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Economic Restructuring and Children's Educational Attainment: Lessons from China's State-owned Enterprises Reform

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Abstract: China's state-owned enterprises (SOEs) reform in the mid-1990s has greatly changed the distribution of labor earnings and family incomes in urban areas. This paper studies the impact of the reform-induced family income changes on children's educational attainment. I approach this question by exploiting variations in children's exposure to the policy change and in the shock intensity across sectors where these children's fathers initially worked. The empirical results show that after the shock, the earning gap between SOEs and non-SOE public organizations (hereinafter referred to as non-SOEs) was enlarged, and that SOE children were less likely to attend high school and college, compared with their non-SOE peers. Using additional geographical variations in economic structure, I find evidence of a negative externality, i.e., the impact of the shock was magnified in cities with higher percentage of SOE workers before the reform. Furthermore, SOE children whose parents have fewer siblings were even more adversely affected. To demonstrate the mechanism of the "sibling effect", I show that credit-constrained SOE families tend to receive more gift money from siblings than non-SOE families, which suggests the possible existence of informal insurance among extended family members.

Keywords: economic restructuring, educational attainment, SOE reform, mass layoffs, informal insurance, intergenerational cost, tripple difference

JEL classification: I25, O15, J62, J63, P31

1. Introduction

Economic restructuring is frequently seen in economic histories. It may be an effect of general development trends, such as globalization and technological progress, or may be caused by more purposeful actions, such as government-initiated reforms and updates of certain industry policy. Many studies have explored the side effects of economic restructuring, such as job separations – as well as its hidden cost – and income inequality;[1] these studies share a focus on its impact on the immediate generation being affected. Yet, research is yet to be done to investigate whether economic restructuring has an impact on the next generation. This issue is crucial because people need to be aware of the possible intergenerational cost of economic restructuring in order to respond through social protection polices, or, to fully evaluate existing policies that cause the restructuring for future references. This paper seeks to address this issue of possible intergenerational impact by examining the next generation's educational attainment. While it seems natural to deduce a relationship between economic restructuring and children's level of education, as restructuring can result in significant income redistribution and family income changes, the specific effect is to some extent a priori ambiguous and needs to be investigated empirically [2].

In this paper, I study the impact of economic restructuring on children's educational attainment by exploiting China's state-owned enterprises (SOE) reform in the mid-1990s as a quasi-natural experiment. The progressive economic restructuring caused by the SOE reform had resulted in mass layoffs of around 43 million workers in urban areas from 1995 to 2001; most of them were SOE workers, although a few were laid off from other public-owned entities. While laid-off workers usually failed to find new jobs quickly and therefore suffered drastic income drops, survivors of mass layoffs were also subjected to impacts of the reform: as SOE-associated welfare and services diminished, their disposable incomes shrank quickly as well. In contrast, employees from other public-owned entities were much less influenced[3]. Hence, the shock greatly enlarged the income gap between SOE workers and employers of non-SOE public organizations (hereinafter referred to as non-SOEs) [4]. Using data from China Urban Labor Survey 2001 (CULS2001), I compare the high school and college attainment of SOE children with those of non-SOE children, both before and after the shock, and evaluate the im-

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[1]For example, Autor et al. (2014) and Walker (2013) show that the structural reallocation of labor induced by trade competition and certain industry-specific regulation can reduce the lifetime earnings of workers initially employed in the restructured industries; Keane and Prasad (2002) discuss the rising inequality associated with economic restructuring in transition economies; Autor, Katz and Krueger (1998) and Acemoglu (2002) demonstrate that the skill-biased technical change can lead to changes in the wage structure and increase income inequality.

[2]Studies have shown that children's education in developing countries are susceptible to negative household income shocks (Jensen, 2000). The restructuring shock, however, should not be taken for granted as a simple negative income shock. For example, parents who have suffered job loss due to restructuring may have changed their perception on education. If they realize that achieving higher level of education is a way to avoid future layoff, they might increase their investment in children's education.

[3]Strictly speaking, other public-owned entities might also be affected by the SOE reform through indirect channels. For example, the reform might cause significant economic downturns in regions with high percentages of SOE employment, which might in turn decrease revenues of other entities distributed from the local government. This paper thus focuses on relative impacts of economic restructuring.

[4]Throughout this paper, I use the term "SOE" to refer to three types of enterprises with public ownership: wholly state-owned ones, majority state-owned ones, and collectively owned ones located in the urban area. The size of the private sector in urban China before the SOE reform is almost negligible compared to the public sector – see section 2.3 for more details. For this reason, this paper mainly focuses on the comparisons between entities within the public sector, namely, SOEs and non-SOEs; the latter consist of government agencies (GOVs) and public institutions (PUBs).

pact of economic restructuring on children's educational attainment using a Difference-in-Difference (DID) strategy.

In fact, China provides an ideal empirical setting for the use of DID, as the compositions of the control (non-SOEs) and the treatment (SOEs) groups are relatively stable over time. It's very difficult, if possible, for workers in urban areas to swtich from one work unit to another before 1992. This unique feature is due to China's socialist legacy: the private sector only started to take shape in the 1980s; and when the private sector was still much underdeveloped, the labor market barely existed and urban residents were assigned to employment tenures in public-owned work units. In other words, labor mobility across firms or sectors was almost zero.

I find rigorous evidence showing that in terms of high school and college attainment, children of SOE workers – regardless of whether they were laid off or not – were significantly more adversely affected by the SOE reform than were children of non-SOE employees. I conduct a series of robustness checks to make sure that the results are not driven by other cohort-varying confounders, such as the divergence of returns to education. I also demonstrate that other reforms implemented by Chinese government around the same time do not confound the above results.

Mass layoffs caused by economic restructuring can generate geographical externalities to children's educational attainment through two channels: father's labor market interactions and children's competitions over the limited educational resources[5]. Specifically, in areas with more laid-offs, individual unemployed workers face higher competition for new positions, which suggests lower chances of re-employment and lower equilibrium wage. And this may worsen the performance of children with fathers being laid off. On the other hand, in areas with mass layoffs, there are also more students experiencing father's job loss and family income drops, which would reduce competition for high school and college enrollment and in turn would benefit anyone else's possibility of enrollment. I develop a model that incorporates labor market interaction and features of educational enrollment procedure in China to better illustrate the two opposing externalities.

To empirically test the geographical externalities of economic restructuring, I use a Difference-in-Difference-in-Difference (DDD) strategy across cities, children's cohorts, and the public-owned sectors where fathers worked. The shock intensity across cities is measured in three different ways: the pre-reform SOE share (hereinafter referred to as SOE share), the post-reform layoff share (hereinafter referred to as layoff share), and a city dummy indicating higher or lower intensity of the shock. The estimated results support a negative externality, i.e., the adverse impact of economic restructuring is amplified in places with higher percentage of layoff or higher share of SOE workers. More importantly, the DDD result differences out cohort-varying unobservables, which could possibly affect parental income differentially and confound the main results.

After establishing a causal relation between economic restructuring and children's education, I go on to investigate how families cope with the substantial income shock in an environment lacking formal financial instruments. Prior studies have found evidence of informal insurance in places where financial markets are underdeveloped. For example, in Indonesia, households usually receive more gifts or informal loans from friends and extended family members when experiencing negative income

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[5]Ananat et al. (2011), for example, discusses how the widespread changes in the income distribution could generate intergenerational spillovers due to general equilibrium considerations.

shock (Fafchamps and Lund, 2003, Fafchamps, 2011). In China, there is also evidence of risk sharing in rural areas (Jalan and Ravallion, 1999). To determine whether this channel holds in urban China, I examine whether families with greater numbers of siblings suffered less from the shock. Now that China's tertiary education is more costly than other stages of education, I explore whether financially-constrained families with needs to cover higher education expenditures could receive more gift money from extended family members. These findings are in line with the informal insurance hypothesis.

This study is one of the first that examines the intergenerational impact of economic restructuring, and it addresses this issue in the context of a developing country where children are more susceptible to economic shocks. Several studies focusing on developing countries have pointed out that nation-wide economic crises may reduce family budgets on children's education and increase the dropout rate as well as the infant mortality rate (Frankenberg et al., 1999, Thomas et al., 2004, Paxson and Schady, 2005, Cameron, 2009). Unlike economic crises which usually are unintended downturns that can impact the whole society, economic restructuring may result from well-intended policies and only certain industries or sectors would be negatively affected. This feature of economic restructuring - as well as the unique situation in China - allows me to exploit novel sources of variations of the shock, thereby identifying the impact of economic restructuring on the next generation's education attainment. This paper contributes to the existing literature on economic shocks by demonstrating a causal relationship between exterior economic environment and children's development in a country where social protection program is underdeveloped. It also calls attention to the often neglected intergenerational effects of economic restructuring, which people need to recognize in order to fully evaluate current policies and respond via new policies.

Furthermore, this study also demonstrates that restructuring-induced family income change can have large impact on the next generation's education, a specific channel that has not been explored before. There exists a growing literature on the impact of family income change associated with parental working status on children's education and future life outcomes (Oreopoulos, Page and Stevens, 2008, Bratberg, Nilsen and Vaage, 2008, Rege, Telle and Votruba, 2011, Ananat et al., 2011, Hilger, 2013) . Although their specific settings differ and findings vary, the above studies in general show that in developed countries, parental employment status has limited impact on children's education and future earnings. This might be attributed to the existence of sound social protection programs that more or less alleviate the income shock caused by job loss, as suggested in two recent works studying various cash transfer programs (Dahl and Lochner, 2012, Aizer et al., 2014). This paper adds to this body of literature in that while idiosyncratic layoff combined with welfare cash transfer have relatively limited impact on permanent income, the impact of economic restructuring and the accompanying mass lay-off can be much greater. The latter could affect family's decision on children's education investment much more profoundly, therefore well worth close scrutiny.

The paper proceeds as follows. Section 2 discusses historical background of the SOE reform and education policies in China. Section 3 gives detailed description of the data and variables used in this paper. Section 4 articulates the identification strategies and presents a simple model illustrating the mechanisms of the geographical externality of economic restructuring. The estimation results and robustness checks are presented in Section 5. Section 6 explores the channels through which affected families deals with the economic restructuring shock, and it is followed by a conclusion that

generalizes main findings and contributions of this paper.

2. Historical Overview

2.1 Allocation of Urban Jobs

Before 1980s, three types of jobs were dominant in the urban area: government agencies, public institutions, and SOEs. All jobs were distributed through government plans, which assign job quotas to designated schools or residential districts and specify the number of new workers needed. Given these quotas, school or residential authorities decide how these quotas are allocated (Bian, 1994*b*). While there is limited information on how jobs are assigned at this level, anecdotes suggest that authorities allocate jobs based on their knowledge and assessment about the job candidates, including age, gender, education, political background, family background, academic performance, and candidate's personal interest.

Other less common forms of employment are either through replacement, namely that children take over their parents' job after they retire, or through informal connections and recommendations. For vast majority of workers, once jobs assigned, they can enjoy lifetime employment without worrying about being dismissed. The flip side, however, is that workers are bound to their employees and working units. The labor mobility was almost zero during the planned economy era. Switching jobs from one entity to another could take tremendous effort and incur considerable administrative costs, possibly involving using connections or bribing (Bian, 1994*a*).

In 1986, the government introduced the contract labor system, requiring that all newly hired workers must be assigned with a five-year labor contract (Naughton, 1996). Since then, the proportion of contract workers in the labor force started increasing from about 4% of total employment in 1985 to 13% in 1990 and further to 39% in 1995 (Meng, 2000). Meanwhile, the government also gradually reduced state allocation and encouraged self-employment or open recruitment by enterprises. State-assigned jobs gradually phased out of the economy after 1996.

2.2 Competitive Pressure on SOEs

Before the opening up policy in 1978, SOEs can generate before-tax cash flows around 14 percent of GNP. This number had been decreasing since then. By 1993, SOEs conversely received support from the government more than 4 percent of GNP to maintain its expenditure on workers' wage and other expenditures (Brandt and Zhu, 2000).

The declining profit in SOEs roots fundamentally in its role in the planned economy era. SOEs guarantee the full employment of the economy. The permanent employment system that prohibits SOEs from freely dismissing workers leads to overstaffing and lowers workers' incentives. Also, unlike normal firms, SOEs are multifunctional social units that are not only engaged in production but also dedicated for a variety of social goals. They provide workers from cradle to grave with the necessities of life, such as schools, housing, health care, child care etc (Lee, 2000).

These social responsibilities burdened SOEs when the market became increasingly competitive.

One of the challenge faced by SOEs was the rise of TVEs in the 1980s. Without much support from the government, TVEs experienced a period of surprisingly high-speed growth after 1985, possibly benefiting from the policy of freeing up the price and the lower labor cost in the rural area [6]. In urban areas, the private sector also started to emerge gradually. The rise of thsee prviate entities in rural and urban areas exposed the inefficiency of SOEs and drove down the profitability significantly (Yusuf, Nabeshima and Perkins, 2006, Naughton, 2007). In contrast, government agencies and public institutions such as hospitals, schools, or other non-profit organizations, were spared from such competitive pressure.

The reforms on SOEs started as early as after 1979, when the government introduced profit-retention system, in order to provide SOEs with stronger profit-oriented incentives. In the mid-1980s, the government also adjusted the wage system linking workers' wage to the economic performance of SOEs. Yet the reform of SOEs was stagnated after the Tiananmen Square protests in 1989, possibly out of the concern of political stability. The political power at the top was fragmented and there was lack of consensus on whether to continue reforming SOEs after the incident (Naughton, 2008). It was not until Deng's famous tour in southern provinces in 1992 that essentially cleared the obstacles of ideological differences over the development of the private sector. Since then, China stepped into a period of fast marketization, and the government finally determined to initiate a progressive economic restructuring after 1995 to reform SOEs and improve economic efficiency.

2.3 Economic Restructuring after 1995

Despite the rapid growth of the private sector after 1992 in urban areas, the data shows that public-owned entities were still dominant in the economy by 1995. Employees in public-owned entities accounted for around 94.1% of total labor force in the five cities surveyed, and only about 5.2% were working in the private sector, which includes private enterprises (PE), foreign invested enterprises (FIE), or self-employed.

SOEs were well protected by the government until after the *zhua da fang xiao* (Grasping the large, letting go of the small) policy was implemented in 1994, which literately means allowing small loss-making SOEs either shut down or privatized while keeping reforming and maintaining the large SOEs. The Labor Law passed in 1994 also laid the legal foundations for SOEs to dismiss no-fault workers to reduce surplus labors (Cai, Park and Zhao, 2008).

