The London School of Economics and Political Science

Essays on Inequality and Intergenerational Mobility in China

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Declaration

I certify that the thesis I have presented for examination for the PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it).

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Chapter 2, "The Great Gatsby Curve in China: Cross-Sectional Inequality and Intergenerational Mobility", was jointly co-authored with Professor Junjian Yi and Professor Junsen Zhang.

This statement is to confirm that I contributed a minimum of 33% of this work. More specifically, I have carried out the empirical analyses.

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I can confirm that my thesis was proofread by Ms. Skye Hughes, Ms. Elizabeth Storer, Ms. Jacqueline Wah, and editors at Transformat.

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Abstract

This thesis consists of three essays on intragenerational and intergenerational inequality. It focuses on the largest developing country, China, and examines historically and currently under-represented groups.

The first chapter, ***"Does Adversity Affect Long-term Consumption and Financial Behaviour? Evidence from China's Rustication Programme"***, investigates the long-term effects of early experiences on economic behaviour, by referring to the largest forced migration experiment in history. Focusing on the historically under-represented group of people who were sent from urban to rural areas to do manual farm work during their adolescence, I demonstrate that they behave conservatively over the long term. They spend less on housing, accumulate more savings and insurance, and invest less in risky assets. One mechanism for the conservative behaviour lies in the habits formed during adversity. My study sheds light on how a policy, experienced especially in the early stage of life, influences a generation over the long term.

In addition to inequality, the second and the third chapters examine intergenerational mobility. The second chapter, ***"The Great Gatsby Curve in China: Cross-Sectional Inequality and Intergenerational Mobility"***, estimates the extent of the decline in intergenerational mobility in income and education during China's economic transition. The decline is more evident for the currently under-represented groups: females, and residents of rural areas and the western regions. To correlate intergenerational mobility with cross-sectional inequality, a Great Gatsby Curve with a negative slope is presented, and related institutional factors are discussed. This chapter is written jointly with Junjian Yi and Junsen Zhang.

The third chapter, ***"Intergenerational Income Persistence and Transmission through Identity: Evidence from Urban China"***, investigates the mechanism of the decreasing intergenerational mobility in income during China's transition. I demonstrate a shift in the leading contributor to the intergenerational income persistence conditional on income group and age cohort. Specifically, education is a leading contributor for all families before the market reform, and for households with below-average income in the post-reform era. However, a new transmission channel, political identity, plays a leading role in households with above-average income in the post-reform era. It sheds light on the necessity of intensifying reform in contemporary China.

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Preface

Inequality is a rising concern in developing countries. In this thesis, I examine intragenerational and intergenerational inequality in the largest developing country, China. Specifically, the thesis analyses the long-term consequences of the largest forced migration in history, estimates intergenerational mobility in education and income in the contemporary era, discusses the mechanism of intergenerational income transmission, and examines the interaction of cross-sectional inequality and intergenerational mobility.

The thesis contains three essays. The first investigates the long-term consequences of early adversity on economic behaviours, using the largest forced migration experiment in history. From 1966 to 1978, 17 million urban youths in China, mostly junior or senior high school graduates, were sent under a rustication policy to the countryside to do farm work for an average of three to four years. Using difference-in-difference estimation with data from the 2005 mini-census, I find that the rusticated generation behaves more conservatively than their earlier and later counterparts. They spend less on housing and purchase more insurance and pension. The intragenerational estimates reveal the same conservative pattern as the intergenerational research. Compared to their age-eligible but non-rusticated peers, the rusticated individuals spend less on housing, accumulate more savings and insurance, and invest less in risky assets. Based on data from the Chinese Household Income Project and Chinese Twins Survey in 2002, the results remain robust under both Ordinary Least Squares (OLS) and twin fixed-effects estimations. I demonstrate that one interpretation of the conservative behaviour lies in the habits shaped during adversity.

Forced migration to rural areas has happened in countries other than China, such as Indonesia, Russia, and the United States (Conquest, 1987; Fearnside, 1997; Taubman, 2004; Viola, 2007). However, China's rustication programme stands as the largest with 17 million population affected. Another important difference from forced migrations in other countries is that in China the migration was by youth in adolescence, when young people become aware of the world. To the best of my knowledge, the present paper is the first to systematically analyse the long-term consequences of rustication on consumption, saving, and investment behaviours. In addition, it investigates where these heterogeneous behaviours come from. This chapter also contributes to the literature on the long-term effects of the Great Depression, military service, and war (Romer, 1990; Bellows & Miguel, 2009; Crafts & Fearon, 2010; Malmendier & Nagel, 2011; Benmelech & Frydman, 2014). It sheds light on how a policy, especially in the early stage of life, affects one generation over the long term.

In addition to the intragenerational inequality, I investigate in the second chapter intergenerational mobility in China's present transitional period, as well as its interplay with cross-sectional inequality. This chapter is written jointly with Junjian Yi and Junsen Zhang. Our results show that intergenerational mobility in both income and education declines sharply along with China's market reform. This trend is particularly significant for females and residents of economically disadvantaged regions, such as rural and western parts. 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 with reference to five factors: return to human capital, cost of education, government policies on human-capital investment, household income, and income inequality. Linking cross-sectional inequality to intergenerational mobility, we draw a Great Gatsby Curve with a negative slope to understand the dynamic interplay of the two. Intergenerational mobility has declined with the increase in cross-sectional inequality since China's economic reform. Poor families benefit less from this growth than rich families do. Given this decline, China's cross-sectional inequality is expected to increase in the future.

To the best of our knowledge, this is the first study to systematically explore the dynamic interplay of inequality and mobility in China. It contributes to the literature on intergenerational mobility (Black & Devereux, 2011; Chetty *et al.*, 2014a,b), and stands out as the first analysis of its patterns with respect to cohort, gender, and region in China's reform era. Moreover, we present the first attempt to relate declining intergenerational mobility to the rising cross-sectional inequality in China by finding a negatively sloped Great Gatsby Curve. It may enrich understanding of the dynamic evolution of inequality in other transitional or developing economies.

In the third chapter, I investigate the channels for intergenerational income transmission during China's economic transition. In addition to the conventional channel of education, I examine two new ones, political and occupational identities. Using the decomposition method (Bowles & Gintis, 2002; Blanden *et al.*, 2007), I discover that for both rich and poor families in the pre-reform era, the conventional channel of education acts as the leading contributor to intergenerational income persistence. In the post-reform era, however, the leading contributor varies across income groups. Education still contributes most to the income persistence across generations in poor households. For the rich, it is the political identity of Communist Party member that leads. The effect of occupational identity as working in the state-owned sector is less important in both types of household in the post-reform period than that in the pre-reform era.

Different from the literature which focuses on the transmission of educational attain-

ment (Chen *et al.*, 2010), this chapter concentrates on the roles of political and occupational identity in the transmission of economic status across generations. The literature has concentrated on wage differences between the state- and privately- owned sectors in China (Zhao, 2002; Démurger *et al.*, 2006), and left the family effects aside. To the best of my knowledge, this is the first paper to estimate the role of occupational identity in a society where intergenerational income mobility is decreasing. It sheds light on the necessity of intensifying the contemporary reforms in China.

Chapter 1

Does Adversity Affect Long-Term Consumption and Financial Behaviour? Evidence from China's Rustication Programme[1]

Does adversity affect long-term economic behaviour? How does a policy influence one generation over the long term? In the first chapter, I examine the long-term consequences of adversity on consumption and financial behaviour, using the largest forced migration experiment in history.

From 1966 to 1978, 17 million urban youths in China, mostly junior or senior high school graduates, were sent to the countryside to do farm work for an average of three to four years under a rustication policy. Using data from the mini-census in 2005, I find that the rusticated generation behaves more conservatively than the non-rusticated generations over the long term, as they consume less housing and purchase more insurance and pension.

In addition to the cross-generational influence, I investigate the intra-generational effects of rustication with data from the Chinese Household Income Project in 2002 and the Chinese Twins Survey in the same year. A similar conservative behavioural pattern is revealed. Individuals with rustication experience spend less on housing, accumulate more savings and insurance, and invest less in risky assets, compared to their age-eligible but non-rusticated peers. Applying a habit-forming model, I suggest that one interpretation for the conservative behaviour lies in the habits formed during adversity. The results shed light on how a policy, especially in the early stage of life, influences one generation over the long term.

As the first chapter of the thesis, it starts with an investigation of inequality with a focus on the historically under-represented group - the rusticated population. This chapter examines how early experience affects one generation, and lays foundation for the analyses of intergenerational inequality and its interplay with cross-sectional inequality in chapters 2 and 3.

[1] A preliminary version of this chapter began circulating in 2013 with the title "Adolescent Shock, Resilience, and Long-Run Effects on Income and Consumption".

1.1 Introduction

Does adversity affect long-term consumption and financial behaviour? How does a policy influence one generation over the long term? I aim to address these two questions in this paper. Literature in economics, sociology, and psychology demonstrates evidence to support the correlation between early life experience and later economic behaviour. In the literature for the Great Depression, Malmendier & Nagel (2011) find that macroeconomic experiences influence individuals' risk taking behaviour. The generation which experienced the Great Depression tends to take fewer financial risks throughout their lives. They also have a markedly lower consumption of durable goods, as shown in Romer (1990) and Crafts & Fearon (2010). Schoar & Zuo (2013) examine the managerial styles of CEOs, and find that those entering the labour market during recession periods behave in a more conservative way.

Similar evidence is revealed among studies on the median- or long- term effects of military service or wars. Benmelech & Frydman (2014) study the behaviour of CEOs with military experience, and find that they are associated with conservative corporate policies and ethical behaviour. Blattman (2009) and Bellows & Miguel (2009) indicate that war violence changes individuals' political attitudes. They are more likely to join local political groups and vote after wars. With respect to other life adversities, Alesina & La Ferrara (2002) and Castillo & Carter (2007) present empirical evidence that people with traumatic experiences, such as disease or divorce, have less trust in others but show more altruism.

In this paper, I use a new quasi-natural experiment, China's rustication policy (programme), to investigate the long-term effects of adversity on economic behaviour. From 1966 to 1978, 17 million urban youths, mostly junior or senior high school graduates (born between 1946 and 1961), were sent to the countryside to do manual work for three to four years on average. With a shift from privileged urban status to an unprivileged rural one during adolescence, their behaviour on consumption and finance is expected to change. Previous studies have intensively investigated the long-term influence of rustication on education and income (Deng & Treiman, 1997; Giles *et al.*, 2008; Xie *et al.*, 2008; Yang & Li, 2011). Several papers touch upon its impacts on mentality or consumption, though with limited empirical evidence or remaining in the dimension of home appliances (Zhang *et al.*, 2007; Zhou, 2013). Nevertheless, as a big change in identity during adolescence when one's belief toward the world is first established (Ghitza & Gelman, 2014), the influence of rustication on later economic behaviour is worth investigating. In this paper, I concentrate on examining its impacts on consumption and financial behaviour, as well as demonstrating auxiliary findings on labour input, education, and income, which

echo the literature (Deng & Treiman, 1997; Xie *et al.*, 2008; Yang & Li, 2011).

I apply difference-in-difference, ordinary least squares (OLS), and fixed-effects estimations to the mini-census in 2005, the Chinese Household Income Project in 2002, and the Chinese Twins Survey in 2002 respectively, to examine the cross- and intra- generational impacts of rustication. To start with, I apply difference-in-difference strategy to the mini-census in 2005 to depict the general behavioural pattern of the rusticated versus non-rusticated generations. Rustication varies across cohort and region. The generation of 1946-1961 were subject to the policy, with almost half of the population rusticated in practice. Cohorts born before 1946 or after 1961 were rarely sent to the countryside. In addition, rustication was more severe in large cities than small ones as the revolutionary propaganda was much stronger and coercion was enforced (Deng & Treiman, 1997). I find that the rusticated generation behaves more conservatively in consumption and finance than the non-rusticated cohorts. They live in smaller houses, spend less on housing purchase, and buy more insurance and pension even after three to four decades. These findings are consistent with the literature that individuals experiencing economic recession tend to spend less on durable goods (Romer, 1990; Crafts & Fearon, 2010), and have a lower willingness to take financial risk (Malmendier & Nagel, 2011; Schoar & Zuo, 2013; Benmelech & Frydman, 2014).

Rustication was announced as compulsory for all age-eligible high-school graduates at the start. However, the quotas of rustication varied according to economic situation and policy changes. When the quota was less than 100% (not all high-school graduates were required to be rusticated), some selection occurred (Li *et al.*, 2010). There are two types of selection in the rustication. First, there exists cross-household selection, as the previously privileged families (such as the rich and/or educated) lost power in the social re-shuffle and were less able to help their children acquire exemptions from rustication (Zhou & Hou, 1999; Li *et al.*, 2010). Second, there is within-household selection. In the case of a binding quota, the parents had to choose which child(ren) to be rusticated. To overcome the potential endogeneity, I specify two empirical strategies. On the one hand, I explicitly control fathers' socioeconomic traits as proxies for the family background in the OLS estimation, with data from the 2002 Chinese Household Income Project in absence of the co-residency bias.[2] On the other hand, I apply twin and sibling fixed-effects estimations to the 2002 Chinese Twins Survey, which is the first dataset on twins in China. Bias from common family background is eliminated. In addition, the within-household selection is largely reduced in the specification for identical twins, as they are genetically the same,

[2]The 2002 Chinese Household Income Project collects socioeconomic information on parents, despite their living separately or being deceased. Thus it overcomes the co-residency bias in conventional household surveys.

and have far less difference than non-identical twins or siblings that are further apart (Li *et al.*, 2010). Moreover, I specify a robustness check controlling the difference between identical twins using birth weight as a proxy for initial endowment following the literature (Rosenzweig & Wolpin, 1995; Behrman & Rosenzweig, 2004).

Just as with the difference-in-difference estimation, I find that individuals with rustication experience behave more conservatively than their age-eligible but non-rusticated peers. They spend less on housing consumption, save more, purchase more insurance, and invest less in risky assets such as stocks and bonds. Consistently across the three empirical strategies, I find that rustication decreases lifetime schooling, but does not have a significant influence on long-term income, as shown in previous studies (Meng & Gregory, 2002, 2007; Xie *et al.*, 2008; Yang & Li, 2011). The results remain robust if the potential influence from initial endowment, occupational choice, and spousal traits is taken into account.

Why do the rusticated individuals behave conservatively? With a simple habit-forming model, I consider one interpretation lies in the habits shaped during adversity (Becker & Murphy, 1988; Orphanides & Zervos, 1994; Crawford, 2010; Costa, 2013). Take housing for instance: given that the past and current consumption of habit-forming goods are complementary, the habit of depressed housing consumption formed during the rustication leads the later consumption to converge to a low steady state.[3] Empirical evidence examining the influence from the incidence versus the intensity of rustication supports the habit explanation. I find that it is mainly the rusticated years (the intensity) rather than the participation in the programme itself (the incidence) that contributes to the findings. The longer the rusticated period, the more likely is the convergence to a steady state of housing consumption. Interview evidence also supports this interpretation. The sent-down youths self-reported that they learned about the toughness of life from the adverse experience in rural areas (Zhou, 2013). It is consistent as well with the evidence on the role of habits and values as determinants for behaviour and socioeconomic changes, such as the rise of the middle class during the Industrial Revolution and modern capitalism (Doepke & Zilibotti, 2008; Weber, 2013). What is worth mentioning is that the habit explanation does not exclude other possible interpretations. Various channels could co-exist, interact with each other, and influence long-term economic behaviour together.

Forced migration to rural areas happened in countries other than China, though none is comparable to its huge population and age concentration in adolescence. Indonesia had a Transmigration programme through the 20^{th} century, moving landless people from

[3]During the rustication, the sent-down youths lived in small shabby houses, called *"collective units"* that were shared with many others. Even by the end of 1976, about 1 million rusticated youths still had no proper dwellings to live in, especially for those who were married (Bonnin, 2013).

densely populated areas to less populous areas. The total population influenced was around five million (Fearnside, 1997). The Soviet campaign, *Dekulakization*, deported better-off peasants and their families to distant parts of the Soviet Union and other parts of the provinces between 1929 and 1932. More than 1.8 million rich peasants were deported during the peak time of 1930-1931 (Conquest, 1987; Viola, 2007). Russia's Virgin Lands Campaign between 1954 and 1963 was considered the predecessor for China's rustication programme. Advertised as a socialist adventure, 300,000 youths travelled to the Virgin Lands in the summer of 1954 (Taubman, 2004). Another parallel can be drawn with the U.S.'s Indian Removal in the 19^{th} century. About 70 thousand Indians were forcibly relocated to designated territories, because of population density concerns and the availability of arable land. Nonetheless, China's rustication programme affects a huge population of 17 million, and has a demographic concentration on adolescence when the attitude towards the world is first established (Ghitza & Gelman, 2014).

To the best of my knowledge, this is the first paper that systematically investigates the long-term impacts of this biggest inner-country migration on economic behaviour. Previous studies focused on its impacts on education and income (Meng & Gregory, 2002, 2007; Xie *et al.*, 2008; Yang & Li, 2011). Other literature touches upon its influence on mentality or consumption, though with little empirical evidence or focusing on the outcome of household appliances (Zhang *et al.*, 2007; Zhou, 2013). Given that rustication shifts urban youths' privileged status into an unprivileged rural one during their adolescence when values are established, its impacts on behaviour are expected to be profound and worthy of investigation. In this study, I try to provide empirical evidence and explanation to locate the heterogeneity in economic behaviour. The study also sheds light on how a policy, pertaining to those in the early stage of life, exerts long-term impacts on a generation through changing their behaviour. The policy implication lies in the importance of later policy interventions if the policy makers take the long-term influence of one policy on economic behaviour into account.

The remainder of the paper is organised as follows. Section 1.2 specifies the theoretical framework. Section 1.3 provides institutional background on China's rustication programme. Section 1.4 describes three data sets followed by Section 1.5 which specifies corresponding empirical specifications. Section 1.6 presents and discusses empirical results. Section 1.7 draws conclusion.

1.2 Theoretical Framework

1.2.1 Set-Up

I adopt a habit-forming model to elaborate the long-term effects of rustication (Becker & Murphy, 1988; Abel, 1990; Orphanides & Zervos, 1994, 1995; Crawford, 2010). Suppose an individual has two consumption goods at period t: an ordinary good c_t with price 1, and a habit-forming good h_t (*eg.*, housing consumption) with price p. Her current utility, $u(c_t, h_t, s_t)$, depends on c_t, h_t, and a measure of stock of past consumption s_t, which depends on h_t but not c_t. The individual accumulates her future stock from previous consumption s_t and h_t. The evolution of stock is described below:

$$s_{t+1} = \delta s_t + h_t,$$

where δ is the depreciation rate of the past consumption stock. Through s_t and h_t, s_{t+1} enters the current utility $u(c_t, h_t, s_t)$. Her income y, is set constant following the literature (Becker & Murphy, 1988; Orphanides & Zervos, 1994, 1995). The maximisation problem is:

$$V(s_0) = max \sum_{t=0}^{\infty} \beta^t u(c_t, h_t, s_t) \tag{1}$$

$$s.t. \quad c_t + ph_t \leq y, \tag{2}$$

$$s_{t+1} = \delta s_t + h_t. \tag{3}$$

Following Orphanides & Zervos (1994), the utility function $u(c_t, h_t, s_t)$ follows the complementarity assumption that the current consumption h_t and the past consumption s_t are complements ($u_{hs} > 0$). In addition, this complementarity is stronger than that between c and $s(u_{hs} \geq u_{cs})$.[4]

Along an optimal path, the budget constraint (2) binds. By substituting $c_t = y - ph_t$ into the utility function, the objective function can be redefined as $x(h_t, s_t) \equiv u(y - ph_t, h_t, s_t)$, which is a function of h_t and s_t only. Rewrite the maximization problem (1) in a dynamic programming framework:

$$V(s) = \max_h [x(h, s) + \beta V(\delta s + h)]. \tag{4}$$

The correspondence describing the optimal consumption path is: $\phi^*(s) \equiv \{s' | V(s) = x(s' - \delta s, s) + \beta V(s')\}$. $\bar{s}$ is a steady state if $\bar{s} \in \phi^*(\bar{s})$. Define s^c as a critical level if

[4]The other three assumptions of the utility function are: Assumption 1. the function $u(c, h, s)$ is second-order continuous for $c, h, s \geq 0$. Assumption 2. the function u is increasing and strongly concave in c and h. Assumption 3. $u_c(c, h, s) > 0$ for all $c, h, s \geq 0$ (Orphanides & Zervos, 1994).

the optimal local dynamic diverges around it. Following Proposition 1 in Orphanides & Zervos (1994), the optimal paths are described as below:

Proposition: The optimal paths converge to a steady state monotonically from any initial stock; if the initial stock lies between two consecutive steady states, the optimal paths converge to either one or the other; exactly one critical level exists between any two consecutive stable steady states (Orphanides & Zervos, 1994).

1.2.2 Modelling the Impact of Rustication

I take the long-term impact of rustication on housing consumption as one instance to illustrate the incorporation of rustication into this model. Housing is habit-adjusted as discussed in the literature (Huang, 2012). Denote s_0 the initial individual stock of consumption at the start of rustication, and τ the duration of rustication. Define $h^*(s)$ the optimal unconstrained housing consumption, where s is the stock of past consumption. During the rustication, the housing consumption is depressed, as the sent-down youths lived in small shabby houses called *"collective units"*, which were shared with many others.[5] Thus I impose a cap on the housing consumption during the rustication, consistent with previous research (Costa, 2013). Set:

$$h_t = \bar{h} < h^*(s_0), \forall t \in [0, \tau]. \tag{5}$$

From the budget constraint (2), $c_t = \bar{c} = y - p\bar{h}, \forall t \in [0, \tau]$. Inserting $\bar{h}$ into eq.(3) and iterating, I obtain the stock of consumption at the end of rustication:

$$s_\tau(s_0) = \delta^\tau s_0 + \frac{1 - \delta^\tau}{1 - \delta}\bar{h}, \quad s_0 \ \ given. \tag{6}$$

If at the end of the rustication, the stock of consumption $s_\tau(s_0)$ is less than the critical level s^c, the housing consumption h_t will converge to a low steady state. Figure 1.1 illustrates the dynamics, with housing consumption on the vertical axis and the stock of consumption on the horizontal axis. The graphing follows Orphanides & Zervos (1995) and Costa (2013). Assume an individual is at the steady state $s_0 = s_h$ initially. During the rustication, she is forced to consume below $\bar{h}$, reducing her stock of consumption over the rustication period, τ. If by the end of the rustication, the stock of consumption $s_\tau(s_0)$ is less than a critical point s^c ($s^c < s_0$), she will enter a new optimal path converging to a new stable steady state with lower housing consumption. Alternatively, if the stock

[5] Even by the end of 1976, about 1 million rusticated youth still did not lived in proper dwellings, especially for those married couples (Bonnin, 2013).

of consumption after the rustication does not drop below any critical value, the housing consumption will converge back to the original level. To summarise:

Prediction: After the rustication, if an individual's stock of housing consumption drops below a critical level, she will enter a new optimal path converging to a steady state with lower utilization of housing consumption.

From the conventional budget constraint with saving, an increase in the financial assets is expected from the decreasing consumption as demonstrated in the prediction above.

What is worth mentioning is that the habit channel could co-exist with other channels, such as the changing risk aversion or discount rate.[6] However, those mechanisms are not mutually exclusive. Moreover, they interact with each other, and shape the long-term economic behaviour together.[7]

1.3 Institutional Background

From 1966 to 1978 during China's Cultural Revolution, approximately 17 million urban youths (1/10 of the urban population), most of whom were junior or senior high school graduates, were sent to the countryside (Li *et al.*, 2010). With no access to formal education, they spent 3-4 years on average in the rural area. They did heavy manual farm work for 12 hours per day and 7 days per week, as documented in Bernstein *et al.* (1977) and Zhou (2013). More than 90% returned to the cities by 1980, two years after the official end of the Cultural Revolution (Bonnin, 2013). About 5% never returned having married local peasants or found employment in non-agricultural jobs in rural areas (Zhou & Hou, 1999).

1.3.1 Origins and Rules of the Rustication

The earliest documented rustication was in 1955. It was small scale with less than 8,000 individuals affected (Bonnin, 2013). Large-scale rustication was initiated in 1966, with the start of the Cultural Revolution. In the first two years of the Cultural Revolution, primary schools, high schools, and universities were shut down. Many urban youths participated in the revolutionary activities. The rustication was made official in 1968,

[6]For instance, when the rusticated youths returned to cities, they were subject to fewer resources compared to their non-rusticated peers because of the lost years in the countryside. Poor economic status is associated with high risk aversion (Binswanger, 1981; Guiso & Paiella, 2008). To prepare for future rainy days, the rusticated youngsters are expected to consume less, save and insure more, and invest less in the risky assets. In addition, it is also plausible that the discount rate alters among the rusticated youths. They discount the future less and save more.

[7]For instance, the wealth effect after returning to cities could interact with the habit-forming channel, and aggravate the negative effect of rustication on housing consumption.

as Mao urged the urban youths to go to the rural areas to be re-educated by the farmers (Zhang *et al.*, 2007; Li *et al.*, 2010). Most were unwilling to be separated from families, and thus coercive techniques such as threatening parents with job loss were used (Deng & Treiman, 1997).

In addition to the revolutionary propaganda, rustication was motivated by deep economic concerns. The rising urban unemployment was an important cause for the large-scale rustication. Interrupted by the Cultural Revolution, senior high schools and universities closed and did not admit new students until 1971/1972. When they reopened, senior high schools did not recruit old students who missed the chance in previous years (Meng & Gregory, 2002). Universities did not admit senior high school graduates directly (Li *et al.*, 2010). The recruiting criterion was not academic merit, but performance in the Cultural Revolution (*e.g.,* participation in the rustication), political attitude, or family background.[8] The dysfunction of senior high schools and universities in absorbing graduates served to increase youth unemployment. In addition, shortly after the foundation of the People's Republic of China in 1949, the baby boom enhanced the employment pressure among urban youths (Banerjee *et al.*, 2010; Zhou, 2013). The red line in Figure 1.2 circles the first baby boom shortly after 1949. Those children were of high-school age when the Cultural Revolution started, and would enter the labour market if there was no rustication.

The local government had yearly send-down quotas to meet. The quota varied according to the economic situation and policy changes. Figure 1.3 depicts the number of rusticated youths migrating into rural areas (Kojima, 1996). From 1967 to 1968, approximately 2 million people were sent to the rural areas. This number peaked at 2.67 million in 1969 (Kojima, 1996; Bonnin, 2013). With the economic recovery and increasing supply of urban jobs, the number of rusticated youths dropped in the following years. A second peak appeared around 1975 when the four leaders of the Revolution, called the *"Gang of Four"*, seized power and strongly advocated rustication using patriotic propaganda (Bai, 2014).

1.3.2 Variation Across Cohort and Region

The majority of the rusticated youths were junior or senior high school graduates. I focus on the cohorts born between 1946 and 1961 following the literature (Li *et al.*, 2010). The earliest birth cohort of 1946 contains the senior high school graduates in 1966 when

[8]Section 1.3.3 discusses the role of family background on rustication in detail.

large-scale rustication began.[9] The latest birth cohort of 1961 includes the junior high school graduates in 1978 when the rustication programme was officially ended. Figure 1.4 graphs the rustication rate in each cohort. It validates the specification on the treated generation between 1946 and 1961. For cohorts out of this range, the rustication rate is less than 10%.

The destination of rustication also varies, depending on the home cities and time of rustication. Bonnin (2013) documents that most rustication was within the province and students were sent to the nearby countryside. However, there was about 8% cross-province migration, mostly from big municipalities to the remote frontiers. Figure 1.5 demonstrates the direction of cross-province migration. It was concentrated in the three biggest municipalities (Beijing, Tianjin, and Shanghai), but also included other provincial capitals such as Wuhan and Chengdu. The destinations were the remote frontiers, such as Heilongjiang in the northeast, Xinjiang in the northwest, and Yunnan in the southwest. Because of the variation of rustication across cohort and region, I adopt a difference-in-difference estimation to capture the generation effect of rustication. Details are displayed in Section 1.5.1.

