The Great Gatsby Curve in China: Cross-Sectional Inequality and Intergenerational Mobility*

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Abstract

This study attempts to provide the first systematical analysis of the temporal patterns of cross-sectional inequality and intergenerational mobility amid China's economic transition and growth. First, we estimate the declining pattern of intergenerational mobility in income and education with respect to cohort. The declining pattern is more significant for females and residents in economically disadvantaged regions. Second, we correlate intergenerational mobility with cross-sectional inequality and find a Great Gatsby Curve with a negative slope in China. Finally, we discuss the institutional and policy factors behind the findings.

Key words: The Great Gatsby curve, cross-sectional inequality, intergenerational mobility
JEL classifications: H72, H75, O15, O53

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1 Introduction

In this study, we investigate the cross-sectional and intergenerational inequalities in China amid its economic transition. Although its economic growth since the 1979 market-oriented reform has been impressive, the rising income inequality in the country is equally remarkable but less well understood (Brandt & Rawski, 2008; Xie & Zhou, 2014). With respect to the inequality, the Gini coefficient rockets from 0.26 to 0.43 between 1980 and 2010, which is equal to that of the US (Figures 1 and 2). Would the rising inequality continue or even get worse? To what extent would the cross-sectional inequality be persistent across generations? How does cross-sectional inequality interplay with intergenerational mobility? In particular, what is the relevance of the Great Gatsby Curve in China (Krueger, 2012)?[1] What are the institutional and policy factors driving the changes in equality and intergenerational mobility? This paper tries to answer these questions. Understanding the interplay between inequality and mobility in China over the 40 years of economic reform may provide interesting insights to the economics literature and draw policy implications for other countries at the similar stage of economic transition and development.

We first estimate the patterns of intergenerational mobility in income and education with respect to cohort, gender, and region in China using multiple micro data sets and recent methodologies in the literature. We then correlate cross-sectional inequality with intergenerational mobility. Finally, we develop a conceptual framework to explain the stylized facts and empirical regularities on changes in cross-sectional inequality and intergenerational mobility. To our best knowledge, this study is the first attempt to systematically explore the dynamic evolution of inequality and mobility in China.

Our results show that intergenerational mobility in both income and education declines sharply. This trend is particularly significant for females and residents from economically disadvantaged regions, such as rural and western parts. We show an increase from 0.315 to 0.442 in the intergenerational income elasticity (IGE) between cohorts born before and after 1970, using data from the Chinese Household Income Projects (CHIPs) in 1995 and 2002. Following Chetty *et al.* (2014a,b), we also examine the change in the percentile rank in the income distribution of a child if the parents' rank increases by one percentile rank. The rank-rank estimate increases from 0.273 to 0.347 across cohorts. Moreover, the rank estimates for daughters and residents of western region reach 0.39 and 0.455 in the late cohort. Since education is a major determinant of income, we also examine the intergenerational education mobility. We find that the rank-rank estimate increases from 0.235 to 0.292 across the two cohorts using the 2010 Chinese Family Panel Studies (CFPS), thereby indicating a declining trend in mobility. As with income, the result is especially significant for girls and residents from less developed regions.

[1]The Great Gatsby Curve describes the negative association between cross-sectional inequality and intergenerational mobility. It was introduced by Alan Krueger using data from developed countries (Krueger, 2012).

To interpret these patterns, we develop a conceptual framework from the human capital perspective (Becker & Tomes, 1979, 1986; Solon, 2004; Corak, 2013). We explain the changes in China's intergenerational mobility through five factors: return to human capital, educational cost, government policies on human-capital investment, household income, and income inequality. As a result of the rapid economic growth, increasing numbers of households become rich and are less likely to be constrained to invest in the schooling of their children (Figure 1). The substantial increase in the educational expenditure of the government also contributes to the undoing of household constraints (Figure 3). These two factors are expected to enhance intergenerational mobility jointly.[2] However, the return to schooling has increased sharply along with the reforms because of the rapid accumulation of physical capital, improvement in technology, and market-oriented institutional reforms (Figure 4). Educational costs, such as tuition, have increased considerably as well (Figure 5). The increase in inequality prohibits children in poor families from being accessible to high-quality education. The changes in these three factors are expected to reduce intergenerational mobility. Our estimated declining intergenerational mobility implies that the effect of the latter three factors dominates that of the former two.

This framework also effectively explains the gender and regional patterns. We suggest that the gender-specific pattern is due to the greater increase in return to human capital for girls than boys (Figure 6). In a country where sons are typically preferred, girls from poor households are under severer family constraints with respect to educational investment than their brothers. We ascribe the regional disparity in inequality to the localization of government expenditure on public education and the difference in income levels across regions (Figure 7). Hence, households from rural and western areas are more likely to be subject to family constraints given the insufficient educational expenditure of the local government and low household income.

By linking cross-sectional inequality to intergenerational mobility, we have an understanding of the dynamic evolution of the two in China. Despite China's fast economic growth, inequality in this country has increased and poor families benefit less from this growth than rich families do. With the significant increase in the educational cost and the decentralization of governmental expenditure on education, poor parents are less able to support their children to access quality education. By contrast, rich parents increasingly invest in the education of their children with the rise in the return to human capital. The educational opportunity for children from poor families has been shrunk relative to that for children from rich families. Therefore, intergenerational mobility has declined with the increase in cross-sectional inequality since China's economic reform. Given

[2]However, with the decentralization of government expenditure on education, the increase in public expenditure is concentrated in economically developed areas, in which local governments are financially well off. Children from poor regions are less likely to benefit or even suffer from the decentralization. Therefore, the positive effect of the increase in public educational expenditure on intergenerational mobility is partly offset by the decentralization of government expenditure.

this decline, China's cross-sectional inequality may increase in the future.

To our best knowledge, this study is the first attempt to understand the dynamic evolution of cross-sectional inequality and intergenerational mobility in China. It stands out as the first systematical analysis of the patterns of intergenerational mobility with respect to cohort, gender, and region in China's reform era. Early empirical works focus on developed countries. Recent studies on China's intergenerational mobility concentrate on one or two dimensions only, and do not investigate the causes of the changing patterns (Knight *et al.*, 2011; Deng *et al.*, 2013). We utilize multiple micro data sets and recent methodologies to study intergenerational mobility in China.

Moreover, we present the first attempt to relate the declining intergenerational mobility to the rising cross-sectional inequality in China by finding a negatively sloped Great Gatsby Curve. This negative relationship is originally derived from cross-country or cross-zone evidence from developed countries (Krueger, 2012; Corak, 2013; Chetty *et al.*, 2014a). However, the literature does not provide time-series evidence supporting the Great Gatsby Curve, and has focused exclusively on the OECD counties. Our study is the first to investigate the Great Gatsby Curve outside those developed countries. Therefore, it may enrich understanding of the dynamic evolution of inequality in other transitional or developing economies.

Finally, we propose a conceptual economic framework to explain the stylized facts and empirical regularities on inequality and mobility in China. We theoretically link market-oriented institutional reforms, fiscal policy transformations, and socioeconomic changes to the changes in China's cross-sectional inequality and intergenerational mobility.

The rest of the paper is organized as follows. Section 2 introduces China's market-oriented institutional, educational, and fiscal policy reforms. Sections 3 and 4 present the empirical results of intergenerational mobility in income and education, respectively. Section 5 links intergenerational inequality with cross-sectional inequality by drawing and analyzing the Great Gatsby Curve in China. Section 6 interprets the increase in inequality and the decline in intergenerational mobility. Section 7 discusses the policy implications of our paper. Section 8 concludes.

2 Research Background

2.1 Market-oriented Institutional Reforms, Increasing Return to Human Capital, and Income Inequality

Over the past four decades, China experienced rapid economic growth. It was one of the poorest countries in 1978, with a real GDP per capita one-fortieth of that of the US. Since that period, however, China undertook structural reforms and achieved an annual growth rate in per capita

GDP that exceeded 8% (Zhu, 2012). In 2012, its real GDP per capita reached one-fifth that of the US.

China's economic growth is spurred by a series of market-oriented institutional reforms, which increase the return to human capital significantly.[3] This economic reform was initiated in the late 1970s by the establishment of the Rural Household Responsibility System. The new system adjusted the incentive structure in the agricultural sector, enhanced the agricultural productivity, and generated a surplus of rural labor (Rozelle *et al.*, 1997). Simultaneously, China adopted an Open-Door Policy that resulted in a huge influx of foreign direct investment. The great inflow of capital generated a high demand for labor in urban and coastal areas.

Given the surplus of labor in rural and inland areas and the high demand in the urban and coastal regions, the household registration (*hukou*) system that restricts rural-to-urban migration was gradually relaxed from the late 1980s.[4] The relaxation of this restraint resulted in an unprecedented increase in domestic migration: according to the 2005 1% mini-census, the total number of rural-to-urban migrants amounted to 0.2 billion. The efficiency of the labor market allocation improved remarkably following this period (Zhao, 1997; West & Zhao, 2000).

In the mid-1990s, the government began reforming the state-owned enterprises (SOEs) and encouraged the diversification of ownership. Prior to the economic reform, China had only two types of enterprises, namely, the stated-owned and collective enterprises. Since the late 1970s, however, the institutional reforms were accompanied by introducing three types of foreign enterprises: Chinese-foreign joint venture management enterprise, Chinese-foreign cooperative joint venture, and foreign sole-source investment enterprise. Nonetheless, private firms were not legalized until 1997 during the 15th Congress of the Chinese Communist Party (Zhu, 2012). Many of the SOEs and collective enterprises were privatized. Thus, market-oriented privatization resulted in a flexible labor market and promoted economic growth (Dong & Xu, 2008, 2009).

Market-oriented institutional reforms adjusted the incentive structure, enhanced labor productivity, and increased private return to human capital (Ge & Yang, 2014, 2011). Figure 4 demonstrates that the return to one additional year of schooling increased by four times from 2% in 1998 to 10% in 2008. The increase in return to college education during the same period was more drastic from 7% to 49% (Li *et al.*, 2012).

Along with the increase in return to education, income inequality increased sharply. Li *et al.* (2012) review the changes in wage structure and return to education in China since the economic reform. They find that the gap in annual wage between the low- and medium- education groups was almost null in 1988 (Figure 8). The annual wage of the high-education group was only marginally

[3] See Zhu (2012) for the discussion on the structural transformation and the economic growth in China.

[4] Individuals born in rural areas are designated as "agricultural *hukou*." Their counterparts in urban areas are "non-agricultural *hukou*." Prior to the economic reform, the labor mobility between rural and urban areas was virtually illegal. This *hukou* system segregated China into two labor markets.

higher than that of the other two groups. By contrast, the annual wage of the high-education group was twice that of the low-education group and 1.5 times that of the medium-education group in the late 2000s. Through decomposition analysis, Ge & Yang (2014) attribute 80% of the wage growth in the reform era to "higher pay for basic labor, rising returns to human capital, and increases in the state sector wage premium." The Gini coefficient nearly doubled from 0.26 to 0.43 between 1980 and 2010 (Figures 1). Inequality is particularly evident in the rural-urban gap and the regional disparity (Fleisher *et al.*, 2010; Xie & Zhou, 2014). Moreover, the degree and timing of the institutional reforms vary across areas, which further aggravate pre-existing regional inequality. [5]

2.2 Education, Fiscal Policies, and Family Constraints in the Investment in the Human Capital of Children

China's economic growth also benefited from the large stock of medium-skilled labor accumulated prior to the economic reform (Heckman & Yi, 2012). The enrollment rate of primary school (grades 1-6) was 98% in 1981, as shown in Figure 9. The progression rate to secondary school, that is, the ratio of junior secondary school (grades 7-9) enrollments over the primary school graduates, was 70% in the same year. This rate almost reached 100% by 2000. The progression rate to senior secondary school (grades 10-12) rose from 26% in 1981 to 82% in 2008. The primary and junior secondary completion rates were much higher in China than those in other Asian countries/regions, such as South Korea and Taiwan, in the early stage of the economic take-off (Becker, 2012).

The fiscal decentralization in primary and secondary education aggravates educational inequality.[6] Prior to the economic reform, the schooling costs were mainly borne by the central government. In the mid-1980s, however, the government initiated fiscal decentralization and designated multiple sources of funding for education for local governments. In urban areas, district governments were financially responsible for primary schools, whereas city governments for secondary schools. In rural areas, counties, towns, and villages were responsible for senior secondary, junior secondary, and primary schools, respectively. Under this policy, the local government relied heavily on surtaxes to finance public educational expenditure. Figure 7 shows the central and local governmental education expenditure in 1991-2006. During this period, the share of central governmental expenditure out of total governmental educational expenditure had been decreasing. Therefore, the per pupil expenditure has been highly positively correlated with the local per capital GDP (Figure 1 in Heckman (2005). For example, the per pupil governmental expenditure in Bei-

[5]For instance, the market-oriented reforms initiated in coastal provinces, and eventually spread into the central and western areas. Thus, the eastern region is exposed to reforms for a longer period and benefits more than its central and western counterparts.

[6]Knight *et al.* (2011) review the evolution of China's educational system in detail.

jing was 16 times higher than that in Guizhou (Table 7 in Heckman (2005). Thus, the inequality in the access to the quality education increased across regions.

In 1994, a tax reform on fiscal re-centralization was implemented. This reform deteriorated the local governments' fiscal capacity. The central government conducted partial transfers to finance local primary and secondary schools. Local governments were expected to meet the remaining gap. However, the central-to-local transfers were insufficient. Hence, local governments, especially those in poor rural areas, were unable to fulfill their obligations. As a result, this reform exacerbated the regional inequality.