For a long period of time, SOEs were supported by the funding from the government bank. The Asian Financial Crises in 1997, however, reminded the government of the risk of the national banking system, which had accumulated large amount of nonperforming loans due to the low profitability of SOEs. Since then, a stricter investment approval process was implemented , which even worsen off SOEs. Altogether, these polices led to mass layoffs around 43 million workers from 1995 to 2001 including 34 million from the state sector(Giles, Park and Cai, 2006)[7].

The registered unemployment rate reported by the official labor statistics is misleading, as it only counts the unemployed as those who registered for unemployment benefit and thereby significantly

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[6]TVEs were once mistaken as collectively owned enterprises, but most of them are in fact private enterprises. See Huang (2008)

[7]Shanghai, Qinghai, and Heilongjiang launched the policy slightly earlier than others. In the robustness check, I drop Shanghai to double check the main results are not driven by the inconsistency of timing.

understates the true unemployment rate (Giles, Park and Zhang, 2005, Feng, Hu and Moffitt, 2015). To get a picture of what was really happening, I plot the distribution of the reported year of unemployment from 1985 to 2001 using data from CULS2001. Figure 1(b) shows that the density of unemployment rises gradually after 1990, then jumps to a new level after 1995, and peaks after the Asian financial crisis in 1997. The fact that most unemployment is highly concentrated from 1995 to 2000 highlights the tremendous impact of the policy change.

The shock was mainly targeted on SOEs, whereas non-SOE public organizations were only mildly affected. Figure 2 displays how the unemployment risk differs across two groups. Those who were born before 1940 mostly had been retired by 1995 when the economic restructuring took place[8]. So there is no significant difference between SOEs and non-SOEs in the fraction of laid-off workers. But for younger cohorts, the bifurcation of the two groups after 1940 suggests that SOE workers were much more likely subjected to layoff than non-SOEs workers after the shock.

The economic restructuring has heterogeneous impacts on workers with different characteristics. For example, the female, less educated, and middle-aged are more likely to lose jobs during the mass layoff period (Appleton et al., 2002). In areas where the state sector historically dominates - e.g., especially in the old industrial area in the northeast - the impact of the shock was more prevalent.

Many laid-off workers failed to find a new job quickly. The data shows that among those who experienced unemployment between 1995 and 2001, only 34.8% were able to get re-employed within 12 months, and 44.7% were re-employed by 2002 (Giles, Park and Cai, 2006). There are three main unemployment compensations, i.e., the public subsidies (including *xiagang* subsidies, unemployment subsidies, and Minimum Living Standard Programme (MLSP, also known as *Dibao*) payments), the pension for the early forced retiree, and the lump-sum severance payments. These compensations actually played a limited role in mitigating the shock. Using CULS2001, Giles, Park and Cai (2006) find that men aged 40-55 and women aged 40-50 were covered by subsidies with more than half, whereas for other age groups, only less than half were covered. In addition, the annualized unemployment subsidy and the pension income are 607 RMB per capita and 2172 RMB per capita respectively for families with one unemployed man. As comparison, the national average disposable income for urban residents in 2001 is 6860 RMB and the income per capita for household without any laid-off member in the data is 9840 RMB, which suggests that a large proportion of income loss was not insured. In fact, families with laid-off member mostly relied on their own savings or other family member's income to survive the period of hardship.

Even if workers were not unemployed, the economic status of SOE workers deteriorated in comparison with the non-SOEs workers. Figure 3 plots the evolution of the average wage by sector throughout 1990s. The average earning gap between SOE workers and non-SOEs workers emerged after 1993, and was enlarged as early as after 1998. Shocks to SOE workers were also reflected from the wage arrears, reduced benefit including lost health insurance and health expenditure reimbursement, reduced pension benefits, and changes in housing benefits.

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[8]China's retirement age for men and women is 60 and 50 respectively. The average retirement age is 55.

2.4 Development of Senior Secondary Education and Higher Education

Previous studies on secondary education in China mainly focus on rural area. The detailed cost of high school in urban area is not well documented. Liu et al. (2009) estimated the tuition fee for high school in rural China to be around $160 in 2006. The real cost could be even larger if other related fees accounted. In CULS2001, the average school expenditure for high school in the five cities surveyed is over 2, 200 RMB (see Figure 5).

High school enrollment rate in urban area is much higher than that in rural area. Table 2 shows that the average high school attainment in five cities is around 68% [9]. In contrast, this number is close to 12% in rural area based on the rural survey of Chinese Household Income Project 2002(CHIP2002). During the Cultural Revolution, college enrollment was almost zero for ten years, whereas the high school enrollment was only mildly affected. The impact on high school is mainly embodied in education quality, such as shortened length of schooling, and increased farm work, physical exercises, etc. College reopened after 1977 and the enrollment had gradually increased since then. The college tuition was waived for all students before 1992, as China's higher education had been fully funded by the government. The tuition cost gradually increased reaching around 2,769 RMB in 1999 (Shen and Li, 2003).

In 1999, a policy to expand the college enrollment was initiated. Statistics from the World Bank shows that the Gross Enrollment Ratio (GER) has a dramatic increase after 2001. Shen and Li (2003) documents that there was also a sharp increase in tuition fee accompanying with this policy. The expansion of enrollment and sudden increase in college tuition may affect SOE and non-SOE family at different margin. If so, the effect of economic restructuring on children's college attainment may be confounded by the college expansion policy. I address this concern in section 6.4.

The education expenses for college is a big burden for family in urban area as compared to expenses on other schooling stages. The estimated college expenditure as a percentage of average disposable income per urban resident is roughly 50% by 2001, whereas it only accounts around 38% for private schools in US as a comparison. Moreover, children from poor families in US heavily rely on financial aid, own work, than their parental income (Hilger, 2013). By contrast, nationwide student loan starts from 2000, and other financial instruments are extremely underdeveloped in China. It's common that children rely on their parents to finance their tuition expenses.

3. Data and Descriptive Statistics

The data used in this paper come from China Urban Labor Survey 2001 (CULS2001), which is administered by the Institute of Population Studies at the Chinese Academy of Social Sciences. The sample frame for the survey is constructed based on the 2000 census. It surveys 3500 urban permanent resident households and around 8100 individuals aged above 16. The survey is designed primarily to study the impacts of the SOE reform on the labor market. It covers five cities – i.e., Fuzhou, Shanghai, Shenyang, Wuhan, and Xi'an – with remarkable regional diversity and variation in the pre-reform

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[9]Liu et al. (2009) estimates that the enrollment rate for high school for urban students might be lower, as there might be promotion from middle school in rural area.

SOE shares.

The survey consists of an individual and a household questionnaire. One unique feature of the individual survey is that it traces out the detailed employment history for those still working in 1996, from which I can observe the sectors where they were employed before the shock. In addition, the survey contains rich information on the family tree so that each child can be uniquely identified via the connection to their parents from the adult survey, even if the children don't currently live with their parents. Other relevant information include respondent's education, marriage, occupation, early life experiences, family structure, etc. Details on the sample and the construction of key variables are described below.

3.1 Data and Definition of variables

A standard measure for the educational attainment in the literature is the years of schooling. However, I focus instead on children's high school attainment and college attainment in this paper for two reasons. First, there is lack of variation for children with attainment on middle school or below, because the compulsory schooling law promulgated in 1986 requires that all the students at least be enrolled in middle school. Second, the survey was conducted in 2001, close to the end of the SOE reform. Some children, although affected by the shock, were not old enough to observe their ultimate educational attainment, but old enough to get information on whether or not they were attending high school or college. To fully utilize the information, I include those children in my analysis as well.

In this context, the measures for the educational attainment are dummies taking values of one if students ever attained high school or college by their schooling age. High schools are only referred to the academic high schools and do not include vocational schools or other post-junior educational institutions. I define children's exposure to the policy change as the sectors where fathers worked prior to children's schooling age and before the shock occurred[10]. Children in the treatment group encompass those with fathers working in state-owned enterprises or urban collective enterprises before 1992, and the control group includes fathers working in either government or public institutions [11].

In the triple-difference analysis, shock intensity at the city level is defined in three ways. First, I extract information from the 2001 survey measuring intensity as the share of total workers who report "ever was laid off last six years". Second, for robustness, I also create a binary variable indicating whether the city is more severely affected by the policy shock. Lastly, I use the city-wide employment share of SOE workers before the shock to capture the idea that cities concentrated with more SOEs might have been more greatly affected by the shock. These information are collected from different city-level statistical yearbooks [12].

There are two reasons why I do not use the unemployment rate as the measure of the shock intensity. First, the official labor statistics in China are not informative about the true unemployment rate as aforementioned, for the registered urban unemployment rate is not calculated based on a rep-

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[10]This definition may not be entirely accurate. Fathers might have changed jobs before the shock and the job they held by then was not necessarily the one when children was adolescent and ready for school. However, using this approximate definition is less a concern in the context of China. As documented in section 2.2, the labor market in urban area was rigid before 1992. Most jobs were lifetime jobs, and it's hard, if possible, for workers to switch from one sector to another.

[11]The definition of the control group is robust to including all the other non-state sectors. See Section 5.3 for more details.

[12] This information is subject to availability. All the cities in the sample report these statistics except Shanghai.

resentative sample survey[13]. Moreover, the de facto unemployment rate may fail to capture the true layoff intensity, as the unemployed, mostly poor, may take whatever jobs coming up to sustain their life during the crisis(Jayachandran, 2006). As an example, Fallon and Lucas (2002) documents that during the 1997 Asian Financial Crisis, the unemployment rate was not soaring and the labor force participation rate could even expand, because the informal sector was able to absorb considerable amount of layoffs.

In analyzing how family cope with the negative income shock, I turn to the household survey from CULS2001, which contains detailed information on family members' demographics, family expenditure, housing condition, durable good consumption, etc. There are 3489 households in the survey. I merge household sample with individual sample to identify the family member who experienced the layoff shock. The independent variable "layoff" is a dummy taking value of one if the household has at least one family member that has ever been laid off[14]. The main outcome variable of interest is the gift money received by the household from friends and relatives. This information is available in the household survey and measured in three ways, the absolute value, the log value, and a dummy taking value of one if the gift money is greater than 1000 RMB.

3.2 Sample and Summary Statistics

The CULS2001 data asks each individual's number of children and their gender, birth year, education, etc. Based on these information, I construct the children samples, which consist of a college sample and a high school sample respectiviely. These two samples differ in children's cohorts included and serve for different purposes of analysis – the college sample is used to investigate the impact of economic restructuring on children's college attainment and the high school sample on high school attainment. The reasons for differentiating the two samples are as follows[15]. First, as aforementioned, to fully exploit the information from the data, I would like to include as many as possible observations of children in the analysis, as long as I can observe their schooling status by 2001. Specifically, the youngest cohort included in the high school sample was born in 1985 and would be 16 years old in 2001, by which I can tell whether they went to high school or not. Similarly, the youngest cohort included in the college sample was born in 1983, as for any children born thereafter, I would not be able to observe whether they went to college or not even if they experienced the shock.

In addition, these two samples differ in the oldest cohort included. The oldest cohort for the high school sample was born in 1954, and the oldest one for college sample was born in 1964. The reason that the oldest cohort is younger in college sample is that people born between 1954 and 1964 might have experienced the closure of college during Cultural Revolution (1968-1978), which may distort the pre-trends for the control and the treatment group in the college sample. Therefore, the college sample is overall smaller than the high school sample.

Since the number of observations within each age group is small, I cluster children into four-

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[13]In an attempt to uncover China's true unemployment rate, Giles, Park and Zhang (2005) re-estimated the unemployment rate using CULS2001, a follow-up survey in 2002, and CULS2005. Figure 1(a) plots their results as compared with the registered unemployment rate reported by the government. The unemployment rate reported by Giles, Park and Zhang (2005) is far above the registered urban unemployment rate, and has increased from 6% in 1995 to above 11% in 2002.

[14]This definition also includes laid-off workers who were later able to get re-employed.

[15]For details on how I construct the children sample, see Appendix C

year groups for college sample and five-year groups for high school sample respectively to lessen the variance within each particular age group[16]. That results in five groups of cohorts in the college sample and six groups of cohorts in the high school sample.

Table 1 reports the summary statistics for the workers in the individual survey. As expected, workers employed in SOE before 1992 are significantly different from those with those employed in non-SOES along a number of characteristics. SOE workers are younger, less educated, and more likely to be party members before work. Table 2 describes the high school sample and college sample for the children respectively. Children with fathers initially employed in SOEs are also younger and less educated. These observations suggest that the distribution of labor across public-owned sectors is not random and simple comparison between these two groups may lead to biased results.

Table 3 presents the summary statistics of the data for the analysis of informal insurance. The average amount of gift received by each family is 769 RMB. There are around 12% households with children in college and around 56% with children in school.

4. Empirical Strategy

In the first part of this section, I discuss how I operationalize the DID method in detail. After that, I introduce a simple model to illustrate the geographical externality of economic restructuring; I then empirically test the hypothesis derived from the model using a DDD method.

4.1 Difference-in-Difference

I use the DID to exploit two dimensions of variations in the economic restructuring shock intensity. The first variation is concerned with children's different levels of exposure to the economic restructuring shock across cohorts. In the college sample, the post-shock group consists of children born between 1980 and1983. They were under the average age of a college freshmen, 18 years old, when the SOE reform started in 1995[17]. In the high school sample, the corresponding post-shock group consists of children born between 1981 and 1985, who were under the average age of a high school freshman – 15 years old – in 1995. These are the people whose collegel and high school education were subject to the impact of economic restructuring.

The second variation is different levels of shock intensity across different organizations – SOEs and non-SOEs in the public sector. As demonstrated in Figure 2 and Figure 3, economic restructuring was mainly targeted on SOEs, where workers experienced slower wage growth and higher risks of being laid off than those employed in government or public institutions. Children with fathers initially working in SOEs are therefore more likely to be affected by economic restructuring.

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[16]For college sample, the five groups of children are those born between 1964-1967, 1968-1971,1972-1975, 1976-1979, and 1980-1983 respectively. For high school sample, the six groups are those born between 1956-1960, 1961-1965,1966-1970, 1971-1975, 1976-1980, and 1981-1985 respectively.

[17]A plausible way to define the post-shock group for the college sample is to include children born between 1978-1983, as they were all under 18 years old by 1995, but it will unbalance the number of age groups included in each cohort. Notice that there is no sharp temporal cutoff distinguishing the pre-shock group from the post-shock group, as the likelihood of being affected by economic restructuring depends on how much children's adolescent period overlaps the window of the restructuring period, and gradually decreases in children's age.