1.3.3 Potential Endogeneity

Rustication was announced as compulsory for almost all age-eligible high school graduates at the beginning. Nevertheless, when the sent-down quota was binding (not all high school graduates were requested to be rusticated), some selection occurred. There was cross- and within- household selection during the rustication (Zhou & Hou, 1999; Li *et al.*, 2010). On the one hand, the possibility of being sent to the countryside varied across households. This is because the previously privileged families (*eg.,* the rich and/or the educated) lost power in the social re-shuffling of the Cultural Revolution. Thus they are less able to help their children acquire exemptions from rustication. One the other hand, children from previously unprivileged families with parents who were workers, farmers, or soldiers during that time period, were more likely to be able to inherit their parents' jobs or join the army. Thus they were able to return to cities earlier, or even be exempted from rustication. In the 1970s, the rustication policy was relaxed. A small proportion of junior high school graduates, most with favoured family backgrounds, were directly admitted into senior high schools.

Figure 1.6 displays one instance of how the possibility of rustication varies with family

[9] During that period, children were admitted into primary school around the age of 8. Primary-school education lasted for six years, followed by three years of junior- and senior- high school education, respectively (Li *et al.*, 2010).

background. The bar indicates the possibility of being rusticated. Numbers in brackets indicate observations in each category with percentages in the parentheses. A majority of the fathers have educational level at elementary school level (35.6%), followed by those who with no schooling (29.3%), with junior high school level (18.3%), and with senior high school level or above (16.8%). Clearly, children from previously privileged family backgrounds, such as those with fathers who were intellectuals, had a higher probability of being sent to the countryside. This is because intellectuals were considered elites before the Cultural Revolution, and were against in the programme. A similar scenario applies to children of enterprise owners, as shown in Figure 1A.1. However, the magnitude of selection is small, with less than 5% conditional on fathers' educational level, or less than 10% on their social status.

In contrast, there is within-household selection in addition to the cross-household selection (Li *et al.*, 2010). Parents had to choose the child(ren) to go to the countryside if not all children were requested for rustication. Different empirical strategies are applied to address the cross- and within- household endogeneity, and will be described in Section 1.5.

1.4 Data

I use three data sets, each of which is associated with one empirical specification, to examine the long-term effects of rustication on housing consumption and financial behaviour. The three data sets supplement each other and are described as below.

1.4.1 Mini-Census 2005

I first use the 2005 mini-census to describe the behaviour of the rusticated generation versus non-rusticated generations. The generation experiencing rustication is expected to behave in a different way from their earlier or later counterparts, as almost half of them were rusticated, and the effect could spill over to other age-eligible but non-rusticated individuals. Figure 1.7 illustrates examples of the spill-over effects. For instance, the surge of population returning to cities after the programme may generate a demand shock on urban housing.[10] Importantly, the cross-generation investigation is not subject to the cross- or within- household selection as described in Section 1.3.3.

The mini-census was implemented from November 1 to November 10 in 2005 by the National Bureau of Statistics of China and the office of the 1% population sampling

[10]The rustication programme was ended officially in 1978. In the following year, 3.95 million rusticated youths returned to cities (Kojima, 1996).

investigation in the State Council of the People's Republic of China. It covered 1% of the national population, or approximately 13,000,000 observations. The data I use covers 20% of the mini-census. My sample focuses on the urban areas, since the target of the large-scale rustication policy was urban educated youths. Rural residents and urban-to-rural migrants are excluded.[11]

The merits of using this data set are two-fold: first, the sample covers all provinces and is representative of the general population. My sample contains approximately 1 million observations with intact information on education and income. The sampling is according to the population in each province, autonomous region, and municipality, and thus representative of the general population. Second, unlike the population census, the mini-census asks detailed questions on housing size, purchasing price, insurance, and working time, in addition to education and income. It provides a rare opportunity to investigate the overall pattern of consumption and financial behaviour across China.

The summary statistics are presented in Column (1) of Table 1.1. Individuals are in their late 40s in 2005 and are sex balanced (52% are male). Almost half (45%) of the sample has at least a senior high school level of education in 2005, but only 5% achieves university level. The annual income is 1,630 U.S. dollars (USD) in 2002 values. The average housing size is 59 square metres, with an estimated market housing price of 7,645 USD in 2002 values. The average working hours are 46 hours per week, or approximately 9 hours per day.[12] Concerning insurance purchase, 30% of the population have unemployment insurance. The proportion of pension and health insurance almost doubles, possibly because of the average age being in the late 40s, when old-age support and medical care become increasingly important.

One possible caveat lies in no direct measurement on rustication being available in the mini-census. However, as I am interested in the cross-generational influence, this information is not necessarily needed. The following two datasets provide detailed rustication information at the individual level, which examines the intra-generational effects of rustication.

1.4.2 Chinese Household Income Project 2002

I apply the 2002 Chinese Household Income Project (CHIP 2002) to examine the intra-generational effect of rustication. CHIP 2002 is a joint research study sponsored by the Institute of Economics at the Chinese Academy of Sciences, the Asian Development Bank,

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

[12] The official working days per week in China are five after 1995.

the Ford Foundation, and the East Asian Institute at Columbia University. Consistent with the previous strategy, I focus on urban residents only. The data covers 54 cities or municipalities from 11 provinces in China, as marked in dark grey in Figure 1.8.

The advantages of using CHIP 2002 data to analyse the long-term impacts of rustication lie in the following features. First, the CHIP project provides rich data on rustication and outcome variables. The survey asks each individual above 35 years old about the experience of rustication and the length of time one was sent to the countryside. In addition, it records the individual's housing consumption (housing size and market price), saving, investment portfolio, expenditure on insurance, as well as working time, occupation, education and income. It provides a rare opportunity to investigate the consequences of rustication from various perspectives. Secondly, it collects information on family background in the absence of co-residency bias. The survey reports socioeconomic status on the parents of household heads and spouses, regardless of whether they live together or are alive. The information contains parental educational levels, social status classified before the Cultural Revolution, and political party affiliation. To the best of my knowledge, this is the only household survey in China that provides such detailed information on family background and overcomes co-residency bias. Last but not least, the area under this survey is geographically and economically representative, which provides an opportunity to yield nationally representative estimates.[13]

Column (2) in Table 1.1 presents the summary statistics. They are generally the same as those found in the mini-census, with no statistically significant differences reported. Among those age-eligible youths born between 1946 and 1961, 42% have been rusticated. Conditional on being rusticated, the average length of being sent to the countryside is 3.89 years (detailed tabulation of the rusticated years is shown in Table 1A.1). By the end of 2002, they have saved 4,342 USD, which is about three years' income.[14] In addition, they have invested 828 USD in stocks and bonds by the end of that year, which is almost half of their annual income. They also spend 195 USD on insurance, which is about 1/10 of annual income.

[13]CHIP is considered geographically representative as the areas under survey cover the northeast (Liaoning), the south (Guangdong), the southwest (Yunnan), and the west (Gansu). It is considered to be economically representative as the surveyed areas include the richest parts in China such as Beijing and Guangdong, as well as the least developed parts such as Gansu.

[14]Saving is defined as the summation of fixed and current deposits, stocks and bonds, and others. Other sources contain money lent, self-owned funds for family business, investment in enterprises/business (except stocks and bonds), and monetary value of commercial insurance as a deposit.

1.4.3 Chinese Twins Survey 2002

The third data set I apply is that of the Chinese Twins Survey in 2002, which is the first twins data set in China, designed by Professors Mark Rosenzweig and Junsen Zhang.[15] The survey was carried out by the National Bureau of Statistics in 2002 in five cities in China, depicted in yellow triangles in Figure 1.8.[16] It includes 1,838 identical twins, 1,152 non-identical twins, and 1,672 singletons (as control group) aged between 18 and 65. The survey collects information on each twin's housing consumption, working time, schooling, income, emotional control, and other demographic details, such as age, gender, and number of household members. Similar questions are also asked to their non-twin siblings and singletons in the control group.

My sample contains 602 identical twins and 4,866 siblings born between 1946 and 1961 with intact information on rustication, education, and income.[17] In addition to providing a rich set of outcome variables, I consider the following advantages of using the Twins Survey for this study. First, it contains detailed information on rustication, such as whether individuals were rusticated and for how many years. Second, it facilitates the elimination of bias from cross- and within- household selection, as discussed in Section 1.3.3. This is because identical twins share similar genetics and have same family background. By adopting a twin fixed-effects strategy, I can eliminate influence from the unobserved family background. In addition, the differences between identical twins are much less than those between the non-identical twins and among further apart siblings. Thus the within-household bias on rustication is much reduced under this strategy. Similarly, siblings share the same family background although with various genetic traits. The sibling fixed-effects estimation supplements the results from the twin fixed-effects strategy.

Summary statistics on identical twins and siblings are displayed in Columns (3) and (4) of Table 1.1, respectively. They are roughly the same as those presented in the previous two data sets. No statistically significant differences are found for the variables. Specifically, for identical twins born between 1946 and 1961, more than half (54.2%) were rusticated. Almost 30% (180 twins from 90 pairs) of them have within-twin difference in rustication, which generates the variation in the twin fixed-effects estimation. The variation of rustication within identical twins is demonstrated in Table 1A.2.

[15]Professor Mark Rosenzweig is Frank Altschul professor of Economics at the Yale University. Professor Junsen Zhang is Wei Lun Professor of Economics at the Chinese University of Hong Kong.

[16]The five cities are Chengdu, Chongqing, Harbin, Hefei, and Wuhan.

[17]The sibling sample includes siblings of all twins and singletons.

1.5 Empirical Specification

1.5.1 Difference-in-Difference Estimation

Rustication varies across cohort and region, as discussed in Section 1.3.2. Therefore I apply difference-in-difference estimation to the mini-census in 2005 to investigate the generational effect of rustication. The outcome variables contain housing consumption, insurance and pension purchase, as well as working time, education, and income.

The treated generation includes individuals born between 1946 and 1961. The comparison group contains individuals born between 1940 and 1966 but not in the treated generation. I also specify a complementary strategy as comparing balanced rusticated cohorts of 1946-1950 and 1954-1958 *versus* non-rusticated cohorts of 1941-1945 and 1962-1966. They are the earliest (1946-1950) and latest (1954-1958) rusticated cohorts *versus* the non-rusticated cohorts ahead (1941-1945) and afterwards (1962-1966). Specifically, the 1959-1961 birth cohort is excluded as individuals in that cohort were born during the Great Famine, and may otherwise contaminate the results.

In addition to birth cohort, rustication also varies across region. As documented in Bonnin (2013), the rustication was more severe in big cities, as the revolutionary propaganda was stronger and coercion was applied more heavily. To test this argument, I plot the city rustication rate against the logarithm of the city population using the census data in 1953, and present the result in Figure 1.9. A positive and statistically significant coefficient is revealed. With a 1% increase in the city population, the rustication rate is raised by 0.03 percentage points, and is statistically significant at the 5% level. As the average city rustication rate is 0.31 revealed from the Chinese Household Income Project 2002, the 1% rise in the city population indeed increases the city rustication rate by almost 10%. Consistent with the classification in the City Statistical Yearbook, I define cities with population above 1 million as big cities (NBS, 1985, 2002).[18]

The empirical specification is as follows:

$$y_{ict} = \alpha_1 big_c + \alpha_2 treated_t + \alpha_3 big_c * treated_t + X_{ict}\alpha_x + \mu_{ict} \tag{7}$$

where i stands for individual, c represents city, and t identifies time. *big* equals 1 if an individual lives in a big city. Otherwise, it equals 0. The dummy of *treated* equals 1 if an individual was born between 1946 and 1961. It equals 0 if he/she was born between 1940 and 1966 but not in the treated generation. In the complementary specification, *treated*

[18]The cut-off points of city size are 2 million, 1 million, 0.5 million, and 0.2 million according to the City Statistical Yearbook. The range of the population in big cities in 1953 was from 1,091,600 to 6,204,417. The range for small cities was from 26,200 to 916,800.

equals 1 if an individual was born in 1946-1950 or 1954-1958 cohort. It equals 0 if in either the 1941-1945 or 1962-1966 cohort.

y_{ict} is the outcome variable. It includes housing consumption (housing size and price), pension and insurance purchase (unemployment and health insurance), as well as education (dummies of having education at senior high school/above or university/above), income (logarithm of income in the last month), and working time (working hours last week). X_{ict} is a vector of control variables, which contain age, ethnicity, gender, and regional dummies. ϵ_{ict} is the disturbance term. Standard errors are clustered at the city level.

α_3 identifies the effect of rustication. One assumption for α_3 picking up the influence of rustication is that there is a parallel trend in outcome variables between big and small cities before the programme. Otherwise, the change may be because of events other than the rustication. Figures 1.10 - 1.12 check those trends. For instance, the senior high school rates in big cities (blue solid line) and small cities (red dashed line) are roughly parallel for cohorts prior to 1946 (Figure 1.10). With the start of the rustication, the senior high school rate remains stagnant in small cities but drops sharply in big cities. The deviation from the preceding parallel trend identifies the effect of rustication. Similar parallel trends are displayed in income (Figure 1.11) and housing consumption (Figure 1.12), which validate my method of difference-in-difference.

A similar specification as that in Eq. (7) is carried out, except the dummy of big_c is replaced with a continuous variable of city population in 1953:

$$y_{ict} = \beta_1 pop53_c + \beta_2 treated_t + \beta_3 pop53_c * treated_t + X_{ict}\beta_x + \xi_{ict} \tag{8}$$

where $pop53_c$ is the logarithm of city population in 1953. Others variables remain the same as in Eq. (7).

1.5.2 OLS Estimation Controlling Family Background Explicitly

With application to the Chinese Household Income Project in 2002 as described in Section 1.4.2, I specify OLS regression controlling family background explicitly as follows:

$$y_i = \gamma_1 rus_i + \gamma_2 family_i + X_i\gamma_x + \epsilon_i \tag{9}$$

The sample is restricted to individuals born between 1946 and 1961. Standard errors are clustered at the city level and y_i is the outcome variable. It includes housing consumption (housing size and price), and a set of measures on financial behaviour such as saving, share of investment out of income on risky assets, and expenditure on insurance, which

examines individual allocation of net consumption wealth. It also contains education (senior high school/above or university/above), income (logarithm of annual income), and working time (monthly working days and daily working hours).

rus_i is the interested independent variable. It is either a dummy for being rusticated, or the total rusticated years. $family_i$ is a vector indicating family background, which includes dummies for fathers' social status, educational level, and political status. X_i is a vector of control variables, including age, ethnicity, gender, and provincial dummies in all specifications. Additional controls vary slightly in different regressions. In the specification for housing consumption, I control education, income, and number of household members. In the specification for financial behaviour, education and income are additional controls. In the specification for income, I follow the literature (Mincer, 1974; Li *et al.*, 2010) by controlling for schooling, working years, and the squared form. Schooling is included as one additional control in the equation for working time.

1.5.3 Twin and Sibling Fixed-Effects Estimation

Regressions under twin fixed-effects follow conventional specification in the literature (Li *et al.*, 2007, 2010). Conditional on the data availability, my empirical work focuses on estimating the effects of rustication on housing consumption, working time, education and income, with data from the Chinese Twins Survey. The econometric specifications are as below:

$$y_{1j} = \lambda_1 rus_{1j} + Z_j\lambda_Z + X_{1j}\lambda_X + \mu_j + e_{1j} + \varepsilon_{1j} \quad (10)$$

$$y_{2j} = \lambda_1 rus_{2j} + Z_j\lambda_Z + X_{2j}\lambda_X + \mu_j + e_{2j} + \varepsilon_{2j} \quad (11)$$

where the subscript j indicates family. The subscripts 1 and 2 refer to twin orders. All identical twins born between 1946 and 1961 were age-eligible for the rustication. y_{ij} ($i = 1, 2$) is the outcome variable, which includes housing consumption (housing size and property rights), working time (monthly working days and weekly working hours), education (dummies for having education at senior high school/above or university/above), and income (logarithm of income in the last month). rus_{ij} ($i = 1, 2$) is the interested independent variable. Similar to that in the OLS estimation, it indicates a dummy for being rusticated or the total rusticated years.

Z_j is a vector of observed family variables, such as regions, which are the same for identical twins. X_{ij} ($i = 1, 2$) is a set of twin-specific control variables, which differ slightly in the regressions for different outcome variables. Specifically, in the specification for housing consumption, X_{ij} contains age, gender, schooling, number of household

members and logarithm of monthly income. In the specification for working time, X_{ij} contains schooling years, in addition to the common controls of age and gender. In the regression for logarithm income, X_{ij} includes additional controls of schooling years, experience, and square form of experience, as under the OLS estimation. μ_j stands for unobserved family effect, such as parents' social, educational, or political status. e_{ij} $(i = 1, 2)$ indicates unobserved twin-specific endowment, such as ability, and ε_{ij} is the disturbance term. Standard errors are clustered at the household level.

Estimate of λ_1 under OLS estimation is biased because children from previously privileged families are more likely to be sent to the countryside, as discussed in Section 1.3.3. However, it is difficult to find proxies to identify unobserved family effect μ_j and twin-specific endowment e_{ij}, which are possibly correlated with rus_{ij}. To address the bias in OLS estimates, I apply fixed-effects estimation to identical twins. By taking difference between Eqs. (10) and (11), the fixed-effects estimator λ_1 below is obtained:

$$y_{1j} - y_{2j} = \lambda_1(rus_{1j} - rus_{2j}) + (X_{1j} - X_{2j})\lambda_X + \varepsilon_{1j} - \varepsilon_{2j} \tag{12}$$

The unobserved family effects μ_j are eliminated as twins share the same family background. Because identical twins are genetically the same, the influence from twin-specific endowment e_{ij} is reduced. One potential remaining concern is about within-twin selection. Parents may select one twin rather than the other to be sent down, depending on their unobserved endowment.[19] Nonetheless, this difference is far less between identical twins than that between non-identical twins or spaced siblings (Li *et al.*, 2010). I also implement sensitivity analyses to control for the twins' birth weight as measure for initial endowment in Section 1.6.6.

In addition, I apply sibling fixed-effects estimation to siblings of all twins and singletons. The specification is as follow:

$$y_j = \lambda_1 rus_j + Z_j\lambda_Z + X_j\lambda_X + \mu_j + \varepsilon_j \tag{13}$$

where μ_j stands for the unobserved family-specific heterogeneity, which can be eliminated by the fixed-effects estimation. Other variables are defined the same as in Eqs. (10) and (11).

[19] In the later stage of rustication, if a child was an only child or the only one staying at home, he/she could be exempted from the rustication (Liu *et al.*, 1995; Zhou & Hou, 1999).

1.6 Empirical Results

Literature has intensively investigated the influence of rustication since the 1990s, although most focuses on education and income, or on household appliance in recent work (Zhou & Hou, 1999; Xie *et al.*, 2008; Li *et al.*, 2010; Yang & Li, 2011; Zhou, 2013). In this section, I present my new findings on the long-term consequence of rustication on consumption and financial behaviour. I also display the similar results on education and income as shown in the literature, and the auxiliary finding on working time.[20]

1.6.1 The Long-Term Effect of Rustication on Housing Consumption

Table 1.2 presents the long-term effect of rustication on housing consumption. Panel A displays the cross-generational effects of rustication from difference-in-difference strategy. Columns (1) and (3) demonstrate the estimates from Eq. (7), while Columns (2) and (4) show the corresponding estimates from Eq. (8). The first row presents results comparing generation 1946-1961 *versus* other cohorts born between 1940 and 1966. The second row displays the estimates for cohorts 1946-1950 and 1954-1958 *versus* 1941-1945 and 1962-1966. Panels B-D present the intra-generational effects of rustication. Specifically, Panel B presents the OLS estimates controlling family background explicitly. Panels C and D display the results from twin and sibling fixed-effects estimations, separately. The effects of being rusticated and the length of rustication are demonstrated in different rows.

I find that the rusticated generation spends significantly less on housing consumption even in the 2000s, compared to their non-rusticated counterparts as shown in Panel A. Rustication has negative and statistically significant impacts on both housing size and purchase price, consistently across various specifications. As expected, the magnitudes of estimates in Columns (1) and (3) are consistently larger than those in Columns (2) and (4), as the former aggregates the effect from all big cities.

Controlling family background explicitly, the OLS estimates in Panel B reveal a similar pattern. The sent-down youths live in smaller dwellings by 1.8 square metres on average, compared to non-rusticated individuals with education and income controlled (Column (1) of Panel B). It is statistically significant at the 10% level of significance. One additional year of rustication reduces housing size by 0.5 square metres with statistical significance at the high 1% level (Column (2) in Panel B). With respect to the housing price, sent-down individuals spend 796 USD less than their non-rusticated counterparts. One more year of rustication is associated with 187 USD less in housing expenditure. The two estimates are at the 5% and 1% levels of statistical significance respectively. The

[20] Additional findings on self control and self reliance are shown in Table 1A.5 in the appendix.

magnitudes are similar to or within reasonable variation compared to those of estimates presented in Panels A.

Similar results are revealed under twin and sibling fixed-effects strategies. With one more year of rustication, the housing size decreases by 0.8 and 0.5 square metres among identical twins (Column (2) of Panel C) and siblings (Column (2) of Panel D) separately. The magnitude is similar to the one found under OLS specification. The two estimates are statistically significant at conventional levels. The rate of private home ownership drops as well, although with no statistical significance.

The negative impact of rustication on housing consumption is consistent with studies on the influence of the Great Depression. Romer (1990) and Crafts & Fearon (2010) find that the generation experiencing the economic crisis has a markedly lower consumption of durable goods. Similar to the economic recession, rustication induces individuals to forgo the pursuit of the largest household durable goods of housing.

1.6.2 The Long-Term Effect of Rustication on Saving and Investment

Table 1.3 presents the OLS estimates on the long-run influence of rustication on saving and investment, controlling family background explicitly. Columns (1) and (2) present the effects of rustication on the logarithm of household savings, which contains fixed and current deposits, stocks and bonds, and the monetary value of commercial insurance as a deposit. The last two columns display the corresponding results on the ratio of stocks and bonds relative to annual income. It aims to estimate the influence of rustication on the behaviour of investing in risky assets.

I find that rustication increases saving and decreases the investment in risky assets. Specifically, the rusticated youths accumulate 6.5% more saving compared with their non-rusticated counterparts, with statistical significance at the 10% level (Column (1)). In addition, with one more year of rustication, the ratio of stocks and bonds relative to the total income declines by approximately 0.03 percentage points (Column (4)). The estimates are statistically significant at the 10% level.

This financial behaviour is consistent with that of the depression babies (Malmendier & Nagel, 2011). The generation which experiences low stock/bond returns is less likely to participate in the stock/bond market throughout their life. Even if they participate, they invest a lower proportion of their income in such risky assets. Schoar & Zuo (2013) show that CEOs who enter the labour market during recession periods accumulate more long-term assets but have less asset turnover. Evidence on rustication agrees with the literature in the sense that the rusticated individuals accumulate more saving. However, contrast to the effect of the Great Depression, no stocks or bonds existed during the rustication period.

Nonetheless, the rustication still changes their investment behaviour as they spend less in risky assets.

1.6.3 The Long-Term Effect of Rustication on Insurance and Pension

Table 1.4 presents the long-term impacts of rustication on insurance and pension purchase. Panel A presents the difference-in-difference estimates from the 2005 mini-census. The outcome variables are dummies if an individual purchases unemployment or health insurance, or a pension. Panel B displays the OLS estimates of the effect of rustication on annual insurance expenditure from CHIP 2002.

I find that the sent-down generation purchases more insurance than the non-rusticated generations as shown under the difference-in-difference strategy in Panel A. Rustication increases the possibility of purchasing a pension by 0.9%-4.1% (Columns (2) and (5) in Panel A). The probability of buying health insurance is also increased by 1.2%-5% (Columns (3) and (6) in Panel A). All the coefficients are statistically significant at a high 1% level of significance.

Similar evidence is found under the OLS strategy controlling family background explicitly. The sent-down experience increases annual insurance expenditure by 51 USD (Column (1) in Panel B). This estimate is statistically significant at the 10% level of significance. Given the average insurance expenditure is 195 USD (Column (2) in Table 1.1), rustication raises the insurance purchase by almost 25%.

This finding is consistent with the literature that individuals born during the Great Depression are less willing to take financial risks in later life (Malmendier & Nagel, 2011). It is also in accord with the mass media report that Millennials experiencing the economic recession in late-2000s behave in a more risk-averse manner (Groth & Giang, 2012). As shown in the literature, more risk aversion is associated with more insurance purchases (Cicchetti & Dubin, 1994; Rabin & Thaler, 2001). Although no insurance or pension existed during the rustication, the adverse experience still influences the treated population in that they purchase more health insurance and pension in the long run. Nevertheless, rustication does not have a statistically significant impact on the purchase of unemployment insurance. A possible explanation is that the rusticated youths were at the late stage of their working life cycle (44-59 years old) in 2005. The risk of unemployment is low and replaced by the approaching retirement.

1.6.4 Auxiliary Findings: The Long-Term Effect of Rustication on Education, Income, and Working Time

The Long-Term Effect of Rustication on Education and Income The effects of rustication on education and income are first-order results and are studied intensively (Deng & Treiman, 1997; Zhang *et al.*, 2007; Giles *et al.*, 2008; Xie *et al.*, 2008; Yang & Li, 2011). In this section I display similar findings in Tables 1.5 and 1.6 to those in the literature. The table structure is the same as that of Table 1.2.

Lifetime education is decreased, as shown graphically in Figure 1.10 and empirically in Table 1.5. The rusticated generation has lower educational stock than the earlier or later generations, as shown in Panel A of Table 1.5. The finding is robust under various specifications of the difference-in-difference estimation. The intra-generational effect of rustication, as shown in Panels B-D, is consistent with the cross-generational evidence. Controlling for family background explicitly, one more rustication year reduces senior high school and university rates by 0.9% and 0.3% respectively, at a high 1% level of significance (Columns (2) and (4) in Panel B). Similar results are repeated under fixed-effects estimation. Compared to non-rusticated twins, the rusticated twins are 4.4% less likely to reach university level (Column (3) in Panel C). This coefficient is statistically significant at the 10% level of significance.

Although rustication reduces lifetime schooling, it has no statistically significant impact on income across various empirical specifications as shown in Table 1.6. The literature demonstrates similar results (Zhang *et al.*, 2007; Xie *et al.*, 2008; Yang & Li, 2011). Zhang *et al.* (2007) suggest that the insignificant change in income can be ascribed to the improved interpersonal skills and resilience generated by hardship. Detailed discussion is provided in Section 1.6.5.

The Long-Term Effect of Rustication on Working Time A consumer's utility is formed through consumption and leisure, as described in conventional microeconomic settings (MaCurdy, 1981; Seckin, 2001; Arrow & Dasgupta, 2009). Thus in addition to investigating the effect of rustication on housing consumption, I examine its impact on working time, which is a complement for leisure given the total time fixed. Table 1.7 reports the estimates under the four empirical specifications.

I find that there is no statistically significant cross-generational effect of rustication, as presented in Panel A of Table 1.7. In other words, the working pattern does not differ significantly between rusticated and non-rusticated generations. One explanation is the squeezing effect. As the rusticated youths work longer, they squeeze the working time for their peers. Therefore on average, the rustication does not have statistically significant

influence on working time for the overall treated generation.

In comparison to the insignificant cross-generational effect of rustication, the intra-generational effect of rustication on working time is positive and statistically significant as presented in Panels B-D. Specifically, rusticated youths spend around five more hours per week working (Columns (3) in Panels C and D), compared to non-rusticated individuals. The two estimates are statistically significant at 1% or 5% levels respectively. Similar results are revealed for the impact from the total length of rustication. With one additional year of being sent down, working time is raised by 0.2-0.3 days per month (Columns (2) in Panels C and D), and 1.7-1.9 hours per week (Columns (4) in Panels C-D), with statistical significance at conventional levels.[21]

These findings are consistent with mass media reports on the changing work ethic of generation Y who experienced the late-2000s recession.[22] They are "twice as keen to work" (Keogh, 2012), and "work incredibly hard" to protect their jobs (Groth & Giang, 2012), as they start to consider a good job as a "privilege" rather than a "given" (Levit, 2010). However, to the best of my knowledge, all of these claims are from employers' reports or interviews. No empirical studies have been done in this area. This research attempts to provide evidence from survey data to examine the impact of adverse experience on work ethic.