Nevertheless, the public finance of basic education has improved since the early 2000s. In 2001, the responsibility for the salary of teachers was shifted from village to county governments. In the same year, the "Two Exemptions and One Subsidy" program was initiated. All tuition fees for students in primary and junior secondary schools were supposed to be borne by the central government. However, this goal was not fully achieved until 2006, when all of the corresponding fees were exempted in rural areas. However, non-compulsory senior secondary education is not covered by this program.

In addition, China's tertiary education has developed significantly since 1999, although it was stagnant during the Cultural Revolution (1966-1976). From 1978 to 1995, tertiary school enrollment rates hovered around 1.5% to 2.5% (NBS, 2011a). With the economic growth and the rapid accumulation of physical capital, the return to education increased substantially (Li *et al.*, 2012).[7] The increasing marginal productivity of labor, especially of high-skilled labor, led to the increase in the demand for higher education, and finally to the radical expansion of higher education in 1999 (Chow & Shen, 2006). The total number of fresh college graduates rose by more than six folds from less than one million in 2001 to seven million in 2013 (NBS, 2011b). Figure 10 displays the sharp increase in the share of college students in the 18-22 age cohort.

Meanwhile, the private costs of tertiary education increased drastically, exacerbating the inequality in access to higher education. Prior to the late 1990s, higher education was heavily subsidized by the government. However, annual tuition fee rocketed from RMB 800 in 1995 to RMB 5,000 in 2004 (Li *et al.*, 2013). Yearly expenditure per college student even reached RMB 12,318 in 2010 (Li *et al.*, 2013).[8] However, approximately 22% of college students come from families whose annual income was less than that amount in 2010. Nonetheless, loans and scholarships for college students account for less than 10% of the expenditure. Furthermore, these loans are misallocated. They have been granted to only 47% of college students from poor households, whereas the corresponding number for those from well-off families is 57%.

In addition, the regional disparity was amplified by the decentralization of the administration of

[7]The national gross saving rate is as high as 35%-55% throughout the economic reform.

[8]It was based on a national survey of college students that was conducted by Tsinghua University in 2010.

colleges and universities (Li & Xing, 2010). This decentralization classified the higher education into two layers. The central government administrates a small number of distinguished universities, whereas local governments administrate most local colleges and universities. Thus, the quality of local tertiary education depends largely on regional economy. Figure 3 summarizes the ratio of government expenditure on education relative to GDP (NBS, 2013). This ratio increases mildly from 2.4% in 1992 to 4.4% in 2012. Thus, the increase in the government expenditure is small relative to the remarkable expansion of tertiary education.

Hence, individual households may be the ones financing the substantially rising educational cost given that schooling cost increases much more quickly than public expenditure. Figure 5 depicts the increasing trends of tuition over government educational expenditure and GDP from 1991 to 2007. Schooling cost increased by six times from 5% in 1991 to 35% in 2004, followed by a mild decrease after the "Two Exemptions and One Subsidy" program. The ratio of tuition over GDP rose by seven times from 0.1% in 1991 to 0.8% in 2007. Nonetheless, tuition is only a part of total schooling cost. The considerable increase in educational cost exacerbates family constraint in investing in children's human capital. Richer parents are more able to finance their children's education, whereas their poorer counterparts have less capacity to do so. Therefore, the inequality in access to education increases over generations.

3 Intergenerational Income Mobility in China

3.1 Chinese Household Income Projects

We use data from the Chinese Household Income Projects (CHIPs) in 1995 and 2002 to estimate intergenerational income mobility.[9] Literature on developed countries uses income tax records to examine income correlation across generations (Chetty *et al.*, 2014a,b). However, in developing countries such as China, the tax system is immature. The tax data are not available to link children with parents, or track parental income in previous years, which are essential for studies in intergenerational mobility. Thus, we consider household surveys such as CHIPs, which are repeated cross-sectional surveys aiming at collecting information on individual and household income in the survey year and previous years.

Our sample focuses on urban China. Rural residents and rural-to-urban migrants are not included.[10] We consider the following advantages of using CHIP data to analyze intergenerational mobility in income. First, CHIPs provide detailed income of each individual based on wage, sub-

[9]It is jointly sponsored by the Institute of Economics at the Chinese Academy of Sciences, the Asian Development Bank, the Ford Foundation, and the East Asian Institute at Columbia University.

[10]Migrants from rural to urban areas still hold rural registration (*hukou*), and do not have equal access to educational and occupational opportunities as urban citizens do.

sidy, bonus, private business, and capital income over the preceding six (1995 survey) or five (2002 survey) years. By averaging the income across years, we can eliminate random income shock in a specific year. Thus, CHIPs provide a rare opportunity to calculate lifetime income in China. Second, this survey records the relations among household members in detail, which facilitate our identification of the parent-child pairs. Finally, the data cover 11 province-level administrative units in China. The surveyed areas are geographically and economically representative and can yield nationally representative estimates.[11]

In the appendix, we describes the main variables (Table A1). To estimate the time trend in intergenerational income mobility, we categorize the sample into early and late cohorts. The former includes individuals born between 1949 (when the People's Republic of China was founded) and 1970 (including 1970).[12] Most of these individuals completed their education prior to the economic reform. The late birth cohort covers children born after 1970. Most of whom were educated and began working during the post-reform era. To reduce income measurement errors among freshmen in the labor market, we restrict children to those who are at least 23 years old and have worked for a minimum of three years. The average ages of the early and late cohorts are 30 and 25 years, respectively. These ages belong to the early-middle stage in life cycle of working individuals. The average ages of fathers in the early and late cohorts are 57 and 53 years, respectively, which belong to a late stage for the working people.

In order to smooth income shocks in specific year(s), our sample contains fathers having income records for *at least* three years. No restriction on mothers' income is applied, nevertheless, as there can be housewives with no income, especially in the early birth cohort. Annual family income refers to the yearly income from both parents, which is averaged across at least three preceding years (survey year included). From early to late cohorts, the yearly household income increases by almost two-thirds, from RMB 9,331 to 15,432 in 2002 price. Children's average income is RMB 6,628 and 8,940 in the two cohorts, respectively.[13] Across regions, both parents and children in the eastern (coastal) areas consistently report a much higher income than their counterparts in the western and central areas. The regional disparity between the central and western areas is minimal, although the family income almost doubles from early to late cohorts in the western region (from

[11]CHIPs are considered geographically representative because the surveyed areas cover the northeast (Liaoning), the south (Guangdong), the southwest (Yunnan), and the west (Gansu). It is economically representative as well because the surveyed areas include the richest areas in China such as Beijing and Guangdong, as along with the least developed parts such as Gansu.

[12]We choose 1970 as a cut-off point because the economic reform began in 1978. The normal age at which children enroll in primary school is around 7 in China. Thus, those born after 1970 are considered to have been educated in the new era. We distinguish the two cohorts based on education because education is the main cause of intergenerational income persistence in previous studies.

[13]The income reported in the 1995 wave is adjusted by Consumer Price Index to the price in 2002. RMB 9,331 is approximately USD 1,500. RMB 15,432 is roughly USD 2,481. RMB 6,628 equals USD 1,060, and RMB 8,940 corresponds to USD 1,430.

RMB 7,860 to 13,234).

3.2 Econometric Specification

Following conventional specification in the literature of intergenerational mobility, we regress the log child income on log parental income to estimate the IGE. We calculate the IGEs in both cohorts separately to determine the changes in intergenerational mobility over the institutional reforms. The regression is specified as follows:

$$\ln y_{it} = \alpha_0 + \alpha_1 \ln y_{i,t-1} + \alpha_x X_i + \varepsilon_{it}, \tag{1}$$

where $\ln y_{it}$ is the natural logarithm of the annual income of a child. $\ln y_{i,t-1}$ is the average natural logarithm of the family income derived from both fathers and mothers over a period of at least three years. X_i is a vector of control variables, which include age, the squared ages of the child and the father, the gender dummy of the child, wave dummy, and provincial dummies.[14] Standard errors are clustered at the household level. We are interested in the slope of α_1 because it measures the percentage change in the income of children with respect to the percentage change in parental income. This slope is labeled as the IGE. A larger α_1 indicates a stronger intergenerational association and implies less mobility across generations. We also examine the gender- and region-specific effects in each cohort.

However, the elasticity may be biased if the cross-sectional dispersion of log income differs across the two generations. For instance, the elasticity may be high in one society simply because the variance of the log income of children is high. By considering this potential difference, we investigate the intergenerational income correlation, which is defined as follows:

$$\text{correlation in log income} = \alpha_1 * \frac{\sigma_{t-1}}{\sigma_t}, \tag{2}$$

where σ_{t-1} and σ_t are the standard deviations of the logarithm income of parents and children, respectively. The correlation is bounded between 0 and 1, and factors out the influence of the various dispersion of log income across the two generations.

In addition, we specify a rank-rank regression following the recent literature (Chetty *et al.*, 2014a,b) because the log-log specification has two shortcomings (Chetty *et al.*, 2014a). First, the log of the income of the children and log parental income are nonlinearly related. Figure 13 depicts mean log child income vs. the log parental income.[15] The association is flat at the

[14] We include father's age rather than mother's because in China, household income is mainly earned by males. In addition, it is sufficient to include one of them because the ages of parents are highly correlated.

[15] We draw this non-parametric graph by sequentially averaging every 50 log of parental income and by calculating the mean of the corresponding logarithm income of the children.

bottom and increases sharply after the cutoff at approximately RMB 4,915, which is roughly the 38th quintile of the family income.[16] This pattern is similar to that in developed countries (Chetty *et al.*, 2014a,b). Non-linearity is evident. Therefore, the intergenerational elasticity/correlation is sensitive to the point of estimation. Second, the log-log specification excludes zero income and is restricted to families with positive income. Thus, it may overestimate intergenerational mobility because children from families with low income are more likely to be trapped in the bottom than their richer counterparts. The rank-rank regression overcomes these two problems. We plot the association between the percentile ranks of children against parents in Figure 14. We find that the income rank of the children is almost linearly dependent on parental rank. In addition, we can examine the intergenerational association between generations from the entire population (including individuals with zero income).

The rank-rank regression is specified as below:

$$rank_{it} = \beta_0 + \beta_1 rank_{i,t-1} + \beta_x X_i + \epsilon_{it}, \tag{3}$$

where $rank_{it}$ and $rank_{i,t-1}$ are the percentile ranks of children and parents in their income distribution, respectively. β_1 is the rank-rank estimate that measures the change in the percentile rank in the child's income distribution if the income of his/her parents changes by one percentile rank. A higher β_1 indicates a stronger intergenerational rank association and in turn, lower intergenerational mobility. X_i is the vector of control variables, as described in Eq.1. As with elasticity and correlation specifications, we also investigate the gender and regional patterns. Specifically, we rank parents and children within each subgroup in term of income distribution.

3.3 Temporal Patterns in Intergenerational Income Mobility

We first examine the cohort pattern in intergenerational income mobility. Before we present the intergenerational income association among the three specifications, we display the quintile transition matrices to provide an intuition on the mobility pattern. Table A2 in the appendix shows the percentage of children in quintile *i (i=1,2,3,4,5)*, given parents in quintile *j (j=1,2,3,4,5)* for each cohort. A statistic of particular interest is the proportion of children moving into the top quintile given their parents in the bottom quintile (Chetty *et al.*, 2014a). The statistic is 3.17% in the early cohort, and 3.64% in the late one, implying slightly higher probability of "success" after the market reform. However, the proportion of children trapped in the bottom quintile conditional on parents in the bottom increases by a larger magnitude, from 39.20% to 45.12% across cohorts. This finding implies less mobility along with the institutional changes. The proportions of children staying in the top quintile as their parents did are 51.59% and 45.45% in each cohort, sequentially. Given

[16] 4,915 is the natural exponential of 8.5.

the mixed information, we need a regression analysis to examine the degree of intergenerational income mobility.

Panels A-C in Table 1 report the IGE, correlation, and rank-rank estimates across cohorts. The first two columns present the estimates of the early and late cohorts. Column (3) shows the corresponding changes in each specification. Within each panel, the first row exhibits the overall estimation of intergenerational mobility, whereas the two other rows display the gender-specific estimates. We find a statistically significant increase in the intergenerational association, thus implying declining intergenerational mobility. The pattern remains robust across the three specifications. With a 1% increase in the lifetime income of parents in the early and late cohorts, the income of their children increases by 0.315% and 0.442%. Both estimates are statistically significant at the high 1% level. After adjusting the IGEs with different variances of log income across generations, we find a similar increase in the intergenerational correlation. The increases in elasticity and correlation are 0.127 and 0.105, respectively, and are statistically significant at the 10% and 5% levels. The rank-rank estimates are slightly smaller than the corresponding log-log estimates. This difference may be attributable to the inclusion of zero observations. One percentile increase of parental ranking in their income distribution in the early and late cohorts raises the ranking of the children by 0.273 and 0.347 percentiles, respectively. The difference between the two estimates is statistically significant at the high 1% level. Figure 15 depicts the rank-rank association across cohorts.

With respect to gender-specific patterns, the decline in intergenerational mobility is more significant for girls than boys, as demonstrated in row 3 of each panel in Table 1. All three estimates for girls are more than doubled in the late cohort than the corresponding ones in the early cohort (0.496 vs. 0.205 for elasticity, 0.373 vs. 0.155 for correlation, and 0.390 vs. 0.172 for rank-rank estimate). The increases are all statistically significant at the 5% level (columns (3)). However, a significant increase is not observed in boys. We ascribe this gender difference to the higher return to human capital for girls than boys with the market reform (Figure 6). In addition, girls are more subject to family constraints than boys, especially those in the poor regions (Figure 11[17]). Our results are not likely to be biased by women's shift from labor market into households because of marriage. The labor force participation rates for urban non-migrant women is above 90% for those between 25 and 40 years old from 1990 census. Nevertheless, the estimates for girls are likely to be an upper bound of the true value possibly because of the co-residency issue in the data.[18]

The estimates may also be contaminated by unobservables. Thus, we include pre-labor market entry controls, such as average schooling years of parents and political status of fathers (Communist Party membership). The patterns remain robust, although the magnitudes are reduced in the

[17]This topic is detailed in section 6.2.