The specification of the empirical model is the following:

$$E_{ias} = \alpha_0 + \alpha_1 SOE_{is} \times Postshock_{ia} + \rho_{ia} + \eta_{is} + \theta^J X_{ias} + \varepsilon_{ias} \qquad (1)$$

where E_{ias}^C is the educational attainment of children i, in age group a, with father or mother employed in sector s. SOE_{is} is a dummy taking value of one if children i's father or mother was employed in SOE before 1992. The post-shock group are children born between 1980-1983 in the college sample, and born between 1981-1985 in the high school sample, as described above. ρ_{ia} is children's cohort fixed effect and η_{is} is sector fixed effect. X_{ias} is a rich set of children and father controls, which includes father's education, party membership, height, occupation dummies, industry dummies, early life experiences, school ranking, school quality, etc, and the number of children's siblings, sisters, and brothers.

The DID imposes a strong assumption that the treated group do not self-select into other groups after the shock. This assumption requires that the composition of the treatment and the control are relatively constant over time, but this is to some extent untenable in the case of China's SOE reform. Although it maybe difficult for SOE workers to find jobs in government agencies and public institutions, which usually require higher education levels, there might still exist considerable pre-SOE workers who switched to the rising private sector after 1992, when the urban labor market became less rigid. Using data from CULS2001, I can keep track of workers' employment history and conduct an Intent-to-Treat (ITT) analysis by defining the treated group as children whose fathers worked in SOE before the shock. The advantage of this definition is that it has accommodated the possiblility of labor mobility and the corresponding loss of non-compliers induced by post-shock sorting [18].

The validity of DID in this research also hinges on that people do not anticipate the shock and thereby self-select into "safer sectors" before the shock. There are two reasons why this assumption is plausible in the context of China. First, it's hardly possible for the majority to anticipate before 1992 the SOE reform and its consequence. As discussed in section 2.2, there lacks consensus among top leaders as for whether to deepen the marketization reform, and major reforms were mainly undertaken in rural areas until Deng made his famous southern speech in 1992, which substantially expedited the marketization in urban China. Given the above facts, it is thus unlikely for common workers to foresee a sweeping social transition and thereby to make corresponding adjustment ahead of time. Second, the labor market was rigid and the labor mobility across firms was extremely low before 1992. This is becuase the labor assignment was controlled by the personnel department and most positions were permanent once jobs were assigned. It's difficult and costly for workers to switch jobs before 1992 from SOEs to non-SOE public organizations or the other way around, if possible.

Another concern is related to the allocation of jobs. As shown in Table 1 and Table 2, SOE workers and non-SOE workers are different in many aspects. The former, for example, are younger, less educated, and less likely to be party members before working. It is important to emphasize that, although my identification strategy doesn't rely on the assumption of random job assignment, it does require no omitted cohort-varying and sector-specific effect correlated with the allocation of jobs. This assumption could potentially be violated, for instance, if there is a mean divergence of

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[18]This definition is similar to Autor et al. (2014), which defines worker's exposure to the trade shock as the sectors where workers were initially employed prior to the shock.

returns to father's education. Since fathers working in SOE are on average less educated than those in non-SOEs, if children from less educated families had increasingly got less chance of education, we could possibly observe a negative estimate of α_1 even in the absence of the economic restructuring shock. I address this concern by proposing two different strategies. First, I add a variety of father demographic control variables, which might predict the allocation of father's jobs, and interact them with the post-shock cohort dummy. Second, a triple difference strategy is adopted, as described in the next subsection, to difference out any other cohort-varying and sector-specific changes.

The exclusive focus on father's job change misses an important fact that China's female labor force participation rate is particularly high compared to other countries. Although father is typically considered the main family supporter, mother's wage is also an important part of family income in urban China. For this reason, I also report the estimated impact of economic restructuring from mother's side on children's education in section 5.1.

4.2 The Geographical Externality

In this section, I investigate whether the impacts of economic restructuring on children vary across cities with different economic structure.

4.2.1 Theoretical Considerations

Geographically concentrated firms within the same industry can benefit from each other through within-industry externalities. However, such agglomeration economies may become diseconomies if the local economy is struck by certain industry-specific shock. GM layoffs in Metro Detroit and mine closure in resource-exhausted cities are examples that laid off workers often find it difficult to find new jobs locally when the whole local economy is damaged by mass layoffs caused by economic restructuring. These unemployed workers often fail to find jobs easily because other workers with similar skills are also competing for jobs at the same time, which could either prolong the unemployment spell or lower the equilibrium wage. In the extreme case, the local labor market could eventually become saturated to absorb newly unemployed workers.

Such externality could be amplified in developing countries, where the labor supply is inelastic due to poverty, high cost of migration, or underdeveloped financial market. In these scenarios, unemployed workers would probably have to supply their labor in order to survive no matter how low the wage is, and this could further drive down the equilibrium wage or prolong the unemployment spell [19]. This is actually what happened in China during the SOE reform. The old industrial zones with historically high percentage of SOEs employment, such as Shenyang, Wuhan, and Shanghai, have significantly larger proportion of layoffs between 1995 and 2001. Children living in those cities are accordingly more affected by the shock. By comparison, children living in Fuzhou and Xi'an, where there was less proportion of workers employed in the public firms, were less affected.

On the other hand, economic restructuring may also have a positive externality. The enrollment into high school and college in China is competitive. Students must pass a city-wide and a nation-wide exam, i.e., the so-called High School Entrance Exam (*Zhongkao*) and College Entrance Exam

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[19]Jayachandran (2006), for instance, illustrates how those factors could exacerbate the productivity shock for the poor in rural India as a result of their inelasticity of labor supply.

(Gaokao)[20]. Only those who score above a certain threshold may enter the high school or the college, and the threshold is an increasing function of the number of the exam takers and their competitiveness. In a city with widespread layoffs, it would thus be relatively less challenging for any children, even including those with fathers laid off, to compete against others, given that the test score is an increasing function of family income. Such positive externality could potentially benefit children for better chance of accessing to education, and partially offset the negative externality of economic restructuring.

4.2.2 The model

In the following paragraph, I construct a simple model formalizing the above idea. The model has N cities. Each city has a mass with population 1, and each individual has one child. All the jobs offer the same wage w and everyone is fully employed prior to the economic restructuring shock. After the shock, there is a proportion of τ_n $(0 < \tau_n < 1)$ displaced workers competing for α_n vacancies of new jobs in city n. Both τ_n and α_n are exogenously given and the shock intensity is measured by τ_n. The expected wage for laid-off workers after the shock is $\frac{\alpha_n}{\tau_n}w$, where $\tau_n > \alpha_n$ and α_n/τ_n represents the probability of acquiring a new job and captures the geographical externality that the more displaced workers in the city, the lower the equilibrium wage. Meanwhile, I assume that the wage of survivor workers is not affected by the shock to keep the model simple.

High school enrollment

Each child is required to take the high school entrance exam, and only those who score above the city mean are able to enter high school[21]. Children's score of the high school entrance exam is a linear function of the parents' private investment and city n's public investment in education plus a disturbance term

$$
\begin{cases}
G_s = f(w) + g(\tau_n) + \varepsilon & \textit{Survivor worker} \\
G_l = f(\frac{\alpha_n}{\tau_n}w) + g(\tau_n) + \varepsilon & \textit{Displaced worker}
\end{cases}
\tag{2}
$$

where $\varepsilon \sim N(0,1)$ and $f'(\cdot) > 0$. $g(\cdot)$ denotes the public education investment in city n and $g'(\cdot) < 0$. Both $g()$ and $f()$ are bounded between 0 and 1. The mean of the scores for the high school entrance exam in city n is

$$
M^H = (1 - \tau_n)G_s + \tau_n G_l
\tag{3}
$$

the probability of going to high school or college for children with displaced fathers is

$$
\pi^H = Prob(G_l > M^H)
\tag{4}
$$

College enrollment

One difference between the probability of enrolling college and enrolling high school is the threshold. Note that the college exam is nation-wide. The threshold of college entrance is the national mean of the test scores rather than the city mean. And the former is exogenously given from the perspective

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[20]For more detailed description on the High School Entrance Exam, see Dee and Lan (2015)

[21]Here I simply assume that all the children prefer to have higher education

of the exam-takers in a particular city.

The probability of going to college for children with displaced fathers thus is

$$\pi^C = Prob(G_l > \overline{M}) \tag{5}$$

where $\overline{M}$ is the nation-wide average scores for the college entrance exam.

Proposition 1. *If* $f(w) - f(\frac{\alpha_n}{\tau_n}w) < \frac{(1-\tau_n)\cdot f'\alpha_n w}{\tau_n^2}$ *, father's job displacement induced by economic re-structuring has a negative externality on children's high school enrollment, i.e.,* $\partial \pi^H / \partial \tau_n < 0$.
    If $f(w) - f(\frac{\alpha_n}{\tau_n}w) > \frac{(1-\tau_n)\cdot f'\alpha_n w}{\tau_n^2}$ *, father's job displacement has a positive externality, i.e.,* $\partial \pi^H / \partial \tau_n > 0$.

proof. see Appendix B1.

Proposition 2. *Father's job displacement induced by economic restructuring has a negative external-ity on children's college enrollment,* $\partial \pi^C / \partial \tau_n < 0$*, and* $\partial \pi^C / \partial \tau < \partial \pi^H / \partial \tau_n$.

proof. see Appendix B2.

Proposition 1 shows two opposing externalities of economic restructuring at work simultaneously on children's high school enrollment. On the one hand, the increase of city-wide displaced work-ers intensifies the labor market competitiveness over the limited vacancies and accordingly lower the expected re-employment wage. As a consequence, families with laid off workers decrease their invest-ment in education, which lowers children's test score, and is reflected by the decrease of $f(\frac{\alpha_n}{\tau_n}w)$. The negative externality is scaled by $(1-\tau_n)$, because the marginal negative externality on each individual is smaller when there are already lots of workers unemployed[22]. The overall negative externality is thus captured by the marginal decrease of $f(\frac{\alpha_n}{\tau_n}w)$ multiplied by $(1-\tau_n)$, which is equal to $\frac{(1-\tau_n)\cdot f'\alpha_n w}{\tau_n^2}$.

On the other hand, more workers being laid off implies more children suffer from the family income loss. On the whole, the city-wide average score would fall, making the threshold lower and entering high school easier for everyone, even including those children with father laid off. Since the threshold is an increasing function of $\tau_n f(\frac{\alpha_n}{\tau_n}w)$ and a decreasing function of $\tau_n f(w)$, the lower $f(\frac{\alpha_n}{\tau_n}w)$ is and the higher $f(w)$ is, the more the threshold would decrease caused by the increase of τ_n. The marginal decrease of the threshold is thus captured by the term $f(w) - f(\frac{\alpha_n}{\tau_n}w)$, which represents the positive externality. Theoretically, if the gap between $f(w)$ and $f(\frac{\alpha_n}{\tau_n}w)$ is large enough, the positive externality can dominate the negative one. However, it turns out that the opposite is more likely to be true, as the $f(w) - f(\frac{\alpha_n}{\tau_n}w) < 1$ by definition and is thus generally less than $\frac{(1-\tau_n)\cdot f'\alpha_n w}{\tau_n^2}$ when τ_n is small.

Proposition 2 depicts a slightly different pattern. It states that the externality on college enrollment is always negative regardless the scale of the layoff, and the negative externality on college enrollment is stronger than that on high school enrollment. There are two reasons that drive the results. Firstly, the supply side of education, such as school construction, could possibly increase children's educa-tional attainment (Duflo, 2001). Yet the mass layoff induced by economic restructuring damaged the

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[22]To understand why, consider the extreme case where everyone is laid off. The family' private investment in education would not make any difference in children's school performance. In that case, children's scores are normally distributed, and the negative externality is almost zero.

local economy and incentivized the government to reduce the public investment on education. Children living in the city that is the most affected therefore suffer the most from the reduced supply of education. Nonetheless, this is not the case for high school enrollment. Such effect is mostly canceled out, because the competitors for high school are from the same city.

Secondly, the college enrollment is nation-wide rather than city-wide. The probability of enrolling college does not depend on the city-wide average score but the national average score, which is exogenously given. Accordingly, the threshold is no longer a function of the scale of the layoff as in the case of high school enrollment analysis. Its overall negative externality is therefore smaller than that on college enrollment, as the former also has the positive externality, which could partly offset its negative externality.

4.2.3 Triple Difference

Proposition 1 and 2 provide testable hypotheses for the externality of economic restructuring on high school enrollment and college enrollment respectively. The idea is captured by the following regression

$$E_{iasc} = \alpha_0 + \alpha_1 SOE_s \times Postshock_a \times Intensity_c + \tau_{cs} + \lambda_{as} + \mu_{ac} + \theta^J X_i + \varepsilon_{iasc} \tag{6}$$

where c denotes city, s sector, and a age group. E_{iasc} is children i's education outcome. $Intensity_c$ is the shock intensity in city c, and measured in three different ways. The specification includes a full set of double interactions, namely city-sector(τ_{cs}), age-sector(λ_{as}), age-city(μ_{ac}), and ε_{iasc} is a random disturbance term. Other parameters and variables are defined in the same way as in Equation 1.

In this setting, migration could be a concern if people can freely migrate to cities less affected by the SOEs reform. However, this seems unlikely in this context. First, the scale of migration across cites in China is limited by 2000, despite the prevalence of the rural-to-urban migration. According to the census in 2000, the percentage of cross-city migrants over the last five years takes up less than 4%[23]. In addition, one advantage of the 2001 survey is that it was completed right after the end of the reform. For workers that intend to migrate out after the shock, they might not be able to adjust that quickly by 2001.

5. Results

5.1 Impacts of Economic Restructuring on Children's Education

Table 4 presents the results estimated with difference-in-difference strategy. According to columns 1 and 3, economic restructuring significantly reduces children's attendance in high school and college. I relax the parallel-trend assumption and allow for sector-specific trends in columns 2 and 4 by adding interactions of children's cohort and the sectors where father were employed. In the robustness check,

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[23]The cross-city migrants are defined as those whose origins is the city and the out-migrating destination is another city. The percentage of cross-city migrants is the number of cross-city migrants divided last five years by the total amount of urban residents from the original city in the census.

I further control cohort-varying variables that may be correlated with father's initial job assignment, i.e., father's educational attainment, height, party membership before work, and early life experience dummies. Including these additional controls does not change the results significantly.

