%	Q75%	Q99%
Panel A: 1998							
Employment	338.4	499.7	14	82	168	358	3205
Output	20833.6	40356.1	549.7	3833.5	7617.0	18453.7	279100.7
Profit	1110.6	5951.3	−16198.1	−8.5	151.8	822.7	39634.4
Panel B: 2001							
Employment	347.5	502.6	13	88	178	380	3227
Output	29700.2	62395.4	245.8	4744.5	10122.9	25389.1	446041.4
Profit	2386.7	8857.3	−11943.4	0.0	256.8	1407.2	63348.1

Notes: This table displays the employment, output, and profit in the CIED data. A 1% winsorization is conducted. The sample consists of POEs that are investigated across all 1998–2001 periods.

**Figure A1** Effect of the Massive Layoff on the Private Economy: Wage Shock

Note: This figure demonstrates a potential mechanism explaining why private market wages are merely affected by the SOE reform. The reform leads to a simultaneous increase in both labor demand and supply. This dual increase results in a rise in equilibrium employment, yet maintains stable wages. The implication is that the influx of workers from SOEs, increasing labor supply, is effectively matched by a corresponding rise in labor demand, possibly due to the expansion of the private sector or other economic factors stimulated by the reform. This balanced dynamic in the labor market ensures that despite the increase in employment numbers, wage levels do not experience a downward pressure, illustrating a key aspect of labor market adjustments post-SOE reform.

Table A3 Effect of the Massive Layoff on POE Establishments

	Log POE Registration			Log Total Employment			Log Average Employment		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Loglayoff</i> × 1993	0.016 [−.012, .043]	0.012 [−.016, .040]	0.029** [.005, .053]	0.043 [−.055, .141]	0.045 [−.059, .150]	0.044 [−.060, .147]	0.027 [−.059, .114]	0.022 [−.070, .113]	0.019 [−.072, .110]
<i>Loglayoff</i> × 1994	0.048* [−.007, .103]	0.051* [−.001, .104]	0.066*** [.030, .102]	0.047 [−.033, .128]	0.059 [−.029, .147]	0.057 [−.032, .146]	0.035 [−.051, .122]	0.039 [−.053, .130]	0.033 [−.058, .124]
<i>Loglayoff</i> × 1995	0.042* [−.005, .089]	0.044* [−.001, .090]	0.068*** [.032, .104]	0.049 [−.041, .138]	0.053 [−.040, .145]	0.054 [−.042, .150]	0.048 [−.027, .123]	0.041 [−.036, .119]	0.041 [−.036, .118]
<i>Loglayoff</i> × 1996	0.067*** [.021, .114]	0.070*** [.036, .105]	0.069*** [.037, .100]	0.080* [−.013, .172]	0.079 [−.020, .178]	0.087* [−.008, .183]	0.057 [−.031, .145]	0.053 [−.040, .147]	0.051 [−.042, .144]
<i>Loglayoff</i> × 1997	0.063*** [.022, .104]	0.063*** [.024, .102]	0.069*** [.029, .110]	0.066 [−.029, .161]	0.079 [−.019, .177]	0.083* [−.016, .182]	0.061 [−.022, .144]	0.063 [−.023, .149]	0.055 [−.028, .138]
<i>Loglayoff</i> × 1998	0.075*** [.028, .122]	0.069*** [.027, .110]	0.078*** [.043, .112]	0.166*** [.068, .264]	0.177*** [.079, .275]	0.166*** [.068, .264]	0.120*** [.033, .207]	0.122*** [.034, .211]	0.111** [−.001, .146]
<i>Loglayoff</i> × 1999	0.101*** [.063, .139]	0.090*** [.046, .134]	0.109*** [.062, .156]	0.099** [.016, .181]	0.096** [.009, .184]	0.114*** [.040, .187]	0.061 [−.021, .142]	0.056 [−.029, .141]	0.072* [−.001, .146]
<i>Loglayoff</i> × 2000	0.113*** [.066, .159]	0.116*** [.056, .176]	0.117*** [.071, .162]	0.115** [.004, .225]	0.139** [.024, .255]	0.155** [.038, .273]	0.065 [−.028, .158]	0.084* [−.013, .181]	0.093* [−.000, .187]
<i>Loglayoff</i> × 2001	0.070*** [.025, .115]	0.066** [.015, .116]	0.084*** [.046, .122]	0.120* [−.011, .251]	0.142** [.015, .269]	0.145** [.014, .276]	0.046 [−.073, .166]	0.060 [−.056, .176]	0.059 [−.055, .172]
Control	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Province FE	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calender yr. FE	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Survey yr. FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Calender yr. FE × Province FE	No	No	Yes	No	No	Yes	No	No	Yes
Obs.	2,324	2,109	2,095	3,679	3,598	3,587	3,679	3,598	3,587
R-squared	0.836	0.821	0.928	0.288	0.298	0.355	0.204	0.208	0.277