[18]This issue is discussed in section 3.4.

sensitivity analysis (Panel A of Table 2[19]). Similarly, the decline in mobility is driven by girls, with statistically significant increases across three specifications (columns (7)-(9)).

In addition, previous studies report an attenuation bias (Solon, 1989). Income from a specific year may not be a proper measurement of lifetime income because it contains transitory shock and measurement errors. To validate our results, we compare estimates using average household income from at least three years with those using household income in the survey year. The results are presented in Panel B of Table 2. The two sets of results reveal similar decline in intergenerational mobility. As expected, however, the one-year estimates are consistently smaller in magnitudes. Taking the correlation for an instance, compared to the one-year estimates, the three-year ones in early and late cohorts rise by 15% and 8% respectively (compare columns (3) and (4) in Panel B of Table 2 with columns (1) and (2) in Panel B of Table 1). The one-year coefficients are biased downward by a factor of $\sigma_y^2/(\sigma_y^2 + \sigma_v^2)$ in the existence of transitory fluctuations in specific years.[20]

Three sets of estimates are also generated for regional specific intergenerational mobility in East, Central, and West China, as shown in Table 3.[21] The table format follows that of Table 1. For the early cohort, intergenerational mobility is lower (the estimate is higher) in the east than in the central and west areas. This finding is consistent across the three empirical specifications. However, the intergenerational income association in West China increases sharply with institutional changes. The income elasticity, correlation, and rank-rank estimate are 0.545, 0.411, and 0.455, respectively, and exceed the levels of the early cohort in eastern areas. For the late cohorts in West China, all of the estimates are statistically significant at the 1% level. Across cohorts, the IGE, intergenerational correlation, and rank-rank estimate increase by 0.321, 0.256 and 0.254 (column (3)), respectively, in West China. These increases are statistically significant at the 5% level. The eastern and central areas display a similar trend, although the increases are statistically insignificant. These results may be ascribed to insufficient subsidies by the local government for public education in economically disadvantaged regions, such as the West. Parents in such areas have increasingly more difficulties to finance their children's education, given their traditionally poor economic situation and the increase in schooling cost as a result of the reform. Section 6 explains these findings in detail.

[19]Columns (1)-(2) display the log-log estimates of early and late cohorts respectively. Columns (3)-(4) present the adjusted intergenerational correlations. Columns (5)-(6) report the rank-rank coefficients. The numbers in columns (7)-(9) refer to the corresponding changes across cohorts.

[20]σ_y^2 is the variance of income in either generation, and σ_v^2 is the variance of transitory fluctuations in lifetime income (Solon, 1989). The basic assumptions in Solon (1989) are that variances in income y and transitory fluctuations v are the same for both generations. In addition, the v in each generation is correlated neither with each other nor with the income.

[21]Because the data points are less than 100 in each province, we investigate the regional income mobility at the level of three general geographic regions based on the definition from the National Bureau of Statistics of China instead of the provincial level.

3.4 Absolute vs. Relative Intergenerational Income Mobility

In addition to estimating the *relative* intergenerational income mobility, we are also interested in the *absolute* mobility which measures the expected rank in the income distribution of a child conditional on a specific percentile rank of parental income (Chetty *et al.*, 2014a,b). The rank-rank estimation (Eq.3) describes the change in the income ranks of children when parental income rank changes by one unit. Therefore it measures the *relative* income mobility. However, its implication is ambiguous because it may be driven by the worse outcome of children from high-income families than the better outcome of children from the low-income households (Chetty *et al.*, 2014a). Thus, we also explore *absolute upward mobility*, which is defined as the absolute percentile rank of children if the income of their parents are at the 25^{th} percentile rank in the distribution (Chetty *et al.*, 2014a). We select the 25^{th} percentile rank because we are interested in the upward mobility of children from poor households. The rank-rank association is linear; thus, the average of the bottom half of parental distribution is the 25^{th} percentile. For family i in region r *(r=east, central, west)* the association between the percentile rank of children ($rank_t$) and parental percentile rank ($rank_{t-1}$) is:

$$rank_{irt} = \beta_{0,r} + \beta_{1,r} rank_{ir,t-1} + \epsilon_{irt}, \tag{4}$$

where $\beta_{1,r}$ estimates the relative income mobility across generations (within region r). It measures the change in the percentile rank of the income distribution of a child (in region r) if the parental percentile rank changes by one unit (in that region). A large $\beta_{1,r}$ indicates a strong intergenerational association and limited relative mobility across generations. The intercept, $\beta_{0,r}$, denotes the expected rank of children from the lowest-income families.

We define absolute income mobility as the expected rank of a child if his/her parents are in the 25^{th} rank in their income distribution in region r *(r=east, central, west)* based on relative income mobility estimate ($\beta_{1,r}$) and intercept ($\beta_{0,r}$) in Eq. 4:

$$rank_{25,r} = \beta_{0,r} + 25\beta_{1,r}. \tag{5}$$

Specifically, $rank_{25,r}$ measures the expected percentile rank of a child in his/her income distribution (in region r) if his/her parents are at the 25^{th} rank in the income distribution of their generation (in that region). A large $rank_{25,r}$ indicates a high expected rank of a child from poor families and a mobile society.

Table 4 summarizes absolute and relative intergenerational income mobility by region. Panels A and B demonstrate the rank-rank association in early and late cohorts, respectively. In the early cohort, the west area displays the highest intergenerational mobility, as indicated by the highest estimate for the absolute upward mobility (43 in column (3) of panel A) and the lowest estimate for the relative mobility (0.2 in column (4) of panel A). In the late cohort, consistently across three

regions, it is more difficult for children in the low-income families to move upward, as shown by the smaller estimates in column (3) of panel B compared with the corresponding ones in panel A. Importantly, the absolute upward mobility estimate in the western region shifts downward to the bottom, with a rank of 36. At the same time, the relative mobility estimate in the western region climbs up to the top, indicating the highest income association across generations (column (4) in panel B). The difference between the central and east regions is not statistically significant though.

To visually depict the relative and absolute intergenerational income mobility, we draw the heat maps in Figures A1-A4 in the appendix. The smaller the relative estimate, the more mobile a society is (in lighter color). By contrast, the larger the absolute estimate, the more mobile a society is (in darker color). In the early cohort, it is more mobile across generations for children from western families, compared with their counterparts in the eastern and central areas (the lightest color in Figure A1 and the darkest color in Figure A2). In the late cohort, however, the western region shows the least intergenerational mobility (Figures A3-A4).

Households from the western areas were traditionally poor. Thus, they benefited more from the national development policies after the foundation of the People's Republic of China, such as the promotion of primary and junior high school education, compared with their counterparts in the central or eastern areas. In the late cohort, however, this premium diminishes because of the increasing cost of education and the localization of the government expenditure on education. Educational funding is more difficult to obtain for local governments in less developed regions. Consequently, local households bear more financial burden to invest in the human capital of their children. The tightening of the household constraints in poor regions increases the intergenerational income association along with the market reform.

Finally, we note two potential biases in our estimates of intergenerational income mobility using the CHIPs data, namely, the co-residency and life-cycle biases. On the one hand, the surveyed individuals are either those who live in the households or those who maintain close economic relationships with their households even if absent at the time of the survey.[22] In this case, children who migrated permanently are not included. On the other hand, the average age of 25 in the late cohort still belongs to the early state of the working life cycle, although we restrict children to be at least 23 years old and have worked for at least three years. To overcome both limitations of the data, now we use a new data set derived from the 2010 Chinese Family Panel Studies to investigate intergenerational education mobility.

[22]The CHIP sample is a sub-sample of the national census. It follows the definition of household members provided by the National Bureau of Statistics of China.

4 Intergenerational Education Mobility

4.1 Chinese Family Panel Studies

Education is a main determinant of income (Mincer, 1974). Thus, we examine the intergenerational education mobility together with our previous findings regarding income mobility to provide an overall mobility pattern across generations in China. We apply data derived from the 2010 Chinese Family Panel Studies (CFPS). To our best knowledge, CFPS is the only household survey in China that tracks down lineal relatives and siblings who are not living at home and collects their socioeconomic information.[23] The use of CFPS to examine intergenerational mobility in education is important because of the following four aspects. First, it overcomes the co-residency bias by providing detailed information on the heads of households, their spouses, children, parents, and siblings, regardless of whether they live together or not. Second, schooling years are less affected than income by the life-cycle bias. In addition, the measurement errors related to schooling years are much less than those associated with income. Finally, the sample size is large and covers 25 provinces, municipalities, or autonomous regions. CFPS contains approximately 15,000 households.[24]

Table A3 in the appendix summarizes statistics across two birth cohorts, namely, 1956-1970 and 1971-1985. The cut-off point of 1970 echoes that under the specification for income mobility. Children in the early cohort were educated prior to the market reform, and those in the late cohort were educated when the reform began.[25] By considering assortative mating, we present the *average* schooling years of parents. The statistics show that schooling years of both generations increase gradually. On the one hand, the average schooling years for children increase from 7.6 in the early cohort to 8.6 in the late cohort, which approaches the completion of junior high school. On the other hand, the average schooling years of parents are merely 2.7 for the early cohort; however, most parents of the late cohort completed primary school (4.5 years). Nearly 70% of the parent-child pairs are obtained from rural area, and are representative of the general population in China.

Columns (2) - (6) describe the data by region. Specifically, columns (2) - (3) describe the data in urban and rural areas, respectively. The remaining three columns describe the data from East, Central, and West China.[26] The disparity in education between urban and rural areas persists for

[23]The 2010 survey was conducted by the Institute of Social Science Survey at Peking University and was sponsored by Peking University, the Ministry of Education, and the National Natural Science Foundation of China.

[24]CFPS does not track the income of individuals in previous years. Therefore we cannot investigate intergenerational income mobility by calculating parental lifetime income net of random shock in specific year(s).

[25]The economic reform began in 1978. In China, the normal age of enrollment in primary school is about seven. Thus, those born after 1970 are considered to have been educated in the new era.

[26]The region is divided according to parental status, specifically, the status of mothers, because we are interested in children's educational outcome conditional on parental education, taking their possible migration into concern. In addition, a child's *hukou* status at birth naturally follows that of his/her mother by law.

both generations. In each cohort, the schooling years of children in urban area are consistently higher than their rural counterparts by three to four years.[27] Across cohorts, the average schooling years of parents are almost doubled in both urban and rural areas.[28] The disparity between eastern and western regions increases significantly in both generations. The schooling years of children in the western area increase by only 8.6% (6.2 vs. 6.7) from early to late cohorts. Correspondingly, that in the eastern region increases significantly by almost 20% (8.2 vs. 9.8). Furthermore, the standard deviation of schooling years of children in the western region is larger than that of children in the eastern region, thereby indicating the severer cross-sectional inequality in West China.

4.2 Econometric Specification

Following the literature (Hertz *et al.*, 2008; Knight *et al.*, 2011), we regress child's schooling years on parental average schooling years:

$$s_{it} = \gamma_0 + \gamma_1 s_{i,t-1} + Z_i \gamma_X + \epsilon_{it}, \tag{6}$$

where s_{it} represents the schooling years of the children; $s_{i,t-1}$ denotes the average schooling years of parents; Z_{it} is a vector of the control variables, including child's age, gender, *hukou* status, mother's age, dummies for surviving parents, and regional dummies.[29] Standard errors are clustered at the household level. γ_1 picks up the educational association across generations. We estimate γ_1 in cohorts 1956-1970 and 1971-1985 separately to examine the trend in the intergenerational education mobility.

As in income mobility, we consider the differential variance in schooling across generations and examine the intergenerational education correlation as follows (Hertz *et al.*, 2008):

$$\text{intergenerational education correlation} = \gamma_1 * \frac{\sigma_{t-1}}{\sigma_t}, \tag{7}$$

where σ_{t-1} and σ_t are the standard deviation of the schooling years of parents and children, respectively.

Furthermore, we measure the rank-rank educational association across generations by:

$$rank_{it} = \lambda_0 + \lambda_1 rank_{i,t-1} + \lambda_z Z_i + \phi_{it}, \tag{8}$$

where $rank_{it}$ and $rank_{i,t-1}$ are the percentile ranks of the children and their parents in their schooling

[27] 10.4 vs. 6.6 in the early cohort, and 12.2 vs. 7.8 in the late cohort.

[28] From 4.6 to 7.7 in the urban area, and 2 to 3.7 in the rural area.

[29] CFPS records individual schooling regardless of whether the individual is alive. Thus, we include the dummy variables that control for the status of each surviving parent in the survey year.

distribution, respectively. λ_1 measures percentile change in the distribution of schooling years of children if the average schooling years of their parents change by 1 percentile rank. Z_{it} denotes the same vector of control variables as in Eq.6. Similar as the definition under intergenerational income mobility, the gender- and region-specific ranks refer to those of the distribution of schooling years in each subgroup.