1.6.5 Incidence *Versus* Intensity of Rustication

Does the incidence or the intensity of rustication shape long-term economic behaviour? In this section, I examine the effects of being rusticated and the length of rustication simultaneously, under a twin fixed-effects estimation. Supporting evidence for the habit channel is revealed in Table 1.8.

With the rustication dummy (the incidence) and the total years (the intensity) entering the equations simultaneously, I discover that it is the intensity, rather than the incidence of rustication, that drives the behaviour pattern. Specifically, with one more year of rustication, housing size is reduced by 0.63 square metres, with statistical significance at the 10% level (Column (1)). One additional rusticated year is also associated with 1.8 more hours of work per week, as demonstrated in Column (2). The estimate is statistically significant at the 5% level. The incidence of rustication, however, is not statistically significant in

[21]The measurement on working time from the Chinese Household Income Project (Panel B) is considered less precise than that from the Twins Survey (Panels C and D). In the former survey, average working time in the previous year is collected rather than that in the previous week as in the Twins Survey. Thus it introduces more memory errors.

[22]Generation Y, also known as Millennials, refers to those born between the early 1980s and early 2000s, who are the descendants of the Generation X.

either of the specifications.

Consistent with previous findings, neither the incidence nor the intensity of rustication affects long-term income, as shown in Column (3). In addition, neither of them has a statistically significant influence on education (Columns (4) and (5)), possibly because of the dispersed effects when putting the rustication dummy and length of time simultaneously into the regression.

The finding that the intensity rather than the incidence of rustication drives the results supports the explanation of habit formation. It is because the longer the rusticated years, the more stable the habit is. In this scenario, an individual is more likely to converge to the steady state in the long term.

1.6.6 Robustness Checks

Tables 1A.3 - 1A.4 show the robustness checks. To address the potential endogeneity from cross- and within- household selection, I use a twin fixed-effects strategy with an application to identical twins.

The first concern is that individuals' initial endowment may be correlated with their exposure to rustication and the later outcome simultaneously. In such a case, the estimates are contaminated. Although identical twins, for instance, are genetically similar to each other, their slight difference may still bias parental choice in making the rustication decision as discussed in Section 1.3.3. Following the literature, I choose weight at birth as one measure for initial endowment, and include it as an additional control in Eq. (12) (Rosenzweig & Wolpin, 1995; Behrman & Rosenzweig, 2004). Results are presented in Panel A of Table 1A.3. A similar pattern as that in the baseline results is revealed. The magnitudes and levels of significance of the robustness estimates are similar or within reasonable variation.

The second concern is that rustication may alter individuals' occupational choice and thus affect their long-term working behaviour. Taking the endogenous occupational choice into account, I control explicitly for the working sector and occupational type in the main regressions. Results are displayed in Panel B of Table 1A.3. Similar to the findings in the baseline results, the rusticated individuals decrease their housing consumption but work for longer hours. Moreover, I test directly the effects of rustication on participating in the state-owned sector, being a white-collar worker, or the possibility of self-employment. Results are presented in Table 1A.4. No statistically significant influence is revealed from rustication on the sectoral or occupational choice.

Last but not least, as housing consumption and time allocation are jointly decided between married couples, the traits of the spouse may also affect the results. To address

this concern, I include the schooling and working sector of the spouses of twins into the estimation. Again, the baseline results remain robust after controlling for spousal information, as shown in Panel C of Table 1A.3.

1.7 Conclusion

In this paper, I investigate the long-term consequence of adverse experience on economic behaviour. Using the largest forced migration experiment of China's rustication programme between 1966 and 1978, I estimate its influence on housing consumption and financial behaviour in the 2000s.

By applying a difference-in-difference estimation to the mini-census in 2005, I first examine the cross-generational effect of the rustication. I find that the rusticated generation behave more conservatively than the non-rusticated cohorts. They live in smaller houses, spend less on housing purchases, and buy more insurance and pension in the long term. Second, I investigate the intra-generational impact of rustication, applying OLS and fixed-effects estimations to the Chinese Household Income Project and the Chinese Twins Survey in 2002 respectively. A similar behavioural pattern was demonstrated. The rusticated individuals behave more conservatively than their non-rusticated counterparts. They reduce housing consumption, increase saving and insurance, and decrease investment in risky assets even three to four decades after the programme. The findings are consistent with the literature that consumer behaviour changes following economically hard times. Romer (1990) and Crafts & Fearon (2010) find that consumption on durable goods dropped sharply during the Great Depression. In addition, the depression babies who experienced low returns from stocks and bonds invest less in risky assets throughout their lifetime.

How to explain the long-term conservative behaviour after experiencing an adversity? I suggest that one interpretation lies in the habits formed during adversity. In the scenario of rustication, the sent-down individuals experienced depressed housing consumption during the rustication (Bonnin, 2013). Following the habit-forming model (Becker & Murphy, 1988; Abel, 1990; Orphanides & Zervos, 1994, 1995; Crawford, 2010), if their stock of housing consumption drops below a critical level at the end of the rustication, their lifetime consumption is expected to converge to a low steady state. Empirical evidence that the effects of rustication mainly derive from the intensity rather than the incidence supports this interpretation. The longer the rusticated years, the more likely it is that the housing consumption converges to a steady state. Consequently, saving can be expected to increase. What is worth mentioning is that, the habit interpretation does not exclude other possibly co-existing mechanisms.

This research fits with the literature on how adversity, such as economic recession, wars, or other traumatic life experiences, influences long-term economic behaviour (Bellows & Miguel, 2009; Blattman, 2009; Malmendier & Nagel, 2011; Schoar & Zuo, 2013; Benmelech & Frydman, 2014). It also contributes to studies on migration (Conquest, 1987; Mitchneck & Plane, 1995; Fearnside, 1997; Viola, 2007), and stands out as an analysis of the largest inner-country migration. Furthermore, it provides evidence on how a policy, and especially one applied in the early stage of life, influences long-term socioeconomic development. The future research agenda includes a general equilibrium analysis on the effects of rustication on cross-sectional inequality and intergenerational investment, its long-term effects on the connection between urban and rural areas, and on rural development.

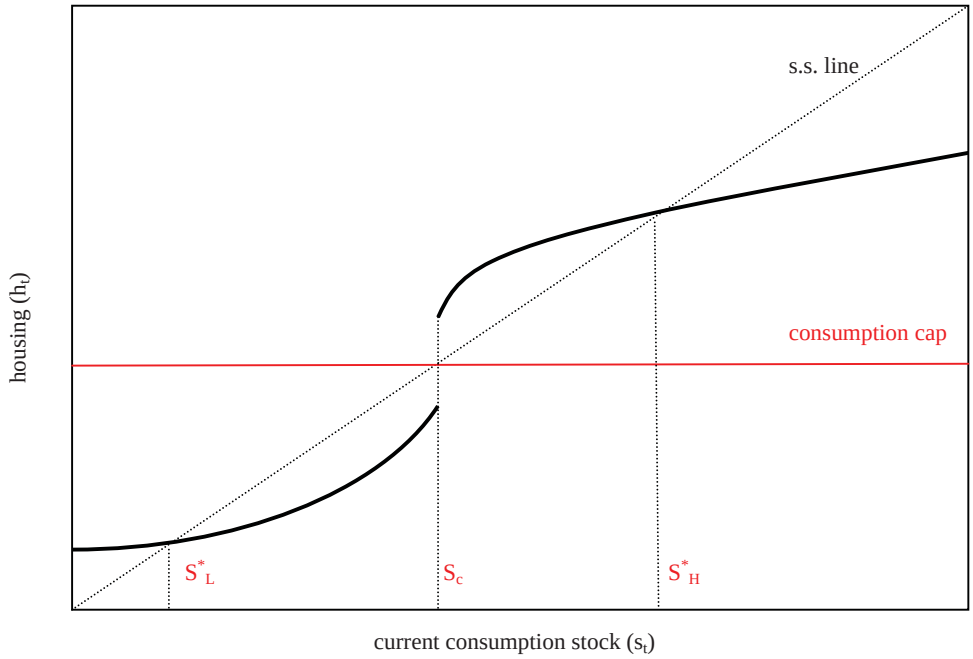
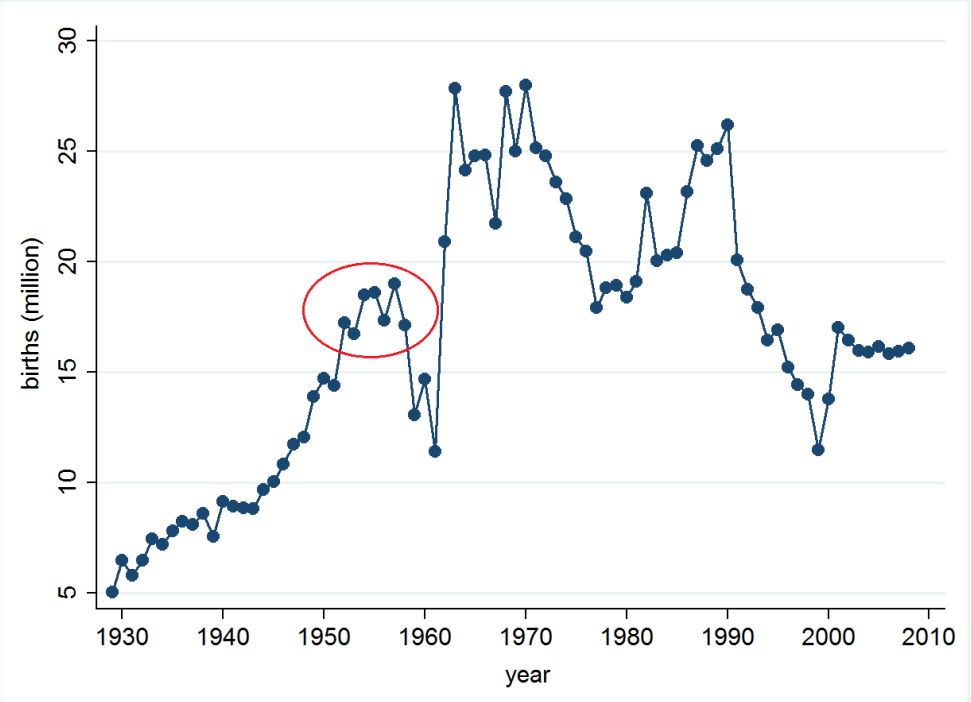
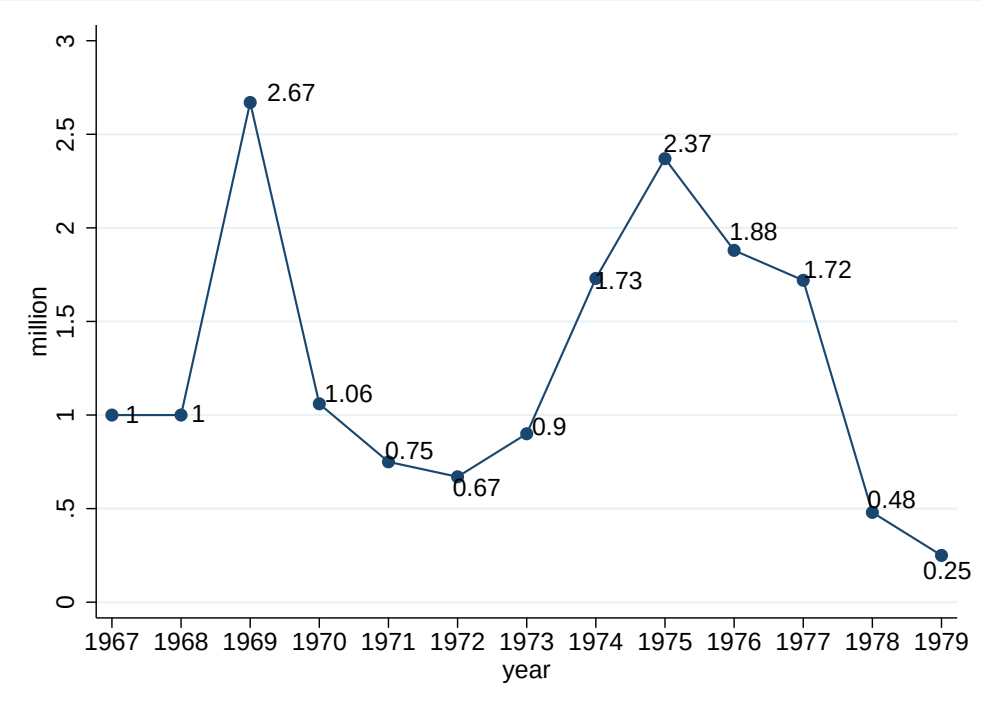


Figure 1.1: Illustration of Rustication Dynamics in an Optimisation Problem with Multiple Steady States



Data source: National Bureau of Statistics of China.
The red line circles the first baby boom after the foundation of P.R.China in 1949.

Figure 1.2: Number of Births in China (1930 - 2010)



Data source: Kojima (1996).

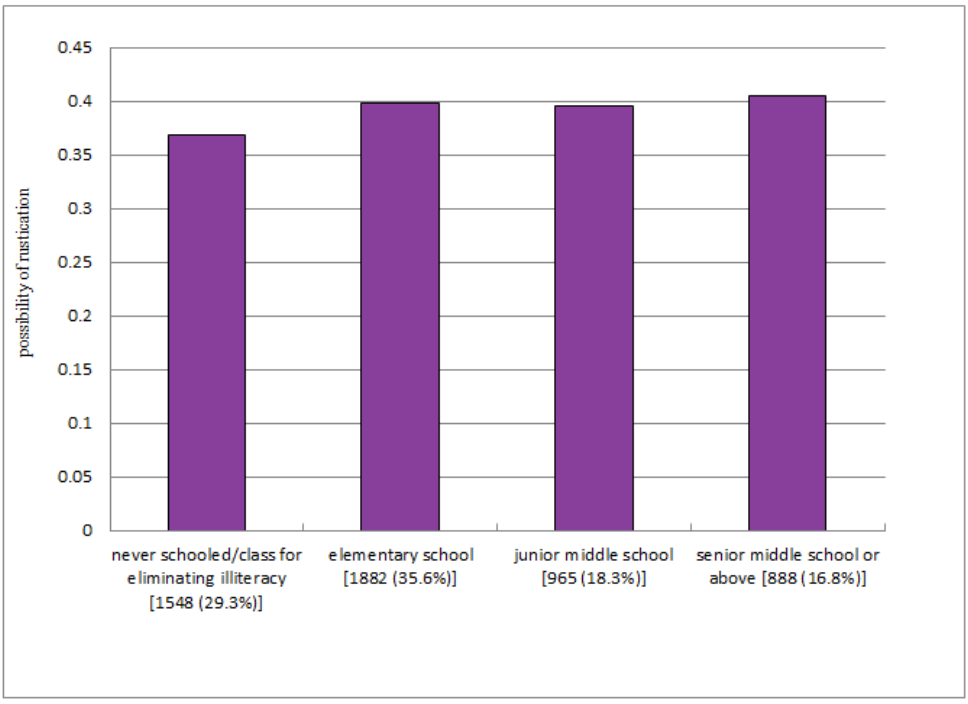
Figure 1.3: Number of Rusticated Youths

Data source: Chinese Household Income Project 2002.

Figure 1.4: Rustication Rate in Each Cohort

Data source: Bonnin (2013).

Figure 1.5: Migration in the Rustication



Data source: Chinese Household Income Project 2002.

Figure 1.6: Variation in the Possibility of Rustication by Father's Educational Status

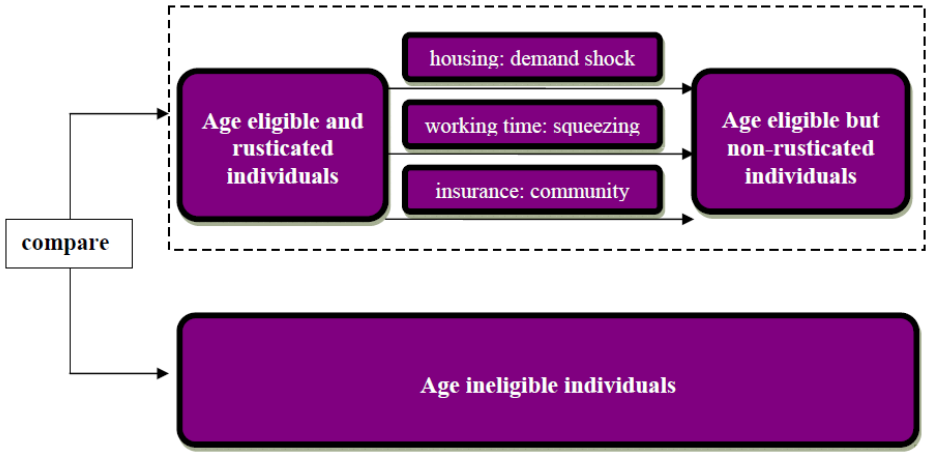


Figure 1.7: An Illustration on the Spill-over Effect of Rustication

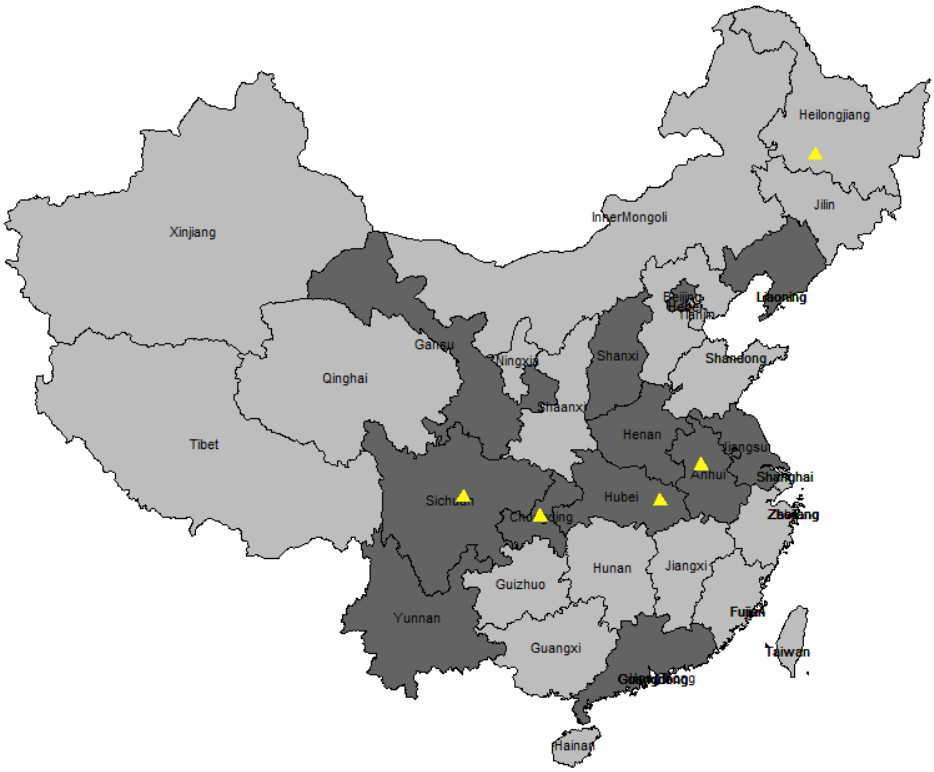
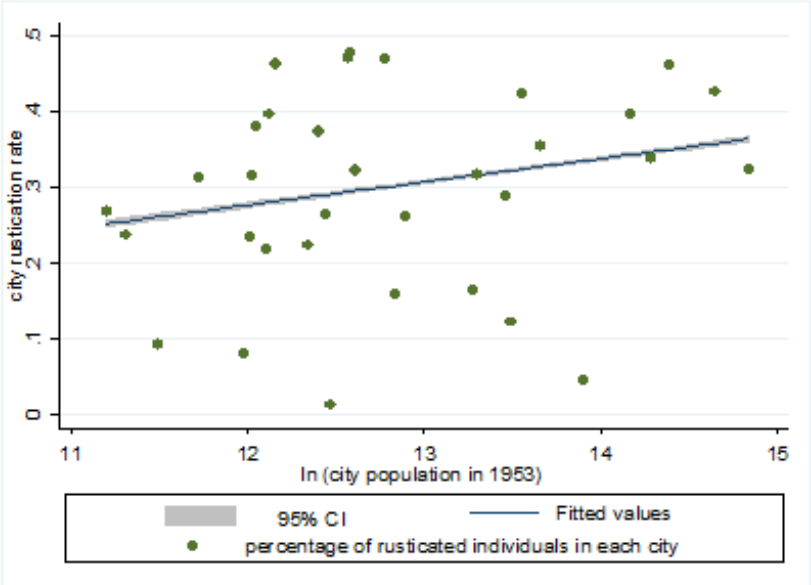


Figure 1.8: Data Coverage in the Chinese Household Income Project 2002, Chinese Twins Survey 2002, and mini-census 2005



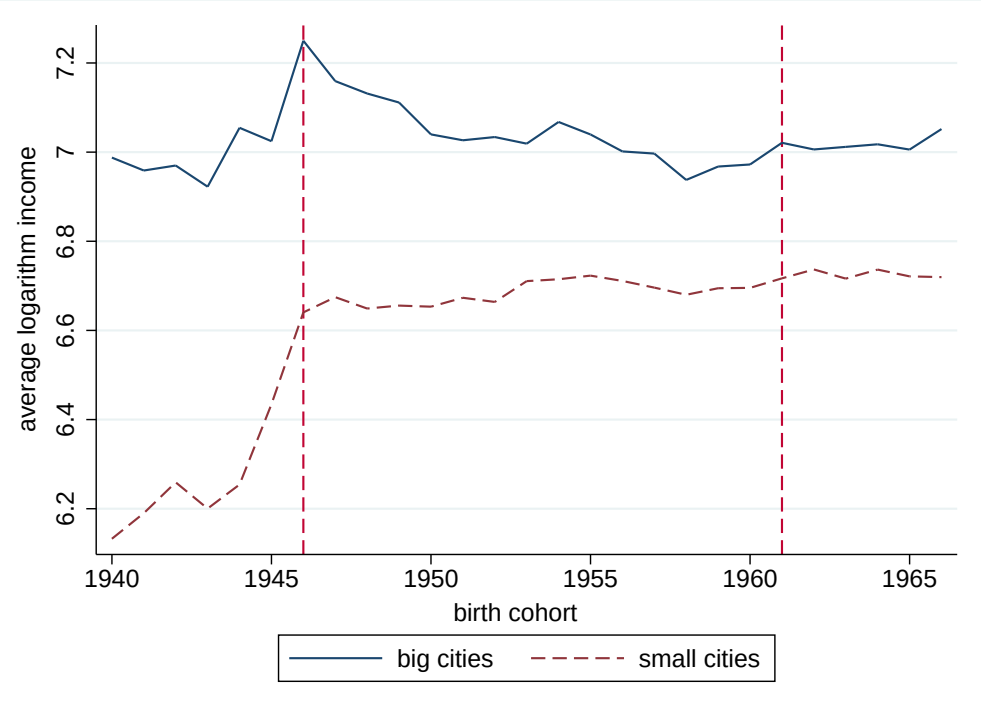
rustication rate = -0.088 + 0.03 ln (city population in 1953)
(0.197) (0.015)

Data source: Chinese Household Income Project 2002 and Census 1953.

Figure 1.9: Rustication Rate and City Population in 1953

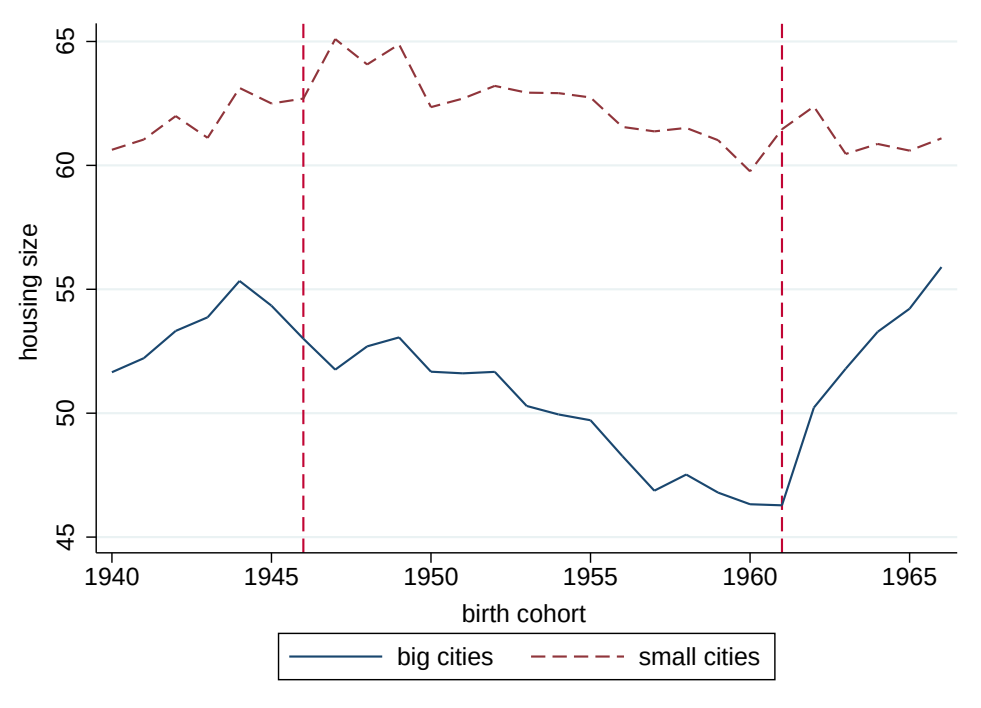
Data source: Mini-census 2005.

Figure 1.10: Senior High School Rate in Each Cohort



Data source: Mini-census 2005.

Figure 1.11: Average Logarithm of Monthly Income in Each Cohort



Data source: Mini-census 2005.

Figure 1.12: Housing Size (square metres) in Each Cohort

Table 1.1: Summary Statistics for the Rusticated Generation (Birth Cohort 1946-1961)

	Mean (Standard deviation)			
	Mini census 2005	CHIP 2002	Identical twins 2002	All siblings 2002
	(1)	(2)	(3)	(4)
Age	49.75	48.02	47.19	47.81
	(7.39)	(4.13)	(3.93)	(4.04)
Gender (male = 1)	0.52	0.49	0.48	0.48
	(0.50)	(0.50)	(0.50)	(0.50)
Being rusticated	-	0.42	0.54	0.45
(yes = 1)	-	(0.49)	(0.50)	(0.50)
Rusticated years	-	3.89	3.40	4.02
(conditional on rustication)	-	(2.66)	(3.46)	(3.29)
Senior high school	0.45	0.59	0.54	0.50
or above	(0.50)	(0.49)	(0.50)	(0.50)
University or above	0.05	0.05	0.05	0.05
	(0.22)	(0.21)	(0.21)	(0.22)
Annual income (USD)[a]	1,630.07	1,447.50	1,391.79	1,242.76
	(1,507.98)	(1,066.13)	(2,153.70)	(1,898.29)
Housing size (m^2)	58.92	50.13	60.35	58.66
	(41.14)	(22.76)	(40.81)	(38.55)
Private housing (=1)	-	-	0.77	0.78
	-	-	(0.42)	(0.41)
Housing value (USD)[b]	7,645.06	10,135.41	-	-
	(14,623.06)	(11,798.46)	-	-
Saving (USD)	-	4,341.84	-	-
	-	(5,162.82)	-	-
Investment on stocks	-	828.14	-	-
And bonds (USD)	-	(2,679.77)	-	-
Annual insurance	-	194.96	-	-
expenditure (USD)	-	(756.40)	-	-
Unemployment insurance	0.30	-	-	-
(purchased = 1)	(0.46)	-	-	-
Pension	0.62	-	-	-
(purchased = 1)	(0.49)	-	-	-
Health insurance	0.61	-	-	-
(purchased = 1)	(0.49)	-	-	-
Monthly working days	-	22.86	22.27	22.38
	-	(3.89)	(5.76)	(5.59)
Weekly working hours[c]	45.56	40.25	42.88	42.87
	(10.96)	(6.73)	(15.14)	(15.71)
Observations[d]	223,722	4,469	602	4,866

Notes: [a] Annual income in Columns (1) and (2) is transferred from monthly income.
[b] Housing price in Columns (1) and (2) is purchasing price and estimated market price respectively.
[c] The weekly working hours in Column (2) is transferred by daily working hours*5, as the legal weekly working days are five in China in 2002.
[d] Number of observations varies slightly in the specifications for income, housing consumption, working time, saving, investment, and insurance, due to missing values.