Notes: This table presents the estimation result on the effect of the Massive Layoff on POE establishments and employment following specification (3). Observations are at the province-industry-year level. Standard errors are clustered at the province level. The 95% confidence interval values are indicated within square brackets. *, **, and *** denote significance at 0.10, 0.05, and 0.01 levels, respectively. Yes indicates that the control is included in the estimation, and No vice versa. The magnitudes of coefficients are relative to 1992. *Loglayoff* is the natural log of the massive layoff intensity, which is calculated by equation (1). I estimate the coefficient of the interaction term between *Loglayoff* and year dummies. Columns (1)–(3) report estimation results for POE registration using NECIPS data. Columns (4)–(9) report estimation results for private employment using CPES data, which has been winsorized at the 99th percentile. This table is to test the existence of pre-policy trends. One can see that before the implementation of SOE reform, the magnitudes of coefficients are well-balanced. And there is a clear spike in the period after SOE reform.

Table A4 Robustness Check: Policy Window Selection

	<i>Base year =1995</i>			<i>Base year =1994</i>		
	Log POE Registration	Log Total Employment	Log Average Employment	Log POE Registration	Log Total Employment	Log Average Employment
	(1)	(2)	(3)	(4)	(5)	(6)
$\text{Loglayoff} \times \text{Treat}$	0.034*** (0.010)	0.074*** (0.014)	0.046*** (0.011)	0.042*** (0.012)	0.076*** (0.017)	0.050*** (0.015)
Obs.	1,947	3,200	3,200	1,947	3,200	3,200
R square	0.929	0.360	0.282	0.929	0.360	0.282

Notes: This table displays estimation results on the impact of the Massive Layoff on POE establishments and employment following specification (2). Observations are at the province-industry-year level. Standard errors are clustered at the province level. *, **, and *** denote significance at 0.10, 0.05, and 0.01 levels, respectively. The variable *Loglayoff* represents the natural log of Massive Layoff intensity, calculated using equation (1). The dummy variable *Treat* is set to 1 for samples observed one year post the base year, 0 for samples observed below the base year. Columns (1)–(3) present results for the 1996–2001 policy window, while Columns (4)–(6) change to policy window to 1995–2001. Columns (1) and (4) are estimating the effect of the Massive Layoff on POE registration using the NECIPS data. Columns (1) and (4) focus on POE registration effects using NECIPS data. Columns (2)–(3) and (5)–(6) use CPES data, winsorized at the 99th percentile, to analyze private employment effects. The table conducts a sensitivity analysis on policy window selection, indicating that the main results are robust regardless of the policy window chosen.

Table A5 Robustness Check: Variable Selection

	Log POE Registration			Log Total Employment			Log Average Employment		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\hat{\beta}_1$	0.002*** (0.001)	0.105** (0.043)	0.043*** (0.012)	0.006*** (0.001)	0.0002* (0.000)	0.083*** (0.001)	0.005*** (0.001)	0.0002* (0.023)	0.052*** (0.018)
Obs.	2,745	2,745	2,095	4,075	4,075	3,587	4,075	4,075	3,587
R-squared	0.919	0.917	0.929	0.354	0.336	0.366	0.260	0.257	0.278

Notes: This table reports the results of testing the robustness of the main findings. Observations are at the province-industry-year level. Standard errors are clustered at the province level. *, **, and *** denote significance at 0.10, 0.05, and 0.01 levels, respectively. The estimated $\hat{\beta}_1$ is the coefficient of interest. In Columns (1), (4), and (7), I replace the log form layoff intensity with its original definition. In Columns (2), (5), and (8), I measure the intensity of SOE layoffs as the ratio of the number of SOE workers to the total SOE employment in 1996. In Columns (3), (6), and (9), Instead of controlling for the ratio of SOE employment in the base year, I control the total SOE employment and total POE employment in 1996 separately. Overall, the results imply that my main findings are robust to several specifications.