Controlling these interactions can alleviate the concern of mean divergence stemming from the systematic differences in father's observables, but does not address that resulted from father's unobservables. For example, non-SOEs workers may be more political connected and the return to political connection could have increased during the SOE reform. Children with father employed in non-SOEs therefore could benefit more from fathers' political resources and get better education opportunities. In the triple-difference regression, however, I show that this hypothesis is not supported by the evidence. As displayed in Table 6, the impact of economic restructuring on children is significantly larger in cities with higher percentage of laid-off workers or SOE workers, which is very much in line with an negative externality. On the other hand, if the result is driven by the increase of return to political connection or other cohort-varying unobservables, it is hard to explain the pattern with such regional variation.

Throughout this paper, I follow the literature focusing on the impact of fathers' employment status on children's educational attainment, as fathers are typically considered the main supporter of the family. However, China's female labor participation rate was particularly high as documented by Maurer-Fazio et al. (2011) and Meng (2012). Mother's income may also play an important role influencing children's education[24]. To exclude mother's effect and estimate the impact of economic restructuring purely from the father's side, mothers' working status must be controlled, as father's earnings may well predict mother's earnings given the assortative matching of marriage. I thus add into equation (1) dummies of the sectors where mother worked and its interactions with children's post-shock cohorts. The results presented in columns 4 and 8 show that the impacts of economic restructuring from fathers side alone can significantly reduce children's educational attainment [25].

The impact of economic restructuring from the mother side is explored in the same manner. Results are presented in Table 4 panel B. Interestingly, mother's working status appears to have significant impacts on children's college enrollment, but not on high school enrollment. One explanation is that the college expenditure costs so much for the family in the urban area that mother's income is as relevant as father's income in the decision of sending children to the college. Since the nation-wide student loan for college just started in 2000, children from the credit-constrained families might forgo their opportunity of receiving further education and start entering the job market earlier. By contrast, the decision of entering high school is less likely to be a concern of credit-constraint, as the cost of enrolling in high school is significantly lower than college and more affordable for most urban families. Father's working status affecting children's high school enrollment thus may work not through channels of credit-constraint but others that could worsen children's school performance or competitiveness.

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[24]Women's labor participation rate is historically high in China - around 70% as compared to 59% in US in 2001 (Data from world bank). In the urban area, Meng (2012) estimates that in 1988, the employment rate for women was 75%, while in OECD countries the level is 52.4%.

[25]Since the labor force participation rate for mother is lower, the sample size is reduced from 1858 and 2824 to 1624 and 2423 for high school sample and college sample respectively.

5.2 Other reforms in the 1990s

The Chinese government introduced numerous policies to reform the socialist system during the mid-1990s. In this subsection, I conduct a survey on some of these reforms that might confound the main results.

Wage Reform   Since 1956, urban wages were centrally regulated and scaled based on a series of indicators, such as regions, occupations, industries, sectors, level of management of enterprises (central or local), characteristics of the workplace, etc (Yueh, 2004). This wage system was maintained for almost 30 years and had become increasingly rigid after China's economic reform in 1978. In 1985, the MOL (Ministry of Labor) started overhauling the old system by linking wage budgets to public enterprises' profitability, in an effort to provide worker with better incentives. The wage system for non-SOEs on the other hand were mostly intact except for several mild adjustments. Starting from 1993, the MOL issued new rules, allowing SOEs to set their own internal wage structure within the budget established by the government. GOV wages were still following a nation-wide standard system, whereas wages in PUBs were adjusted with the goal of being more flexible and market-oriented. Some public institutions were permitted to follow firms to set their own wages. .

The concern is that the wage reform in 1993 might have led to an abnormal earning change in non-SOEs that was not internalized by the market. For example, if earnings in non-SOEs grow much faster than SOEs in cities like Shenyang or Wuhan, where the shock intensity was among the largest, the resulting variation of children's educational gap between the two sectors might also increase in shock intensity, and therefore the DDD result is confounded.

Using data from China Household Income Project 2002 (CHIP2002), I plot the average personal income for non-SOE workers over years between 1998 and 2002 in selected cities [26]. If the above hypothesis holds, wages in non-SOEs should have grown faster in Wuhan or Shenyang than in other cities during this period. Figure 8 shows that, to the contrary, the income growth in non-SOEs is mostly parallel among all the selected cities, and that Wuhan even experienced a particularly lower wage growth in non-SOEs. This result is not surprising, given that Wuhan is one of the cities that were most affected by the reform. The lower wage growth rate in non-SOE public organizations probably reflects the reduced fundings from the government during this period.

Housing Reform   New housing stock was historically allocated to urban residents through state work units since 1949. Starting from 1994, individuals in state-owned housing were allowed to buy full or partial property rights to their current homes. The price was highly subsidized and most buyers paid less than 15% of the market value for their own homes (Wang, 2010, Gao, 2010). If the householder employed in non-SOEs was more likely to reside in public housing than those employed in SOE prior to the reform, the former would have benefited more from the housing subsidy and could potentially confound the impacts of economic restructuring.

I use data from the urban survey of Chinese Household Income Project 1988 (CHIP1988) and 1995 (CHIP1995) to check whether the residence of housing differs between SOE and non-SOEs. As shown in Table 10, the percentage of households residing in public housing is 0.845 and 0.88 for the householder employed in SOE and non-SOEs respectively in 1988, and the two figures are 0.452 and 0.465 respectively in 1995. While this figure is close to each other for SOE and non-SOEs,

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[26]The selection is subject to availability and based on the principle for ease of comparison. See Figure 8 for more details.

for households working private sectors, the number is lower to 0.564 and 0.315 in 1988 and 1995 respectively. These figures demonstrate that the proportion of the public housing allocated to the SOE and non-SOEs group are more or less balanced.

Increase of enrollment and tuition for tertiary education   The government expanded the tertiary education enrollment and increased the college tuition fee after 1999. Both of these changes may have different implications for children with fathers employed in SOE and non-SOEs. If the policy disproportionately favors the rich family, children with fathers in non-SOEs would have benefited more from the policy. In that case, the education policy could be a confounder to the shock of economic restructuring. To rule out this possibility, I provide following two robustness checks. First, not all the children from the post-shock group are exposed to the college expansion policy except for those born after 1981. I therefore drop these children from the sample and re-estimate the impacts of economic restructuring at the cost of losing part of statistical power. In Table 11 columns 3 and 4, the results show that the estimates seems robust to these changes and remains negative.

Moreover, if the education policy does affect families at different margin, one implication of the "favoring-the-rich" hypothesis is that children living in urban area would benefit more from the policy than those in rural area, given the large rural-urban income gap in China. I check this hypothesis using data from China Family Panel Survey 2010 (CFPS2010), which provides information on respondents' educational attainment and residential area when 12. Based on these information, I plot the fraction of people who attained college over age and by their residential area when young. As displayed in Figure 7, the fraction of people attending college increased over time for both groups of children. The gap of college attainment between the two group also increased. However, the new policy on tertiary education in 1999 appears not to especially benefit those living in urban area, as otherwise there would be a jump of the gap of college attainment after 1982.

5.3 Additional Robustness Checks

This section provides several additional robustness checks for the main results obtained in section 5.1.

Drop Shanghai   As a direct-controlled municipality by the central government, Shanghai is different from other cities in many aspects. The special economic zone set up in 1990 is also a sign that Shanghai may have implemented different economic policies in the 1990s (Wang, 2013). In addition, as pointed out by Huang (2008), Shanghai, together with Heilongjiang and Qinghai, implemented the SOE reform slightly earlier than other provinces. Given the unique political and economic position of Shanghai, I drop it from the sample to make sure that my results are not driven by Shanghai's special policy. As seen in Table 11 columns 1 and 2, dropping Shanghai doesn't greatly affect the results.

Use all non-state sectors as the control group   Since Chinese reforms follow a gradual trajectory in the 1980s, the growing private sectors might have attracted considerable amount of labors that would otherwise work in SOEs or non-SOEs. In that case, the treatment group and comparison group in the 1980s would have drawn from a different population than that before 1980, and the composition of the two group might have changed over time.

Nevertheless, it's worth emphasizing that the job mobility in the 1980s is still low especially for SOE workers that already had a job, and the private sectors in urban area were almost negligible

before 1992[27]. As an additional robustness check, I use all non-state sector as the control group instead of only the government and public institutions. In this exercise, I rely on a weaker assumption by allowing non-SOEs workers to freely move to private sectors. The results presented in Table 12 column 3 indicates that the results are not driven by the inappropriate definition of the control group.

Add father's demographic interactions As shown in Table 1, father's pre-treatment characteristics are unbalanced between the treated and the control group. These systematic differences may be associated with the dynamics of the outcome variables. To control for the these potential cohort-varying observables, I add children's cohort dummy interacted with a rich set of father's demographic variables including education, height, party membership, and personal early life experience, such as being sent down to rural area after 16 and living in urban area before 16, etc. The results presented in column 4 of Table 11 indicates that adding these demographic interactions do not make a big difference.

The divergence of return to education and other observables Using Urban Household Survey, Meng (2012) and Ge and Yang (2014) documented the divergence of return to education in urban China. Returns to college-and-above education have risen from around 16% in 1988 to over 50% by 2003, while the returns to junior high school remain below 20%. Since SOE workers are generally less educated than non-SOEs workers, their income might have changed not because of economic restructuring but the divergence of returns to education. To rule out this possibility, I add interactions of children's post-shock cohorts with father's educational attainment, school ranking, and school performance into the DID regression, to control for the cohort-varying variables related to father's educational attainment and cognitive skills. As shown in Table 12, most coefficients of these interactions are not significant, suggesting that adding these controls do not greatly change the main results.

Falsification exercises using placebo post-shock cohort I perform a falsification test to check if there are time-varying unobservables driving the results. In the main analysis, the treated cohort is defined as the youngest cohort of children not eligible for college or high school by 1995. In the falsification test, I use an earlier cohort - those not eligible for college or high school by 1990 - as the placebo post-shock group. If the results are driven by time-varying unobservables, we would see a negative effect even in absence of the economic restructuring. The results presented in Table 14, however, do not support this hypothesis. Most of the estimates are either insignificant or wrong-signed.

Mortality attrition Including more cohorts lends more statistical power to the study, but also raises the concern of mortality attrition, because older cohorts are more likely subjected to fathers' death and disappear from the sample. If the attrition is systematically different by education level and socioeconomic status, it would bias the DID estimates. Assuming that younger cohorts are less likely subjected to the mortality attrition, I estimate equation (1) using younger cohorts to make sure that the results are not driven by the the mortality attrition. The results presented in Table 13 suggests that the mortality attrition is not a threat to the identification strategy.

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[27]See the discussion in 2.1 and 4.1

5.4 Discussion of the Mechanisms

There are two channels through which economic restructuring can adversely affect worker's earnings: the reduction in relative earnings associated with job loss (extensive margin) and the reduction in relative earnings and welfare at the initial employer (intensive margin) [28]. In this subsection, I discuss which factor plays a more important role in influencing children's education.

Firstly, I provide the evidence that economic restructuring can affect children by exposing them at a higher risk of experiencing father's job loss. Figure 4 (c) and (d) plot the fraction of children who experienced father's job loss before they went to college or high school. The likelihood of experiencing father's job loss drastically increases from almost zero to around 10% and 15% following the shock, highlighting the impact of mass layoffs induced by economic restructuring. The rising risk of experiencing father's job loss also coincides with the decrease of educational attainment for the children in the treatment group, as illustrated in Figure 4 (a) and (b).

To more accurately quantify the impacts of economic restructuring on children's chance of experiencing father's job loss, I estimate a reduced-form model with the similar specification of Equation 1,

$$Layoff_{ias} = a_0 + a_1 SOE_s \times Postshock_a + \rho_a + \eta_s + \theta^J X_i + \varepsilon_{ias}$$

where $Layoff_{ias}$ is defined as a dummy taking value of one if the child experienced father's job loss before entering college or high school and older than 6 years old. Other parameters and variables are defined in the same way as in Equation 1. The results presented in Table 5 are consistent with the visual evidence. Economic restructuring caused children in the treatment significantly more likely to experience father's job loss following the SOE reform.

The estimated coefficients, which are around 5.5%, are quantitatively small, as compared to the impacts of economic restructuring on children's college and high school enrollment, which are around 10% and 8%. These results imply that the earning change at the intensive margin may also play a role. This observation is consistent with the finding from Fallon and Lucas (2002) and McKenzie (2004), in which they show that the real wage decrease at the initial employer are the main contributor to the fall of average income during the financial crisis in Argentina in 2002 and in Southeast Asia in 1997. Nevertheless, since the family income throughout a child's adolescent life cannot be observed from the data, there is no easy way to accurately estimate the impact of the change in earnings at the intensive margin. Overall, these results only provide suggestive evidence that both of these channels play a role in children's educational attainment.

Lastly, it is important to acknowledge that economic restructuring could affect children's outcomes through channels other than change in family income. For example, economic restructuring may also affect parental networking, parental attitude towards education, and parents' and children's physical and mental health due to the increased stress, etc, which then influence children's education accordingly. Although these effects may be fully or partially caused by the earning change [29], I cannot rule

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[28]Here the discussion mainly focuses on possible negative impacts of economic restructuring on earnings. However, in some cases, economic restructuring may increase workers' relative earnings if they can find an better job during the job transition.

[29]For example, Liu and Zhao (2014) finds that children's health was adversely affected by the SOE reform through the

out all these channels due to the paucity of data.

6. Sibling Effect

6.1 Sibling Effect

There are anecdotal evidence in developing countries that informal social network, usually formed by extended family members and friends, matters in household's risk smoothing. For example, siblings can provide informal insurance such as gift money, informal loans, or other non-monetary support for families that suffer income shock. Also, they could use their social connections and help the laid-off families indirectly by facilitating them to get re-employed. In this section, I investigate whether more siblings that parents have could alleviate the adverse impacts of economic restructuring on children's education.

The number of parental siblings is possibly correlated with the unobserved family characteristics, which could potentially shift along the same dimension as the former does and consequently confound the sibling effect. For example, richer families might have more siblings and they are less vulnerable to the shock. Zhou (2014) proposes a strategy dealing with this issue. In her paper, she argues that the sex of a child is determined by the nature, given the fact that the ultrasound technology adopted in detecting children's gender was introduced in China after the 1980s. Since the parents studied in this research are mostly born before 1970s, having one more brother or sister is plausibly random. The total number of brothers or sisters are thus arguably exogenous conditional on the total number of siblings[30]. Also, having more brothers could be more beneficial to the family, as male siblings are generally considered more financially capable and helpful than female siblings. For theses reasons as well as a robustness check, I investigate whether having one more parental brother relative to sister could possibly alleviate the shock for children. To do so, I replace the number of parental sibling with the number of brothers and control for the total number of parental siblings.