Table 1.2: The Long-Term Effects of Rustication on Housing Consumption

Housing Consumption				
	(1)	(2)	(3)	(4)
Panel A. Difference-in-Difference Estimates - Mini Census				
	Housing size (m^2)		Purchasing price	
	big city * treated	population * treated	big city * treated	population * treated
1946-1961 vs.	-4.663***	-1.347***	-621.0**	-231.4**
others in 1940-1966	(1.134)	(0.324)	(315.1)	(101.8)
Observations	223,625	147,908	187,538	120,033
1946-1950 & 1954-1958 vs.	-4.584***	-1.357***	-594.8*	-231.5***
1941-1945 &1962-1966	(1.115)	(0.320)	(309.6)	(83.1)
Observations	169,159	110,930	142,369	90,615
Panel B. OLS Estimates - Control Family Background Explicitly (CHIP)				
	Housing size (m^2)		Purchasing price	
Being rusticated (=1)	-1.760*		-796.2**	
	(0.994)		(324.0)	
Rusticated years		-0.516***		-186.8***
		(0.154)		(61.5)
Observations	4,289	4,289	4,338	4,338
Panel C. Twin Fixed-Effects Estimates - Identical Twins				
	Housing size (m^2)		Property rights (private=1)	
Being rusticated (=1)	-3.653		-0.006	
	(2.714)		(0.058)	
Rusticated years		-0.806**		-0.005
		(0.362)		(0.009)
Observations	584	584	570	570
Panel D. Family Fixed-Effects Estimates - All Siblings				
	Housing size (m^2)		Property rights (private=1)	
Being rusticated (=1)	-2.976		-0.019	
	(2.393)		(0.046)	
Rusticated years		-0.535*		-0.0061
		(0.319)		(0.006)
Observations	826	826	788	788

Notes: robust standard errors are displayed in the parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Additional regressors in all specifications include gender, ethnics, age, and regional dummies. In addition, schooling years, number of household members, and income are controlled in Panels B-D. Father's social, educational, and political status are also controlled in Panel B.

Table 1.3: The Long-Term Effects of Rustication on Saving and Investment

Saving and Investment (CHIP 2002)				
	Ln (saving)[a]		**Stocks & bonds/income**	
	(1)	(2)	(3)	(4)
Being rusticated (=1)	0.065*		-0.111	
	(0.037)		(0.122)	
Rusticated years		0.003		-0.032*
		(0.006)		(0.018)
Observations	3,968	3,968	4,338	4,338

Notes: robust standard errors are displayed in the parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Additional regressors in all specifications include gender, age, schooling, regional dummies, father's social, educational, and political status. In the specifications for saving, income is also controlled.

[a] Savings contain fixed and current deposits, stocks and bonds, and monetary value of commercial insurance as a deposit.

Table 1.4: The Long-Term Effects of Rustication on Insurance and Pension

Insurance Purchase						
Panel A. Difference-in-Difference Estimates - Mini Census 2005						
	Purchase=1					
	big city * treated			population * treated		
	unemployment	pension	health	unemployment	pension	health
	(1)	(2)	(3)	(4)	(5)	(6)
1946-1961 vs.	0.031	0.031***	0.043***	0.009	0.009***	0.012***
others in 1940-1966	(0.019)	(0.008)	(0.008)	(0.006)	(0.003)	(0.003)
Observations	223,705	223,705	223,705	147,944	147,944	147,944
1946-1950 & 1954-1958 vs.	0.006	0.041***	0.050***	-0.0006	0.012***	0.013***
1941-1945 &1962-1966	(0.020)	(0.009)	(0.009)	(0.006)	(0.003)	(0.003)
Observations	169,225	169,225	169,225	110,959	110,959	110,959
Panel B. OLS Estimates -Control Family Background Explicitly (CHIP 2002)						
	Insurance expenditure					
	(1)			(2)		
Being rusticated (=1)	51.27*					
	(30.24)					
Rusticated years				7.14		
				(5.32)		
Observations	4,338			4,338		

Notes: robust standard errors are displayed in the parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Additional regressors in all specifications include gender, ethnics, age, and regional dummies. In addition, schooling years, income, and father's social, educational, and political status are controlled in Panel B.

Table 1.5: The Long-Term Effects of Rustication on Education

	Education			
	Senior high school or above		University or above	
	(1)	(2)	(3)	(4)
Panel A. Difference-in-Difference Estimates - Mini Census				
	big city * treated	population * treated	big city * treated	population * treated
1946-1961 vs.	-0.052***	-0.017***	-0.027***	-0.010***
others in 1940-1966	(0.015)	(0.004)	(0.005)	(0.001)
Observations	223,722	147,951	223,722	147,951
1946-1950 & 1954-1958 vs.	-0.047***	-0.014***	-0.025***	-0.010***
1941-1945 &1962-1966	(0.015)	(0.004)	(0.004)	(0.001)
Observations	169,238	110,963	169,238	110,963
Panel B. Probit/OLS Estimates - Control Family Background Explicitly (CHIP)				
Being rusticated (=1)	0.009		0.003	
	(0.019)		(0.007)	
Rusticated years		-0.009***		-0.003***
		(0.003)		(0.001)
Observations	4,465	4,465	4,465	4,465
Panel C. Twin Fixed-Effects Estimates - Identical Twins				
Being rusticated (=1)	-0.011		-0.044*	
	(0.485)		(0.027)	
Rusticated years		-0.007		-0.005
		(0.007)		(0.003)
Observations	602	602	602	602
Panel D. Family Fixed-Effects Estimates - All Siblings				
Being rusticated (=1)	0.011		0.005	
	(0.017)		(0.008)	
Rusticated years		-0.002		0.0002
		(0.003)		(0.002)
Observations	4,866	4,866	4,866	4,866

Notes: robust standard errors are displayed in the parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Additional regressors in all specifications include gender, ethnics, age, and regional dummies. Father's social, educational, and political status are also controlled in Panel B.

Table 1.6: The Long-Term Effects of Rustication on Income

Ln (income)		
	(1)	(2)
Panel A. Difference-in-Difference Estimates - Mini Census		
	big city * treated	population * treated
1946-1961 vs.	-0.004	-0.005
others in 1940-1966	(0.016)	(0.005)
Observations	117,128	75,504
1946-1950 & 1954-1958 vs.	0.013	0.0003
1941-1945 &1962-1966	(0.018)	(0.006)
Observations	88,563	56,399
Panel B. OLS Estimates - Control Family Background Explicitly (CHIP)		
Being rusticated (=1)	0.017	
	(0.023)	
Rusticated years		0.002
		(0.004)
Observations	4,338	4,338
Panel C. Twin Fixed-Effects Estimates - Identical Twins		
Being rusticated (=1)	0.075	
	(0.089)	
Rusticated years		0.017
		(0.013)
Observations	600	600
Panel D. Family Fixed-Effects Estimates - All Siblings		
Being rusticated (=1)	0.023	
	(0.026)	
Rusticated years		-0.003
		(0.006)
Observations	4,435	4,435

Notes: robust standard errors are displayed in the parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Additional regressors in all specifications include gender, ethnics, age, and regional dummies. In addition, schooling years, working years and the square form are controlled in Panels B-D. Father's social, educational, and political status are also controlled in Panel B.

Table 1.7: The Long-Term Effects of Rustication on Working Time

	Working Time			
	Monthly working days		Weekly working hours	
	(1)	(2)	(3)	(4)
Panel A. Difference-in-Difference Estimates - Mini Census				
	big city * treated	population * treated	big city * treated	population * treated
1946-1961 vs.	–	–	-0.091	0.009
others in 1940-1966	–	–	(0.206)	(0.067)
Observations	–	–	116,141	74,880
1946-1950 & 1954-1958 vs.	–	–	0.051	0.049
1941-1945 &1962-1966	–	–	(0.218)	(0.076)
Observations	–	–	87,850	55,954
Panel B. OLS Estimates - Control Family Background Explicitly (CHIP)				
Being rusticated (=1)	0.033		0.286	
	(0.149)		(0.212)	
Rusticated years		0.024		0.119**
		(0.023)		(0.056)
Observations	3,152	3,152	3,139	3,139
Panel C. Twin Fixed-Effects Estimates - Identical Twins				
Being rusticated (=1)	1.395		5.528***	
	(0.887)		(2.430)	
Rusticated years		0.295*		1.886***
		(0.170)		(0.517)
Observations	282	282	282	282
Panel D. Family Fixed-Effects Estimates - All Siblings				
Being rusticated (=1)	1.192		5.231**	
	(0.755)		(2.239)	
Rusticated years		0.199*		1.668***
		(0.103)		(0.341)
Observations	374	374	374	374

Notes: robust standard errors are displayed in the parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Additional regressors in all specifications include gender, ethnics, age, and regional dummies. In addition, schooling years are controlled in Panels B-D. Father's social, educational, and political status are also controlled in Panel B.

Table 1.8: The Long-Term Effects from Being Rusticated versus Rusticated Length

Twin Fixed-Effects Estimates					
	Housing size	Weekly working hours	Ln (income)	Senior high school/above	University/ above
	(1)	(2)	(3)	(4)	(5)
Being rusticated (=1)	-1.841	0.265	0.035	0.012	-0.042
	(2.924)	(3.557)	(0.096)	(0.052)	(0.028)
Rusticated years	-0.628*	1.849**	0.014	-0.008	-0.001
	(0.338)	(0.756)	(0.013)	(0.008)	(0.002)
Schooling	-0.431	0.387	0.040*		
	(1.027)	(0.586)	(0.023)		
Ln (income)	9.867***				
	(2.480)				
Number of household members	6.260***				
	(1.523)				
Observations	584	282	600	602	602

Notes: robust standard errors are displayed in the parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Additional regressors in all specifications include gender, ethnics, age, and regional dummies.

Appendix A

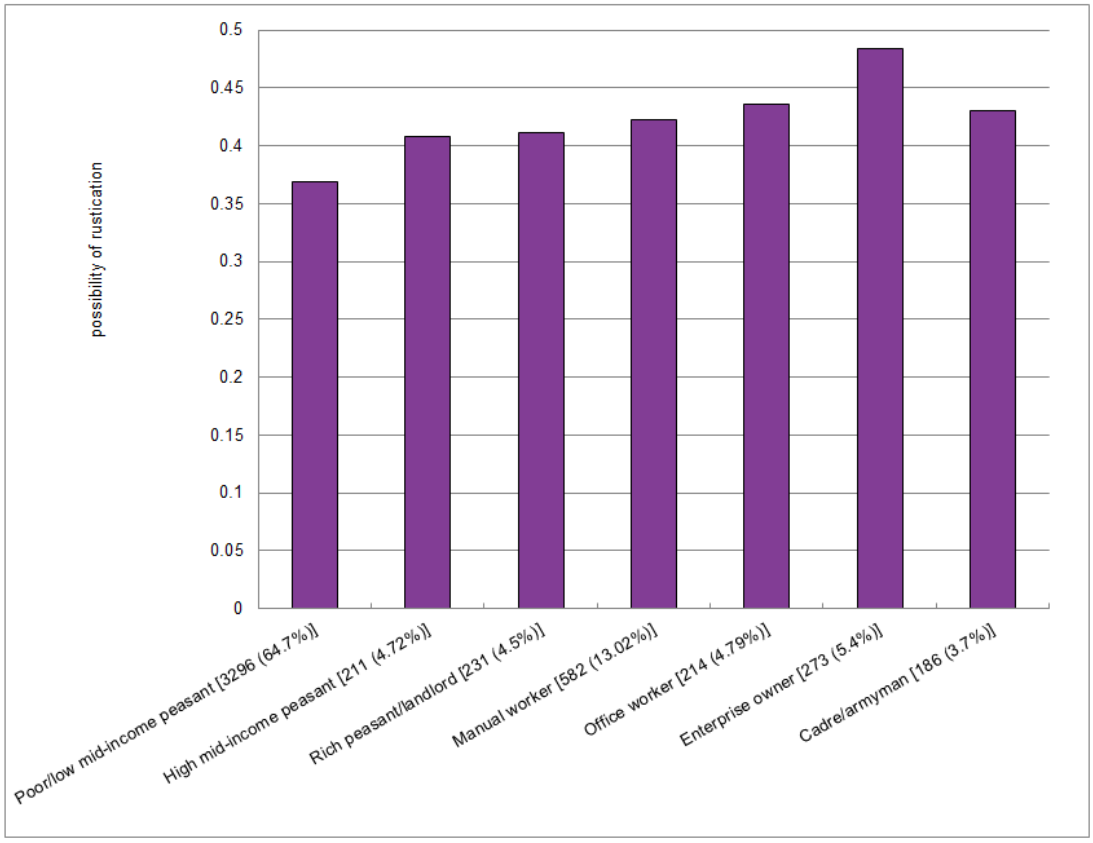
The Long-Term Effect of Rustication on Self Control and Self Reliance

As an exogenous shock, rustication transformed the youngsters' privileged urban status into an unprivileged rural one, and exposed them to unfamiliar environment. It is therefore expected to change their attitude toward others and control over themselves. Table 1A.5 presents my findings on the long-term effects of rustication on self control and self reliance.

Panel A presents the impact of rustication on self control ability, specifically on the capacity of controlling negative emotions, from the data of identical twins. The outcome variable is a dummy equal to 1 if an individual self-reports that he/she can always control anger or disgust. Otherwise it equals 0. Under twin fixed-effect estimation, I discover that individuals experiencing rustication are 17.5% and 18.1% more able to control anger and disgust respectively than their non-rusticated counterparts (Columns (1) and (3)). Both of the two estimates are at the 5% level of statistical significance. Similarly, with one more year of rustication, their capacity to inhibit negative emotion increases by 3%-4% (Columns (2) and (4)). Although the result is potentially subject to the self-report bias, it sheds light on the influence of rustication on non-cognitive skills (Zhang *et al.*, 2007).

Panel B shows the influence of rustication on self reliance. The outcome variable is a dummy of borrowing money from family or friends in emergency rather than from financial institutes with data from CHIP 2002. Columns (1) and (2) display the OLS estimates, while Columns (3) - (4) show the corresponding probit estimates, with family background controlled explicitly. With one additional sent-down year, an individual is about 0.4% less likely to borrow money from family members or friends in emergency, under both OLS and probit estimations (Columns (2) and (4)). Both of the two estimates are statistically significant at the 10% level of significance. In other words, they are more inclined to rely on themselves in the case of a financial crisis.

These findings are consistent with the literature that individual experiences affect psychosocial outcomes and shape attitude toward others. Blattman & Annan (2010) find that people exposed to severe war violence have higher psychological distress afterwards than those experiencing little war violence. Individuals with life traumatic experience, such as disease or divorce, are less likely to trust others (Alesina & La Ferrara, 2002). It is also coherent with the way that economic recession in the 2000s alters the Generation Y. They are reported to behave more modestly and hate conflicts (Groth & Giang, 2012).



Data source: Chinese Household and Income Project 2002.

Figure 1A.1: Variation in the Possibility of Rustication by Father's Social Status

Table 1A.1: Tabulation of Rustication Years

Years of rustication (conditional on being rusticated)	**count (percent)**
1 year	114 (5.89)
2 year	482 (24.88)
3 year	538 (27.77)
4 year	262 (13.53)
5 year	201 (10.38)
6 year	90 (4.65)
7 year and above	250 (12.91)
Mean	3.89 years
Observations	1,937

Notes: The data is from the Chinese Household Income Project 2002.
The sample is restricted to individuals born between 1946 and 1961.

Table 1A.2: Variation in Rustication within Identical Twins

Variation in rustication within twins	
Neither rusticated	186
	(30.90)
One rusticated	180
	(29.90)
Both rusticated	236
	(39.20)
Observations	602

Notes: The data is from the Chinese Twins Survey in 2002.
The sample is restricted to identical twins born between 1946 and 1961.

Table 1A.3: Robustness Checks (Twin Fixed-Effect Estimates)

	Twin Fixed-Effect Estimates - Identical Twins		
	Housing size	working days/month	working hours/week
	(1)	(2)	(3)
	Panel A. Control for initial endowment (birth weight)		
Being rusticated (=1)	-3.068	0.752	3.532*
	(2.824)	(0.759)	(2.038)
Rusticated years	-0.767**	0.262	1.745***
	(0.366)	(0.177)	(0.535)
Observations	572	272	272
	Panel B. Control for working sector and occupational type[a]		
Being rusticated (=1)	-5.524	1.388*	5.550**
	(3.488)	(0.802)	(2.265)
Rusticated years	-1.492**	0.246	1.833***
	(0.606)	(0.162)	(0.440)
Observations	270	282	282
	Panel C. Control for spouse's traits[b]		
Being rusticated (=1)	-9.366**	0.646	4.230
	(4.625)	(1.327)	(3.747)
Rusticated years	-1.880	0.174	2.236**
	(1.223)	(0.244)	(0.871)
Observations	192	134	134

Notes: robust standard errors are displayed in the parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Schooling years, income, and number of household members are controlled in the specification for housing size. Schooling years are controlled in the specification for working time.

[a] Working sector equals 1 if an individual is in the state-owned sector. Otherwise it equals 0. Occupational type equals 1 if an individual works with white-collar job. Otherwise it equals 0.

[b] Spousal traits include schooling and working sector.

Table 1A.4: The Long-Term Effects of Rustication on Occupational Choice

	Twin Fixed-Effect Estimates - Identical Twins					
	State-owned sector (=1)		White collar (=1)		Self-employment (=1)	
	(1)	(2)	(3)	(4)	(5)	(6)
Being rusticated (=1)	0.018		0.004		0.018	
	(0.087)		(0.078)		(0.034)	
Rusticated years		-0.011		0.011		0.013
		(0.018)		(0.020)		(0.013)
Observations	292	292	286	286	292	292

Notes: The sample is restricted to identical twins born between 1946 and 1961.
Schooling years are controlled in all specification.

Table 1A.5: The Long-Term Effects of Rustication on Self Control and Self Reliance

Self Control and Self Reliance				
	(1)	(2)	(3)	(4)
Panel A. Emotional control (identical twins)				
	anger control		disgust control	
Being rusticated (=1)	0.175**		0.181**	
	(0.079)		(0.079)	
Rusticated years		0.042***		0.030**
		(0.015)		(0.014)
Observations	272	272	270	270
Panel B. Borrow money from family/friends (CHIP)				
	OLS		Probit	
Being rusticated (=1)	-0.017		-0.017	
	(0.017)		(0.017)	
Rusticated years		-0.004*		-0.004*
		(0.003)		(0.002)
Observations	4,357	4,357	4,357	4,357

Notes: robust standard errors are displayed in the parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Additional regressors in all specifications include gender, age, schooling, and regional dummies. Father's social, educational, and political status are controlled in Panel B.

Chapter 2

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

In addition to the investigation of the long-term consequences of adversity on historically under-represented rusticated group, this chapter surveys the intergenerational mobility during China's current transition period and explores its interplay with the cross-sectional inequality.

Since the 1979 market-oriented reform, China's economic growth has been impressive. However, the rising income inequality is equally remarkable though less well understood (Brandt & Rawski, 2008; Xie & Zhou, 2014). In this chapter we first estimate the patterns of intergenerational mobility in income and education with respect to cohort. Our results show that intergenerational mobility in both income and education declines sharply along with the economic transition. Different from the focus on the historically under-represented group in chapter 1, we pay special attention to the currently under-represented groups in this chapter: females and residents from economically disadvantaged regions, such as rural and western parts. We find that the decreasing trend in the intergenerational mobility is particularly significant for those groups.

How does cross-sectional inequality interplay with intergenerational mobility? We second correlate intergenerational mobility with cross-sectional inequality and find a Great Gatsby Curve with a negative slope in China (Krueger, 2012). The negative slope indicates that with the increasing inequality in this country, poor families benefit less from the economic growth than rich families do. Together with the decreasing intergenerational mobility demonstrated above, we expect that cross-sectional inequality may increase in the future.

Finally, 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 through five factors: return to human capital, cost of education, government policies on human-capital investment, household income, and income inequality.

2.1 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 2.1 and 2.2). 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)?[23] What are the institutional and policy factors driving the changes in inequality 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 the best knowledge of our 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

[23]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).

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.

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 2.1). The substantial increase in the educational expenditure of the government also contributes to the undoing of household constraints (Figure 2.3). These two factors are expected to enhance intergenerational mobility jointly.[24] 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 2.4). Educational costs, such as tuition, have increased considerably as well (Figure 2.5). 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 2.6). 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 2.7). 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 under-

[24]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.

standing 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 reduced 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 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 2.2 introduces China's market-oriented institutional, educational, and fiscal policy reforms. Sections 2.3 and 2.4 present the empirical results of intergenerational mobility in income and education, respectively. Section 2.5 links intergenerational inequality with cross-sectional inequality by drawing and analysing the Great Gatsby Curve in China. Section 2.6 interprets the increase in

inequality and the decline in intergenerational mobility. Section 2.7 discusses the policy implications of our paper. Section 2.8 concludes.

2.2 Research Background

2.2.1 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.[25] 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 labour (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 labour in urban and coastal areas.

Given the surplus of labour 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 loosened from the late 1980s.[26] 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 labour 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.

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

[26] 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 labour mobility between rural and urban areas was virtually illegal. This *hukou* system segregated China into two labour markets.

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 labour market and promoted economic growth (Dong & Xu, 2008, 2009).

Market-oriented institutional reforms adjusted the incentive structure, enhanced labour productivity, and increased private return to human capital (Ge & Yang, 2014, 2011). Figure 2.4 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.*, 2012a).

Along with the increase in return to education, income inequality increased sharply. Li *et al.* (2012a) 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 2.8). The annual wage of the high-education group was only marginally 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 labour, 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 2.1). 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 exacerbate pre-existing regional inequality. [27]

2.2.2 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 labour accumulated prior to the economic reform (Heckman & Yi, 2012). The enrolment rate of primary school (grades 1-6) was 98% in 1981, as shown in Figure 2.9. The progression rate to secondary school, that is, the ratio of junior secondary school (grades 7-9) enrolments 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

[27] 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.

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.[28] 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 2.7 shows the central and local governmental education expenditure in 1991-2006. During this period, the share of local governmental expenditure out of total governmental educational expenditure has been increasing. Indeed, Heckman (2005) (Figure 1) shows that the per pupil expenditure is highly positively correlated with the local per capital GDP. For example, the per pupil governmental expenditure in Beijing was 16 times higher than that in Guizhou in 2004 (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 enrolment rates hovered around 1.5% to 2.5% (NBS, 2011a). With the economic growth and the rapid accumulation of physical capital, the return to educa-

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

tion increased substantially (Li *et al.*, 2012a).[29] The increasing marginal productivity of labour, especially of high-skilled labour, 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 2.10 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).[30] 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 mis-allocated. 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 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 2.3 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 2.5 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

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

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

their poorer counterparts have less capacity to do so. Therefore, the inequality in access to education increases over generations.

2.3 Intergenerational Income Mobility in China

2.3.1 Chinese Household Income Projects

We use data from the Chinese Household Income Projects (CHIPs) in 1995 and 2002 to estimate intergenerational income mobility.[31] 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 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.[32] We consider the following advantages of using CHIP data to analyse intergenerational mobility in income. First, CHIPs provide detailed income of each individual based on wage, subsidy, 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.[33]

In the appendix, we describes the main variables (Table 2A.1). 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).[34] Most of these individuals completed

[31] 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.

[32] 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.

[33] 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.

[34] We choose 1970 as a cut-off point because the economic reform began in 1978. The normal age at which children enrol in primary school is around 7 in China. Thus, those born after 1970 are considered to

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 labour 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 (USD 1,127) to RMB 15,432 (USD 1,864) in 2002 price. Children's average income is RMB 6,628 (USD 800) and RMB 8,940 (USD 1,080) in the two cohorts, respectively.[35] 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 RMB 7,860 (USD 949) to RMB 13,234 (USD 1,598).

2.3.2 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:

$$\ln y_{it} = \alpha_0 + \alpha_1 \ln y_{i,t-1} + \alpha_x X_i + \varepsilon_{it}, \tag{14}$$

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 age of the child and the father, the gender dummy of the child, wave dummy,

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.

[35]The income reported in the 1995 wave is adjusted by Consumer Price Index to the price in 2002.

and provincial dummies.[36] 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 labelled 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. By considering this potential difference, we investigate the intergenerational income correlation, which is defined as follows:

$$\text{correlation in log income} = \alpha_1 * \frac{\sigma_{t-1}}{\sigma_t}, \tag{15}$$

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 2.13 depicts mean log child income vs. the log parental income.[37] The association is flat at the bottom and increases sharply after the cut-off at approximately RMB 4,915, which is roughly the 38$^{\text{th}}$ quintile of the family income.[38] 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 2.14. 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).

[36] 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.

[37] 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.

[38] 4,915 is the natural exponential of 8.5.

The rank-rank regression is specified as below:

$$rank_{it} = \beta_0 + \beta_1 rank_{i,t-1} + \beta_x X_i + \epsilon_{it}, \tag{16}$$

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. (14). 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.

2.3.3 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 2A.2 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, where 1 indicates the lowest quintile and 5 refers to the highest quintile. 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 the mixed information, we need a regression analysis to examine the degree of intergenerational income mobility.

Panels A-C in Table 2.1 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, which is 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 2.15 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 2.1. 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, no such significant increase is observed in boys. We ascribe this gender difference to the higher return to human capital for girls than boys with the market reform (Figure 2.6). In addition, girls are more subject to family constraints than boys, especially those in the poor regions (Figure 2.11).[39] Our results are not likely to be biased by women's shift from labour market into households because of marriage. The labour 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.[40]

We note that the estimates may be contaminated by unobservables. Thus, we include pre-labour 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 sensitivity analysis (Table 2.2).[41] Similarly, the decline in mobility is driven by girls, with statistically significant increases across three specifications (Columns (7)-(9)).

Three sets of estimates are also generated for regional specific intergenerational mo-

[39]This topic is detailed in section 2.6.2.

[40]This issue is discussed in section 2.3.4.

[41]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.

bility in East, Central, and West China, as shown in Table 2.3.[42] The table format follows that of Table 2.1. 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 even 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 2.6 explains these findings in detail.

2.3.4 Absolute vs. Relative Intergenerational Income Mobility

In addition to estimating the *relative* intergenerational income mobility as in section 2.3.3, 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. (16)) 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). The 25^{th} percentile rank is selected 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 (Chetty *et al.*, 2014a). For family *i* in region *r (r=east, central, west)* the association between the

[42] 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.

percentile rank of children ($rank_t$) and parental percentile rank ($rank_{t-1}$) is:

$$rank_{irt} = \beta_{0,r} + \beta_{1,r} rank_{ir,t-1} + \epsilon_{irt}, \tag{17}$$

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$^{\text{th}}$ 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. (17):

$$rank_{25,r} = \beta_{0,r} + 25\beta_{1,r}. \tag{18}$$

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$^{\text{th}}$ 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 2.4 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 (0.455 in 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 2A.1 - 2A.4 in the appendix. The smaller the relative estimate, the more mobile a society is (in lighter colour). By contrast, the larger the absolute estimate, the more mobile a society is (in darker colour). 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 colour in Figure 2A.1 and the darkest colour in Figure 2A.2). In the late cohort, however, the western region shows the least intergenerational mobility (Figures 2A.3 - 2A.4).

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.[43] 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.

2.4 Intergenerational Education Mobility

2.4.1 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

[43]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.

siblings who are not living at home and collects their socioeconomic information.[44] 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.[45]

Table 2A.3 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.[46] 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.[47] The disparity in education between urban and rural areas persists for 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.[48] Across cohorts, the average schooling years of parents are almost doubled in both urban

[44]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.

[45]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).

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

[47]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.

[48]10.4 vs. 6.6 in the early cohort, and 12.2 vs. 7.8 in the late cohort.

and rural areas.[49] 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.