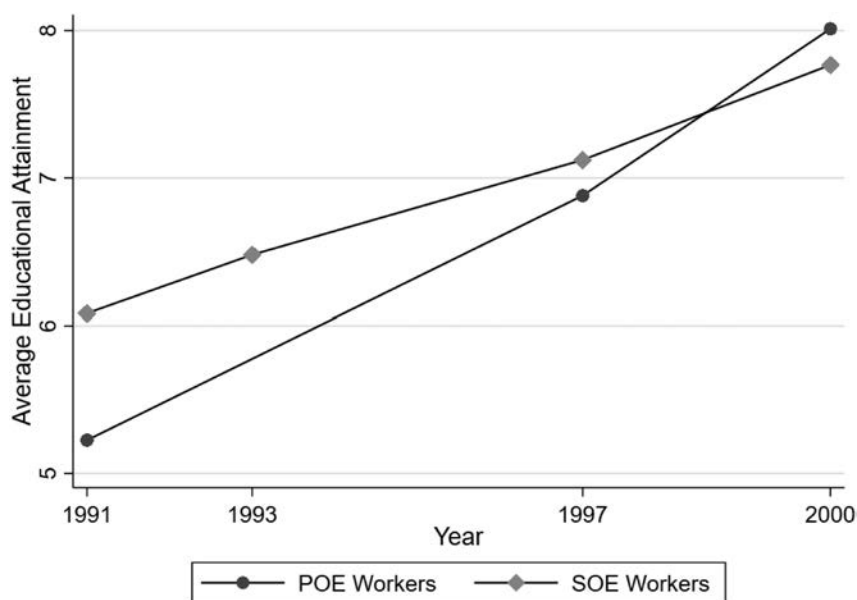


Figure A2 Average Educational Attainment By Sector

Data Source: *The China Health and Nutrition Survey*, 1991–2000 Waves.

Table A6 Effect of the Massive Layoff on POE Employment: Occupational Transition (Labor)

	Log Number of Transitional Workers		
	(1)	(2)	(3)
<i>LogLayoff</i>	0.128** (0.062)	0.121* (0.067)	0.123* (0.069)
Control	No	Yes	Yes
Province FE	Yes	Yes	No
Industry FE	Yes	Yes	Yes
Survey yr. FE	Yes	Yes	No
Survey yr. FE $\times$ Province FE	No	No	Yes
Obs.	199	174	174
R-squared	0.801	0.818	0.826

Notes: This table displays regression results with the (log) number of transitional workers as the dependent variable and the (log) intensity of SOE layoffs as the independent variable. I use the same controls as previous regressions. The observations are province-industry-survey year level. Standard errors clustered at the province level, are shown in parentheses. Significance levels of 0.10, 0.05, and 0.01 are marked with *, **, and ***, respectively. I use China House Income Project (CHIP) data 1999 and 2002 waves to run the regression. Transitional workers are identified as those employed in the private sector during the survey year who have previously worked in SOEs. While the results do not establish causality between these variables, the positive correlation observed supports the hypothesis that the increase in transitional workers could be a key driver of the main findings.

Table A7 Productivity Shock: Primitive Investigation

	Log Output (1)	Log Profit (2)
Log (Ex_SOE WorkerRatio)	0.074*** (0.026)	0.090*** (0.028)
Industry FE	Yes	Yes
Province FE	Yes	Yes
Entrepreneur-level Controls	Yes	Yes
Register year-level Controls	Yes	Yes
Present Employment	Yes	Yes
Observations	1,523	1,523
R-squared	0.632	0.477

Notes: Standard errors are clustered at the province level. Data from the CPES 1999 and 2002 waves. The sample consists of all POEs in the CPES that registered before 1998 to ensure they were affected by The SOE reform. The specification sees (7).

Table A8 Production Function Estimation

Production Function Estimated by Akerberg et al. (2015)			
Estimator	Coefficient	Std. Dev.	Obs.
β_k	.081***	.001	354,748
β_l	.565***	.008	354,748

Notes: This table presents the estimated result for the production function (6). I use the method suggested by Akerberg et al. (2015) to control for the potential endogeneity that arises from the productivity shocks that can be observed by firms but can not observed by researchers.

A.2 Firm-level Productivity Shock: Specification

$$Y_{ipj} = \alpha + \beta \text{LogEx_SOERatio}_{ipj} + X_{ipj}\gamma + \theta_p + \mu_j + \epsilon_{ipj} \quad (7)$$

where i , p , and j index firm, province, and industry, respectively. The outcome variables include the (log) output and profit. The independent variable $\text{LogEx_SOERatio}_{ipj}$ is the ratio of Ex-SOE workers to the total employment. The control variables include entrepreneur characteristics (age, education year, and sex), register year firm characteristics (the log form output, profit, capital, and labor input), and present labor input. Industry and Province FE are included in the regression equation.

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