4.3 Temporal Patterns of Educational Mobility

In this section, we first examine the cohort pattern. Panels A and B in Table A4 in the appendix display the quintile transition matrices for early and late cohorts, respectively. Each cell reports the percentage of children in quintile i ($i = 1, 2, 3, 4, 5$), as given by the rows, conditional on having parents in quintile j ($j = 1, 2, 3, 4, 5$) indicated by the columns. 1 refers to the lowest educational quintile and 5 indicates the highest. In the early cohort, 28.36% of children from the lowest-education families remain at the bottom. The corresponding proportion of children remaining at the top given their parents at the top is 38.99%. The polarization becomes severer with the market reform. In the late cohort, almost 40% of children from families with the lowest schooling are trapped in the lowest educational bin in their generation. On the other extreme of the spectrum, about half (48.64%) of the children with highest-education parents remain in the top. In addition, upward mobility becomes more difficult with the institutional change. In the early cohort, 14.79% of children from the lowest-education families move up to the highest quintile. The corresponding percentage is merely 8.16% in the late cohort. To sum up, the transition matrices imply that the educational mobility across generations declines significantly with the market reform.

Panels A-C in Table 5 present the intergenerational education association from three empirical specifications. The table format is similar to that of Table 1. We find an increasing trend in the intergenerational schooling association from early into late birth cohorts. Specifically, for early-cohort children, an additional year of parental schooling enhances their schooling by 0.339 years. For late-cohort children, this increment is 0.352 years. Both estimates are statistically significant at a high 1% level. The trend of statistically significant increase persists in intergenerational education correlation when it is corrected by the ratio of the standard deviation of parental schooling over the schooling of children (Eq. 7). The smaller magnitude of this result compared with that of the regression coefficients may be attributed to the smaller variance of schooling in the generation of the parents compared with that in the generation of the children. Rank-rank estimation generates a similar rising trend. The magnitude of increase from early to late cohort is 0.057. This increase is statistically significant at a high 1% level. Figure 16 depicts the rank-rank association across cohorts. The association in the late cohort is almost perfectly linear.

We then examine the change in the gender pattern. Increasing educational association across generations is mainly driven by girls, similar to that observed in income estimation. Within each

cohort, the estimates are consistently larger for girls than for boys. Across cohorts, the increase in intergenerational association is more significant for girls as well. In the intergenerational education correlation, the association for daughters increases statistically significantly by 13% from 0.299 to 0.339 with the market reform. However, this statistically significant trend is not observed for sons under this specification. In the rank-rank estimation, both girls and boys demonstrate statistically significant increases in schooling association with their parents. Nonetheless, the estimated magnitude of increase for sons is almost 40% less than that for daughters. We consider the more significant increase for daughters an outcome of an interaction between the preference for sons in China and the rising educational cost. As a result of the traditional son preference, girls are more severely constrained in obtaining investment in their human capital than boys, especially in rural area. In other words, if a family has both sons and daughters, the parents typically invest in the education of the boys rather than that of the girls. In addition, the family constraints on the educational investment in girls are tightened by the sharp increase in educational cost during the market reform.

Tables 6 - 7 show the regional disparity in intergenerational schooling mobility. Table 6 reports the intergenerational education association in urban and rural areas, whereas Table 7 presents the association in eastern, central, and western areas. The patterns of significant increase in educational association are consistent across generations in less developed regions, such as the rural and western areas. However, this trend is not observed in either urban area or in the economically developed eastern (coastal) area. Specifically, the rank-rank estimate in rural area increases statistically significantly by 31.4% from 0.207 to 0.272 (Panel C in Table 6). The significant decrease in intergenerational mobility in less developed areas remains in the geographic comparison among East, Central, and West China. As shown in Panel B of Table 7, the intergenerational schooling correlation in western region is as low as 0.276 in the 1956-1970 cohort, but reaches 0.348 for the 1971-1985 cohort. The increase of 0.0719 is statistically significant at the high 1% level. Mobility in the central region decreases under the rank-rank specification as well, although the magnitude of decline is much smaller than that in the western region (0.0438 vs. 0.121).[30] In sum, intergenerational education mobility decreases significantly in economically disadvantaged areas, such as the rural and western regions. This decline may be ascribed to the localization of government expenditure on education and to the sharp rise in educational cost with the institutional changes. The funding for local education is difficult to obtain for local governments in less developed regions, especially given the pressure of rising schooling cost following the reform. Therefore, the financial burden of investment in the human capital of children shifts to households. This issue is discussed in detail in section 6.

[30]We focus on the correlation and rank-rank estimation as these consider the differential positions of individual distribution in each generation. The rest of our discussion follow this procedure.

4.4 Absolute vs. Relative Education Mobility

We investigate the absolute vs. relative education mobility over the course of reform and development at the provincial level to depict the variation in mobility across geography and time. Relative education mobility is based on estimates of Eq.8. Absolute education mobility is based on Eqs. 4 and 5, except replacing parental and children's income ranks with their schooling ranks.[31] Table 8 presents the absolute vs. relative intergenerational education mobility. The first four columns display the ranks of upward mobility, province/region names, estimates of absolute mobility and relative mobility in the early cohort. The last four columns show the corresponding information for the late cohort. Panels A and B display estimates of absolute and relative mobility in each province and the three general geographic regions, respectively. The findings are consistent with those for income mobility, as shown in Table 4. The western region loses its premium with regard to absolute upward mobility in both education and income with the market reform.

Figures A5-A8 in the appendix translate Table 8 into heat maps that visually describe the geographic patterns in intergenerational mobility under institutional reforms. In the early cohort, neither relative nor absolute mobility are clearly segregated geographically, as shown in Figures A5-A6. In the late cohort, however, we observe a clear geographic pattern. East coastal areas, such as Jiangsu, Anhui, Fujian, and Jiangxi, report the lowest intergenerational relative mobility (lightest color in Figure A7) and the highest absolute upward mobility (darkest color in Figure A8). In comparison, the inner areas of China (central and western regions) display much higher relative mobility and lower absolute mobility. This result may be attributed to the fact that the market reform originated in the coastal area. Thus, individuals in that region benefited from the reform and became rich earlier than their peers in the inner land. In the post-reform era, therefore, wealthy parents from this region can fund the education of their children, especially in the background of the sharp increase in the educational cost. In addition, the localization of educational cost may also tighten the family constraint on human capital investment in children in relatively poor inner regions, thereby enlarging the geographic disparity between the coastal and inner areas.

5 The Great Gatsby Curve in China: Cross-Sectional Inequality and Intergenerational Mobility

This section investigates the correlation between cross-sectional inequality and intergenerational mobility in China amid rapid economic growth and structural transformation. The aggregate time-

[31] Our sample includes provinces or municipalities with at least 150 observations and with statistically significant estimates. Therefore, we exclude seven and three data points from the early and late cohorts, respectively. The seven data points omitted in the early cohort are Chongqing, Beijing, Tianjin, Zhejiang, Anhui, Jiangxi, and Fujian. The three excluded in the late cohort are Chongqing, Beijing, and Tianjin.

series statistics imply a negative correlation between income inequality and intergenerational income mobility. Figures 1 and 2 show a drastic increase in cross-sectional inequality over the past four decades. Our estimates indicate that intergenerational income mobility decreases in the same time period.

As a preliminary check, Figures A9-A10 graph correlations between income inequality and intergenerational income mobility. Figure A9 ranks cohorts in different regions by two dimensions.[32] The horizontal axis shows the income inequality of the parents of a cohort in a given region, which is measured by the Gini coefficient of family income. The vertical line is the rank-rank estimate of relative income mobility.[33] A large estimate indicates low intergenerational mobility. Given two cohorts and three regions, we obtain six data points. In Figure A10, we replace estimates of relative income mobility with estimates of absolute mobility in the vertical line. A high estimate of absolute income mobility denotes high intergenerational upward mobility. Both figures suggest that intergenerational mobility is negatively correlated with income inequality. The slope coefficients are marginally statistically significant when we control for fixed regional effects.[34] The slope coefficients also imply that the association between cross-sectional inequality and intergenerational mobility is economically important. For instance, Figure A10 shows that the average rank of children whose parents belong to the bottom half of the income distribution decreases by 14 when the Gini coefficient of the generation of their parents increases by 0.1. Based on Figures A9-A10, we may conclude that income inequality and intergenerational income mobility are negatively correlated and display a pattern similar to that of developed countries. But we should be cautious in drawing conclusions from these two figures because there are only six data points in each figure.[35]

So, we examine the relationship between educational inequality and intergenerational education mobility with variations across cohort and geography, which generate more data points and more precise estimates (Figures 17 - 18). The horizontal lines in both figures show the educational inequality in parental generation indicated by the standard deviation of the log schooling years. The vertical line displays the rank-rank estimate of the relative education mobility in Figure 17, and the estimate of the absolute mobility in Figure 18.[36] The sample size of CFPS is larger than that of CHIP; therefore, we stratify the sample at the provincial level to obtain a total of 40 points for both figures. Across cohorts and provinces, cross-sectional educational inequality and inter-

[32]The definition of cohort is similar to that provided in Section 4.3 where we analyzed the cohort pattern of intergenerational income mobility.

[33]The estimates are reported in Table 6.

[34]The fixed-effects estimates are identical to the between estimates when we have only two periods. Hence, the estimates measure the association between the change in cross-sectional inequality and the change in intergenerational mobility.

[35]With a small number of observations, the slope of the fitted line is more likely to be driven by outliers.

[36]The estimates are reported in Table 8.

generational education mobility are negatively related. The slope coefficients are both statistically and economically significant. For instance, Figure 18 indicates that the average rank of children whose parents belong to the bottom half of the distribution decreases by approximately 4 when the standard deviation of the log schooling years of the parents increases by 0.1. This relationship may be labeled as the Great Gatsby Curve of education.

Therefore, we have that (1) the cross-sectional inequality of both parental income and schooling years increases across the early and late cohorts; (2) the intergenerational mobility in both income and education declines across these two cohorts; (3) cross-sectional inequality and intergenerational mobility in terms of income and education are negatively correlated. Although these negative correlations do not necessarily indicate causality, they provide insight into the dynamic interplay of cross-sectional inequality and intergenerational mobility in China. Hence, we outline a simple framework to determine the structural drivers underlying these negative relationships in the following section.

6 Explaining the Declining Intergenerational Mobility and the Great Gatsby Curve in China

This section explains the decline in intergenerational mobility and relates it to the increase in cross-section inequality in China. First, we develop a simple conceptual framework to understand intergenerational mobility from a human capital perspective (see also a simple model in the appendix). We then incorporate the Chinese market-oriented institutional reforms and policy, as well as other socioeconomic changes, into this unified framework to explain the negative relationship between cross-sectional inequality and intergenerational mobility. We also explain the estimated patterns of intergenerational mobility in China in terms of cohort, gender, and region. Finally, we compare the explanations for the changes in intergenerational mobility reported by China and the US.

6.1 A Conceptual Discussion from a Human Capital Perspective

This section presents a conceptual discussion of intergenerational mobility, based on Becker & Tomes (1986), Becker & Tomes (1979), and Solon (2004).[37] The detailed model is provided in

[37] A similar framework has also been discussed by Corak (2013) on income inequality, equality of opportunity, and intergenerational mobility. As discussed in Section 2.1, the rising cross-sectional inequality is largely due to the increase in the return to human capital, and the timing and degree (or the differential treatments) of the institutional reforms and public policy changes across areas (rural vs. urban), regions (west, central, vs. east (coast)), and sectors (public (SOEs) vs. private). In what follows, we focus on the driving forces behind the declining intergenerational mobility, and on explaining the negative correlation between cross-sectional inequality and intergenerational mobility.

the appendix. This model emphasizes the difference between rich and poor families with respect to economic incentives and opportunities to invest in the human capital of children. The incomes of children are determined by their human capital, which is a function of endowments and family investment. Various incentives and opportunities result in different degrees of intergenerational income mobility. The economic incentive to invest in the human capital of children is mainly affected by the return to human capital in the labor market. The economic opportunity refers to the family credit constraints to invest in the human capital of children. The severity of family credit constraint is influenced by the return to human capital, educational cost, government educational expenditure, family income, and income inequality. Intergenerational mobility is low when more families are subject to credit constraints and the severity of the family constraint increases. We summarize five factors that affect intergenerational mobility below.

The first factor is the return to human capital, which lowers intergenerational mobility. With the increase in return to human capital, both rich and poor parents want to enhance investments in the human capital of their children. However, poor parents are less able to do so than rich ones because of the tight credit constraint. The second factor is the price or cost of investment in the human capital of their children. With the increase in the cost of human capital investment in children, more poor families are less able to invest in their children's human capital. Consequently, intergenerational mobility decreases.

The third factor is government expenditure on the human capital of children, which generally enhances the educational opportunities of all children. Because children from poor families gain marginally more from the expenditure, intergenerational mobility increases. In real life, however, this effect depends on the distribution of government expenditure. On the one hand, intergenerational mobility increases if public expenditure mainly targets disadvantaged families. On the other hand, the mobility decreases if children from wealthy families benefit more from the public expenditure. The fourth factor is average family income. Given the distribution of family income, higher average family income suggests that more families are able to invest in the human capital of their children. As poor families gain marginally more from the increase in family income, intergenerational mobility increases.

The fifth factor is the degree of inequality in family income. Given the average family income, a higher degree of inequality (say, due to an exogenous policy shock, holding the above four factors constant) implies more poor families subject to credit constraint in investing in their children's human capital; consequently, the intergenerational mobility is lower. Moreover, the effect of inequality interacts with the effects of other four factors. The intuition is as follows. The effects of other four factors on intergenerational mobility are stronger for poorer families. As inequality increases, the effects of the other four factors are larger. Therefore, a high degree of inequality inflates the negative effects of the increase in return to human capital and the price of human cap-

ital investment, as well as the positive effects of government educational expenditure and family income on intergenerational mobility.