2.4.2 Econometric Specification

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

$$s_{it} = \gamma_0 + \gamma_1 s_{i,t-1} + Z_i \gamma_X + \epsilon_{it}, \tag{19}$$

where s_{it} represents the schooling years of the children; $s_{i,t-1}$ denotes the average schooling years of parents; Z_i is a vector of the control variables, including child's age, gender, *hukou* status, mother's age, dummies for surviving parents, and regional dummies.[50] 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):

$$\text{intergenerational education correlation} = \gamma_1 * \frac{\sigma_{t-1}}{\sigma_t}, \tag{20}$$

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:

$$rank_{it} = \lambda_0 + \lambda_1 rank_{i,t-1} + \lambda_Z Z_i + \phi_{it}, \tag{21}$$

where $rank_{it}$ and $rank_{i,t-1}$ are the percentile ranks of the children and their parents in their schooling 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_i denotes the same vector of control variables as in Eq. (19). Similar

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

[50] 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.

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.

2.4.3 Temporal Patterns of Educational Mobility

In this section, we first examine the cohort pattern. Panels A and B in Table 2A.4 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 2.5 present the intergenerational education association from three empirical specifications. The table format is similar to that of Table 2.1. 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 increases 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 (Panel B of Table 2.5) when it is corrected by the ratio of the standard deviation of parental schooling over the schooling of children (Eq. (20)). 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 2.16 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 2.6 - 2.7 show the regional disparity in intergenerational schooling mobility. Table 2.6 reports the intergenerational education association in urban and rural areas, whereas Table 2.7 presents the association in eastern, central, and western areas. We focus on the correlation and rank-rank estimation as these consider the differential positions of individual distribution in each generation. 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 2.6). 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 2.7, 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 0.072 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). 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 2.6.

2.4.4 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. (21). Absolute education mobility is based on Eqs. (17) and (18), except replacing parental and children's income ranks with their schooling ranks.[51] Table 2.8 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 2.4. The western region loses its premium with regard to absolute upward mobility in both education and income with the market reform.

Figures 2A.5 - 2A.8 in the appendix translate Table 2.8 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 2A.5 - 2A.6. 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 colour in Figure 2A.7) and the highest absolute upward mobility (darkest colour in Figure 2A.8). 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

[51] 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.

disparity between the coastal and inner areas.

2.5 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-series statistics imply a negative correlation between income inequality and intergenerational income mobility. Figures 2.1 and 2.2 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 2A.9 - 2A.10 graph correlations between income inequality and intergenerational income mobility. Figure 2A.9 ranks cohorts in different regions by two dimensions.[52] 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.[53] A large estimate indicates low intergenerational mobility. Given two cohorts and three regions, we obtain six data points. In Figure 2A.10, 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.[54] The slope coefficients also imply that the association between cross-sectional inequality and intergenerational mobility is economically important. For instance, Figure 2A.10 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 2A.9 - 2A.10, 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.[55]

[52]The definition of cohort is similar to that provided in Section 2.3.2 where we analysed the cohort pattern of intergenerational income mobility.

[53]The estimates are reported in Table 2.6.

[54]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.

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

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 2.17 - 2.18). 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 2.17, and the estimate of the absolute mobility in Figure 2.18.[56] 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 intergenerational education mobility are negatively related. The slope coefficients are both statistically and economically significant. For instance, Figure 2.18 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 labelled 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.

2.6 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.

[56] The estimates are reported in Table 2.8.

2.6.1 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).[57] The detailed model is provided in 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 income of children is 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 labour 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 increase 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 rising cost of human-capital investment in children, increasingly more poor families are not 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. If public expenditure mainly targets disadvantaged families, intergenerational mobility increases. On the opposite, 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

[57] A similar framework has also been discussed by Corak (2013) on income inequality, equality of opportunity, and intergenerational mobility. As discussed in Section 2.2.1, 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.

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

2.6.2 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 2.4 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 2.5 indicates that from 1991 to 2007, the ratio of tuition fees relative 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 2.3 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 public finance of education.

Therefore, children from poor regions are less likely to benefit from the increase in the expenditure on public education (Figure 2.7).[58] 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 2.1).

Our estimated decreasing intergenerational mobility implies 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. 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 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

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

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 2.6 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 2.11 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 2.12 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 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%.

2.7 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 increases the geographic variation in school quality. Thus, school quality is also likely to 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 19th and early 20th centuries. At that time, the US underwent 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 2.2). Specifically, the Gini coefficient of China in 1970 was only half of that of the US. In 2008, the Gini coefficient of China equalled 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 improved. 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.

2.8 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 raises the steady state of cross-sectional inequality in the long run (Becker & Tomes, 1986).[59] 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 provides a foundation for future studies that seek to identify causality and mechanisms.

[59]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 2.1), the trend of inequality is expected to 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 is anticipated to become more significant.

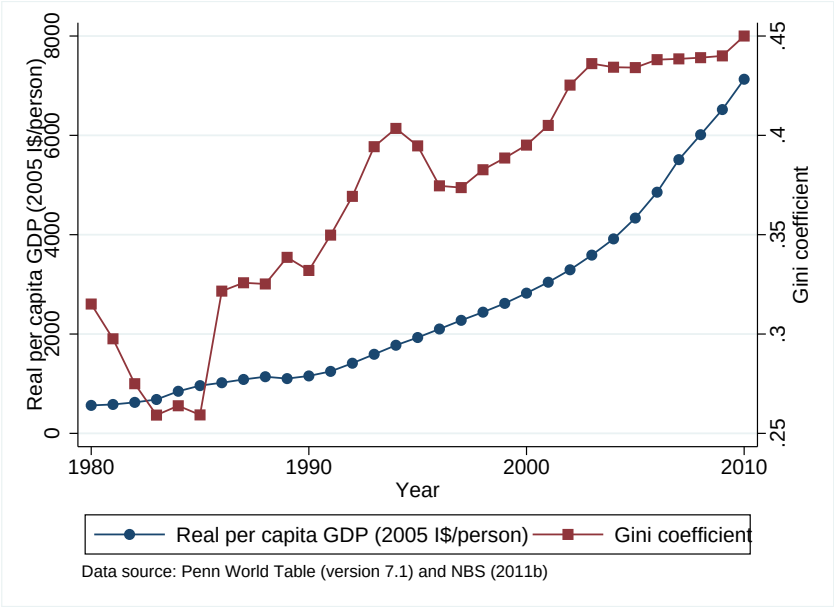


Figure 2.1: Per Capita GDP and Gini Coefficient in China

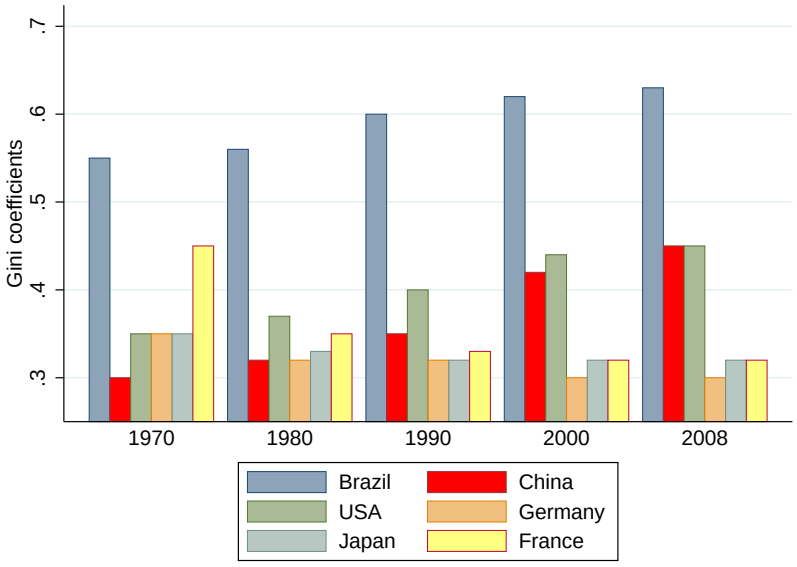


Figure 2.2: International Comparison of Gini Coefficients

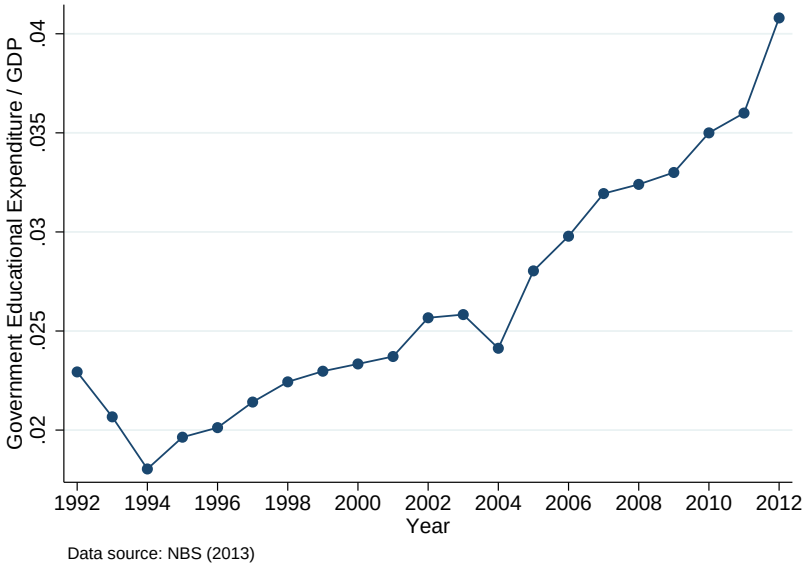


Figure 2.3: Government Educational Expenditure/GDP

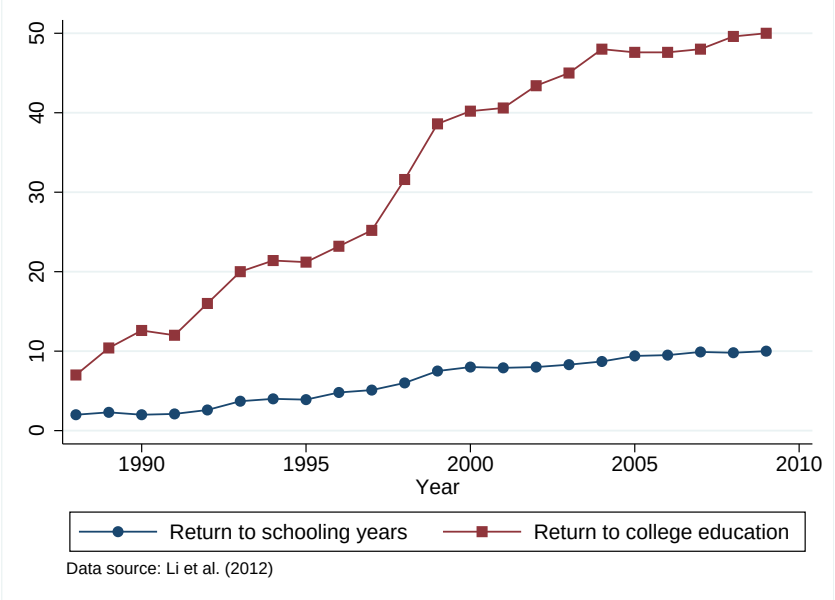


Figure 2.4: Return to Education in Urban China

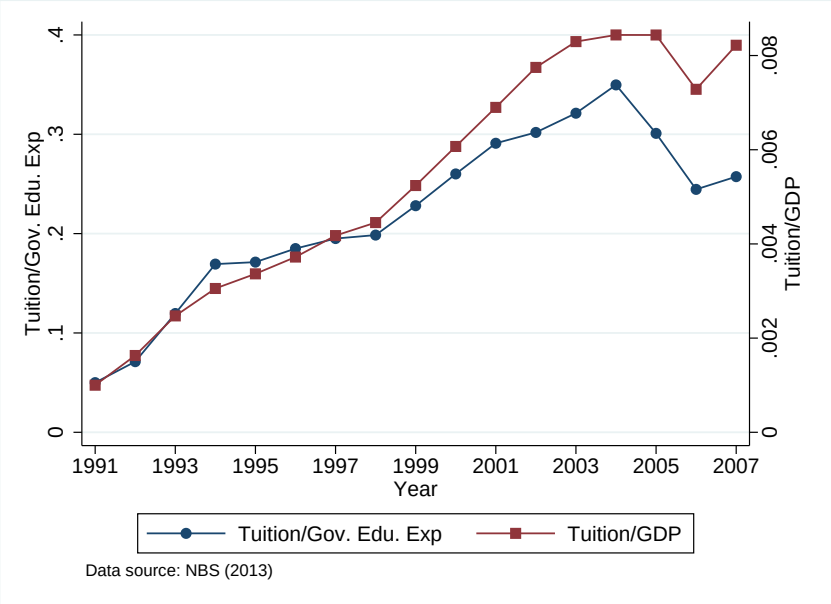


Figure 2.5: Increase in Tuition in China

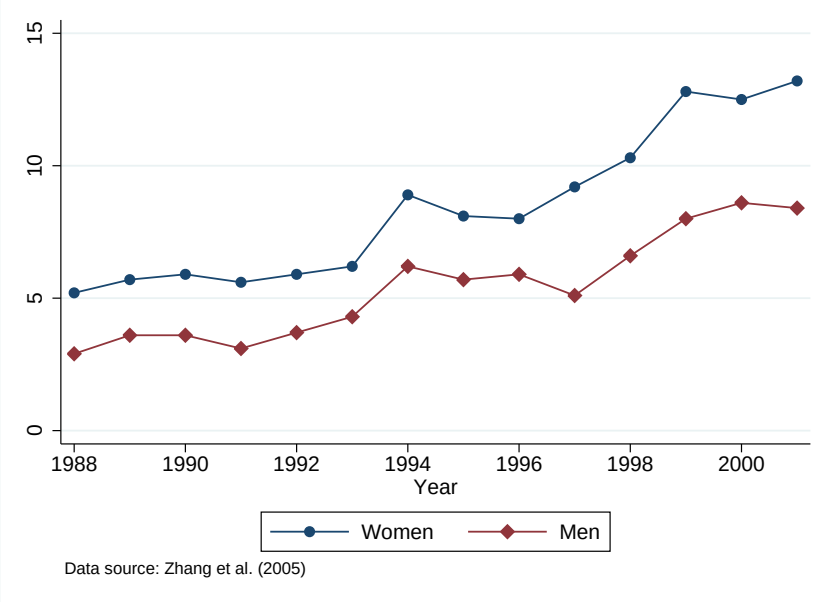


Figure 2.6: Return to Schooling Years by Gender

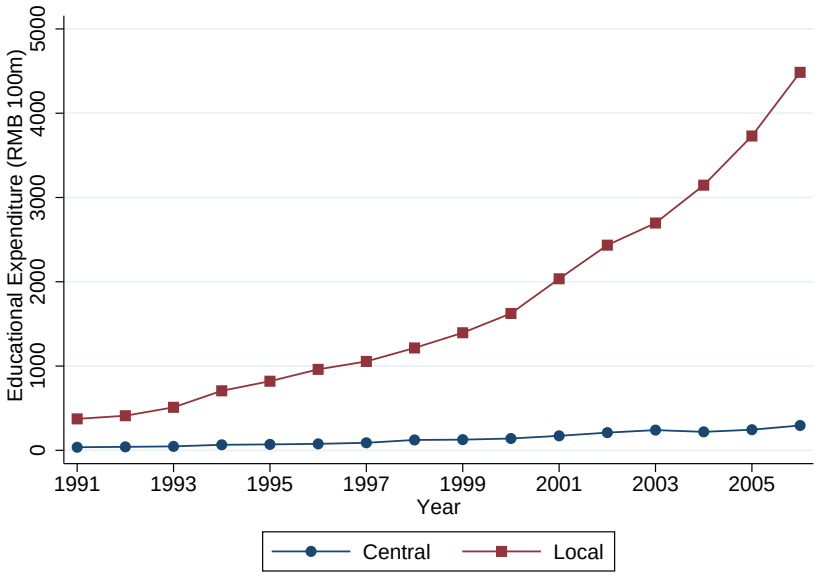
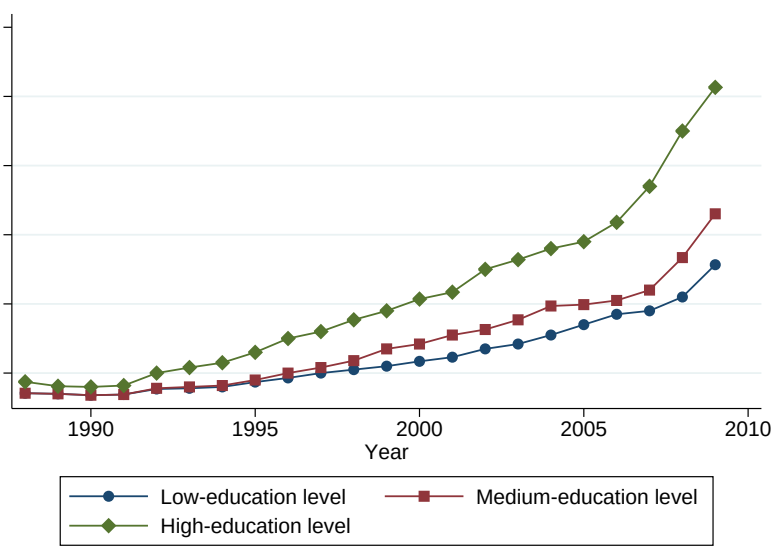


Figure 2.7: Central and Local Governmental Expenditure on Education



Data source: Li et al. (2012)

Figure 2.8: Annual Wage of Urban Workers

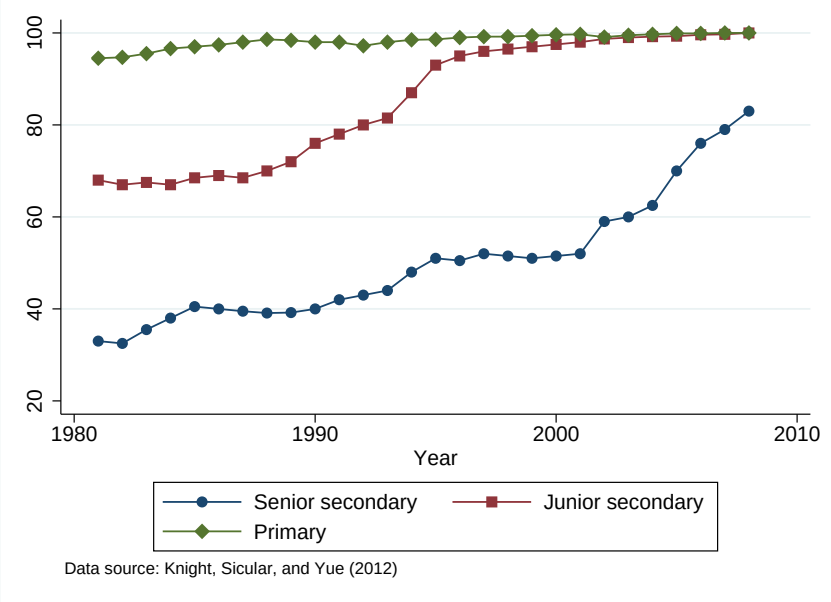


Figure 2.9: Primary School Enrolment Rates and Secondary School Progression Rates

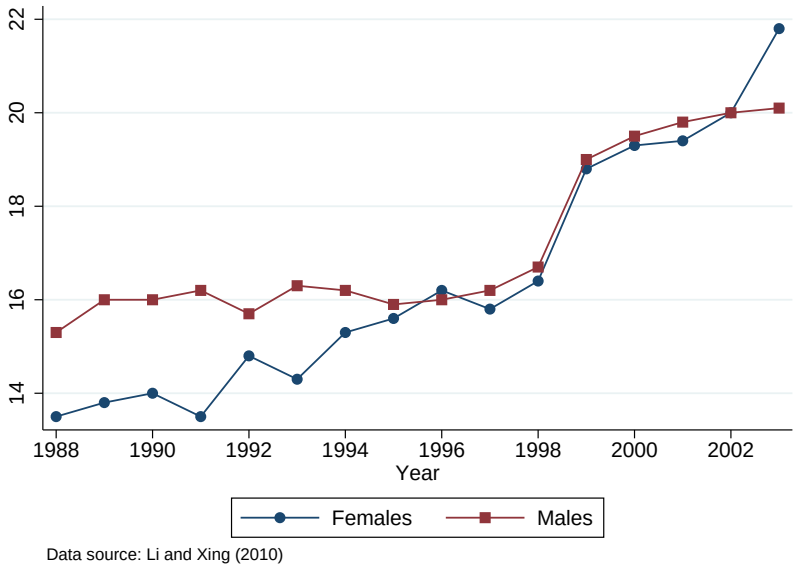


Figure 2.10: Tertiary School Enrolment Rates

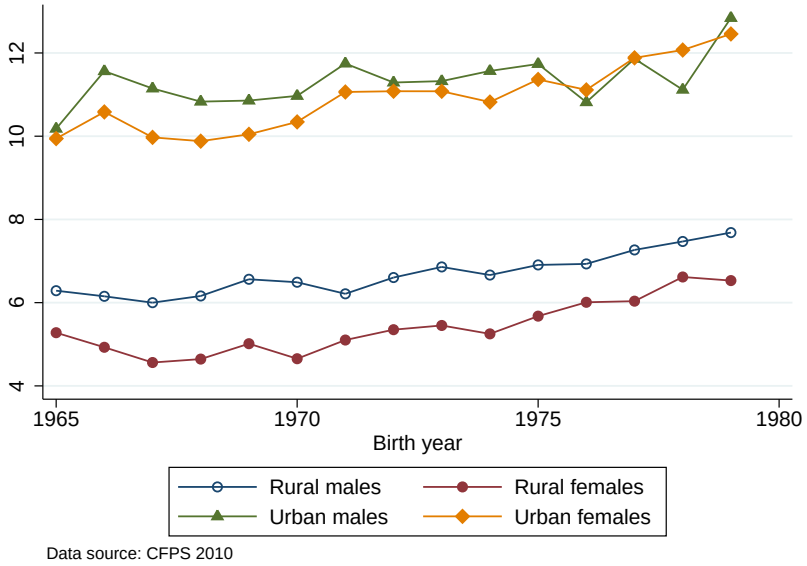


Figure 2.11: Schooling Years by Gender and by Region

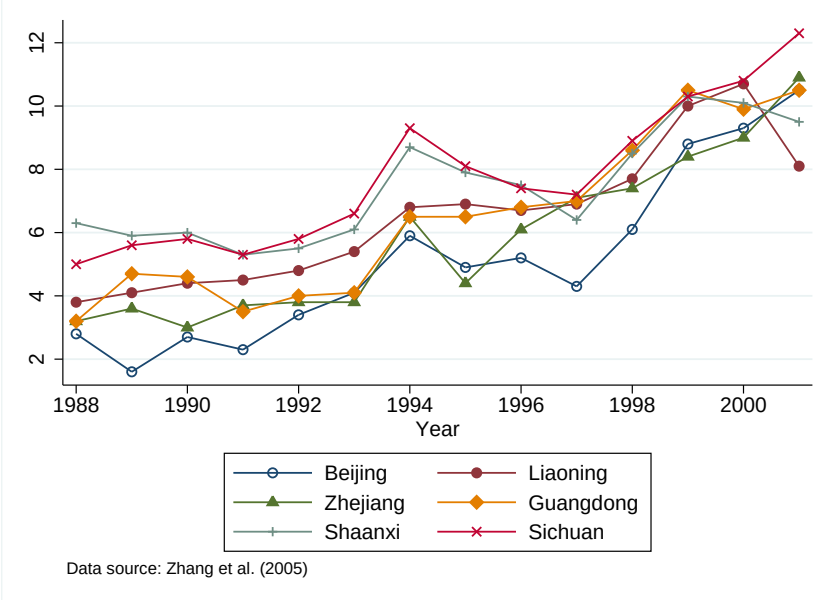


Figure 2.12: Return to Schooling Years by Province

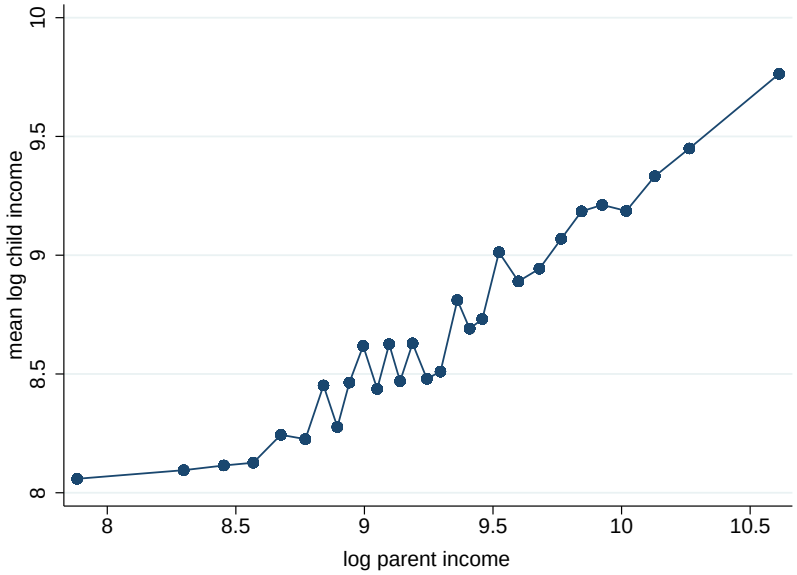


Figure 2.13: Logarithm of the Income of Children vs. Logarithm of the Income of Parents

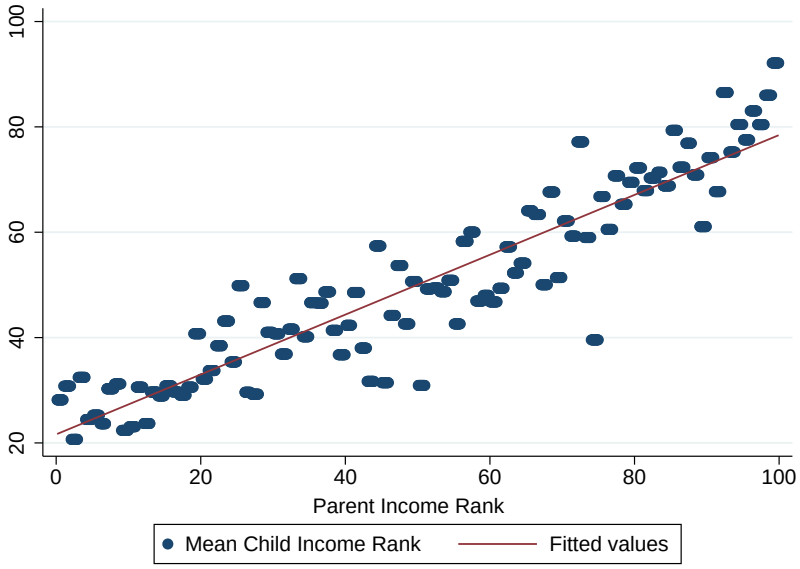


Figure 2.14: Income Rank of Children vs. Income Rank of Parents

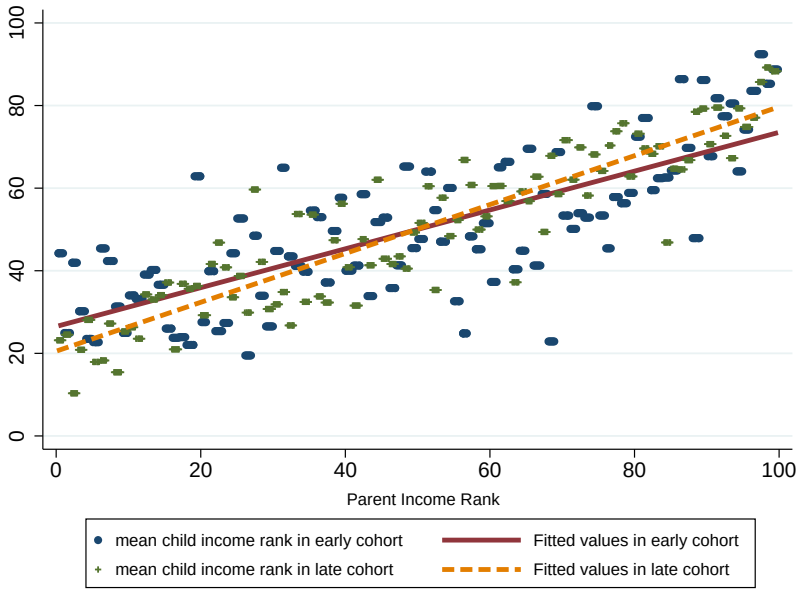


Figure 2.15: Income Rank of Children vs. Rank of Parents in Early and Late Cohorts

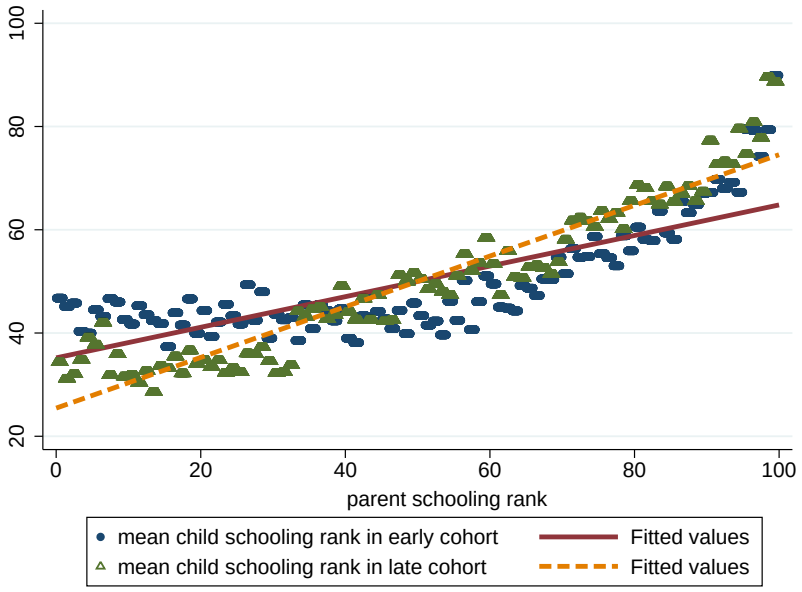


Figure 2.16: Schooling Rank of Children vs. Rank of Parents in Early and Late Cohorts

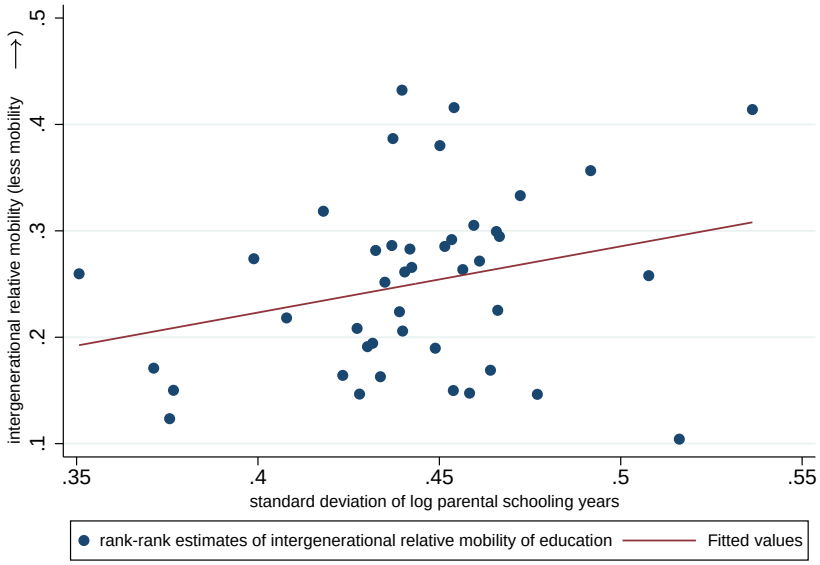


Figure 2.17: Relative Mobility vs. Standard Deviation of Parental Schooling
Note: slope=0.720 with a standard error of 0.376.