The empirical specification is the following

$$E_{iash} = \alpha_0 + \alpha_1 SOE_s \times Postshock_a \times Sib_h + \alpha_3 SOE_s \times Postshock_a \tag{7}$$
$$+ S^f + S^m + \rho_a + \eta_s + \theta^J X_i + \varepsilon_{iasc}$$

where Sib_h is a count variable of the total number of siblings or brothers that the children's parents have. I control for S^f and S^m, the number of paternal siblings and maternal siblings respectively. In the specification for the brother effect, I also control for the total number of brothers in addition to the total number of siblings.Other parameters and variables are defined in the same way as in Equation 1. If having more siblings or brothers relative to sisters does mitigate the shock of economic restructuring,

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income channel.

[30]One caveat of this strategy is that the household might take the stopping rule because of the son preference, which is a common practice in some Asian countries including China. If the household's fertility decision is biased towards the son, the number of male siblings could still be endogenous. However, when studying the brother effect on the household saving in China, Zhou (2014) shows that her result is robust to controlling the son preference for urban China, which suggests that the gender preference appear not be a major problem in urban area.

we are expected to observe a positive α_1 and a larger negative α_3 as compared to that in equation (1).

Table 7 report the results in equation (7). As shown in columns 1 and 3, having one more parental sibling significantly reduces the impact of economic restructuring on children's educational attainment. In addition, children in families without any parental siblings suffered even more from the shock. Column 2 and 4 show that the results remain robust and significant even after I replace the regressor with the number of parental brothers. Taken together, these evidence suggest that parental siblings can provide certain form of informal insurance to buffer against the impact of economic restructuring shock on children's education.

6.2 Sibling Effect: mechanisms

There are multiple ways through which parental siblings could alleviate the economic restructuring shock. While it's hard to distinguish them all empirically, I present evidence on the existence for one of them - i.e., the monetary gift sending among extended family members. Using data from the household survey of CULS2001, I first conduct a cross-section data analysis to examine whether families with workers initially employed in SOEs before economic restructuring received more gift money than other families. Then I provide evidence that the siblings, especially the male ones, do send more gift money for families with more financial pressure.

6.2.1 Informal insurance for families in need

Fafchamps and Lund (2003) shows that risk sharing through gift money exchanging among extended family members in rural Philippines. The anecdote suggests that this practice is also prevalent in urban China. Yet there has been lack of rigorous evidence on that regard. In this section, I investigate whether household with family members employed in SOEs sector before 1992 relies on gift money to cope with the economic restructuring shock. Nevertheless, a naive OLS regression is likely subject to the omitted variable bias, as the unobservable characteristics at the family level may determine the allocation of jobs before 1992 as well as the amount of gift money received simultaneously.

Instead, I focus on whether the gift money acquired by SOE families varies by their financial need. In particular, tertiary education is costly and can impose a big burden for families in China [31]. Families with children in college could be more vulnerable and financially sensitive to economic restructuring shocks. SOE families with children in college thus are more likely to seek for financial support, and the gift money acquired by them is therefore expected to be larger.

The CULS2001 provides rich information on gift money received at the household level. Using data from the household survey, I estimate the following equation with a Difference-in-Difference setup

$$Gift_h = \lambda_0 + \lambda_1 SOE_h \times College_h + \lambda_2 SOE_h \times School_h + \lambda_3 SOE_h \quad (8)$$
$$+ \lambda_4 College_h + \lambda_5 School_h + \theta X_h + \varepsilon_h$$

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[31] Figure 5 shows how the educational expenses including tuition and miscellaneous fees vary across schooling stages. On average, college tuition costs around 4000 RMB per year - roughly 2000 RMB higher than that on all other schooling stages.

where $Gift_h$ is the amount of gift money received from relatives and friends of household h in 2000. SOE_h represents the SOE family and is taking value of one if the household head and his/her spouse were both employed in SOEs before 1992. $College_h$ is a dummy equal to 1 if household h has a child in college , and 0 otherwise. A vector of controls include city fixed effect, household head birth year fixed effect, gender and education level of the household head, and the size of the family. In order to narrow the comparison between families with children in college and families with children in school but not in college, I also add dummy $School_h$, which indicates whether the family has children in school, and its interaction with SOE_h. The coefficient of interest, λ_1, is expected to be positive and interpreted as the insurance effect in response to economic restructuring shock. The difference-in-difference specification allows for unobservables to be correlated with the employment status or the likelihood of having children in college, as they are absorbed by the main effects of SOE_h and $College_h$.

Table 8 presents the estimated results based on equation (4). Column 1 shows that for families with children in college, the gift money received from relatives and friends is 687 RMB larger on average for SOE families than non-SOE families. After adding controls of $School_h$ and its interaction with SOE_h, I find the estimates are still large and significant at 1% level. Columns 3-6 show that the result is robust to different measures. On average, being employed in SOE in 1992 increases the inflow of gift money by around 80% for household with children in college, as depicted in column 3. Columns 5 and 6 show that the likelihood of receiving gift money greater than 1000 is significantly larger as well. The impact of being working in SOEs before 1992 on gift money is mostly negative - though not significant except that in column 1, which highlights the potential endogeneity between the job allocation and the amount of gift money acquired. This might be caused by the fact that less capable workers were more concentrated in SOEs, and their friends and relatives are poorer, so their ability to borrow is also confined. Therefore, if simply running the regression of the amount of gift money on the layoff, we probably end up underestimating the true effect.

An alternative interpretation for the positive λ_1 is that SOE families without children in college might acquire less money than non-SOE families. This is plausible, for instance, if SOE workers are more isolated and less willing to interact with others, and accordingly having weaker social ties would discourage their gift money received. To get a sense whether the effect is driven by such channel, I plot the marginal effect of being a SOE worker before 1992 on the gift money acquired for two groups of families: those with children in college and those without. The results presented in Figure 6 show that the change appears mainly driven by the increase of gift money received by the family with children in college rather than the decrease of that received by the family without children in college. This result is thus inconsistent with the alternative hypothesis mentioned above.

6.2.2 Informal insurance and the brother effect

In this section, I provide evidence that brother could help families in need through sending gift money. If the change of gift money reflects informal insurance among extended family members, the received gift is expected to vary across the number of siblings, as more siblings means a larger capacity that one can borrow. On the other hand, if the change of gift money is driven by the varying unobserved family characteristics, the impact of layoff on gift money is not expected to change across the number

of siblings.

To implement this idea, I estimate a saturated DDD model with the following specification

$$
\begin{aligned}
Gift_h \;=\; & \lambda_0 + \lambda_1 SOE_h \times College_h \times Brothers + \lambda_2 SOE_h \times Brothers + \lambda_3 SOE_h \times College_h \quad (9) \\
& + \lambda_4 College_h \times Brothers + College_h + Brothers_h + SOE_h + Siblings + \theta X_h + \varepsilon_h
\end{aligned}
$$

where the variable of interest is $Layoff_h \times College_h$ interacted with the total number of brothers the household head and her spouse have. If the hypothesis of informal insurance on educational expenses holds, λ_1 is expected to be positive. Since the number of siblings might be correlated with certain family characteristics, I use brothers as a proxy for siblings while controlling for the total number of siblings in the same way as in equation (8). The results presented in Table 9 are essentially in line with the hypothesis.

7. Conclusions

China's SOE reform in the mid-1990s provides an ideal case for researchers to examine the intergenerational consequences of economic restructuring. While workers employed in non-SOE public organizations were less affected, SOE workers - both the laid-offs and the survivors - suffered drastic drop in their cumulative earnings. This immediate impact also has striking intergenerational implications. SOE children were more susceptible to the reform and were less likely to attend high school and college compared to their non-SOE peers. Moreover, I present evidence on the existence of informal insurance within extended families in urban China. SOE children whose parents have fewer siblings received less gift money and were even more adversely affected by the reform.

Furthermore, this paper develops a conceptual framework to understand the mechanisms of two opposing externalities of economic restructuring in terms of its intergenerational impacts on children's education. Higher percentages of SOEs imply more laid-off workers after the reform. For the immediate generation, individual laid-off workers were subject to greater impacts in cities with higher percentage of SOEs, as with more SOE peers, each one suffered from higher job competition after the mass layoffs given the inelastic labor demand. For the next generation, in cities with more pre-reform SOEs, more children experienced father's job loss and drops in family income. This would reduce competition for high school and college enrollment, which in turn benefits anyone else's chance of getting enrolled. I test the model predictions by examining cities with different percentages of SOE workers before the reform. The empirical results support the evidence of a negative externality: the shock of economic restructuring was amplified in cities with higher percentages of pre-reform SOE workers.

The evidence points to an adverse impact of economic restructuring on next generation's educational attainment in a society lacking effective social aid programs and credit markets. Although the existing informal social network could partially alleviate the shock, the SOE reform in general had

produced profound impacts on not only the immediate generation but also the next generation. The magnitude of the impacts suggests that intergenerational costs of economic restructuring should be taken into consideration in policy design and evaluation [32].

While research has shown the government-initiated SOE reform facilitated the relocation of resources, increased economic efficiency, and spurred economic growth (Song, Storesletten and Zilibotti, 2011), the distributional consequences of the reform, especially its intergenerational implications, hasn't been fully explored. Existing empirical evidence suggests that the economic efficiency was achieved to a large extent at the cost of SOE workers, which might contribute to an enlarged income gap in urban areas [33]. Taking this result a step further, this paper argues that the increased income inequality have led to greater inequality in the educational attainment of the next generation. Given higher return to more years of schooling, an potential topic for future research to explore is to what extent the income distribution of the next generation in the urban area has been altered by the economic restructuring.

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[32]There are some successful experiences in targeting laid-off families with children in school in developing countries during economic crisis. See, for example, Cameron (2009), Galasso and Ravallion (2004).

[33]Based on the calculation from Ravallion and Chen (2007), both the relative and absolute Gini index in the urban area increased dramatically after 1990 as compared to rural area. Also see Xia et al. (2014), Benjamin et al. (2008), Knight and Song (2003) for more discussion on China's rising inequality associated with the SOEs reform in the 1990s.

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Figures and Tables

Figure 1: The unemployment shock
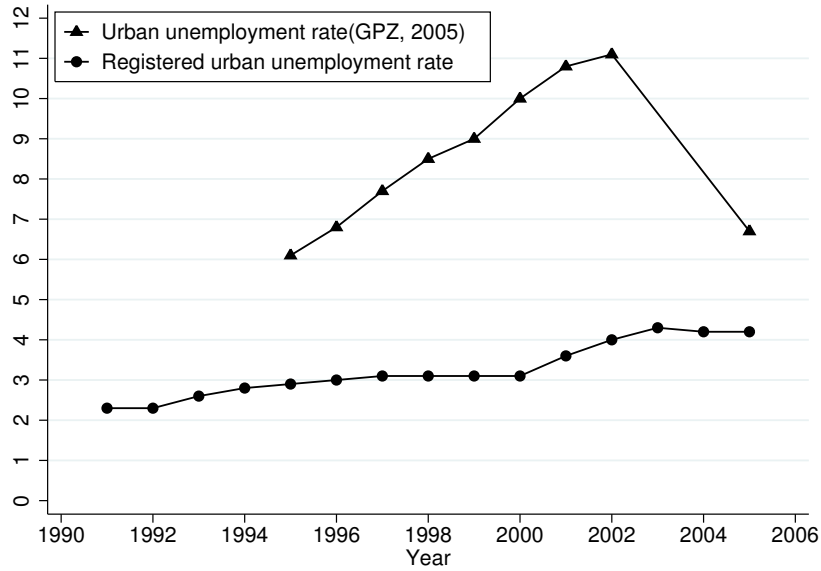
(a) Unemployment Rate
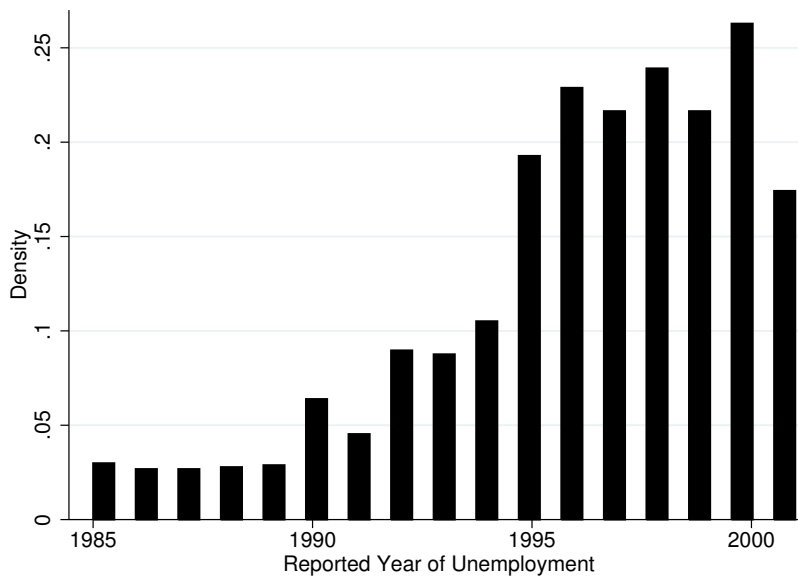
(b) The distribution of the reported year of unemployment, 1985-2001

Source: CULS2001. This figure shows the distribution of the reported year of unemployment, 1985-2001. Unemployment is a dummy taking value of 1 if this person has ever been unemployed before, and include those who ever been laid off, involuntary retirees, registered as unemployment, or without work and actively searching for work.

Figure 2: Unemployment over workers' birth year, 1920-1960
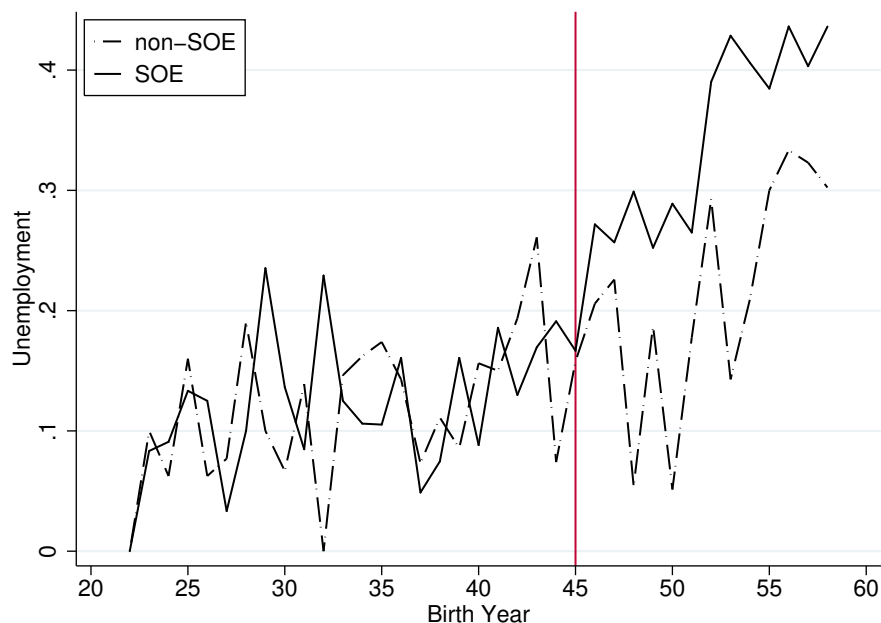
Source: CULS2001. This figure shows the differential impacts of SOE reform across sectors. Unemployment is a dummy taking value of 1 if this person has ever been unemployed before, and include those who ever been laid off, involuntary retirees, registered as unemployment, or without work and actively searching for work.