6.2 Institutional and Socioeconomic Causes of the Decrease in Intergenerational Mobility and the Great Gatsby Curve in China

Based on the conceptual framework discussed above, this section explains our estimated pattern of intergenerational mobility. We also explain the negative association between the increasing cross-sectional inequality and the declining intergenerational mobility. We link the institutional, educational, fiscal, and socioeconomic changes discussed in the background section to the theoretical determinants of intergenerational mobility. The decline of China's intergenerational mobility is mainly determined by the "fights" among these factors.

First, the return to human capital has increased considerably which is contributable to the rapid accumulation of physical capital, technological progress, and especially the market-oriented institutional reforms. Figure 4 shows that from 1998 to 2008, the return to one additional year of schooling increased by four times. In the same period, the return to college education was seven times higher than that to senior high school education. Second, educational cost also rises sharply. Figure 5 indicates that from 1991 to 2007, the ratio of tuition fees relarive to GDP increases more than eight times. In particular, the annual tuition fee for tertiary education increases by more than fifteen times from 1995 to 2010.

Third, Figure 3 suggests that the share of government expenditure for education in GDP has doubled from 2% in 1992 to 4% in 2012. However, the public expenditure on education is heavily concentrated in economically developed areas, in which local governments are financially well off with the decentralization of the management of public finance for education. Therefore, children from poor regions are less likely to benefit from the increase in the expenditure on public education (Figure 7).[38] Fourth, the real per capita income has increased by less than five times since the early 1990s (Zhu, 2012). Fifth, income inequality as measured by the Gini coefficient has also doubled in the same period (Figure 1).

We believe that the negative effects of the increases in the return to human capital, the price of human capital investment, and income inequality offset the positive effects of the increases in government expenditure on child human capital and family income. This occurrence lowers intergenerational mobility in China. Specifically, the statistics show that the increases in the return to human capital and in the price of human capital investment are greater than the increases in government expenditure on the human capital of children and family income on average. Moreover, the increase in inequality exacerbates this situation. Consequently, poor families are increasingly

[38] So, the positive effect of the increase in government educational expenditure on intergenerational mobility is partly offset by the decentralization.

subject to severe credit constraint on investment in the human capital of their children. This conclusion is supported by the survey reported in Li *et al.* (2013). This study notes that the share of college students coming from rural and west areas have been decreasing since the 1990s. More families cannot afford the tuition for their children's tertiary education. In 2010, 22% of current college students were from families whose annual income was less than the average yearly expenditure of the college students. By contrast, college education was almost free before 1995, as discussed in the background section. Thus, the educational opportunity for children from poor families has decreased relative to that for children from rich families.

The negative correlation between cross-sectional inequality and intergenerational mobility can be driven by the interplay among the four effects as follows. First, with the increase in inequality, more poor families are less able to provide quality education to their children, thereby reducing intergenerational mobility. Second, the increase in inequality inflates the negative effect of the increases in return to human capital and the price of human capital investment on intergenerational mobility. Third, inequality also inflates the positive effects of the increases in government educational expenditure and family income. Given that the increases in return to human capital and the price of human capital investment are greater than the increases in government educational expenditure and family income, the net effect of inequality on intergenerational mobility is negative. Fourth, Becker & Tomes (1986) show that a low intergenerational mobility leads to a high steady state of the degree of cross-sectional inequality.

We now turn to explain our estimated gender- and region-patterns of intergenerational mobility. The estimates show that the pattern of decline is more significant for girls. This finding is attributed to two main reasons. First, the return to schooling is higher for females than males. The gender gap in return to schooling has been widening (Zhang *et al.*, 2005). Figure 6 presents the return to schooling by gender for urban residents from 1988 to 2001. In 1988, the rate of return to one additional schooling year is 5.2% for girls but only 2.9% for boys. In 2001, the return rates are 13.2% and 8.4% for girls and boys, respectively. Second, girls from poor families are subject to tighter credit constraint than boys because of the preference for sons. Based on the CFPS data, Figure 11 graphs schooling years by gender and rural/urban areas. The figure shows the persistent gender gap in schooling years for rural area. By contrast, the corresponding gap in the urban area shrinks and eventually disappears.

In addition to gender difference, intergenerational mobility displays regional disparity. The pattern of decline is more significant in less developed areas, such as rural and western regions. Figure 12 graphs the return to schooling years for six provinces according to Zhang *et al.* (2005), and suggests that the increase in return to schooling is more significant in the two most developed provinces/municipalities, namely, Zhejiang and Beijing. However, this increase lowers intergenerational mobility. Given the declining mobility in less developed rural/western regions, the regional

pattern may not be driven by return to human capital. Alternatively, we suggest that the regional disparity is mainly driven by the gap in per capita income and the severity of credit constraint. Given the distribution of family income, intergenerational mobility is expected higher in a society with higher average income, as fewer households are subject to credit constraint. However, households in rural and western regions have tighter credit constraint on investment in the human capital of their children than their wealthier counterparts. As discussed in the background section, the management of public finance for education has been localized; therefore, the share of government expenditure on education is low in less developed areas, such as rural area and western provinces. The drastic increase in educational costs has exacerbated credit constraints, especially in these regions. As per a recent national survey of college students, Li *et al.* (2013) reports that the poverty rates are 28% and 32% for students from western provinces and rural area, respectively. These values exceed the national average level of 22%.

7 Policy Implications

To draw policy implications, we first compare our interpretation of the change in intergenerational mobility in China to that of a recent study in the US (Chetty *et al.*, 2014a). This study outlines five significant factors correlated with intergenerational mobility in the US: residential segregation, income inequality, quality of the primary school attended, social capital, and family stability. Among these factors, family stability is the most significant factor (Table IX in (Chetty *et al.*, 2014a)). Although we cannot conduct a similar analysis at the level of cross-commuting zones given our small sample size, we note that some of the factors can be incorporated into our framework to explain China's declining intergenerational mobility. With regard to school quality, for instance, the fiscal decentralization of educational expenditure enhances the geographic variation in school quality. Thus, school quality may also be a major determinant of the geographic variations in intergenerational mobility in China. Nevertheless, some factors in Chetty *et al.* (2014a) may not be applicable to China. For example, out-of-wedlock births and divorces were rare during our study period; less than 1% of parents in both early and late cohorts were divorced at the time of the survey year, when their average age was 55 years old. Therefore, marital stability should not be a major contributing factor in the analyses of the patterns of intergenerational mobility in China.

Because the US and China are at different stages of economic development, it is reasonable that the findings in Chetty *et al.* (2014a) may not be fully applicable to China. Over the past four decades, China has experienced fundamental structural change, whereas the economic structure in the US has remained relatively stable. Interestingly, our explanation is more similar to that of Olivetti & Paserman (2014), which examined the change in intergenerational mobility across two or three generations in the US in the late 19^{th} and early 20^{th} centuries. At that time, the US under-

went drastic structural changes and rapid economic growth. Our estimate of the intergenerational income elasticity in the early cohorts (born before 1970) in China is similar to that of the 1880 cohort in the US. The results of Olivetti & Paserman (2014) indicated that intergenerational mobility in the US decreased during the early 20th century. This decline was attributed to an increase in the return to human capital and to regional disparities in economic development. In the present study, we also consider these two factors as determinants of the patterns in China in terms of cohort, gender, and region. Furthermore, we regard the fiscal decentralization of public educational expenditure in China to be another major factor.

We then compare the US and China in terms of both cross-sectional inequality and intergenerational mobility. Cross-sectional inequality has increased in both countries, although the increase in China is more significant (Figure 2). Specifically, the Gini coefficient of China in 1970 was only half of that of the US. In 2008, the Gini coefficient of China equaled that of the US and reached a historic maximum of 0.45. The increase in cross-sectional inequality is mainly caused by the increase in return to human capital and the regional disparity in economic development (Ge & Yang, 2014; Xie & Zhou, 2014).

In contrast to China's declining intergenerational mobility, that in the US has either increased or remained constant over the past few decades (Chetty *et al.*, 2014b). This finding may be ascribed to the sharp increase in federal and state government expenditure on human capital of children. Since the 1970s, the US government has initiated a series of means-tested programs to alleviate the credit constraints on disadvantaged families, such as Medicaid, food stamps, and Head Start. Therefore, the positive effect of the reduction in credit constraint on intergenerational mobility overcomes the negative effect of the increases in return to human capital and cross-sectional inequality. In China, however, the tightening of household credit constraints may reinforce the negative effect of increase in return to human capital on intergenerational mobility.

This comparison between the US and China has significant implications for the design and revision of relevant public policies to improve intergenerational mobility and to reduce cross-sectional inequality in China. To promote intergenerational mobility, the Chinese government should aim to reduce the household credit constraints on investment in the human capital of children promptly and effectively. Moreover, the government should initiate various programs to subsidize the education of children from disadvantaged families, such as the left-behind children with parents who are rural-to-urban migrants. In addition, the efficacy of loan and scholarship programs at the tertiary level should be enhanced. Furthermore, the central government should increase the spending on education and enhance the efficiency of its usage. China has progressed substantially in these aspects (Meng, 2013). But more efforts are needed to ensure equal access to quality education for all age-eligible children.

8 Conclusion

In this study, we investigate the temporal patterns of cross-sectional inequality and intergenerational mobility during the economic reform era in China. First, we find that the intergenerational mobility in both income and education has decreased. Specifically, the percentile rank of a child increases from 0.27 to 0.35 for cohorts born before and after 1970, with one-unit increase in the percentile rank of family income in his/her parents' generation. The corresponding rank-rank estimates of intergenerational education mobility are 0.24 and 0.29 for early and late cohorts, respectively. Second, we discover that the cross-sectional inequality is negatively correlated with the intergenerational mobility, and illustrate a Great Gatsby Curve in China. Finally, we discuss the structural forces in the decline of intergenerational mobility and in the negative correlation between cross-sectional inequality and intergenerational mobility. These forces are the increase in return to human capital and educational cost, as well as the decentralization of government expenditure on education and rising income.

Our results imply that the cross-sectional inequality in China may increase in the future. On the one hand, the increase in inequality in the parental generation intensifies the severity of family credit constraints, thereby decreasing the intergenerational mobility. On the other hand, low intergenerational mobility enhances the steady state of cross-sectional inequality in the long run (Becker & Tomes, 1986).[39] Therefore, the increase in cross-sectional inequality and the decline in intergenerational mobility may dynamically reinforce each other, thus aggravating the inequality in the future.

Our study remains limited. It is beyond the scope of our paper to establish causality between a specific institutional, policy, or socioeconomic change and intergenerational mobility. We also do not distinguish the mechanisms through which these changes affect intergenerational mobility in China. We instead attempt to statistically characterize the temporal patterns of inequality and mobility during China's economic reform era as the majority of the literature on intergenerational mobility does. We then try to understand these patterns by incorporating the institutional, policy, and socioeconomic changes into a unified economic framework from a human capital perspective. Our study can be a basis for future studies that seek to identify causality and mechanisms.

[39]The cross-sectional inequality in an economy may converge to the steady state from either a high or a low level. If the degree of inequality initiated from a high level, the trend was decreasing; otherwise, the trend was increasing. Because the income inequality was very low at the beginning of the economic reform (Figure 1), the trend of inequality may be increasing. Furthermore, the decline in intergenerational mobility increases the steady state level of inequality in China. Therefore, the increasing trend of income inequality in China may become more significant.

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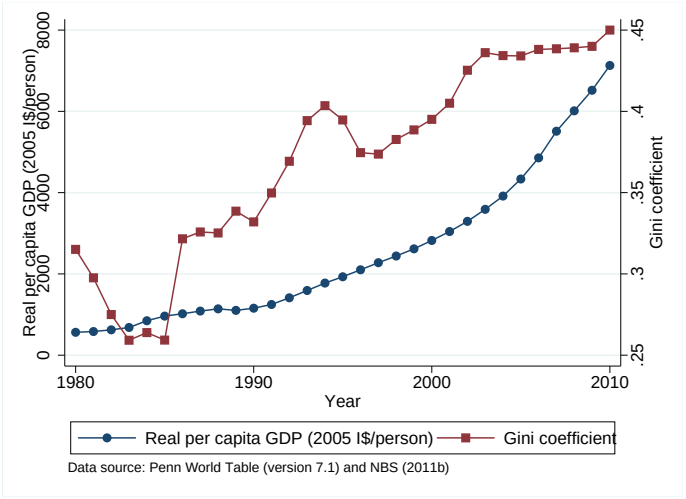