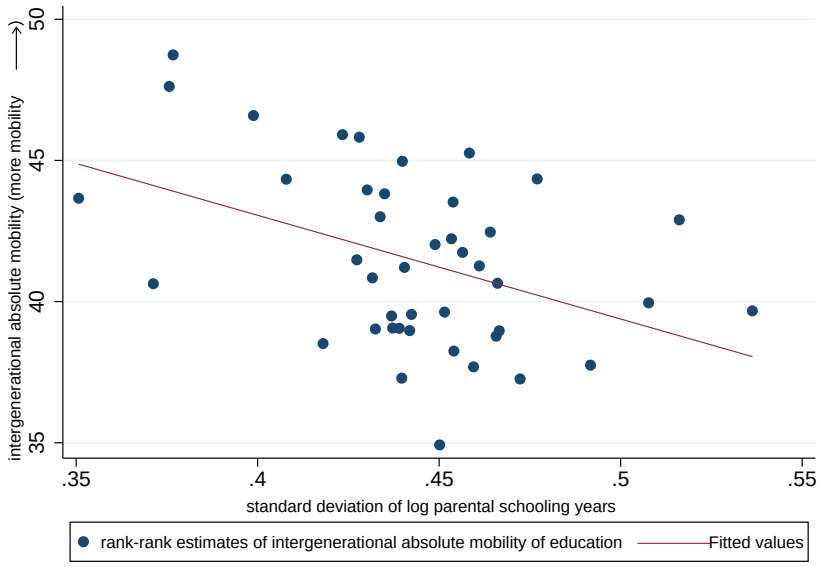


Figure 2.18: Absolute Mobility vs. Standard Deviation of Parental Schooling
Note: slope=-41.340 with a standard error of 12.985.

Table 2.1: 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 2.2: Sensitivity Analysis of Intergenerational Income Mobility

	Augmented income regressions[a]								
	Regression coefficient (β)		**Correlation**[b]		**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)
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)

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

[b]: 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 2.3: 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 2.4: 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 2.5: 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 2.6: 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 2.7: 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 2.8: Absolute vs. Relative Intergenerational Education Mobility in 22 Provinces or 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.

Appendix B

A Simple Model on Intergenerational Income Mobility

Model Setup

For simplicity, we assume that family i contains one parent from generation $t-1$ and one child from generation t.[60] The parents are altruistic. They care about not only their own consumption ($c_{i,t-1}$) but also earnings of their children (y_{it}). Thus, parental preference can be represented by a utility function in the following form

$$U_{i,t-1} = (1-a)\ln C_{i,t-1} + \alpha \ln y_{it}, \tag{22}$$

where $0 < \alpha < 1$ measures the degree of parental altruism toward their child. The parents allocate their after-tax earnings ($(1-\tau)y_{i,t-1}$) between their personal consumption ($C_{i,t-1}$) and investment in the human capital of their child ($I_{i,t}$). The budget constraint is given by

$$(1-\tau_t)y_{i,t-1} = C_{i,t-1} + p_{t-1}I_{i,t-1}, \tag{23}$$

where τ is the tax rate. We normalize the price of consumption good to one. Then, p_{t-1} is the price of human capital investment. In contrast to previous literature, we use p_{t-1} to capture the rapid increase in the costs of human capital investment in China in the past decades, such as tuition.

The child's income is generated from the semi-log function:

$$\ln y_{it} = \mu + r_t h_{it}, \tag{24}$$

where h_{it} is the human capital and r_t is the monetary return to human capital. We note that

$$var(\ln y_{it}) = r_t^2 var(h_{it}) + h_t^2 var(r_t) + 2cov(r_t, h_{it}).$$

Given the distribution of human capital stock, a high return to human capital implies great cross-sectional income inequality.

Return to human capital is determined by four factors: stock of physical capital (K_t), stock of human capital (H_t), technological progress (A_t), and market-oriented institutional

[60] In our empirical analysis, we use the average parental schooling years and the total parental income as the dependent variables. Therefore, it is suitable to assume only one parent is present in the family.

reforms (M_t) such that

$$r_t = r(K_t, H_t, A_t, M_t).^{61}$$

Both the stock of physical capital and the technological progress enhance the marginal productivity of human capital r_t. Thus, we have $\partial r_t/\partial K_t > 0$ and $\partial r_t/\partial A_t > 0$. In addition, the market-oriented institutional reforms not only increase the marginal productivity of human capital but also reduce the gap between marginal productivity and market wage. Thus, we have $\partial r_t/\partial M_t > 0$. Institutional reforms significantly increase return to human capital in China, as discussed in the background section. Finally, the marginal productivity of human capital decreases with the stock of human capital such that $\partial r_t/\partial H_t < 0$.

For simplicity, the human capital is produced by the following equation

$$h_{it} = \theta_t \ln(I_{i,t-1} + G_{i,t-1}) + e_{it}, \tag{25}$$

where $G_{i,t-1}$ is the governmental investment in child's human capital, and e_{it} is the child's endowment. We assume that governmental and family investments are substitutes in Eq. (25).[62]

We also assume that the endowment transmission follows a first-order autoregressive process such that

$$e_{it} = \delta + \lambda_t e_{i,t-1} + v_{it}, \tag{26}$$

where v_{it} is *i.i.d.* λ_t is determined by the biological heritability of genetic endowments, degree of assortative mating, and intergenerational transmission of family culture. Following the literature, we assume that $\lambda_t = \lambda$ which is exogenous in our analysis (Becker & Tomes, 1979, 1986).

Intergenerational Income Elasticity without Credit Constraint

We first consider the scenario wherein the credit market is perfect; thus, parents can borrow against the child's perspective earnings or they are sufficiently rich. In this case, investment decisions are independent of parental income (Becker & Tomes, 1986; Behrman *et al.*, 1982). Thus, a log-linear intergenerational income regression can be derived easily as:

$$\ln y_{it} = \mu_t^1 + \lambda_t g_t \ln y_{i,t-1} + v_{it}^1,$$

where $g_t = r_t/r_{t-1}$, μ_t^1 is a constant and v_{it}^1 is an error term.

[61] We assume that the aggregate production is $Y_t = Y(K_t, H_t, A_t, M_t)$.

[62] This function of human capital production follows that of Solon (2004) and is simplified for analytical convenience, as shown below. It does not allow human capital investment to complement genetic endowments.

Without credit constraints, the intergenerational transmission of endowments is the only channel that bridges parental and child's earnings.[63] In this case, the increase in return to human capital across generations can inflate the effect of intergenerational endowment transmission on intergenerational mobility. In other words, the role of intergenerational transmission of genetic ability in the intergenerational mobility of earning is amplified by the increase in return to human capital.[64] The higher the increase in the return to human capital, the lower the intergenerational mobility is. At the steady state $r_t = r_{t-1}$ and $\lambda_t = \lambda_{t-1}$, the IGE is uniquely determined by the intergenerational transmission of endowment such that:[65]

$$\beta_1 = \lambda.$$

Intergenerational Income Elasticity with Credit Constraint

In this section, we consider the scenario wherein the credit market is imperfect. Parents can neither borrow from the future earnings of their child nor from the credit market (because they are too poor). In this case, the investment decision is determined by parental income. By some simple algebras, we derive the log-linear equation of intergenerational income regression as follows:[66]

$$\ln y_{it} \approx \mu_t^2 + [(1-\gamma_t)r_t] \ln y_{i,t-1} + r_t e_{it}, \tag{27}$$

where μ_t^2 is a constant, e_{it} includes an error term, and γ_t is a function of two variables. The first variable is the progressivity in government investment in child's human capital (s_t) measured by the ratio of the government expenditure relative to household disposable income $s_t = s(G_{i,t-1}, \tau_t, y_{i,t-1})$. The second variable is the price of human capital investment (p_{t-1}). Thus,

$$\gamma_t = \gamma(s_{t_1}, p_{t-1}).$$

We have $\partial(1-\gamma_t)/\partial s_t < 0$ and $\partial(1-\gamma_t)/\partial p_{t-1} > 0$. We interpret $1-\gamma_t$ as the severity of the credit constraint. When the share of government expenditure is high or the price of human capital investment is low, the credit constraint is mild.

The two channels through which parental income correlates with the income of the child are shown in Eq. (27). The first channel is related to the credit constraint ($(1-\gamma_t)r_t$

[63] This conclusion is derived from our simplified framework. In real life other channels exist, including parental characteristics.

[64] We assume that persons with higher genetic ability have more human capital.

[65] This result hinges on the assumption regarding the linear specification of the production function.

[66] We use an approximate equality because we derive the expression by using a first-order Taylor approximation.

). A severe credit constraint suggests high IGE. The increase in the ratio of government expenditure on the human capital of children relative to disposable household income promotes intergenerational mobility. The increase in the price of human capital investment limits intergenerational mobility. In addition, the effect of the severity of credit constraint is enhanced by the return to human capital in the labour market. The second channel is the intergenerational transmission of endowment, as the final term in Eq. (27) is a function of parental endowment, which is in turn a determinant of parental income.

We then derive the IGE at the steady state. Eq. (27) is a first-order autoregression of $\ln y_{it}$ that contains a serially correlated error term. This term follows a first-order autoregression. As shown in Solon (2004), the steady-state of IGE is derived as follows:

$$\beta_2 = \frac{(1-\gamma)r + \lambda}{1 + (1-\gamma)r\lambda}. \tag{28}$$

We find that $\partial\beta_2/\partial r > 0$, $\partial\beta_2/\partial(1-\gamma) > 0$, and $\partial\beta_2/\partial\lambda > 0$. Because $\beta_2 > \beta_1$, IGE is higher in the scenario with credit constraints than that in the case without credit constraints.

The Weighted Intergenerational Income Elasticity

In real life, poor households are subject to credit constraints to finance their child's human capital investment, whereas rich households do not. The estimated IGE combines both scenarios. Therefore, IGE for a population containing both types of households is derived as follows:

$$\beta = (1-\pi)\beta_1 + \pi\beta_2,$$

where $\pi = \frac{\sum_{i=1}^{n} \sigma^2_{\ln y_{it} \ln y_{it-1}}}{\sum_{i=1}^{N} \sigma^2_{\ln y_{it-1}}}$ and $\frac{n}{N}(= d)$ is the share of parents subject to credit constraint. IGE increases with the share of households that are subject to credit constraints in a population ($\partial\beta_t/\partial d_t > 0$), because $\beta_1 < \beta_2$ and $\partial\pi_t/\partial d_t > 0$.

The share of households subject to credit constraints is determined by the equilibrium condition, which postulates that the marginal return to human capital investment is equal to interest rate in the capital market. When the return to human capital investment is higher than the interest rate, parents are subject to credit constraints. Otherwise, parents invest in the human capital of the child at the point where the marginal return to human capital investment equals the interest rate. Therefore, d is function of the following form:

$$d = d(D, y, r, G, p, r_a),$$

where D is a measure of the degree of income inequality in the parental generation, y can

be re-interpreted as the average family income, and r_a is the return to asset or interest rate.

A larger D indicates that more families are subject to credit constraints, $\partial d/\partial D > 0$. Intergenerational mobility decreases with inequality.[67] We also have $\partial d/\partial y < 0$, $\partial d/\partial G > 0$, $\partial d/\partial r_a < 0$, $\partial d/\partial r > 0$, and $\partial d/\partial p > 0$. As a result, the effects of average family income, return to human capital, the price of human capital investment, and government expenditure on the human capital of children on IGE are not only intensively marginal, but also extensively marginal. The former refers to the change in the severity of credit constraints, and the latter refers to the variation in the share of households subject to credit constraints.

Finally, we summarize five major theoretical determinants of IGE, assuming that the intergenerational transmission of endowment is constant. When we discuss a given variable as below, other variables are held constant.

1. Return to human capital (r). We have $\partial\beta/\partial r = \beta_2\partial\pi/\partial r + \pi\partial\beta_2/\partial r > 0$. The return to human capital lowers intergenerational mobility not only by causing more families subject to the credit constraints, but also by inflating the effect of the credit constraints on the IGE.

2. Price of human capital investment (p). We have $\partial\beta/\partial p = \beta_2\partial\pi/\partial p + \pi\partial\beta_2/\partial p > 0$. With the increasing educational cost, families become poorer in the relative term. More families are subject to credit constraints, and the credit constraints on households already suffering from them tighten further. Intergenerational mobility decreases with the increase in the price of human capital investment.

3. Government expenditure on the human capital of children (G). We have $\partial\beta/\partial G = \beta_2\partial\pi/\partial G+\pi\partial\beta_2/\partial G < 0$. The effect of government expenditure on intergenerational mobility is the opposite of that of the price of human capital investment. Therefore, intergenerational mobility increases with the increase in government expenditure.

4. Average family income (y). We have $\partial\beta/\partial y = \beta_2\partial\pi/\partial y + \pi\partial\beta_2/\partial y < 0$. With the increase in family income, fewer households are subject to credit constraints. Hence, intergenerational mobility increases with family income.

5. Degree of income inequality (D). We have $\partial\beta/\partial D = \beta_2\partial\pi/\partial D > 0$. With the increase in inequality (due to an exogenous (policy) change, holding the average family income constant), more households are subject to credit constraints. Thus,

[67] In the long run, both inequality and intergenerational mobility are equilibrium outcomes. However, some factors may independently affect inequality such as tax reforms and public transfers.

intergenerational mobility decreases with inequality. Moreover, degree of inequality, return to human capital, price of human capital investment, government expenditure, and average family income interact with one another. For example, π is large when inequality is high. Therefore, $\partial\beta/\partial r = \beta_2 \partial\pi/\partial r + \pi\partial\beta_2/\partial r$ increases. Hence, the effect of the return to human capital on intergenerational mobility is strong. In summary, the increase in inequality can enhance not only the negative effects of the return to human capital and the price of human capital investment, but also the positive effects of government expenditure and family income on intergenerational mobility.