Figure 3: Average Wages, non-SOEs versus SOEs
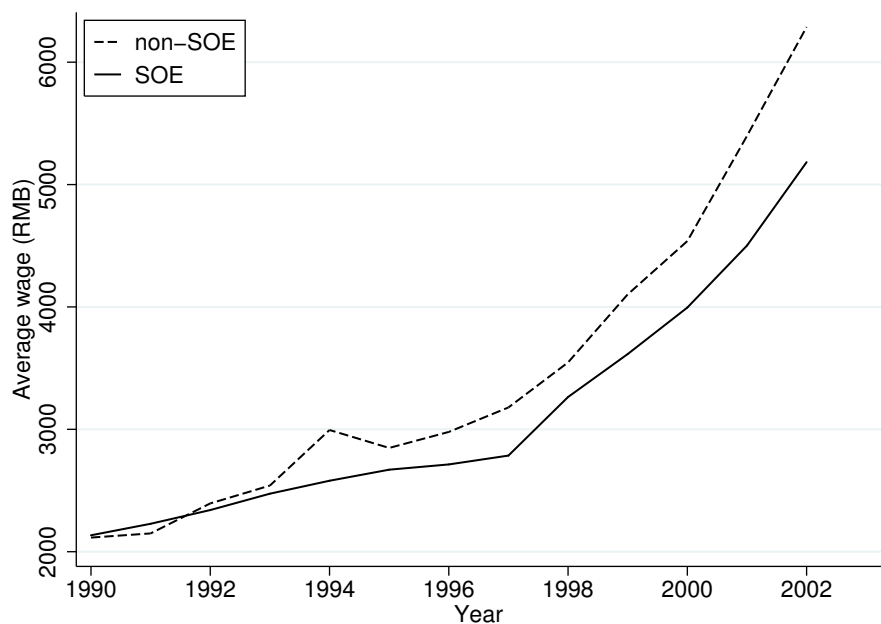
Sources: China Statistical Yearbook 1991-2003. All wages are deflated with the officially-reported price indices in the urban area. The wage for non-SOEs is an average of GOVs and PUBs weighted by the number of workers employed in GOVs and PUBs separately.

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Figure 4: Children's educational attainment and adolescent experience of father's layoff

(a)

(b)

(c)

(d)
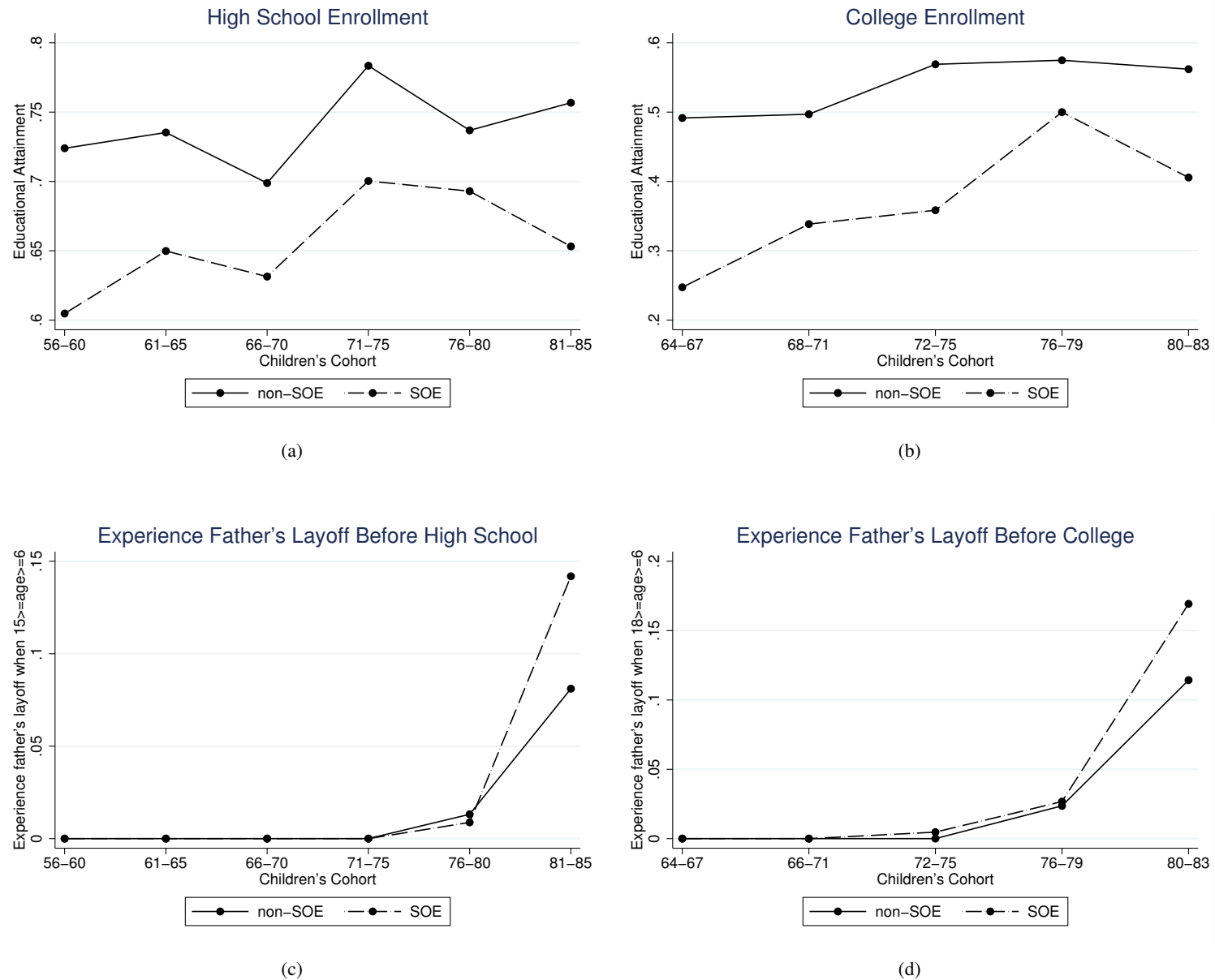
Sources: CULS2001. Y axis represents the unweighted average of educational attainment and the likelihood of experiencing father's layoff when young for a given cohort.

Figure 5: Average schooling expenditure per person for various educational stages
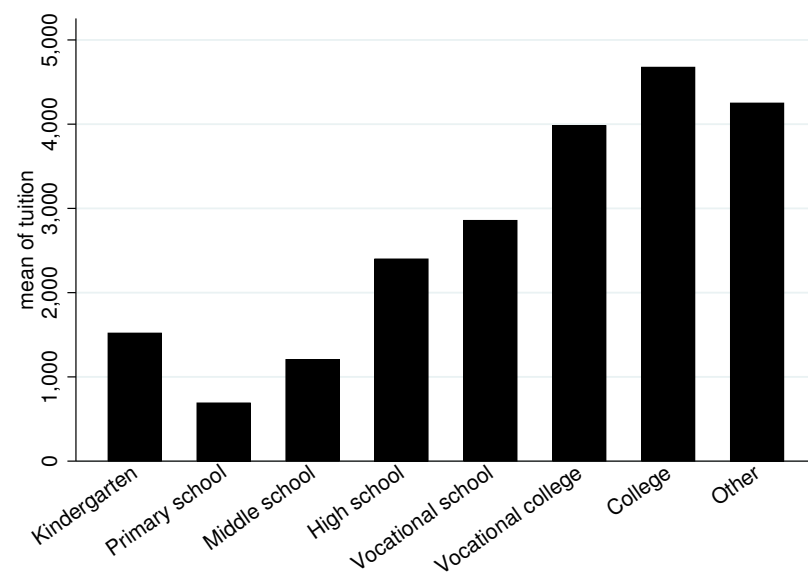
Data source: CULS2001

Figure 6: Marginal effects of layoff shock on gift money
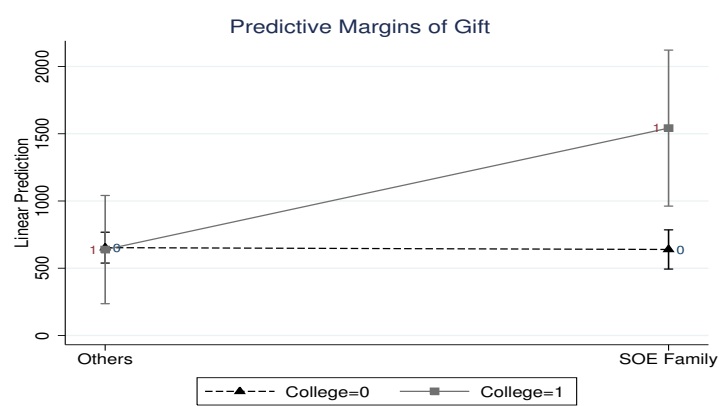
(a)
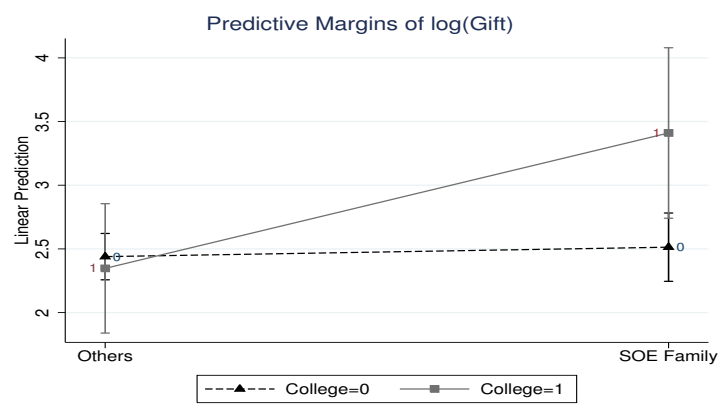
(b)
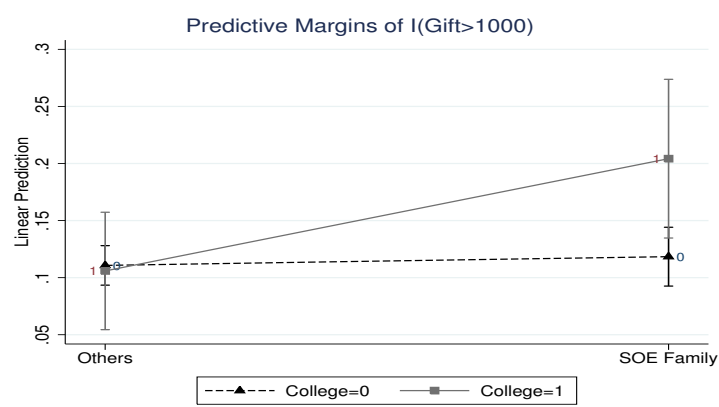
(c)

Source: CULS2001. The gift money is measured at three different ways: the absolute value, the log value, and a dummy taking value of one if gift money received is greater than 1000 RMB. Each figure plots the predicted value of the gift money and 95% confidence interval from Equation 8. These figures show that SOE families with children in college have higher gift money received than other three types of family, and the results are robust to different measures of gift.

Table 1: Unweighted summary statistics: SOE vs non-SOEs workers

| | Mean | | Diff |
	SOE	non-SOEs	
Demographics			
Layoff	0.193	0.0910	0.102***
Age	47.87	50.02	-2.15***
Male	0.488	0.519	-0.032**
Years of Education	10.01	11.66	-1.654***
Marriage	0.855	0.870	-0.015
Height	165.3	165.6	-0.289
Lives in city before 16	0.860	0.805	0.054***
Party Member (before work)	0.138	0.234	-0.096***
Children	1.432	1.568	-0.136***
Siblings	2.038	1.787	0.251***
Brother	1.030	0.934	0.097***
Sister	1.007	0.852	0.155***
Occupations			
Farmer	0.004	0.00400	0.002
Worker	0.774	0.774	0.398***
Self-employed	0.0630	0.0630	-0.069***
Run a business	0.0770	0.0770	-0.166***
Administrator	0.0470	0.0470	-0.043***
Technician	0.0300	0.0300	-0.067***
Observations	4557	1988	

Table 2: Summary statistics of main analysis samples

| | All | | SOE | | non-SOEs | |
	Mean	SD	Mean	SD	Mean	SD
College Sample						
College Attainment	0.435	0.496	0.381	0.486	0.539	0.499
Age	27.15	5.766	26.68	5.797	28.07	5.594
Gender	1.479	0.500	1.483	0.500	1.472	0.500
Siblings	1.032	1.061	0.949	1.025	1.196	1.110
Sisters	0.369	0.606	0.347	0.594	0.414	0.625
Brothers	0.361	0.582	0.330	0.536	0.422	0.659
Observations	1855		1232		623	
High School Sample						
High School Attainment	0.679	0.467	0.651	0.477	0.728	0.445
Age	30.30	8.832	29.41	8.892	31.91	8.491
Gender	1.481	0.500	1.484	0.500	1.475	0.500
Siblings	1.374	1.318	1.299	1.332	1.511	1.282
Sisters	0.574	0.793	0.543	0.797	0.629	0.785
Brothers	0.575	0.739	0.533	0.715	0.652	0.775
Observations	2822		1832		990	

Table 3: Summary statistics (household sample)

	Mean	SD
Household's Characteristics		
Gift received	769.0	3273
Dummy: gift received	0.119	0.323
Gift sent out	712.3	1795
Dummy: gift sent out	0.385	0.487
Children in college	0.119	0.323
Children in high school	0.0906	0.287
Children in school	0.561	0.496
Family size	3.119	1.030
Household Head's Characteristics		
Age	48	13.73
Gender	1.283	0.450
Education	10.91	5.169
Laid-off	0.278	0.448
Siblings	1.889	1.810
Brothers	0.962	1.152
Sisters	0.926	1.131
Observations	3489	

Table 4: Difference-in-Difference

DEP VARIABLES	(1) College	(2) College	(3) College	(4) High School	(5) High School	(6) High School
Post-shock Cohort × Father in SOE	-0.0564*	-0.111***	-0.0863*	-0.0803***	-0.0784**	-0.132***
	(0.0318)	(0.0391)	(0.0444)	(0.0180)	(0.0378)	(0.0423)
Mean of Outcome Variable	0.4345	0.4345	0.4494	0.6871	0.6871	0.6936
Observations	1,855	1,855	1,620	2,822	2,822	2,412
Post-shock Cohort × Mother in SOE	-0.0514*	-0.111**	-0.191**	0.0109	0.00788	-0.0445
	(0.0294)	(0.0487)	(0.0781)	(0.0538)	(0.0522)	(0.0447)
Mean of Outcome Variable	0.4119	0.4119	0.4419	0.6622	0.6622	0.6810
Observations	1,964	1,964	1609	3,200	3,200	2517
Children and Parental Controls	Yes	Yes	Yes	Yes	Yes	Yes
Children's Cohort × Parental Job FE	No	Yes	Yes	No	Yes	Yes
Spouse Controls	No	No	Yes	No	No	Yes

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Robust standard errors are clustered at community level (70 clusters). College sample includes children whose birth year ranges from 1964 to 1983, and high school sample ranges from 1956 to 1985. The post-shock cohort for college sample are born from 1980 to 1983, and for high school sample born from 1981 to 1985. Cohort fixed effect and job sector fixed effect are included in all specifications. Parental controls include the parent's education, party membership, height, occupation dummies, industry dummies, early life experience, school ranking, school quality, etc. Children contorls include the number of children's siblings, sisters, and brothers. Spouse controls include dummies of sectors where mother worked and its interactions with children's post-shock cohorts.