Figure 1: Per Capita GDP and Gini Coefficient in China

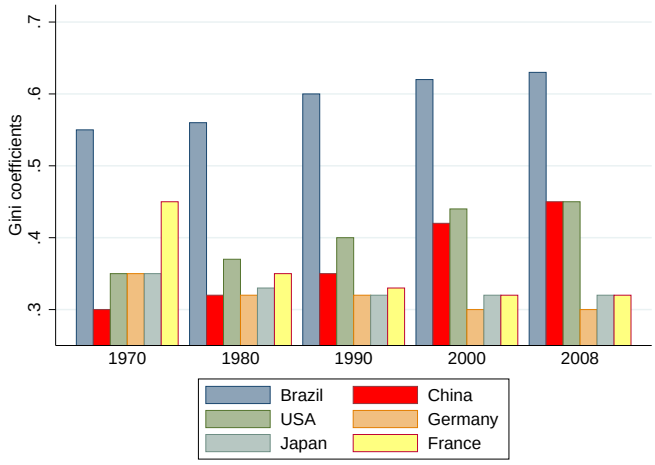


Figure 2: International Comparison of Gini Coefficients

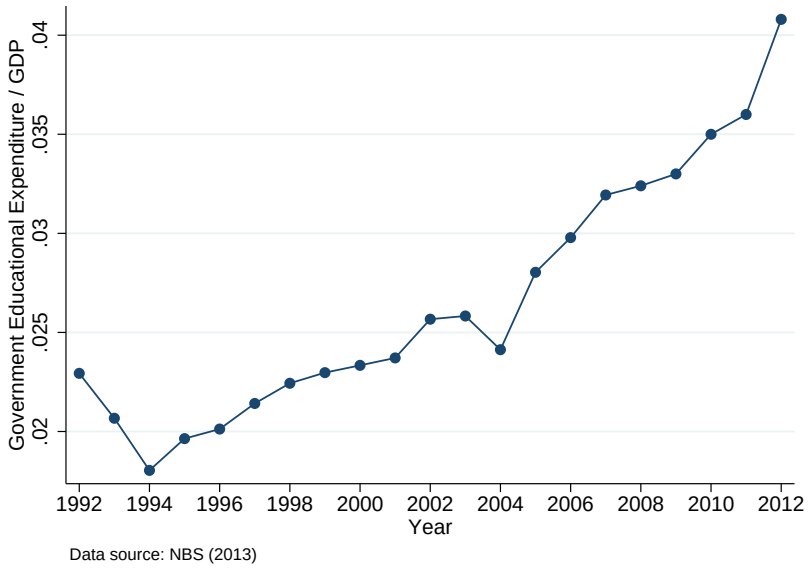


Figure 3: Government Educational Expenditure/GDP

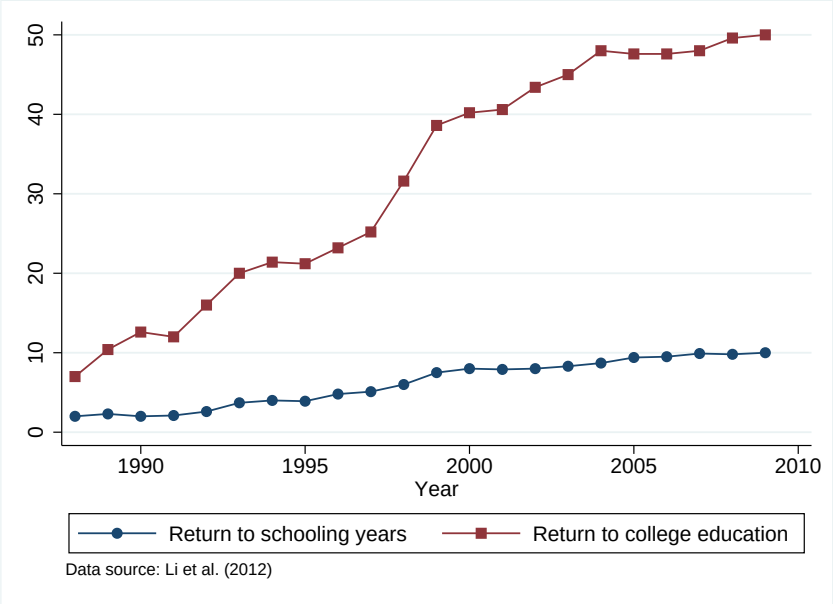


Figure 4: Return to Education in Urban China

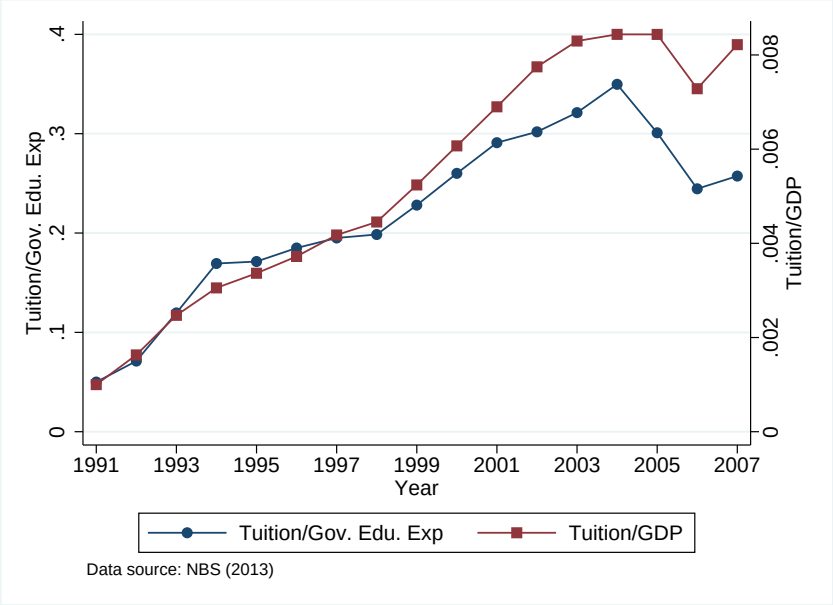


Figure 5: Increase in Tuition in China

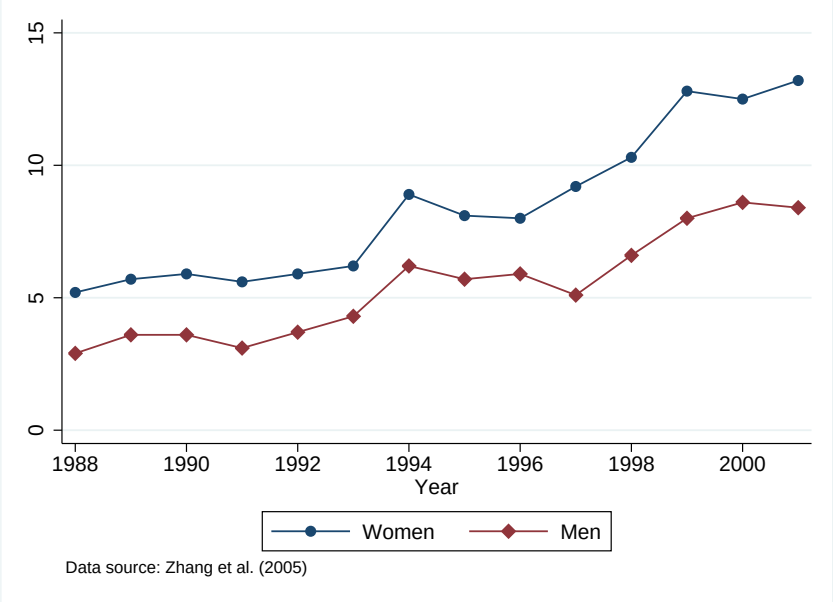


Figure 6: Return to Schooling Years by Gender

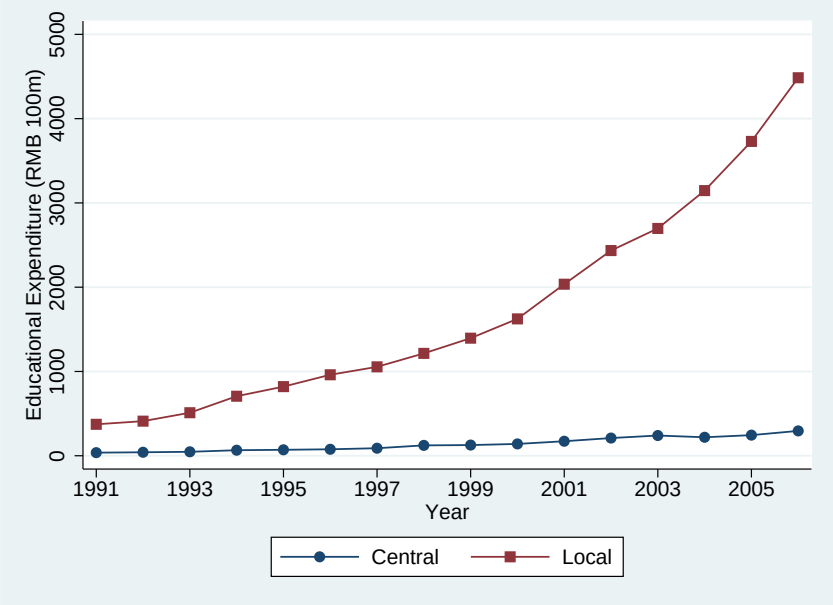
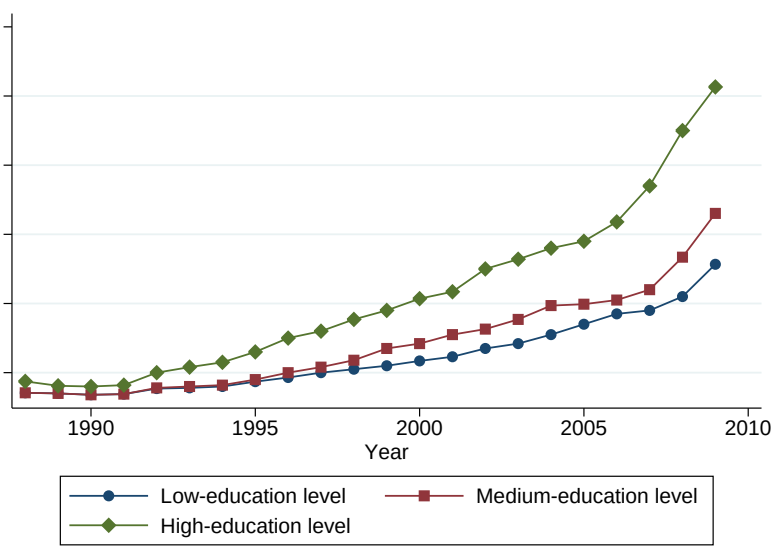


Figure 7: Central and Local Governmental Expenditure on Education



Data source: Li et al. (2012)