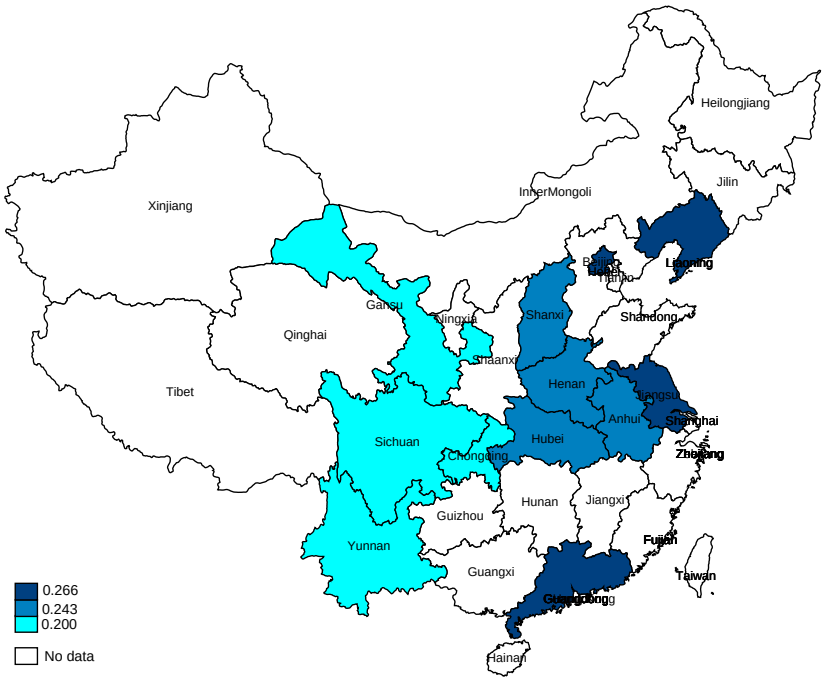


Figure 2A.1: Relative Intergenerational Income Mobility in Early Cohort

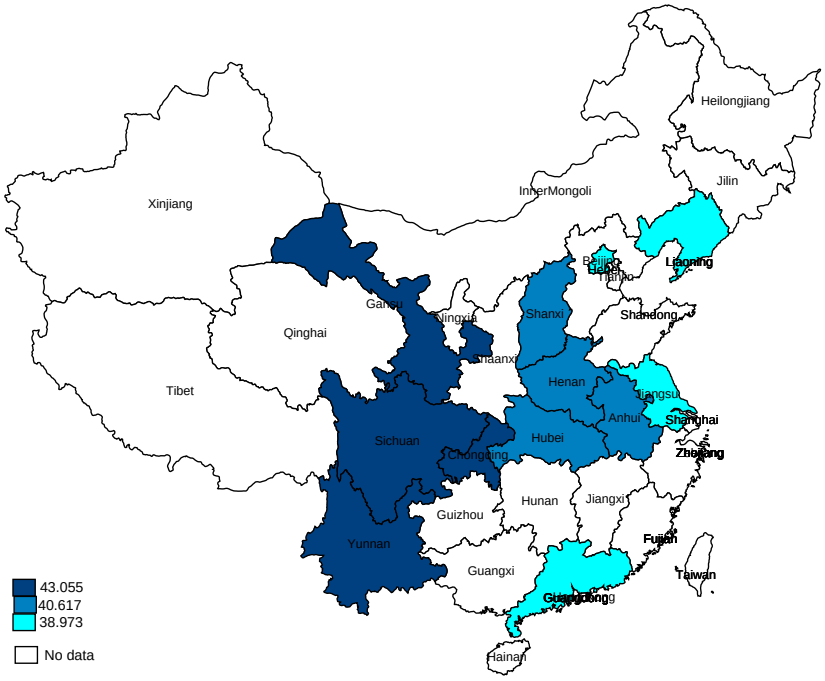


Figure 2A.2: Absolute Intergenerational Income Mobility in Early Cohort

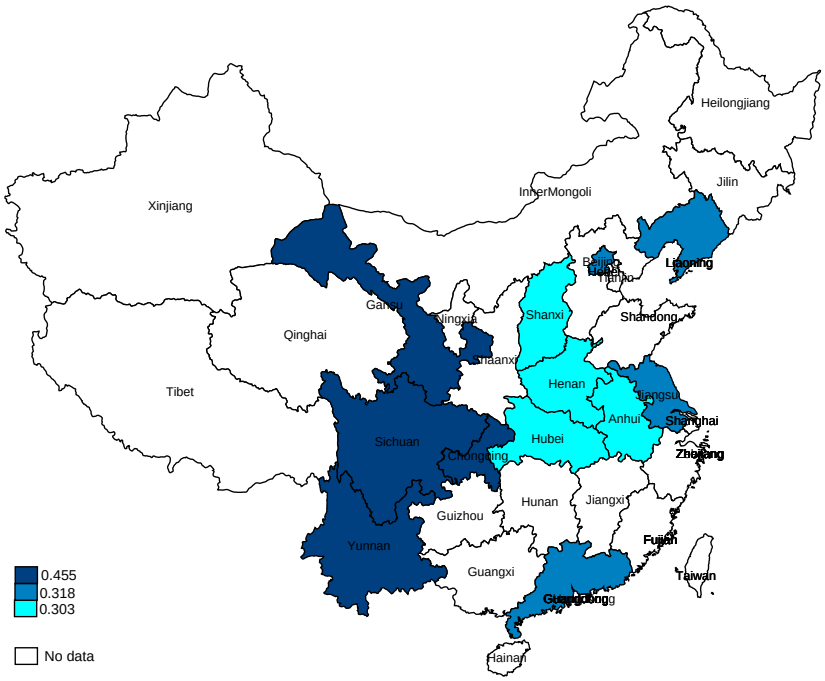


Figure 2A.3: Relative Intergenerational Income Mobility in Late Cohort

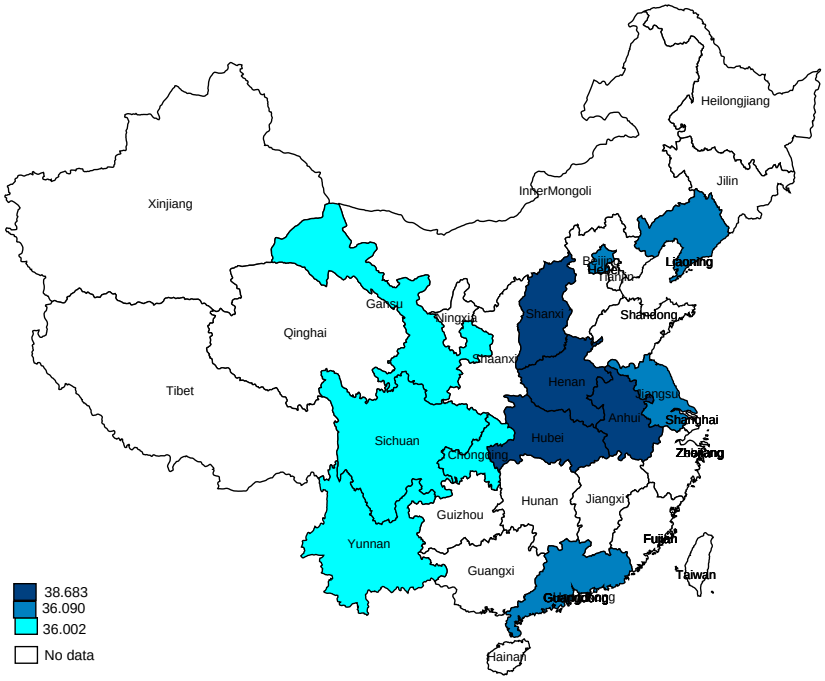


Figure 2A.4: Absolute Intergenerational Income Mobility in Late Cohort

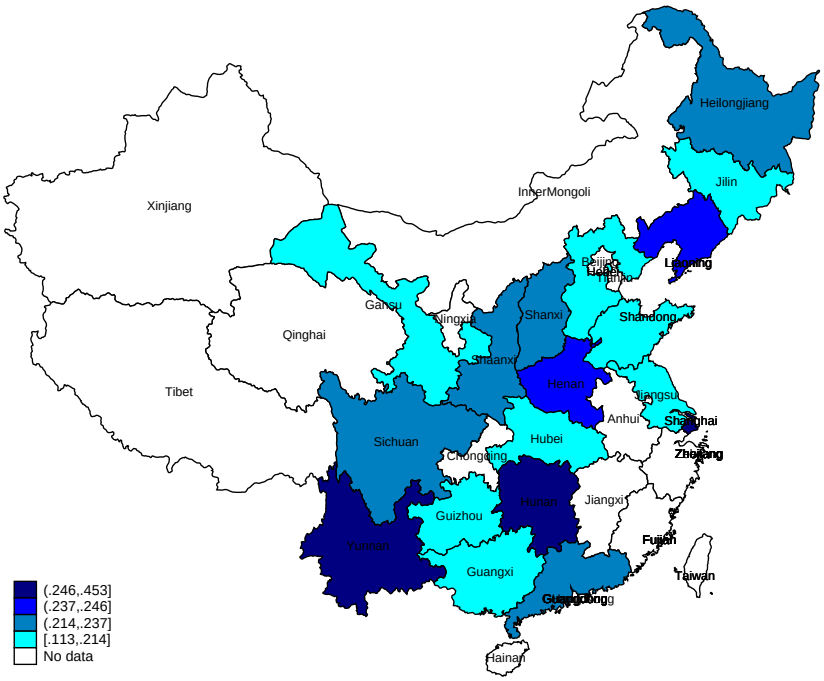


Figure 2A.5: Relative Intergenerational Education Mobility in Early Cohort

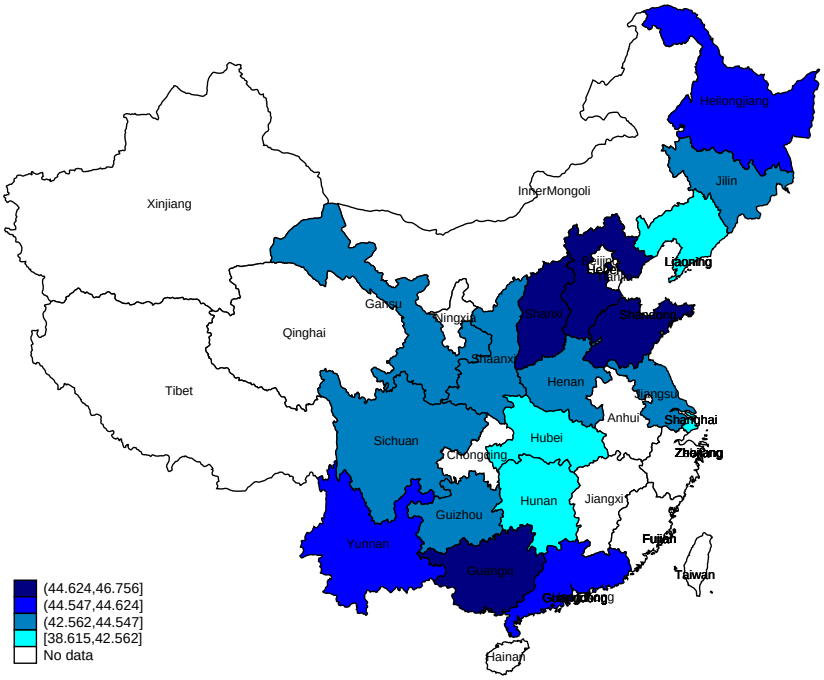


Figure 2A.6: Absolute Intergenerational Education Mobility in Early Cohort

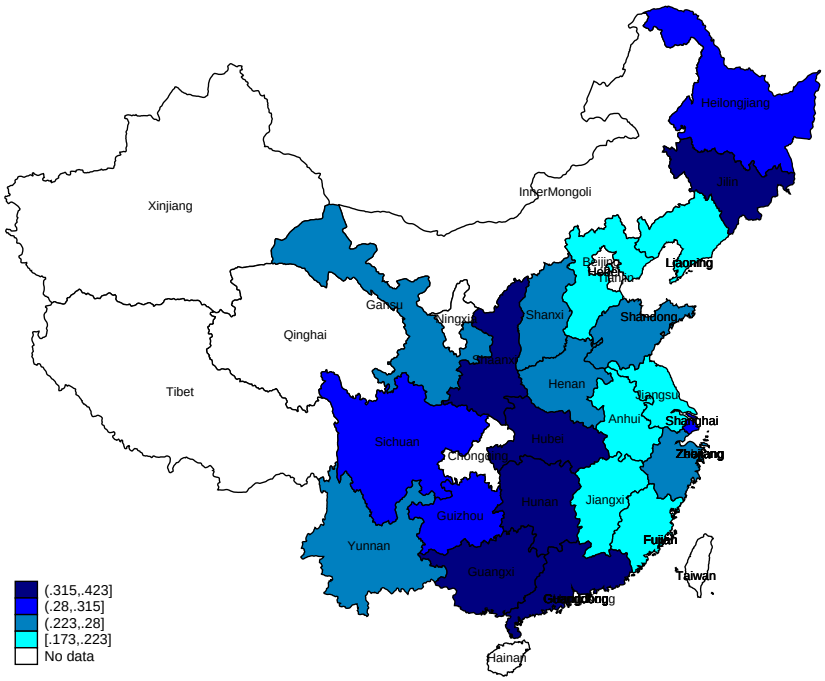


Figure 2A.7: Relative Intergenerational Education Mobility in Late Cohort

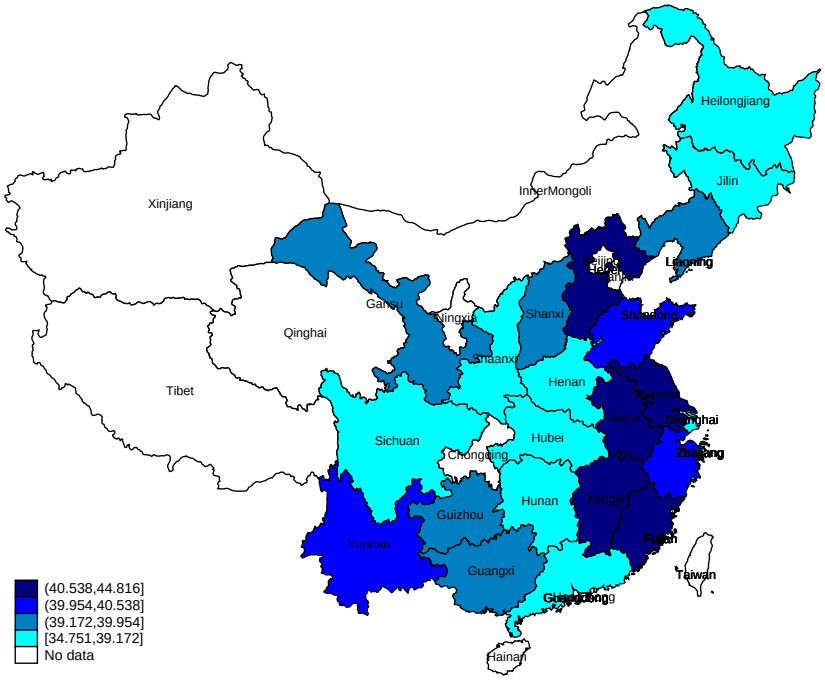


Figure 2A.8: Absolute Intergenerational Education Mobility in Late Cohort

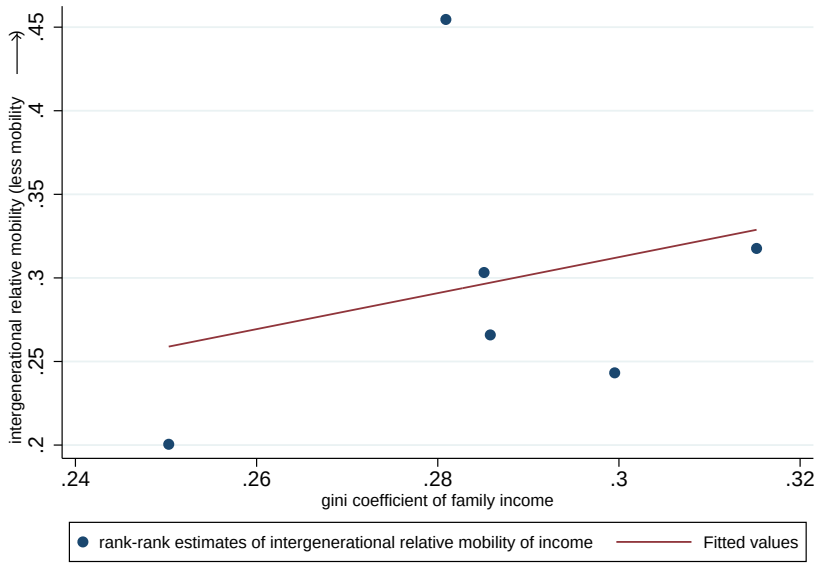


Figure 2A.9: Relative Mobility vs. Gini Coefficient of Family Income
Note: slope=4.198 with a standard error of 2.972.

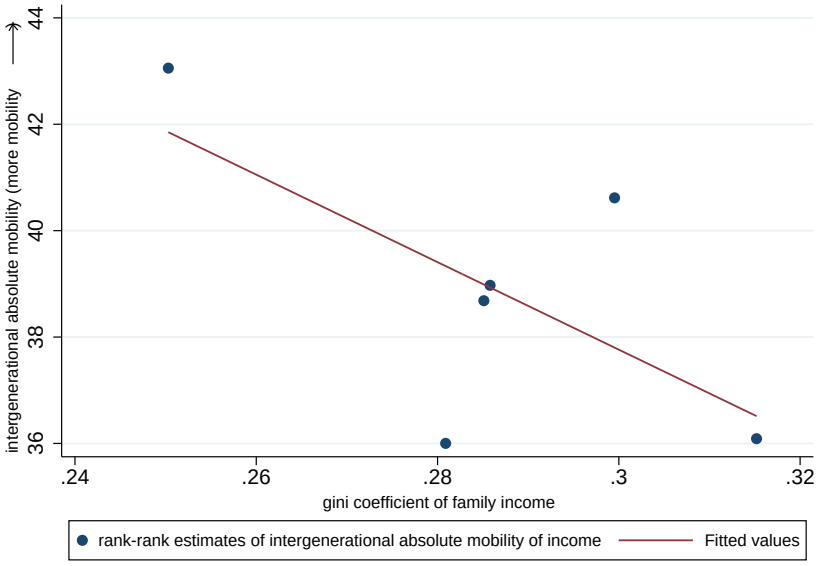


Figure 2A.10: Absolute Mobility vs. Gini Coefficient of Family Income
Note: slope=-135.779 with a standard error of 78.547.

Table 2A.1: Summary Statistics on the Chinese Household Income Projects Data

	Mean			
	(Standard deviation)			
	Overall	East	Central	West
Early cohort				
child's annual income	6628.004	8572.219	4827.629	5087.22
	(5,783.354)	(6,822.393)	(3,040.306)	(5,231.885)
annual family income[a]	9331.364	10899.52	8010.927	7859.751
	(5,887.859)	(6,497.635)	(5,380.898)	(3,972.818)
child's gender (male=1)	0.705	0.679	0.722	0.738
	(0.456)	(0.468)	(0.449)	(0.442)
child's age	29.523	30.072	29.269	28.648
	(4.298)	(4.473)	(4.103)	(4.041)
father's age	57.139	57.467	57.151	55.334
	(4.683)	(4.609)	(4.693)	(4.782)
Observation	627	293	212	122
Late cohort				
child's annual income	8939.762	11502.71	6567.196	6888.833
	(7,622.202)	(8,973.904)	(4,816.738)	(5,885.124)
annual family income[a]	15432.46	18809.11	11958.42	13234.25
	(11,384.180)	(14,051.720)	(7,029.896)	(7,396.300)
child's gender (male=1)	0.6	0.608	0.61	0.57
	(0.490)	(0.489)	(0.489)	(0.496)
child's age	25.462	25.632	25.154	25.542
	(2.353)	(2.407)	(2.183)	(2.441)
father's age	53.28	53.378	53.098	53.334
	(4.548)	(4.163)	(4.917)	(4.793)
Observation	821	383	259	179

Note: 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.
Income is converted to RMB 2002 using the CPI. Specifically, in the early cohort, child's annual income of RMB 6,628 equal to USD 800 in 2002 price. Annual family income of 9,331 equals USD 1,127. In the late cohort, RMB 8,940 is equivalent to USD 1,080. RMB 15,432 is equal to USD 1,864.
[a]: Annual family income refers to the average annual income from fathers and mothers over a minimum of three years prior to the survey wave (included).

Table 2A.2: Quintile Transition Matrix of Intergenerational Income Mobility

Panel A. Early cohort						
		Parent Quintile				
		1	2	3	4	5
	1	39.20%	24.00%	18.40%	15.20%	3.20%
Child	2	19.35%	31.45%	25.00%	16.94%	7.26%
Quintile	3	21.26%	24.41%	19.69%	18.11%	16.54%
	4	16.80%	12.80%	25.60%	23.20%	21.60%
	5	3.17%	7.14%	11.11%	26.98%	51.59%
Panel B. Late cohort						
		Parent Quintile				
		1	2	3	4	5
	1	45.12%	31.71%	15.24%	6.71%	1.22%
Child	2	23.03%	30.30%	25.45%	16.36%	4.85%
Quintile	3	16.97%	24.24%	24.85%	16.97%	16.97%
	4	10.91%	7.27%	23.03%	27.27%	31.52%
	5	3.64%	6.67%	11.52%	32.73%	45.45%

Note: Each cell reports the percentage of children in the quintile (as given by the row), conditional on family income in the quintile (as given by the column). 1 indicates the lowest quintile and 5 refers to the highest quintile.

Table 2A.3: Summary Statistics on the Chinese Family Panel Studies Data

	Mean (Standard deviation)					
	Overall	Urban	Rural	East	Central	West
Early cohort: 1956-1970						
child's schooling years	7.577	10.407	6.587	8.191	7.899	6.179
	(4.420)	(3.452)	(4.273)	(4.077)	(4.355)	(4.751)
parental average schooling years	2.663	4.6	1.971	3.012	2.738	1.672
	(3.667)	(4.593)	(2.910)	(3.901)	(3.555)	(2.916)
child's gender (male=1)	0.494	0.493	0.483	0.491	0.489	0.502
	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)
child's Hukou status (agricultural=1)	0.666	0.0543	0.868	0.591	0.635	0.813
	(0.472)	(0.227)	(0.338)	(0.492)	(0.482)	(0.390)
Observation	11832	2469	7212	4805	3498	2834
Late cohort: 1971-1985						
child's schooling years	8.628	12.152	7.762	9.805	9.007	6.712
	(4.474)	(3.481)	(4.190)	(3.904)	(4.119)	(4.907)
parental average schooling years	4.501	7.7	3.695	5.234	4.917	2.972
	(3.988)	(4.047)	(3.488)	(3.952)	(3.992)	(3.558)
child's gender (male=1)	0.444	0.479	0.427	0.442	0.442	0.44
	(0.497)	(0.500)	(0.495)	(0.497)	(0.497)	(0.496)
child's Hukou status (agricultural=1)	0.678	0.0627	0.842	0.614	0.637	0.809
	(0.467)	(0.243)	(0.365)	(0.487)	(0.481)	(0.393)
Observation	13610	2566	9421	5168	4317	3721

Note: The divisions of urban vs. rural areas and of the three geographic regions are based on the status of the mothers.

Table 2A.4: Quintile Transition Matrix of Intergenerational Education Mobility

Panel A. early cohort 1956-1970						
		Parent Quintile				
		1	2	3	4	5
Child Quintile	1	28.36%	26.80%	27.59%	12.21%	5.03%
	2	21.17%	22.53%	23.11%	22.06%	11.11%
	3	17.71%	19.32%	18.72%	22.53%	21.76%
	4	17.96%	17.46%	17.49%	23.96%	23.11%
	5	14.79%	13.91%	13.10%	19.23%	38.99%
Panel B. late cohort 1971-1985						
		Parent Quintile				
		1	2	3	4	5
Child Quintile	1	37.69%	33.65%	17.68%	8.15%	2.83%
	2	24.76%	25.42%	23.34%	17.66%	8.82%
	3	16.46%	18.30%	23.89%	25.49%	15.83%
	4	12.93%	15.10%	21.06%	27.07%	23.88%
	5	8.16%	7.53%	14.04%	21.63%	48.64%

Note: Each cell reports the percentage of children in the quintile (as given by the row), conditional on family income in the quintile (as given by the column). 1 indicates the lowest quintile and 5 refers to the highest quintile.

Chapter 3

Intergenerational Income Persistence and Transmission through Identity: Evidence from Urban China

In chapter 2 we describe the patterns of intergenerational mobility in income and education in contemporary China. In addition, we investigate its interplay with cross-sectional inequality, drawing the Great Gatsby Curve. Based on the descriptive analysis, in this chapter I explore the mechanism for the intergenerational income transmission amid China's current economic transition.

I find that the estimated intergenerational income elasticity increases by 40% for cohorts educated before and after the market reform, from 0.32 to 0.44. It even reaches 0.52 among households with income above average in the post-reform era, and is 56% higher than the corresponding one in households with below-average income.

How to interpret this intergenerational income persistence, especially among the rich families? Besides the conventional channel of education, I innovatively estimate the contribution from political and occupational identities. Schooling is a leading contributor for all families before the market reform, and for households with income below average in the post-reform era. However, a new transmission channel, political identity, plays a leading role among households with above-average income in the post-reform era. The contribution from occupational identity is smaller in the post-reform period than that of the pre-reform era. It sheds light on the necessity of intensifying the reforms in contemporary China.

3.1 Introduction

To what extent do the children of the rich stay rich and those of the poor remain poor? Is the intergenerational correlation aggravated or attenuated with the economic transition and development? What is the mechanism for the intergenerational income transmission? In this paper, I aim to answer the three questions. Becker & Tomes (1979, 1986) initiate the concept of intergenerational elasticity (IGE) of income, incorporating families into the general analysis of economic development.[68] Specifically, it estimates how sensitive the change in a child's income corresponds to that of parental income. The literature has investigated intensively how to improve the measurement of the IGE, and examined the degree of intergenerational mobility in different countries and periods (Mazumder & Levine, 2002; Mayer & Lopoo, 2005; Bratsberg *et al.*, 2007; Lee & Solon, 2009). However, to the best of my knowledge, only several studies have been done on the interaction between intergenerational mobility and economic transition, and the political economy of intergenerational mobility (Chen *et al.*, 2010; Ichino *et al.*, 2011).

China's contemporary transition period provides a good institutional background against which to investigate this question. A heated debate is ongoing about the growing differences between the rich second generation (*fu er dai*) and the poor second generation (*qiong er dai*). Children of the first generation who benefited from China's economic reform inherit privileged socioeconomic status from their parents.[69] The poor second generation, in contrast, does not have equal access to economic opportunities and is trapped in an intergenerational poverty trap. To link to the concept of intergenerational mobility, on the one hand, with the introduction of market economy and privatization, altruistic parents are motivated to accumulate wealth and hand it down to their children. With no inheritance or bequest tax, the intergenerational income persistence is expected to rise. On the other hand, the Chinese government has raised expenditure on public education intensively (Guo & Min, 2008). Children from economically disadvantaged families are facilitated with basic education, and are more able to climb up along the socioeconomic ladder than before. The intergenerational income persistence is anticipated to decrease. Therefore, the absolute degree of intergenerational mobility in contemporary China remains an empirical question.

Adopting retrospective data in urban China from the Chinese Household Income Projects (CHIPs) in 1995 and 2002, I investigate the degree of intergenerational elasticity of income during its transition period. I find that the intergenerational income persistence

[68]The intergenerational income elasticity is defined as $(\Delta Y_1/Y_1)/(\Delta Y_0/Y_0)$, where Y_1 is child's income, and Y_0 is parental income.

[69]The economic reform started in 1978, and is ongoing in China. It has introduced market economy to replace the stagnant planned economy.

is increased significantly along with economic development and market reform. The IGE of income jumps from 0.32 to 0.44 from early into late cohorts, increasing by 40 percent. Specifically, the early birth cohort refers to individuals born between the year of 1949 when the People's Republic of China was founded and the year of 1970 (included). Most of them complete education and work before the economic reform. Late birth cohort includes people born after 1970. Most of them receive education and work in the post-reform era. In addition, the pattern of intergenerational transmission varies across rich and poor families. I discover that in the pre-reform period, there is no statistically significant difference in the IGE between the lower and upper 50% income groups. Nevertheless, after the reform, the difference of IGE between the two income groups enlarges and has statistical significance. Moreover, the intergenerational income elasticity in families with above-average income even reaches 0.52, which is 56% higher than that of the lower 50% income group.

Recent literature also investigates channels through which income is transmitted from one generation to the next (Blanden *et al.*, 2007; Sacerdote, 2007; Mazumder, 2008). Education is the most well-established channel (Bowles & Gintis, 2002; Blanden *et al.*, 2004). Children from rich families can get access to better education than their poorer counterparts, and increase their future earnings. Blanden *et al.* (2007) characterize non-cognitive skills as another channel for intergenerational income mobility with data from Britain. They demonstrate that non-cognitive skills, together with ability, account for almost half of the intergenerational elasticity of income. Other transmission mechanisms include health (Eriksson *et al.*, 2005; Currie & Moretti, 2007) and personality (Groves, 2005).

In this paper, I examine two new transmission channels, political and occupational identities. Social networking is important for career success (Seibert *et al.*, 2001); thus obtaining identities in the network is crucial (Akerlof & Kranton, 2010). In China, family plays a significant role in an individual's networking in the labour market (Chen & Feng, 2011). I incorporate family influence on children's political and occupational identities into the analysis of the intergenerational income persistence. Specifically, being a Communist Party member implies income premium, as it allows easy access to promotion and possibly economic rents. Being in the state-owned sector implies earning a premium and protection from market vicissitude. Nevertheless, in the post-reform era, the private sector competes with state-owned sector, providing high earnings to attract high-skilled workers. Parents are expected to make various investment portfolios in their children's political and occupational identities across different periods.

Using the decomposition method (Bowles & Gintis, 2002; Blanden *et al.*, 2007), I

find that for both rich and poor families in the pre-reform era, the conventional channel of education acts as the leading contributor to intergenerational income persistence. In the post-reform era, however, the leading contributor varies across income groups. Education still contributes most to the income persistence across generations for poor households. For the rich, it is political identity as being Communist Party members that contributes most to the intergenerational income persistence. Impact from occupational identity from working in the state-owned sector is less important in the post-reform period than that in the pre-reform era in both types of households. Results remain robust when taking the correlation between education and political or occupational identity into account.

To the best of my knowledge, only two studies have touched upon the effect of political identity on intergenerational mobility. Ichino *et al.* (2011) predict through a theoretical model that in societies where the rich participate more in politics, both social spending on public education and intergenerational income mobility are lower. They also present empirical evidence that party affiliation has stronger explanatory power than education in determining intergenerational mobility. Chen *et al.* (2010) explore the linkage between institutional change and intergenerational mobility in China. They find that the more open the economic institutions are the less the social mobility, since the elites can jointly invest in their children and the reform. In contrast to Chen *et al.* (2010) who focus on the transmission of educational attainment, I concentrate on the roles of political and occupational identities in the transmission of economic status across generations. Regarding the choice between state- and privately- owned sectors in China, the literature has concentrated on self-selection between the two sectors, leaving the family effects aside. To the best of my knowledge, this is the first paper estimating the role of occupational identity in a society with decreasing intergenerational income mobility.

The rest of this paper is organized as follows. Section 3.2 reviews the literature. Section 3.3 describes a simple model of intergenerational transmission. Section 3.4 provides details of the data, followed by Section 3.5, which presents econometric specification. Section 3.6 analyses empirical evidence. Section 3.7 discusses and Section 3.8 concludes the paper.

3.2 Literature Review

The cornerstone paper on intergenerational income transmission is that of Becker & Tomes (1979), who have developed an equilibrium theory of intergenerational mobility and distribution of income. Their later paper (Becker & Tomes, 1986) crystallizes a model for the intergenerational transmission of income, and specify a possible concave intergenerational income relationship under imperfect access to capital market. Solon

(2004) rationalizes the log-linear regression commonly used in the empirical works to examine the intergenerational income elasticity.

Early empirical work focuses on point estimation of income correlation between fathers and sons in developed countries, and especially the United States. The estimated coefficients are relatively low, around 0.2 or less in the U.S. (Sewell *et al.*, 1975; Behrman & Tarbman, 1985). Solon (1989, 1992) points out the bias in the estimates from previous studies, which are from "the error-ridden data"or "the unrepresentative samples". In addition, he proposes improved methods by taking an average across several years to measure the lifetime income for parents and using instrumental variables (IVs) to address the endogeneity caused by unobserved common factors influencing both parents' and children's income. A new estimate of IGE around 0.4 is generated, which reveals a less mobile society than the one described before. Lee & Solon (2009) estimate the trend in intergenerational income mobility in U.S. across twenty years. They find no statistically significant variation in the intergenerational income mobility across the years, though this result is challenged by other studies (Hauser, 1998; Mazumder & Levine, 2002; Mayer & Lopoo, 2005). Mayer & Lopoo (2005) attempt to reconcile the previous conflicting findings by claiming a nonlinear trend in the IGE.

Recent studies touch upon the intergenerational mobility patterns in developing countries. Lillard & Kilburn (1995) report an intergenerational income elasticity of 0.26 between parents and sons in Malaysia. Labar (2007) estimates the IGE of income to be 0.29 in China between 1991 and 2004. Guo & Min (2008) indicate that the overall IGE of income for the father-son pairs in urban China is around 0.32 in 2004, though the estimate is potentially biased since one-year income may not be an appropriate proxy for lifetime income. Gong *et al.* (2012) estimate that the intergenerational income elasticity in China is 0.74 for father-son pairs, 0.84 for father-daughter pairs, 0.33 for mother-son pairs, and 0.47 for mother-daughter pairs. However, the estimates are potentially biased due to lack of panel datasets or valid instrumental variables.[70] Chen *et al.* (2010) examine the changes in IGE through pre-Mao, Mao, and post-Mao periods in urban China, showing a decrease in intergenerational income mobility.[71] Nevertheless, they use one-year income to measure parental lifetime income due to the limitation of cross-sectional data

[70]Guo & Min (2008) use one-year income as proxy for father's lifetime income which is vulnerable to random shocks in specific year. Gong *et al.* (2012) adopt predicted parental permanent income with education as an instrument. However, whether the prediction and instrument are convincing is open to discussion. For instance, parental education can be positively correlated with some unobserved factors, such as the diligence in the family culture, which can be positively correlated with children's income. In this scenario, this instrument violates the exclusion restriction, and biases the coefficients upward.

[71] They consider cohorts "born before 1940 educated under the pre-Mao regime", and those "born from 1970 on as educated under the post-Mao regime".

structure. Deng *et al.* (2013) correct for co-residency bias in urban China, and report an estimated IGE of 0.45 in 1995 and 0.51 in 2002 between fathers and sons.

Researchers in recent decades have applied various methods to investigate causal mechanisms through which economic status is transmitted from one generation to the next. One method is to estimate sibling correlation in order to implicitly assess the impact of family background on children's earnings (Björklund *et al.*, 2006; Mazumder, 2008). However, this method cannot provide a direct estimation of intergenerational mobility. Another method is using adoptees or twins to identify the nature versus nurture effects (Behrman & Rosenzweig, 2002, 2005; Plug, 2004; Antonovics & Goldberger, 2005; Sacerdote, 2007; Liu & Zeng, 2009). Nevertheless, the underlying assumptions of random assignment of adoptees and equal treatment as biological children are not plausible (Black & Devereux, 2011). For twins, assortative mating between the twin and his/her spouse biases the estimates under fixed-effect estimation (Black & Devereux, 2011).

A third method is to decompose the intergenerational income persistence through intermediate variables. The basic idea is to account for intergenerational income persistence by children's intermediate attributes, which are affected by parental income, and will influence children's future income. The prevalent intermediate variables include IQ test scores (Bowles & Gintis, 2002), education, non-cognitive skills (Blanden *et al.*, 2007), and health (Currie & Moretti, 2007). However, the causality drawn from this method is controversial, since it is difficult to distinguish among different transmitting channels. A fourth method is to use natural experiments to isolate the direct causal effect of parental income on children (Dahl & Lochner, 2005; Oreopoulos *et al.*, 2008). Despite the difficulty of having such natural experiments, this method, nevertheless, is also implausible in drawing causal arguments since the shocks may influence not only parental income but also other factors in the families, such as psychological ones, which may cause an endogenous problem (Black & Devereux, 2011). Most studies in examining transmission channels focus on developed countries. Little is known about developing countries.

Akerlof & Kranton (2010) bring the notion of 'identity' into economics, initiate the concepts of Identity Economics, and emphasize the importance of identity in economic behaviour. However, they focus on analysing the correlation between identity and economic preference and outcome. The impact of identity on intergenerational mobility is little touched upon. Recently, there has been a rising surge of studies in estimating the impact of political force on intergenerational mobility. Ichino *et al.* (2011) find that party affiliation has greater explanatory power than education, which is traditionally considered the main determinant of IGE. In China's context, Chen *et al.* (2010) study the connection between the 1979 economic reform and intergenerational mobility. They demonstrate a

decreasing social mobility in the context of a more open economy, and argue that elites can invest in their children and the reform jointly. With regard to state- versus privately-owned sectors, the literature focuses on wage differences (Zhao, 2002; Démurger *et al.*, 2006).

In this paper, I apply the decomposition method to investigate the degree and channel of the intergenerational income transmission during China's transition period. In contrast to the literature, I concentrate on examining the impact of political and occupational identities on intergenerational mobility, and attempt to establish an interpretation framework of identity transmission across generations. To the best of my knowledge, no previous studies have linked the decreasing intergenerational mobility with occupational identity.

3.3 Model

Solon (2004) rationalizes the log-linear regression, which is commonly used in empirical work to examine intergenerational income elasticity. I follow his model though making one adjustment in the production function to fit into China's context.

Assume there is one parent at time $t-1$, and one child at time t in family i. The parent allocates after-tax lifetime income $(1-\tau)y_{i,t-1}$ between his/her own consumption $C_{i,t-1}$ and investment for the child, $I_{i,t-1}$. Specifically, it is assumed that the parent cannot borrow against the child's prospective earnings and does not bequest financial asset directly. The budget constraint for the parent is:

$$(1-\tau)y_{i,t-1} = C_{i,t-1} + I_{i,t-1}. \tag{29}$$

Meanwhile, the government also invests in the child through investment in public education, G_{t-1}. Solon (2004) considers the investment in children's education from parents and government as perfect substitutes, which is the conventional case in developed countries. Nevertheless, in developing countries as China, access to capital markets is limited. In this scenario, I separate governmental investment (G_{t-1}) from parental investment (I_{t-1}), and focus on the effect of the latter.

Parental and governmental investments generate the child's intermediate outcome, which can further generate his/her future income:

$$h_{it} = \theta \ln(I_{i,t-1}) + \eta G_{t-1} + e_{it}, \tag{30}$$

where θ is the marginal product of parental investment in the child.[72] e_{it} is the child's un-

[72]The original model in Solon (2004) is expressed as $h_{it} = \theta \ln(I_{i,t-1} + G_{t-1}) + e_{it}$.

observed endowment affecting his/her outcome, such as unobserved ability. h_{it} is a vector of child's intermediate outcome, including education, political status, and occupational status. Education is a traditional determinant for earnings. As indicated by Blanden *et al.* (2007) and Currie & Almond (2011), it is the major channel through which wealth can be transmitted from one generation to the next. Thus schooling is my baseline intermediate variable.