Table 5: Likelihood of experiencing fahter's job loss when young

SPECIFICATIONS	(1) College Sample	(2) High School Sample
Post-shock Cohort $\times$ Father in SOE	0.0526* (0.0286)	0.0539** (0.0267)
Mean of Outcome Variable	0.0410	0.0269
Observations	1,855	2,822

Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are clustered at community level (70 clusters). The dependent variable is a dummy taking value of one if the child experienced father's job loss when her age was between 6 and 18 for college sample, and between 6 and 15 for high school sample, respectively. The post-shock group for college sample are born from 1980 to 1983, and for high school sample born from 1981 to 1985. Father controls include father's education, party membership, height, occupation dummies, industry dummies, early life experience, school ranking, school quality, etc. Children contorls include the number of children's siblings, sisters, and brothers. Cohort fixed effect, job sector fixed effect, father controls, and children controls are included in all specifications.

Table 6: Triple difference (DDD)

	College			High School		
	(1)	(2)	(3)	(4)	(5)	(6)
INTENSITY MEASURE	Layoff Share	SWS	SOE Share	Layoff Share	SWS	SOE Share
Post-shock Cohort × Father in SOE	-0.409*	-0.208**	-0.737**	-0.290*	-0.181*	-0.774
× Intensity	(0.228)	(0.103)	(0.314)	(0.163)	(0.106)	(0.528)
Post-shock Cohort × Father's Job FE	Yes	Yes	Yes	Yes	Yes	Yes
City Dummy × Father's Job FE	Yes	Yes	Yes	Yes	Yes	Yes
City Dummy × Post-shock Cohort	Yes	Yes	Yes	Yes	Yes	Yes
Mean Outcome of Variable	0.4345	0.4345	0.4345	0.6871	0.6871	0.6871
Observations	1,855	1,855	1,498	2,822	2,822	2,272

Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are clustered at community level (70 clusters). Dependent variables are college enrollment and high school enrollment. The post-shock group for college sample are born from 1980 to 1983, and for high school sample born from 1981 to 1985. College sample includes children whose birth year ranges from 1964 to 1983. High school sample ranges from 1956 to 1985. Layoff Share is the percentage of workers who report ever being laid off during the reform. SWS is a dummy that equals to 1 if the city is Shenyang, Wuhan, or Shanghai, where the layoff share are significantly larger than others. SOE Share is the city-wide employment share of SOE workers before the shock. This information is available in city-level statistical yearbooks except Shanghai. Father controls include father's education, party membership, height, occupation dummies, industry dummies, early life experience, school ranking, school quality, etc. Children contorls include the number of children's siblings, sisters, and brothers. Father and children controls are included in all specifications.

Table 7: Sibling effect

| | College | | High School | |
| | (1) | (2) | (3) | (4) |
SIBLING MEASURE	Siblings	Brothers	Siblings	Brothers
Post-shock Cohort × Father in SOE	0.0165**	0.0394***	0.0189**	0.0207***
× Parental Siblings	(0.00721)	(0.0100)	(0.00734)	(0.00661)
Post-shock Cohort × Father in SOE	-0.142***	-0.164***	-0.179***	-0.137***
	(0.0504)	(0.0297)	(0.0365)	(0.0257)
Sibling FE	Yes	Yes	Yes	Yes
Brother FE	No	Yes	No	Yes
Mean Outcome of Variable	0.4345	0.4345	0.6871	0.6871
Observations	1,855	1,855	2,822	2,822

Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are clustered at community level (70 clusters). Dependent variables are college enrollment and high school enrollment respectively. The post-shock cohort for college sample are born from 1980 to 1983, and for high school sample born from 1981 to 1985. Sibling and Brother are the total amount of siblings and brothers from both mother and father sides. Father controls include father's education, party membership, height, occupation dummies, industry dummies, early life experience, school ranking, school quality, etc. Children contorls include the number of children's siblings, sisters, and brothers. Cohort fixed effect, job sector fixed effect, father controls, and children controls are included in all specifications.

Table 8: SOE and gift money

DEP VARIABLES	(1) Gift	(2) Gift	(3) Log(Gift)	(4) Log(Gift)	(5) I(Gift>1000)	(6) I(Gift>1000)
College × SOE	687.1**	916.8***	0.833**	0.989**	0.0637	0.0907**
	(328.8)	(345.3)	(0.376)	(0.395)	(0.0391)	(0.0408)
College	155.8	-14.54	-0.0433	-0.0922	0.0229	-0.00486
	(179.9)	(218.1)	(0.230)	(0.266)	(0.0235)	(0.0271)
School × SOE		-404.3**		-0.498*		-0.0560**
		(159.2)		(0.257)		(0.0246)
School		262.3**		0.245		0.0352*
		(126.2)		(0.187)		(0.0183)
SOE	-190.0**	-13.54	-0.0603	0.0744	-0.0171	0.00766
	(74.98)	(100.5)	(0.124)	(0.192)	(0.0117)	(0.0183)
Controls	No	Yes	No	Yes	No	Yes
Mean of Outcome Variable	769.0	774.1	2.506	2.506	0.119	0.119
Observations	3,484	3,433	3,484	3,433	3,484	3,433

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Robust standard errors are in parentheis. Gift is the total gift money received last year from relatives and friends by the household head and her spouse. I(Gift>1000) is an indicator representing the gift money received over 1000 RMB. College is a dummy equal to 1 if the household has at least one child in college or above, and 0 otherwise. SOE is a dummy taking value of one if both household head and spouse were employed in SOEs before 1992. Controls include household head's gender, education, and birth year, as well as the size of the family and the city fixed effect.

Table 9: Informal insurance from siblings (triple difference)

DEP VARIABLES	(1) Gift	(2) Log(Gift)	(3) I(Gift>1000)
College × SOE × Brothers	55.66	0.430*	0.0412*
	(214.9)	(0.233)	(0.0240)
College × Brothers FE	Yes	Yes	Yes
SOE × Brothers FE	Yes	Yes	Yes
SOE × College	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Mean of Outcome Variable	769.0	2.506	0.119
Observations	3,433	3,433	3,433

Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are in parentheis. College is a dummy equal to 1 if the household has at least one child in college or above, and 0 otherwise. SOE is a dummy taking value of one if both household head and spouse were employed in SOEs before 1992. Total number of brothers and total number of siblings household head and her spouse have are controlled in all specifications. Controls include household head's gender, education, and birth year, as well as the size of the family and the city fixed effect.
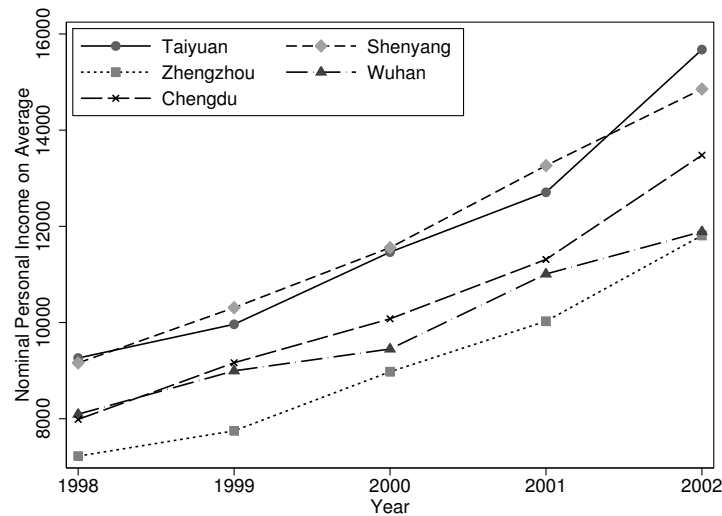
Appendix A: Figures and Tables

Figure 7: College attainment, rural versus urban
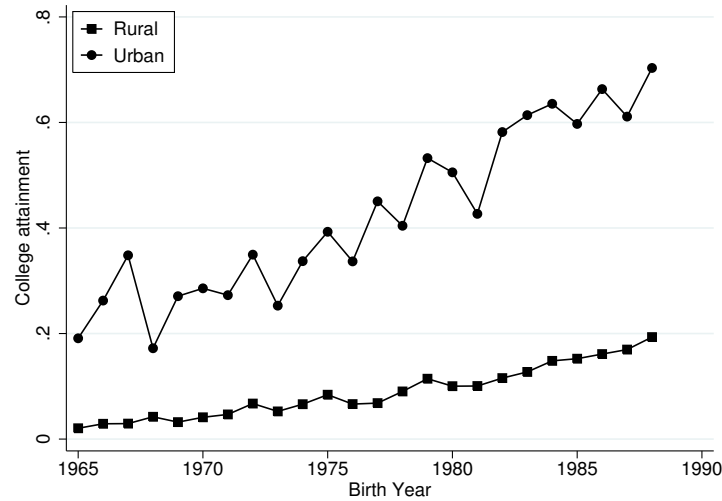
Source: CFPS2010. Rural and urban area refers to the place where the individuals lived at 12 years old.

Figure 8: Income growth in non-SOEs across selected cities

Source: CHIP2002. Personal income is defined as income earned from all enumerated sources throughout the year. The data covers two out of five cities studied in this paper, Wuhan and Shenyang. The comparison cities are chosen to be as close as possible to Wuhan and Shenyang in terms of average personal income, and are subject to availability.

Figure 9: Difference coefficients for high school and college enrollment
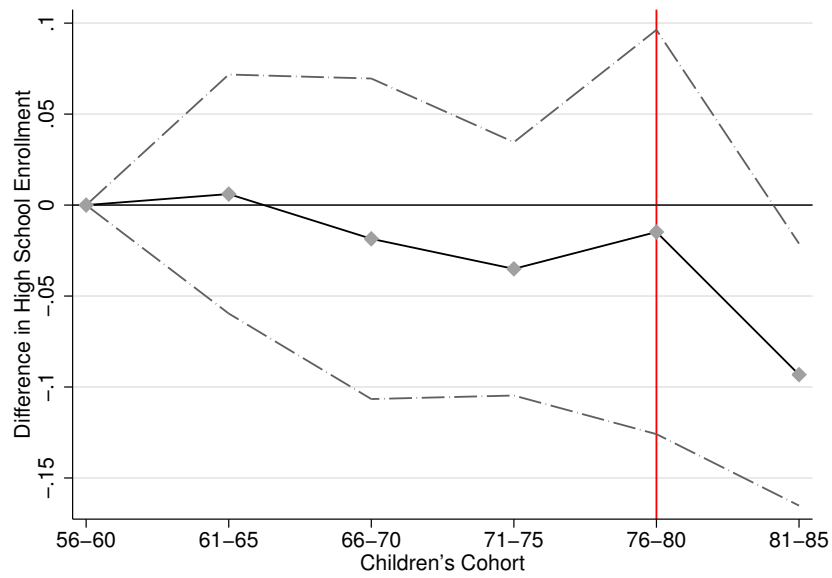
(a) High School
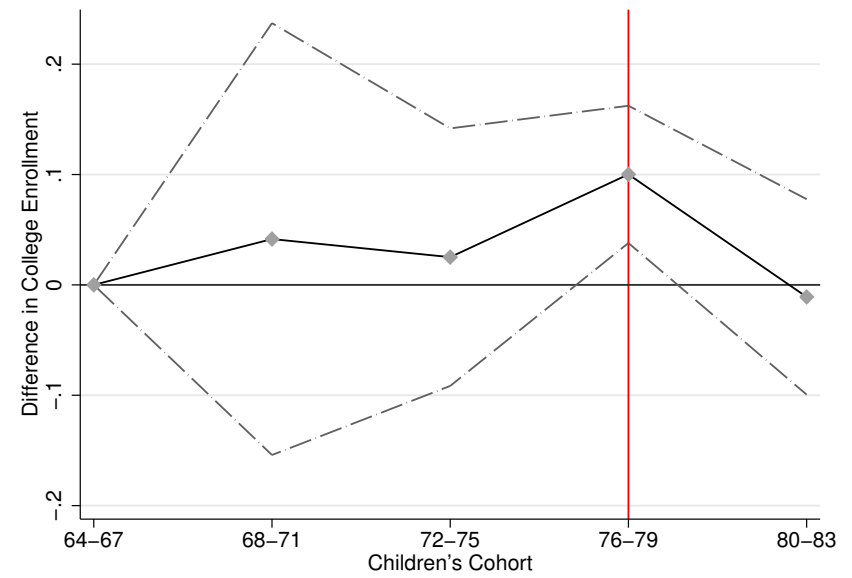
(b) College

Source: CULS2001. Each panel plots regression coefficients and 95% confidence interval from estimating equation (16).

Table 10: Percentage of households residing in public housing

	SOEs	GOVs & PUBs	Private Sectors
1988	0.845	0.880	0.564
Observations	5908	2086	188
1995	0.452	0.465	0.315
Observations	4169	2082	124

Note: CHIP1988 and CHIP1995. Households are categorized based on the sectors where the household head is employed.