Figure 8: Annual Wage of Urban Workers

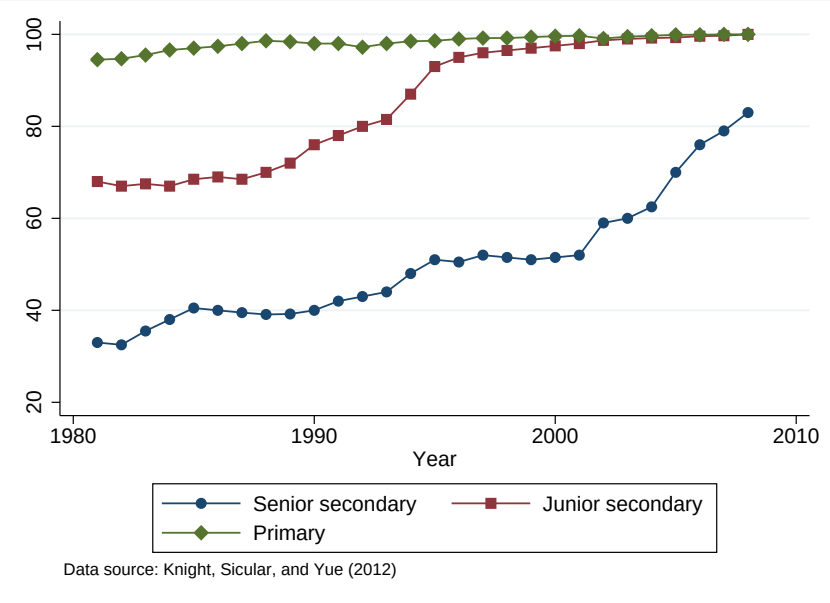


Figure 9: Primary School Enrollment Rates and Secondary School Progression Rates

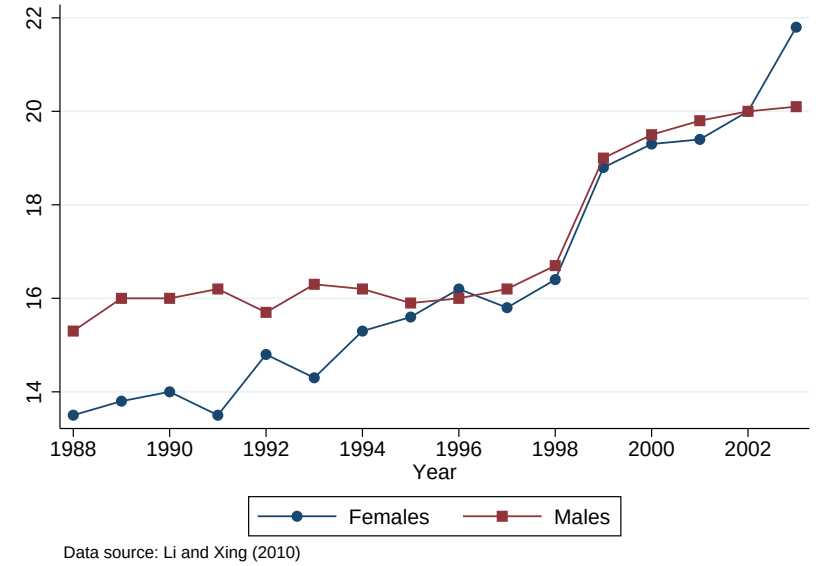


Figure 10: Tertiary School Enrollment Rates

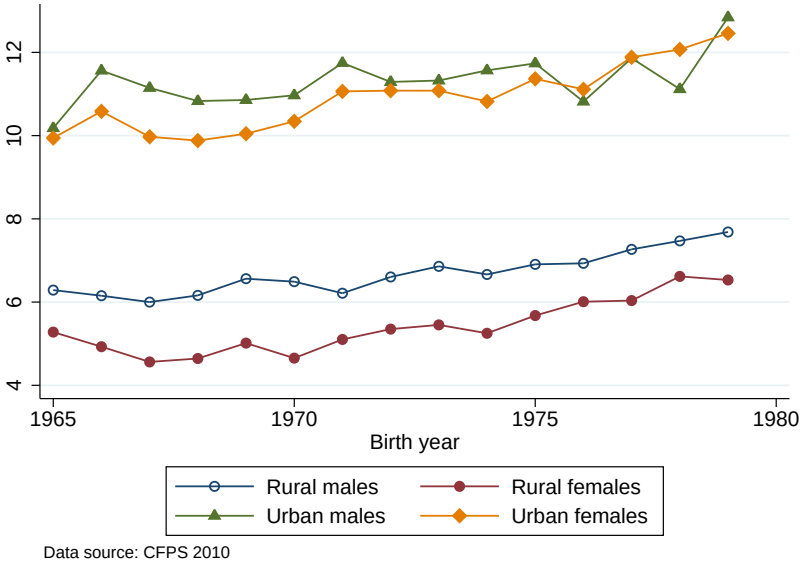


Figure 11: Schooling Years by Gender and by Region

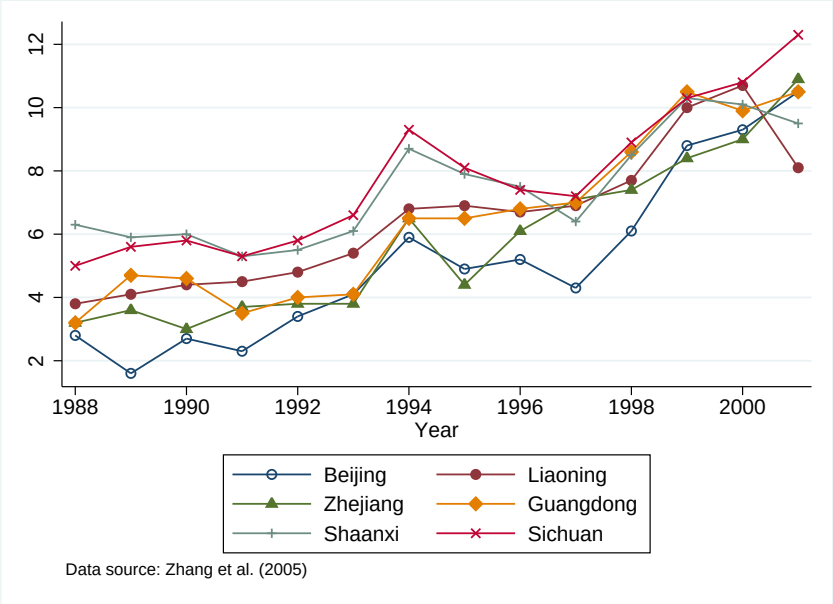


Figure 12: Return to Schooling Years by Province

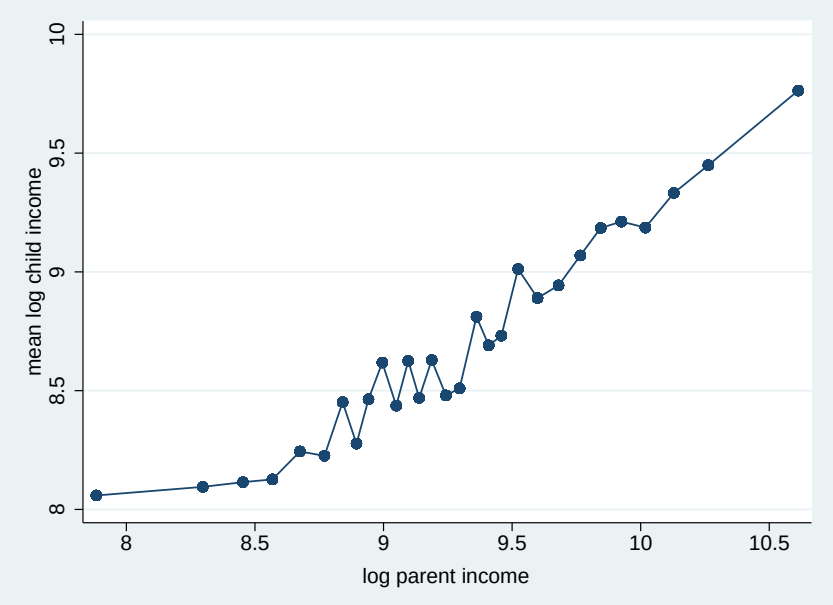


Figure 13: Logarithm of the Income of Children vs. Logarithm of the Income of Parents

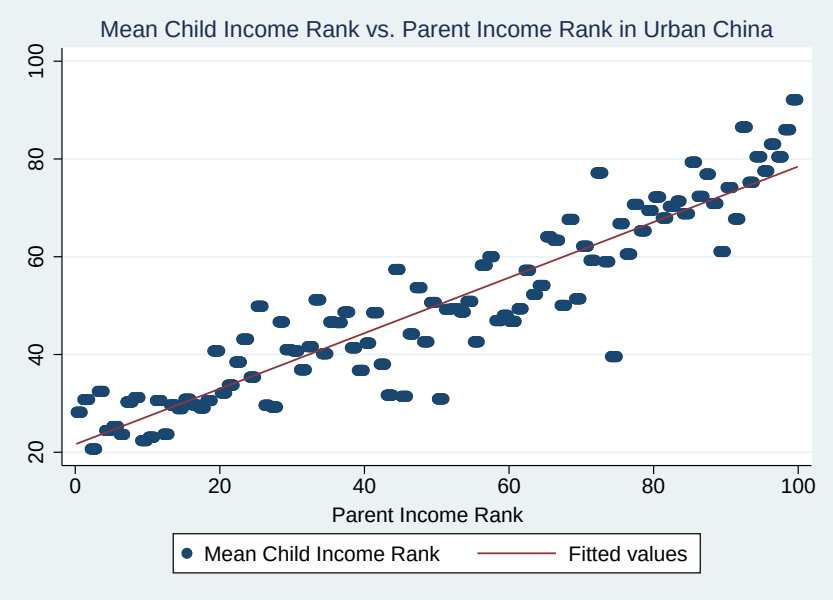


Figure 14: Income Rank of Children vs. Income Rank of Parents

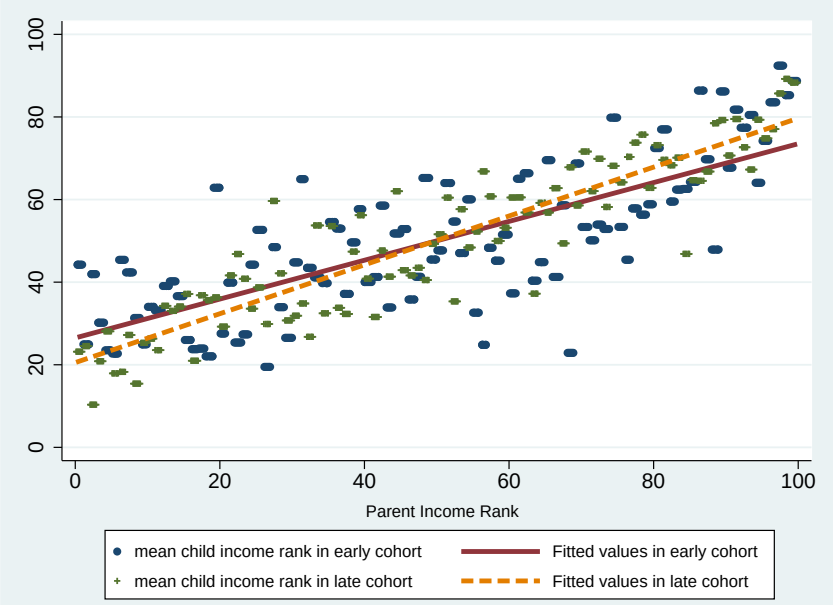


Figure 15: Rank of Children vs. Rank of Parents in Early and Late Cohorts

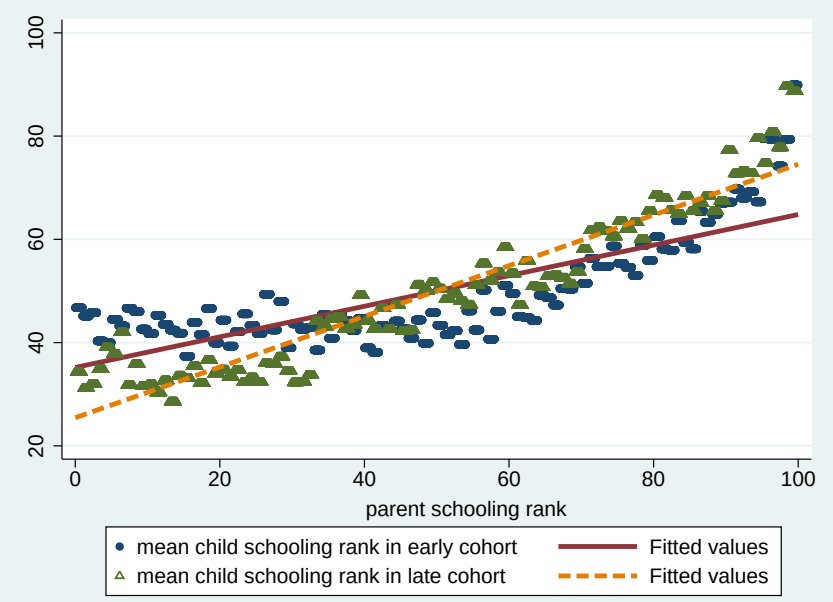


Figure 16: Rank of Children vs. Rank of Parents in Early and Late Cohorts

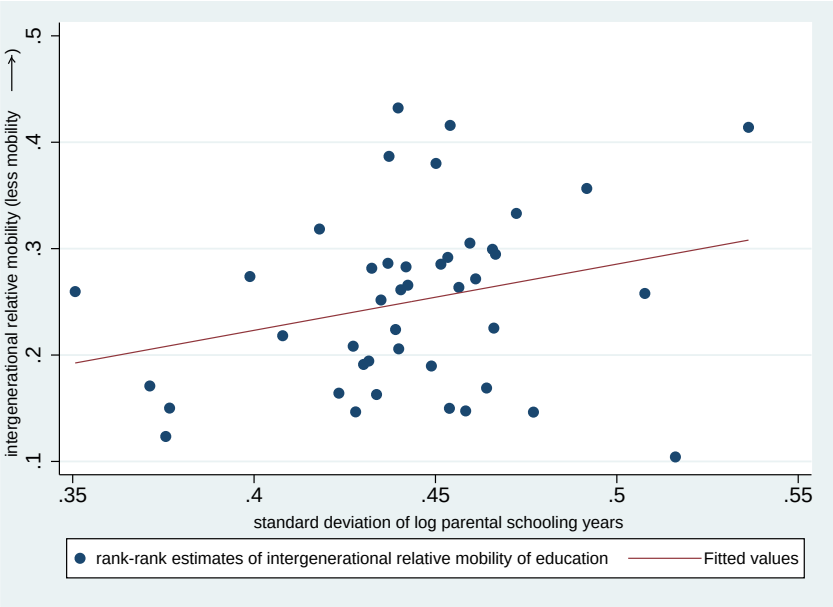


Figure 17: Relative Mobility vs. Standard Deviation of Parental Schooling (slope=0.720 with a standard error of 0.376)

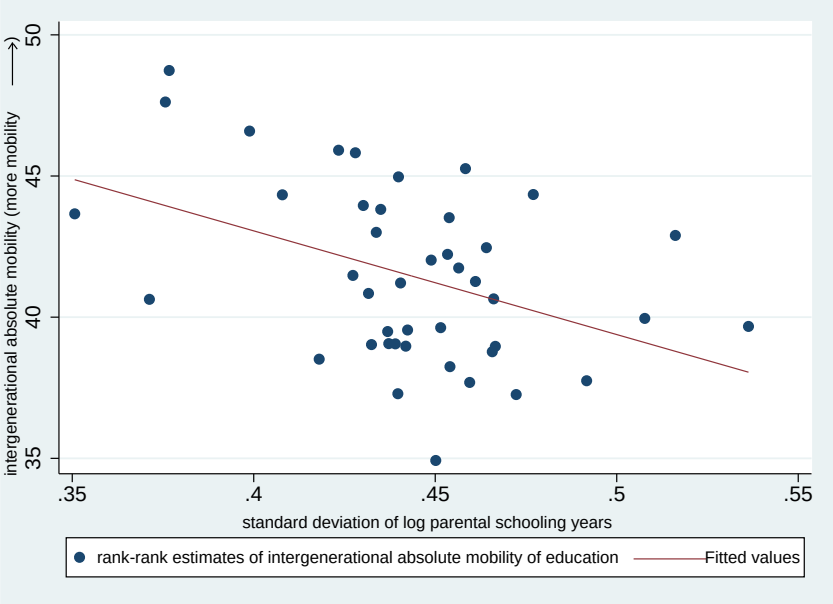


Figure 18: Absolute Mobility vs. Standard Deviation of Parental Schooling (slope=-41.340 with a standard error of 12.985)

Table 1: Intergenerational Income Mobility by Gender

	Estimates		Changes in estimates
	Early cohort	Late cohort	(2) - (1)
	(1)	(2)	(3)
Panel A. Regression coefficient (β)			
All children	0.315***	0.442***	0.127*
	(0.063)	(0.044)	(0.075)
Sons	0.335***	0.416***	0.0812
	(0.066)	(0.081)	(0.086)
Daughters	0.205*	0.496***	0.291**
	(0.116)	(0.074)	(0.137)
Panel B. Income Correlation[a]			
All children	0.231***	0.336***	0.105**
	(0.046)	(0.034)	(0.057)
Sons	0.241***	0.319***	0.078
	(0.048)	(0.062)	(0.078)
Daughters	0.155*	0.373***	0.218**
	(0.088)	(0.055)	(0.104)
Panel C. Rank to Rank			
All children	0.273***	0.347***	0.074
	(0.040)	(0.035)	(0.053)
Sons	0.294***	0.325***	0.031
	(0.045)	(0.047)	(0.065)
Daughters	0.172**	0.390***	0.218**
	(0.081)	(0.054)	(0.097)

Note: The children are at least 23 years old, and fathers are less than 65 years old. Income is converted to RMB 2002 using the CPI. Data source: Chinese Household and Income Projects 1995 and 2002 in urban China. Standard errors clustered by households are in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%.