Table 11: Robustness checks for DID

	(1)	(2)	(3)	(4)
Panel A: Dep Var = College Attainment				
Post-shock Cohort × Father in SOE	-0.121**	-0.112*	-0.120***	-0.100**
	(0.0469)	(0.0591)	(0.0423)	(0.0405)
Observations	1,498	1,646	1,962	1,855
Panel B: Dep Var = High school Attainment				
Post-shock Cohort × Father in SOE		-0.0790*	-0.0807*	-0.0743**
		(0.0457)	(0.0431)	(0.0348)
Observations		2,271	3,003	2,821

Note: Dependent variables are college enrollment in Panel A, and high school enrollment in Panel B. Except in columns 1, college sample includes children born from 1964 to 1983, and high school sample from 1956 to 1985. The post-shock cohort for college sample are born from 1980 to 1983, and for high school sample born from 1981 to 1985. Father controls include father's education, party membership, height, occupation dummies, industry dummies, early life experience, school ranking, school quality, etc. Children contorls include the number of children's siblings, sisters, and brothers. Cohort fixed effect, job sector specific trend, father controls, and children controls are included in all specifications. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Robust standard errors are clustered at community level (70 clusters).

Specifications:
1. Robustness check for college expasions and tuition increase. The post-shock cohort for college sample consists of children born in 1980 and 1981, and the total sample includes children born from 1964 to 1981.
2. Drop Shanghai from the sample.
3. Use children with fathers in all non-SOEs as the control group.
4. Include father's demographic interactions, which are children's cohort dummy interacted with father's education, height, party membership, and personal early life experience including whether was sent down to rural area after 16 and whether lived in urban area before 16.

Table 12: Divergence of return to education and ability

DEP VARIABLES	(1) College	(2) College	(3) College	(4) High School	(5) High School	(6) High School
Post-shock Cohort × Father in SOE	-0.100**	-0.0886**	-0.0879**	-0.0743**	-0.0649*	-0.0729**
	(0.0405)	(0.0387)	(0.0387)	(0.0348)	(0.0352)	(0.0353)
Post-shock Cohort × Father's Education	0.0109	0.00599	0.00419	0.000996	0.00194	0.00137
	(0.00749)	(0.00729)	(0.00741)	(0.00645)	(0.00804)	(0.00582)
Post-shock Cohort × Father's Pschool Quality		0.160***	0.150**		0.108*	0.0941
		(0.0593)	(0.0735)		(0.0623)	(0.0681)
Post-shock Cohort × Father's Mschool Quality		0.226*	0.209*		0.0977	0.124**
		(0.127)	(0.125)		(0.0720)	(0.0593)
Post-shock Cohort × Father's Hschool Quality		-0.0211	-0.0376		0.0325	0.0312
		(0.0739)	(0.0722)		(0.0922)	(0.0951)
Post-shock Cohort × Father's Pschool Ranking			-0.147**			0.0176
			(0.0627)			(0.122)
Post-shock Cohort × Father's Mschool Ranking			0.0817			0.0704
			(0.186)			(0.177)
Post-shock Cohort × Father's Hschool Ranking			0.0899			-0.192
			(0.0857)			(0.132)
Mean of Outcome Variable	0.4345	0.4345	0.4345	0.6871	0.6871	0.6871
Observations	1,855	1,855	1,855	2,821	2,822	2,821

Note: College sample includes children whose birth year ranges from 1964 to 1983, and high school sample ranges from 1956 to 1985. The post-shock cohort for college sample are born from 1980 to 1983, and for high school sample born from 1981 to 1985. Father controls include father's education, party membership, height, occupation dummies, industry dummies, early life experience, school ranking, school quality, etc. Children contorls include the number of children's siblings, sisters, and brothers. Demographic interactions are children's cohort dummy interacted with father's education, height, party membership, and personal early life experience including whether was sent down to rural area after 16 and whether lived in urban area before 16. Cohort fixed effect, job sector specific trend, father controls, children controls, demographic interactions are included in all specifications.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$. Robust standard errors are clustered at community level (70 clusters).

Table 13: Mortality attrition

Panel A: College

Cohorts Sample	(1) 1968-1983	(2) 1968-1983	(3) 1968-1983	(4) 1972-1983	(5) 1972-1983	(6) 1972-1983	(7) 1976-1983	(8) 1976-1983	(9) 1976-1983
Post-shock Cohort × Father in SOE	-0.0670**	-0.113***	-0.0973**	-0.0576	-0.101**	-0.0839*	-0.108**	-0.108**	-0.0859**
	(0.0327)	(0.0377)	(0.0384)	(0.0387)	(0.0425)	(0.0440)	(0.0407)	(0.0407)	(0.0405)
Observations	1,549	1,549	1,549	1,130	1,130	1,130	803	803	803
Father and Children Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children's Cohort × Father's Job FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Father's Demographic Interactions	No	No	Yes	No	No	Yes	No	No	Yes

Panel B: High School

Cohorts Sample	(10) 1966-1985	(11) 1966-1985	(12) 1966-1985	(13) 1971-1985	(14) 1971-1985	(15) 1971-1985	(16) 1976-1985	(17) 1976-1985	(18) 1976-1985
Post-shock Cohort × Father in SOE	-0.0637***	-0.0710*	-0.0689*	-0.0724***	-0.0845**	-0.0823**	-0.0832**	-0.0832**	-0.0806**
	(0.0227)	(0.0362)	(0.0358)	(0.0224)	(0.0400)	(0.0398)	(0.0347)	(0.0347)	(0.0338)
Observations	1,951	1,951	1,950	1,504	1,504	1,503	1,071	1,071	1,070
Father and Children Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children's Cohort × Father's Job FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Father's Demographic Interactions	No	No	Yes	No	No	Yes	No	No	Yes

Note: Dependent variables are college enroolment in Panel A, and high school enrollment in Panel B. The post-shock cohort for college sample are born from 1980 to 1983, and for high school sample born from 1981 to 1985. Father controls include father's education, party membership, height, occupation dummies, industry dummies, early life experience, school ranking, school quality, etc. Children contorls are the number of children's siblings, sisters, and brothers. Father's demographic interactions are children's cohort dummies interacted with father's education, height, party membership, and personal early life experience including whether was sent down to rural area after 16 and whether lived in urban area before 16. Father and children controls are included in all specifications.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$. Robust standard errors are clustered at community level (70 clusters).

Table 14: Falsification exercises using placebo treatments

Panel A: College

Cohorts Sample	(1) 1968-1979	(2) 1968-1979	(3) 1968-1979	(4) 1972-1979	(5) 1972-1979	(6) 1972-1979
Post-shock Cohort × Father in SOE	0.0796	0.0854	0.0934	0.101*	0.101*	0.121*
	(0.0507)	(0.0631)	(0.0658)	(0.0568)	(0.0568)	(0.0628)
Observations	1,131	1,131	1,131	712	712	712
Father and Children Controls	Yes	Yes	Yes	Yes	Yes	Yes
Children's Cohort × Father's Job FE	No	Yes	Yes	No	Yes	Yes
Father's Demographic Interactions	No	No	Yes	No	No	Yes

Panel B: High School

Cohorts Sample	(7) 1966-1980	(8) 1966-1980	(9) 1966-1980	(10) 1971-1980	(11) 1971-1980	(12) 1971-1980
Post-shock Cohort × Father in SOE	0.0144	0.0148	0.0258	0.0368	0.0368	0.0512
	(0.0391)	(0.0569)	(0.0581)	(0.0537)	(0.0537)	(0.0528)
Observations	1,369	1,369	1,369	922	922	922
Father and Children Controls	Yes	Yes	Yes	Yes	Yes	Yes
Children's Cohort × Father's Job FE	No	Yes	Yes	No	Yes	Yes
Father's Demographic Interactions	No	No	Yes	No	No	Yes

Note: Dependent variables are college enrollment in Panel A, and high school enrollment in Panel B. The placebo post-shock cohort for college sample are born from 1976 to 1979, and for high school sample born from 1976 to 1980. Father controls include father's education, party membership, height, occupation dummies, industry dummies, early life experience, school ranking, school quality, etc. Children contorls are the number of children's siblings, sisters, and brothers. Father's demographic interactions are children's cohort dummies interacted with father's education, height, party membership, and personal early life experience including whether was sent down to rural area after 16 and whether lived in urban area before 16. Cohort fixed effect, job sector specific trend, father controls, children controls, demographic interactions are included in all specifications.

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are clustered at community level (70 clusters).

Appendix B: Proof

Proof of proposition 1:

Proof. Combing equation 2 and 3 and plugging 3 into 4, we have

$$
\begin{aligned}
\pi^H &= Prob[f(\frac{\alpha_n}{\tau_n}w) + g(\tau_n) + \varepsilon > (1-\tau_n)f(w) + \tau_n \cdot f(\frac{\alpha_n}{\tau_n}w) + g(\tau_n)] \\
&= Prob[\varepsilon > (1-\tau_n) \cdot (f(w) - f(\frac{\alpha_n}{\tau_n}w))] \\
&= \Phi[(1-\tau_n) \cdot (f(\frac{\alpha_n}{\tau_n}w) - f(w))]
\end{aligned}
\tag{10}
$$

This gives

$$
\frac{\partial \pi^H}{\partial \tau_n} = \Phi' \cdot [f(w) - f(\frac{\alpha_n}{\tau_n}w) - \frac{(1-\tau_n) \cdot f' \alpha_n w}{\tau_n^2}]
\tag{11}
$$

Since $\Phi' > 0$, we have $\partial \pi^H / \partial \tau_n > 0$ if $f(w) - f(\frac{\alpha_n}{\tau_n}w) < \frac{(1-\tau_n) \cdot f' \alpha_n w}{\tau_n^2}$ and $\partial \pi^H / \partial \tau_n < 0$ if $f(w) - f(\frac{\alpha_n}{\tau_n}w) > \frac{(1-\tau_n) \cdot f' \alpha_n w}{\tau_n^2}$. $\square$

Proof of proposition 2:

Proof. Consider the probability of going to college for children whose father lost jobs

$$
\begin{aligned}
\pi^C &= Prob[f(\frac{\alpha_n}{\tau_n}w) + g(\tau_n) + \varepsilon > \overline{M}] \\
&= \Phi[f(\frac{\alpha_n}{\tau_n}w) + g(\tau_n) - \overline{M}]
\end{aligned}
\tag{12}
$$

This gives

$$
\frac{\partial \pi^C}{\partial \tau_n} = \Phi' \cdot [-\frac{f' \alpha_n w}{\tau_n^2} + g'(\tau_n)]
\tag{13}
$$

Since $f' > 0$ and $g' < 0$, we have $\frac{\partial \pi^C}{\partial \tau_n} < 0$.

Rearranging equation 10 yields

$$
\frac{\partial \pi^H}{\partial \tau_n} = \Phi' \cdot [f(w) - f(\frac{\alpha_n}{\tau_n}w) + \frac{f' \alpha_n w}{\tau_n} - \frac{f' \alpha_n w}{\tau_n^2}]
\tag{14}
$$

Since $f(w) - f(\frac{\alpha_n}{\tau_n}w) > 0$, $\frac{f' \alpha_n w}{\tau_n} > 0$, and $g' < 0$, comparing (13) with (12), we have

$$
\frac{\partial \pi^H}{\partial \tau_n} > \frac{\partial \pi^C}{\partial \tau_n}
\tag{15}
$$

$\square$

Appendix C: Sample and Variable Definition

C.1 The Children Sample

In this appendix, I describe the procedure of how I obtain the children's sample from the adult's survey. Specifically, it involves the following four steps:

1. Keep only males in the adult survey.

2. Expand the data based on the number of children each male adult has [34], and generate children's demographic variables including the gender, birth year, and educational attainment based on the information from the adult survey.

3. Keep only those children whose fathers work in state sectors [35].

4. Drop those whose fathers' initial job started before 1949.

After imposing these restrictions, I obtain the final college sample with 1855 observations, and the high school sample with 2822 observations. The sample for the analysis includes all the children identified from the adult survey except those whose mothers are either widow or divorced. In that case, I cannot directly observe these children's father's information. The sample for the analysis of mother's job status is constructed in the same way. And similarly, for those male widow and divorced, their children are out of the sample for mother's job analysis.

C.2 Definition of Father's Job

Now I discuss the definition of father's job in more details. Ideally, I would like to have the control and the treatment group as two parallel tracks that people cannot freely cross. But in fact people do change jobs, which makes it hard to accurately capture and define father's jobs. The labor market barrier in China, however, provides an opportunity to deal with this issue. In China, most of jobs before 1990s are assigned to be life-time jobs, the so-called "Iron Rice Bowl". It is difficult for people to switch jobs across firms, if possible[36]. The job mobility was almost before 1990s and the composition of control and treatment group was thus relatively stable over time. Therefore, even though I cannot directly observe father's job when children is younger than their schooling age, I can use father's initial jobs or jobs right before the shock to approximate.

For those not working in 1996, the survey asks detailed information about their their initial jobs including job types, sectors, industries, how to get the jobs, etc. For the people, I simply define father's jobs as their initial jobs, while for those still working in 1996, the survey does not only ask their initial jobs, but also records their detailed employment history. To fully utilize this information, I define father's jobs for this group of people as the one held in 1992, right before the labor market reform.

---

[34] For males born before 1965, there are less than 4% that don't have any children.

[35] To check the robustness, I also use children with fathers employed in all non-state enterprises as the control group. The results are robust to these changes. See Table 11.

[36] For example, the CULS2001 data shows that for people whose work started in 1970s, only 0.5% had ever changed their jobs by 1996.

Appendix D: Difference-in-Difference with Discrete Terms

The results presented in panel (a) and (b) of Figure 4 only serve for illustrative purpose. In this appendix, I estimate a restricted model with discrete interaction terms and show analytically how the economic restructuring shock evolves,

$$E_{ias} = \alpha_0 + \sum_{a=1}^{A} \beta^a (SOE_s \times Cohort_i^a) + \rho_a + \eta_s + \theta^J X_i + \varepsilon_{ias} \tag{16}$$

where $Cohort_i^a$ is a dummy that indicates whether children i is in age group a. Each coefficient can be interpreted as an estimate of the impact of the shock on the educational attainment for a given cohort. Figure 9 plots these coefficients and their 90% confidence intervals for high school sample and college sample respectively. Similar to the unrestricted comparison shown in Figure 4, the gap between the SOE and non-SOEs group is relatively constant until age group 76-80, and then increases considerably for the post-shock group for the high school sample. In terms of the college attainment, the difference between the two groups has been shrinking until after 76-79, and then grows for the post-shock group 80-83.