The dependent variable is the annual income of the child. The independent variable is the average annual family income over three previous years (at least). The control variables include the age and age squared of children and fathers, gender dummy (in the specification for all children), wave dummies, and provincial dummies.

Early cohorts include children born between 1949 (the year the People's Republic of China was founded) and 1970 (included). Late cohorts include children born after 1970 who were educated and worked in the post-economic reform era.

[a]: Intergenerational income correlation = intergenerational income coefficient $*\sigma_p/\sigma_c$, where σ_p and σ_c are the standard deviations of logarithm annual income of parents and children, respectively.

Table 2: Sensitivity Analysis of Intergenerational Income Mobility

	Regression coefficient (β)		Correlation[a]		Rank to Rank		Changes in Estimates		
	Early cohort	Late cohort	Early cohort	Late cohort	Early cohort	Late cohort	(2) - (1)	(4) - (3)	(6) - (5)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A. Augmented income regressions[b]									
All children	0.297***	0.426***	0.216***	0.323***	0.269***	0.344***	0.129	0.107*	0.075
	(0.070)	(0.050)	(0.051)	(0.038)	(0.045)	(0.039)	(0.085)	(0.063)	(0.060)
Sons	0.330***	0.410***	0.236***	0.314***	0.300***	0.320***	0.0804	0.078	0.02
	(0.074)	(0.063)	(0.053)	(0.048)	(0.050)	(0.052)	(0.096)	(0.072)	(0.072)
Daughters	0.135	0.482***	0.101	0.362***	0.128	0.393***	0.347**	0.261**	0.265**
	(0.127)	(0.084)	(0.095)	(0.063)	(0.093)	(0.062)	(0.152)	(0.114)	(0.111)
Panel B. One-year estimates[c]									
All children	0.275***	0.439***	0.201***	0.311***	0.261***	0.311***	0.164**	0.110**	0.0502
	(0.063)	(0.041)	(0.046)	(0.029)	(0.038)	(0.030)	(0.074)	(0.054)	(0.049)
Sons	0.317***	0.409***	0.221***	0.296***	0.288***	0.294***	0.0918	0.0751	0.00622
	(0.067)	(0.054)	(0.047)	(0.039)	(0.043)	(0.041)	(0.084)	(0.061)	(0.059)
Daughters	0.142	0.495***	0.115	0.339***	0.157**	0.331***	0.353***	0.224**	0.174**
	(0.108)	(0.064)	(0.088)	(0.044)	(0.075)	(0.047)	(0.125)	(0.098)	(0.088)

Note: The children are at least 23 years old, and fathers are less than 65 years old. Income is converted to RMB 2002 using the CPI. Data source: Chinese Household and Income Projects 1995 and 2002 in urban China. Standard errors clustered by households are in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%.

The dependent variable is the annual income of the child. The independent variable is the average annual family income over three previous years (at least). The control variables include the age and age squared of children and fathers, gender dummy (in the specification for all children), wave dummies, and provincial dummies.

Early cohorts include children born between 1949 (the year the People's Republic of China was founded) and 1970 (included). Late cohorts include children born after 1970 who were educated and worked in the post-economic reform era.

[a]: Intergenerational income correlation = intergenerational income coefficient $*\sigma_p/\sigma_c$, where σ_p and σ_c are the standard deviations of logarithm annual income of parents and children, respectively.

[b]: In the augmented regressions, additional control variables include the Communist Party membership of the father and the average schooling years of parents.

[c]: Parental income is the total income of parents in the survey year.

Table 3: Intergenerational Income Mobility by Region

	Estimates		Changes in estimates
	Early cohort	Late cohort	(2) - (1)
	(1)	(2)	(3)
Panel A. Regression coefficient (β)			
East	0.339***	0.438***	0.0992
	(0.071)	(0.063)	(0.094)
Central	0.261**	0.391***	0.13
	(0.131)	(0.080)	(0.152)
West	0.224*	0.545***	0.321**
	(0.125)	(0.098)	(0.155)
Panel B. Income Correlation[a]			
East	0.266***	0.341***	0.0748
	(0.056)	(0.049)	(0.074)
Central	0.194**	0.293***	0.0995
	(0.097)	(0.060)	(0.114)
West	0.155*	0.411***	0.256**
	(0.086)	(0.074)	(0.114)
Panel C. Rank to Rank			
East	0.266***	0.318***	0.0517
	(0.059)	(0.052)	(0.079)
Central	0.243***	0.303***	0.06
	(0.079)	(0.065)	(0.102)
West	0.200**	0.455***	0.254**
	(0.088)	(0.074)	(0.115)

Note: The children are at least 23 years old, and fathers are less than 65 years old. Income is converted to RMB 2002 using the CPI. Data source: Chinese Household and Income Projects 1995 and 2002 in urban China. Standard errors clustered by households are in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%.

The dependent variable is the annual income of the child. The independent variable is the average annual family income over three previous years (at least). The control variables include the age and age squared of children and fathers, gender dummy (in the specification for all children), wave dummies, and provincial dummies.

Early cohorts include children born between 1949 (the year the People's Republic of China was founded) and 1970 (included). Late cohorts include children born after 1970 who were educated and worked in the post-economic reform era.

[a]: Intergenerational income correlation = intergenerational income coefficient $*\sigma_p/\sigma_c$, where σ_p and σ_c are the standard deviations of logarithm annual income of parents and children, respectively.

Table 4: Absolute vs. Relative Intergenerational Income Mobility in East, Central, and West China

Upward mobility rank	Region	Absolute upward mobility	Relative mobility
(1)	(2)	(3)	(4)
Panel A. Early cohort			
1	West	43.055	0.2
2	Central	40.617	0.243
3	East	38.973	0.266
Panel B. Late cohort			
1	Central	38.683	0.303
2	East	36.09	0.318
3	West	36.002	0.455

Note: The children are at least 23 years old, and fathers are less than 65 years old. Income is converted to RMB 2002 using the CPI. Data source: Chinese Household and Income Projects 1995 and 2002 in urban China.
Early cohorts include children born between 1949 (the year the People's Republic of China was founded) and 1970 (included). Late cohorts include children born after 1970 who were educated and worked in the post-economic reform era.

Table 5: Intergenerational Education Mobility

	Estimates		Changes in estimates
	Early cohort	Late cohort	(2) - (1)
	(1)	(2)	(3)
Panel A. Regression coefficient (β)			
All children	0.339***	0.352***	0.0129
	(0.012)	(0.010)	(0.016)
Sons	0.305***	0.303***	-0.002
	(0.015)	(0.014)	(0.020)
Daughters	0.372***	0.392***	0.02
	(0.017)	(0.013)	(0.021)
Panel B. Education Correlation[a]			
All children	0.281***	0.313***	0.0324**
	(0.010)	(0.009)	(0.014)
Sons	0.269***	0.283***	0.0144
	(0.013)	(0.013)	(0.019)
Daughters	0.299***	0.339***	0.0400**
	(0.014)	(0.011)	(0.018)
Panel C. Rank to Rank			
All children	0.235***	0.292***	0.0570***
	(0.011)	(0.009)	(0.014)
Sons	0.214***	0.269***	0.0547***
	(0.015)	(0.013)	(0.020)
Daughters	0.241***	0.317***	0.0762***
	(0.015)	(0.011)	(0.018)

Note: The dependent variable is the schooling years of the child. The independent variable is the average schooling years of the parents. The control variables include the age, gender (in the specification for all children), and *Hukou* status (agricultural or non-agricultural) of the child, as well as the age of the mother, dummies if either parent was alive in the survey year, and regional dummies. Data source: Chinese Family Panel Studies 2010. Standard errors clustered by households are in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%.

[a]: Intergenerational educational correlation = intergenerational education coefficient $*\sigma_p/\sigma_c$, where σ_p and σ_c are the standard deviations of the schooling years of parents and children, respectively.

Table 6: Intergenerational Education Mobility by *Hukou* Status

	Estimates		Changes in estimates
	Early cohort	Late cohort	(2) - (1)
	(1)	(2)	(3)
Panel A. Regression coefficient (β)			
Urban	0.342***	0.389***	0.0467*
	(0.020)	(0.019)	(0.028)
Rural	0.384***	0.349***	-0.0346
	(0.019)	(0.013)	(0.023)
Panel B. Education Correlation[a]			
Urban	0.455***	0.452***	-0.00328
	(0.027)	(0.022)	(0.035)
Rural	0.261***	0.291***	0.0300*
	(0.013)	(0.011)	(0.017)
Panel C. Rank to Rank			
Urban	0.419***	0.430***	0.0109
	(0.027)	(0.020)	(0.033)
Rural	0.207***	0.272***	0.0650***
	(0.014)	(0.011)	(0.018)

Note: The dependent variable is the schooling years of the child. The independent variable is the average schooling years of the parents. The control variables include the age and gender of the child, as well as the age of the mother, dummies if either parent was alive in the survey year, and regional dummies. Data source: Chinese Family Panel Studies 2010. Standard errors clustered by households are in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%.
[a]: Intergenerational educational correlation = intergenerational education coefficient $*\sigma_p/\sigma_c$, where σ_p and σ_c are the standard deviations of the schooling years of parents and children, respectively.

Table 7: Intergenerational Education Mobility by Region

	Estimates		Changes in estimates
	Early cohort	Late cohort	(2) - (1)
	(1)	(2)	(3)
Panel A. Regression coefficient (β)			
East	0.338***	0.300***	-0.0380*
	(0.018)	(0.015)	(0.023)
Central	0.342***	0.324***	-0.0176
	(0.023)	(0.017)	(0.029)
West	0.449***	0.479***	0.0304
	(0.032)	(0.023)	(0.039)
Panel B. Education Correlation[a]			
East	0.324***	0.304***	-0.0197
	(0.017)	(0.015)	(0.023)
Central	0.279***	0.314***	0.0352
	(0.019)	(0.016)	(0.025)
West	0.276***	0.348***	0.0719***
	(0.020)	(0.016)	(0.026)
Panel C. Rank to Rank			
East	0.257***	0.272***	0.0152
	(0.017)	(0.015)	(0.023)
Central	0.250***	0.294***	0.0438*
	(0.021)	(0.017)	(0.026)
West	0.201***	0.322***	0.121***
	(0.021)	(0.017)	(0.027)

Note: The dependent variable is the schooling years of the child. The independent variable is the average schooling years of the parents. The control variables include the age, gender, and *Hukou* status (agricultural or non-agricultural) of the child, as well as the age of the mother, and dummies if either parent was alive in the survey year. Data source: Chinese Family Panel Studies 2010. Standard errors clustered by households are in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%.

[a]: Intergenerational educational correlation = intergenerational education coefficient $*\sigma_p/\sigma_c$, where σ_p and σ_c are the standard deviations of the schooling years of parents and children, respectively.

Table 8: Absolute vs. Relative Intergenerational Education Mobility in 22 Provinces/Municipalities

Early cohort				Late cohort			
Ranking	Province/region	Absolute mobility	Relative mobility	Ranking	Province/region	Absolute mobility	Relative mobility
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. absolute and relative mobility by province							
1	Guangxi	46.756	0.151	1	Jiangsu	44.816	0.173
2	Shandong	45.916	0.141	2	Anhui	42.452	0.196
3	Hebei	45.509	0.145	3	Fujian	41.601	0.176
4	Shanxi	44.707	0.22	4	Jiangxi	41.369	0.217
5	Guangdong	44.624	0.237	5	Hebei	40.644	0.218
6	Heilongjiang	44.584	0.232	6	Shandong	40.538	0.254
7	Yunnan	44.557	0.257	7	Yunnan	40.219	0.246
8	Guizhou	44.547	0.113	8	Zhejiang	40.165	0.28
9	Sichuan	43.939	0.236	9	Guizhou	39.954	0.281
10	Jiangsu	43.624	0.214	10	Guangxi	39.941	0.423
11	Gansu	43.505	0.206	11	Gansu	39.735	0.273
12	Jilin	42.945	0.209	12	Shanxi	39.685	0.266
13	Henan	42.848	0.239	13	Liaoning	39.506	0.223
14	Shannxi	42.667	0.221	14	Guangdong	39.172	0.373
15	Liaoning	42.562	0.246	15	Henan	38.852	0.266
16	hubei	42.509	0.214	16	Heilongjiang	38.673	0.301
17	Shanghai	39.646	0.453	17	Sichuan	38.645	0.314
18	hunan	38.615	0.382	18	Jilin	38.188	0.334
-	-	-	-	19	Shanghai	38.131	0.315
-	-	-	-	20	Shannxi	37.627	0.419
-	-	-	-	21	Hunan	36.797	0.334
-	-	-	-	22	Hubei	34.751	0.372
Panel B. absolute and relative mobility by region[a]							
1	West	43.784	0.209	1	East	39.903	0.277
2	East	43.374	0.256	2	West	39.426	0.292
3	Central	42.924	0.248	3	Central	38.937	0.279

Note: The sample is restricted to provinces/municipalities with at least 150 observations and with statistically significant estimates. We drop seven data points from early cohorts (Chongqing, Beijing, Tianjin, Anhui, Zhejiang, Jiangxi, and Fujian) and three data points from late cohorts (Chongqing, Beijing, and Tianjin).

[a]: The estimates by region are weighted by observations.