Children's occupational and political identities are the innovative channels I investigate in this paper. Occupational identity refers to being employed in the state-owned or private sector. It is a dummy variable that equals one if the child is in the state-owned sector. Otherwise it equals zero. Working in different sectors generates various returns in different economic institutions. Under planned economy, working in the state-owned sector possibly yields higher return than being employed in the private sector. It is because the state-owned sector monopolizes core industries such as electricity and water supply, and is protected by the government against market vicissitude. Under the market economy, however, the monopolistic power of the state-owned sector is weakened by market competition, and the private sector develops and competes with the state-owned sector by providing high earnings. In summary, altruistic parents are expected to use their wealth and networks to help their children involved in the sector yielding a high return, no matter within which economic institutions.

Political identity refers to whether or not a citizen is a Communist Party member in the Chinese context. As the economic reform is led by the Chinese Communist Party, political identity is an important factor influencing income (Li *et al.*, 2012b). Being a Communist Party member is important for high earnings, as it facilitates promotion in enterprises/institutions, and possibly opens up more opportunities to economic rents. Altruistic parents are anticipated to invest in children's political identity in order to help them obtain high earnings.

Specifically, the child's unobserved endowment e_{it} is assumed to be first-order autoregressive as specified in Solon (2004):

$$e_{it} = \delta + \lambda e_{i,t-1} + \nu_{it}, \tag{31}$$

where λ is the coefficient for heritability lying between 0 and 1. ν_{it} is a white-noise error term.

The child's intermediate outcome h_{it} generates his/her income return y_{it} in the logarithm form:

$$\ln y_{it} = ph_{it} + \mu_{it}, \tag{32}$$

where μ_{it} is the error term.

The optimization problem of the family is summarized as follows. The parent maximizes his/her Cobb-Douglas utility function subject to constraints:

$$\max U_i = (1-\alpha)\ln C_{i,t-1} + \alpha \ln y_{it} \tag{33}$$

$$\begin{aligned} s.t.\ (1-\tau)y_{i,t-1} &= C_{i,t-1} + I_{i,t-1} && (34)\\ h_{it} &= \theta \ln(I_{i,t-1}) + \eta G_{t-1} + e_{it} && (35)\\ \ln y_{it} &= p h_{it} + \mu_{it} && (36) \end{aligned}$$

where α lies between 0 and 1, representing parental altruism.

Insert Eqs. (34) to (36) into (33), and solve for the optimal $I_{i,t-1}$:

$$I_{i,t-1} = \left[\frac{\alpha\theta p}{1-\alpha(1-\theta p)}\right](1-\tau)y_{i,t-1} \tag{37}$$

To derive the intergenerational income elasticity, insert Eq. (35) into Eq. (36):

$$\ln y_{it} = \mu + p\left[\theta \ln(I_{i,t-1}) + \eta G_{t-1} + e_{it}\right]. \tag{38}$$

Substituting Eq. (37) into Eq. (38), the intergenerational income elasticity is captured as:

$$\ln y_{it} = \mu^* + \theta p \ln y_{i,t-1} + p e_{it}, \tag{39}$$

where $\mu^* = \mu + p\eta G_{t-1} + \theta p \ln\left\{\alpha\theta p(1-\tau)/\left[1-\alpha(1-\theta p)\right]\right\}$.

Eq. (39) is the linear regression that estimates the intergenerational income elasticity.

3.4 Data

The data set I use is the Chinese Household Income Projects (CHIPs) in 1995 and 2002. It is a series of annual micro-level surveys which aim to measure individual and household income, as well as other socioeconomic factors in China. It is a joint piece of research 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 the Columbia University. The survey is based on face-to-face interviews, and covers 1/3 of the 34 province-level administrative units in China. The provinces and municipalities under the survey are depicted in Figure 3.1. I focus on urban areas only, in order to get rid of income noise from household members' working together on family farms. Rural residents and

migrants from rural to urban areas are not included in the sample.[73]

The reasons why this data set is suitable for the present research is as below. First of all, it records each individual's detailed income from all sources in the preceding six (1995 survey) or five (2002 survey) years. It provides a rare chance to calculate lifetime income in a developing country such as China by taking an average across the years, and getting rid of random income shock in one specific year. Secondly, this survey records a detailed relationship among household members, which facilitates my linkage between parents and children. Last but not least, the areas under this survey are geographically and economically representative, which provides an opportunity to generate nationally representative estimates.[74]

Table 3.1 presents the data description. There are 1,448 parent-child pairs in total, among which 627 pairs (43.3%) with children born before 1970, and 821 pairs (56.7%) with children born after 1970. To avoid measurement error in income from individuals who have just entered the labour market, I restrict it so children had to be at least 23 years old, and had to have worked for at least three years. The average ages of the children in early and late cohorts are 30 and 25 respectively, which are at the early-middle stage of the life cycle for the working population. The average fathers' ages are 57 and 53, which indicate a late stage for the working people. To even income shock in specific year(s), I restrict it so those fathers have to have had at least three years' income. There is no restriction on mothers' income, since there can be housewives with no income, especially in the early birth cohorts. The household annual incomes from both fathers and mothers are RMB 9,331 (USD 1,127) and RMB 15,432 (USD 1,864) in each cohort consequently, adjusted by the Consumer Price Index (CPI) to the price in 2002. Children's annual incomes are RMB 6,628 (USD 800) and RMB 8,940 (USD 1,080) respectively, adjusted to the 2002 price. Children's schooling years increase from 11.6 to 12.4 across cohorts, though both of them fall into the same educational category as approaching the end of senior high school or at the start of university. Percentages of children being Communist Party members drop from 11.8% to 9.1% from early into late cohorts. The proportion of working in the state-owned sector decreases as well, from 91.4% to 74.3% along with the market reform.

A potential sample-bias problem exists in CHIPs data. The household members are defined as those who live together stably or temporarily do not live together but have a

[73]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.

[74]CHIP is considered geographically representative since the areas under survey cover the Northeast (Liaoning), the South (Guangdong), the Southwest (Yunnan), and the West (Gansu). It is considered to be economically representative as the surveyed areas include the richest parts in China such as Beijing and Guangdong, as well as the least developed parts such as Gansu.

close economic relationship.[75] In this case, those children who neither live together nor have close economic relationships with their parents are not included, such as married daughters.

3.5 Econometric Specification

3.5.1 Point estimation

Regression estimating the intergenerational income elasticity follows conventional specifications in the literature (Solon, 1992; Mazumder & Levine, 2002; Mayer & Lopoo, 2005; Lee & Solon, 2009). To capture the effect of institutional change on the IGE, I separate the pooled data (from two waves) into two birth cohorts, and introduce a cohort dummy C_t, which equals zero if a child was born in the early birth cohort (between 1949 when the People's Republic of China was founded and 1970 (included)). C_t equals one if an individual was born after 1970. The reason for choosing 1970 as a cut-off point is as follows. The economic reform started from 1978. The normal age of joining primary school is around seven in China. Thus those born after 1970 are considered to have received education in the post-reform era. Distinguishing the two cohorts by education is because that in the literature it is considered as the main reason for the intergenerational income persistence (Blanden *et al.*, 2007; Chen *et al.*, 2010). The regression is specified as follows:

$$\ln y_{1it} = \alpha_0 + \alpha_1 \ln y_{0i} + \alpha_2 C_t * \ln y_{0i} + \alpha_x X_{it} + \alpha_{cx} C_t * X_{it} + \varepsilon_{1it} \tag{40}$$

where $\ln y_{1it}$ is the natural logarithm of child's annual income at time t for child i. In order to estimate their lifetime income, all the children are at least 23 years old and have worked for at least three years. $\ln y_{0i}$ is the average annual logarithm income of parents over at least three years. C_t is the cohort dummy described above. X_{it} is a vector of control variables. Consistent with the literature (Solon, 1992; Lee & Solon, 2009), it include child's age, father's average age over at least three years, quadratic forms of child's and father's ages to capture the nonlinear correlation, child's gender dummy, wave dummy and provincial dummies.[76]

The coefficients of α_1 and α_2 are what I am interested in. α_1 captures the IGE of income in the early birth cohort. α_2 estimates the change in IGE between early and late

[75]The CHIP sample is a subsample of the national census, and follows the definition of household members from the National Bureau of Statistics of China.

[76]The reason for including the age of father rather than mother is because household income is mainly from father's side in China. In addition, as father's and mother's ages are highly correlated, it is sufficient to include one of them only.

cohorts. $\alpha_1 + \alpha_2$ displays the IGE in the late cohort. Standard errors are clustered by households.

If parental income forms a stringent budget constraint for children's achievements, the IGE of income possibly varies across different income groups. Taking this probability into concern, I classify parental income into upper and lower 50% income groups, which are picked up by a dummy variable Q_i.[77] $Q_i = 1$ if parental total income is in the upper 50% income group in a specific cohort. Otherwise, it equals zero. The regression estimating the IGE of income across different income groups and cohorts is as below:

$$\begin{aligned} \ln y_{1it} &= \beta_0 + \beta_1 \ln y_{0i} + \beta_{QY} Q_i * \ln y_{0i} + \beta_{CY} C_t * \ln y_{0i} + \beta_{QCY} Q_i * C_t * \ln y_{0i} \\ &\quad + \beta_X X_{it} + \beta^k_{QX} Q_i * X_{it} + \beta^k_{CX} C_t * X_{it} + \beta_{QCX} Q_i * C_t * X_{it} + \eta_{1it} \end{aligned} \tag{41}$$

where $\ln y_{1it}$, $\ln y_{0i}$, and X_{it} share the same definition as before. Coefficients of β_1,β_{QY}, β_{CY},and β_{QCY} are the outcomes of interest. β_1 captures the IGE in families in the bottom 50% income group in the early cohort. β_{QY}, β_{CY},and β_{QCY} indicate changes in the IGEs in the upper 50% income group in the early cohort, lower 50% in the late cohort, and upper 50% in the late cohort respectively, compared with that in the lower 50% income group in the early cohort. The vector of control variables X_{it} is also interacted with the two dummies of Q_i and C_t. Standard errors are clustered by households.

3.5.2 Decomposition of intergenerational income persistence

Following the literature (Bowles & Gintis, 2002; Blanden *et al.*, 2007), I decompose the intergenerational income persistence through two Ordinary Least Squares (OLS) equations. The first regression estimating the marginal productivity of parental lifetime income on child's intermediate variables is as follows:

$$\ln h_{1it} = \delta_0 + \delta_1 \ln y_{0i} + \delta_2 C_t * \ln y_{0i} + \delta_X X_{it} + \delta_{CX} C_t * X_{it} + e_{1it} \tag{42}$$

where h_{1it} is a vector of child's intermediate outcome, which includes education, ownership of work unit, and Communist Party membership, as described in Section 3.3. Definitions of other variables remain the same, as described in Section 3.5.1.

The coefficients of δ_1 and δ_2 are outcomes of interest. δ_1 captures the marginal productivity of parental lifetime income on child's intermediate variables in the early birth cohort. δ_2 indicates the change in parental marginal productivity from early into late

[77] Due to small sample size, I divide the sample into two subgroups only, upper and lower 50% income groups.

cohorts. The marginal productivity in the late cohort is $\delta_1 + \delta_2$.

The second regression capturing return to children's intermediate variables is as below:

$$\ln y_{1it} = \gamma_0 + \gamma_1 \ln h_{1it} + \gamma_2 C_t * \ln h_{1it} + \gamma_x X_{it} + \gamma_{cx} C_t * X_{it} + \mu_{1it} \tag{43}$$

where $\ln y_{1it}$, h_{1it}, C_t, and X_{it} share the same definition as described above. μ_{1it} is the error term. γ_1 captures the return to child's intermediate outcome in the early birth cohort. $\gamma_1 + \gamma_2$ captures return in the late cohort. The baseline regression is the one with education only, as schooling is the conventional channel in the intergenerational transmission (Blanden *et al.*, 2007; Currie & Almond, 2011). Political and occupational identity is added in by consequence. Details will be shown in Section 3.6.2.

Insert Eq. (42) into Eq. (43):

$$\begin{aligned} \ln y_{1it} \quad = \quad & (\gamma_0 + \gamma_1\delta_0 + \gamma_2\delta_0 C_t) + \gamma_1\delta_1 \ln y_{0i} + [(\gamma_1\delta_2 + \gamma_2\delta_1)C_t + \gamma_2\delta_2 C_t^2] * \ln y_{0i} \\ & + [\gamma_1\delta_X + \gamma_X + (\gamma_2\delta_X + \gamma_{cx})C_t + (\gamma_1 C_t + \gamma_2 C_t^2)\delta_{cx}]X_{it} \\ & + (\gamma_1 + \gamma_2 C_t)e_{1it} + \mu_{1it} \end{aligned} \tag{44}$$

From Eq. (44) the IGE of income in the early cohort can be decomposed as:

$$\hat{\beta}_{early} = \delta_1\gamma_1 + \frac{Cov(\gamma_1 e_{1it} + \mu_{1it}, \ln y_{0i})}{Var(\ln y_{0i})} \tag{45}$$

$\delta_1\gamma_1$ is the part that can be explained by the intermediate variables. Specifically, it is the product of parental marginal investment in child's intermediate variables (δ_1) and the return to those variables (γ_1). $\frac{Cov(\gamma_1 e_{1it} + \mu_{1it}, \ln y_{0i})}{Var(\ln y_{0i})}$ accounts for the unexplainable element.

Similarly, the IGE of income in the late cohort can be decomposed as follows:

$$\hat{\beta}_{late} = (\delta_1 + \delta_2)(\gamma_1 + \gamma_2) + \frac{Cov[(\gamma_1 + \gamma_2)e_{1it} + \mu_{1it}, \ln y_{0i}]}{Var(\ln y_{0i})} \tag{46}$$

$(\delta_1 + \delta_2)(\gamma_1 + \gamma_2)$ stands for the explainable part by intermediate variables in the late cohort, while $\frac{Cov[(\gamma_1 + \gamma_2)e_{1it} + \mu_{1it}, \ln y_{0i}]}{Var(\ln y_{0i})}$ represents the part remaining unexplained.

Similarly, when introducing the dummy of Q_i for the upper or lower 50% income group, Eqs. (42) and (43) can be rewritten as follows: [78]

[78] Q_i has the same definition as described above. It equals one if parental total income is in the upper 50% income group in each cohort. Otherwise, it equals zero.

$$\begin{aligned}\ln h_{1it} &= \delta_0^{'} + \delta_1^{'} \ln y_{0i} + \delta_2^{'} C_t * \ln y_{0i} + \delta_3^{'} Q_i * \ln y_{0i} + \delta_4^{'} C_t * Q_i * \ln y_{0i} \\ &+ \delta_X^{'} X_{it} + \delta_{CX}^{'} C_t * X_{it} + \delta_{QX}^{'} Q_i * X_{it} + \delta_{CQX}^{'} C_t * Q_i * X_{it} + e_{1it} \end{aligned} \tag{47}$$

$$\begin{aligned}\ln y_{1it} &= \gamma_0^{'} + \gamma_1^{'} \ln h_{1it} + \gamma_2^{'} C_t * \ln h_{1it} + \gamma_3^{'} Q_i * \ln h_{1it} + \gamma_4^{'} C_t * Q_i * \ln h_{1it} \\ &+ \gamma_X^{'} X_{it} + \gamma_{CX}^{'} C_t * X_{it} + \gamma_{QX}^{'} Q_i * X_{it} + \gamma_{CQX}^{'} C_t * Q_i * X_{it} + \mu_{1it} \end{aligned} \tag{48}$$

The IGE of income in each cohort-income group combination can be decomposed as below:

$$\hat{\beta}_{early,lower} = \delta_1^{'} \gamma_1^{'} + \frac{Cov(\gamma_1^{'} e_{1it} + \mu_{1it}, \ln y_{0i})}{Var(\ln y_{0i})} \tag{49}$$

$$\hat{\beta}_{early,upper} = (\delta_1^{'} + \delta_3^{'})(\gamma_1^{'} + \gamma_3^{'}) + \frac{Cov[(\gamma_1^{'} + \gamma_3^{'}) e_{1it} + \mu_{1it}, \ln y_{0i}]}{Var(\ln y_{0i})} \tag{50}$$

$$\hat{\beta}_{late,lower} = (\delta_1^{'} + \delta_2^{'})(\gamma_1^{'} + \gamma_2^{'}) + \frac{Cov[(\gamma_1^{'} + \gamma_2^{'}) e_{1it} + \mu_{1it}, \ln y_{0i}]}{Var(\ln y_{0i})} \tag{51}$$

$$\hat{\beta}_{late,upper} = (\delta_1^{'} + \delta_2^{'} + \delta_3^{'} + \delta_4^{'})(\gamma_1^{'} + \gamma_2^{'} + \gamma_3^{'} + \gamma_4^{'}) + \frac{Cov[(\gamma_1^{'} + \gamma_2^{'} + \gamma_3^{'} + \gamma_4^{'}) e_{1it} + \mu_{1it}, \ln y_{0i}]}{Var(\ln y_{0i})} \tag{52}$$

The subscripts of β in Eqs. (49) - (52) indicate the cohort-income subgroup to which each estimate refers. One potential problem with this method is that either political or occupational identity is closely related with education. Parents can either invest directly in children's political or occupational identity (rent seeking) or invest indirectly through education, which is a pre-request for obtaining a certain political or occupational identity. A criticism of the rich second generation in contemporary China is that they gain a combination of educational, political, and occupational privilege because of their superior family background. How to distinguish the effects from education and that from political/occupational identity is one challenge. I address this problem by implementing robustness checks, including schooling as one additional control in the regression for political and occupational identities. Details are presented in Section 3.7.

3.6 Empirical Results

3.6.1 Estimates of Intergenerational income persistence

Table 3.2 presents the intergenerational income elasticity between parents and children during China's transition period. Panel A demonstrates IGE for all children. Specifically, Columns (1) and (2) display the estimates in early and late cohorts, respectively. Column (3) presents the corresponding differences between the two cohorts. In addition, taking the various income distribution across generations into account, I examine the intergenerational income correlation, which is defined as multiplying intergenerational income elasticity by σ_p/σ_c, where σ_p and σ_c are the standard deviations of logarithm income of parents and children. Panel B displays matrices for the intergenerational income elasticity by income group and cohort, and the differences among subgroups.

I find that child's income increases by 0.315% with 1% increase in the parental income in the early cohort (Panel A). It is statistically significant at a high 1% level of significance. A rough but intuitive interpretation is that if a family's income is RMB 1,000 (USD 121 in 2002 price) higher than the average in the parents' generation, their child's income will be RMB 315 (USD 38 in 2002 price) higher than the average of his/her generation. The estimated elasticity equals that of the UK, which is 0.32 for father-son pairs observed between 1991 and 2003 (Nicoletti & Ermisch, 2008). In the late cohort, the IGE increases by 40%, reaching 0.442 with statistical significance at the 1% level. It approaches an estimate of 0.47 in the U.S. (Grawe, 2004). The difference of 0.127 between IGE in the early and late cohorts is statistically significant at the 10% level. Similarly, the intergenerational income correlation reveals a statistically significant increase across cohorts, by approximately 45%.[79]

Panel B examines the intergenerational income elasticity in each income-cohort subgroup. In the early cohort, the IGE for children in the lower 50% income group is 0.215, with statistical significance at the 10% level. The corresponding one in families with above-average income in the early cohort is 0.445 with 1% level of statistical significance. The difference of 0.23 between the two income categories, however, is not statistically significant. In the late cohort, the IGE differs significantly between the lower and upper 50% income groups, with 0.331 for the former and 0.518 for the latter. Both of the two estimates are at the high 1% level of significance. The statistically significant difference of 0.187 indicates enlarging inequality between the poor and the rich along with the market reform. In other words, it is increasingly more difficult for children from impoverished families to climb up the socioeconomic ladders in the post-reform era.

[79]The calculation is as follows: 0.105/0.231=0.455.

3.6.2 Decomposition of intergenerational income persistence

In this section, I investigate the channels of income transmission across generations. In addition to the conventional channel of education, I focus on examining the contribution of political and occupational identities to intergenerational persistence. Table 3.3 displays the relationship between mediating variables (educational, political, and occupational identities), child's income, and parental income in early and late cohorts. Results are derived from Eqs. (42) and (43). Column (1) presents the marginal productivity of parental investment in child's educational, political, and occupational identities. Columns (2) - (4) show the return to each mediating variable, adding one variable at one time.

In the early cohort, parental income has a statistically significant influence in child's educational and occupational identities, but not their political identity. With a 1% increase in parental income, a child's schooling years are raised by 0.09%, and their possibility of working in the state-owned sector by 4.4%. The two coefficients are statistically significant at the 1% and 5% levels of significance, respectively. However, there is no statistically significant relationship between parental income and child's party membership. In the late cohort, nevertheless, the correlation between parental income and the child's political identity increases sharply and is statistically significant. Specifically, with 1% increase in parental income, the possibility of children being Communist Party members goes up by 4.2%. The marginal productivity of parental investment in children's educational and occupational identities does not change much either in magnitude or significant level across cohorts.

Columns (2) - (4) present returns to the three mediating variables, adding education, political and occupational identity by sequence. Return to education in the early cohort is 0.561, and is statistically significant at a high 1% level (Column (4) in Panel A). The return to Communist Party membership remains around 0.14, and is statistically significant at the 5% level. No statistically significant return from children's occupational identity is found however. It is possible that the market under the planned economy is dominated by the state-owned enterprises and institutions. Therefore, there is not much variation in the sectoral choices. In the late cohort, the magnitude of the return to education decreases, accompanied by an increase in the magnitude of return to the political identity. Specifically, the return to schooling drops from 0.561 to 0.417 (Column (4) in Panel B). Compared to non-Communist Party members, the Party members have 15% higher income in the late cohort. The estimate is at the 5% level of statistical significance. Occupational identity does not present a statistically significant earning premium as that in the early cohort, though the underlying reason could be different. It is possibly the competition from the private sector in the post-reform era that decreases the wage premium of working in the

state-owned enterprises/institutions.

Table 3.4 summarizes contribution from each mediating variable to intergenerational income persistence across cohorts, with percentage in the parentheses. Education acts as leading contributor in both early and late cohorts, explaining 15.9% and 8.1% of the total IGEs, respectively.[80] Regarding occupational identity, there is a sharp decrease from 0.018 to 0.0002 in the contribution of working in the state-owned sector along with market reform. It is possibly the consequence of competition from the private sector that reduces the income premium of working in the state-owned sector. Being Communist Party members, however, contributes increasingly in the late cohort. The contribution even flips signs from -0.002 to 0.006. It is possibly because in the pre-reform era, the Party is more likely to recruit individuals from economically-disadvantaged families as revealed in Column (1) of Table 3.3, although the estimate is not statistically significant. In the post-reform era, nevertheless, the child's possibility of joining the Party is positively correlated with parental income.

More interesting findings are revealed in Tables 3.5 - 3.6, taking the differential effect in each income group into account. Table 3.5 replicates results in Table 3.3 but investigates the intergenerational income persistence across income category and cohort. Results are derived from Eqs. (47) and (48). It is shown in Column (1) that no matter whether in lower or upper 50% income groups of the early cohort, parental income does not have a statistically significant influence on any intermediate variable. Regarding the return to the mediating variables, I find that education generates a higher return in relatively poor families than that of rich families in early cohort (0.611 *vs.* 0.445 in Columns (4) of Panels A and B in Table 3.5), with statistical significance at the high 1% level. Being a Communist Party member is more important for children from rich families than those from poor households. This political identity generates a 17.3% income premium in rich families versus 16.3% premium in poor ones, with statistical significance at the 10% level (Columns (4) of Panels A and B in Table 3.5). In general, however, the patterns of parental investment and return to earnings in rich and poor households do not differ much in the pre-reform era.

In the post-reform era, however, the pattern of intergenerational transmission varies. Economically differentiated parents invest exactly in the intermediate variable that generates the highest return. Specifically, for the poor families, parental investment in education has the highest marginal productivity among the three intermediate variables. With a 1% rise in parental income, the child's schooling is increased by 0.114%. For their

[80]The calculation is as follows. In the early cohort, the education accounts for 0.05 of the intergenerational income elasticity, which is 15.87% of the total IGE (0.315). Similarly, in the late cohort, education accounts for 0.036, which is 8.14% of the total IGE (0.442).

rich counterparts, nevertheless, parental investment is statistically significant in political identity only. With a 1% increase in parental income, the child's possibility of being a Communist Party member is increased by 7.7%, and is statistically significant at the 10% level. Columns (2) - (4) provide possible explanation for this phenomenon. Along with the market reform, parents invest exactly in the attribute generating the highest return for their children, which is education for the poor families (0.428 in Column (4) of Panel C) and political identity for the rich (0.211 in Column (4) of Panel D). It implies that being a Communist Party member plays a significant role for the rich in intergenerational income transmission along the economic transition.

Table 3.6 summarizes contribution from each mediating variable by income group and cohort. For either poor or rich families in the early cohort, education is the leading contributor, accounting for 13.1% and 7.1% of the total IGEs, respectively.[81] For the late cohort, the leading contributor remains as education in households with below-average income (0.0486 in Column (3) of Table 3.6). However, in above-average families, it is the political identity that contributes most to the income persistence across generations (0.0163 in Column (4) of Table 3.6). One possible reason is that as the economic reform was led by the Party, being a Communist Party member implies easier access to economic opportunities and rents. Chen *et al.* (2010) support this idea and claim that elites can invest in their children to take advantage of the economic reform. Thus social mobility decreases as economic institutions become more open. One remaining problem is that the percentage of the total IGE explained by the three mediating variables among the upper 50% income group in the late cohort is low (Column (4) in Table 3.6). Other mechanism is open to examination in future research.

3.7 Discussion

3.7.1 Robustness Check

Two potential challenges exist in decomposing the contribution from political and occupational identities. On the one hand, it is plausible that children from rich families, especially in the late cohort, have a similarly high educational attainment. Thus, it is the small within-group variation in schooling that induces the return to education insignificant. However, this hypothesis is not established because the mean and standard deviation of schooling remains similar across income categories and cohorts. Specifically, the average schooling year is 13.3 with a standard deviation of 2.6 in families with above-average

[81] The calculation is as below. In the early cohort, it is 0.0281/0.215=0.131. In the late cohort, it is 0.0314/0.445=0.071.

income in the late cohort. It is similar to the one in the corresponding income group in the early cohort (12.2 years with a standard deviation of 2.6), and slightly longer than the one in the lower half income category in the late cohort (11.6 years with a standard deviation of 2.5). All of them fall into the same educational category as approaching the end of senior high school or at the beginning of college/university. It is therefore unlikely that the similar schooling among children in rich families accounts for the sharp drop in the contribution of education toward intergenerational income persistence.

On the other hand, the potential correlation between occupational or political identity and education may bias the IGE estimates. The Party selection criteria include superior work ability, good inter-personal skills, and a positive attitude toward the Communist ideology (Li *et al.*, 2007). An increasing emphasis on educational qualifications rather than political loyalty is found by recent research (Walder, 1995). Lin & Bian (1991) also demonstrate a causal effect of education on Party membership in China. In addition, Party membership, which is strongly influenced by education, is a qualification for being officials in the state-owned sector. To separate the effect of education from that of political or occupational identity, I include education as one additional control in Eq. (47) to investigate the effects of parental income on a child's occupational or political identity. Tables 3.7 - 3.8 report the estimates from this robustness check. Compared to corresponding coefficients in Tables 3.5 - 3.6, estimates under the robustness check remain similar with reasonable variation. Specifically, the statistically significant parental investment in children's party membership for rich families in the late cohort remains robust both in the magnitude and the level of significance.

3.7.2 Why Is There a Shift in the Leading Contributor from Educational to Political Identity among Rich Families?

In Section 3.6.2 I present findings on the leading contributor to intergenerational income persistence before and after the economic transition. In the pre-reform era, educational identity contributes most to the income persistence across generations, in either rich or poor families. In the post-reform period, however, households with various incomes invest differently, but exactly in the way that generates the highest return for the children. Specifically, it is schooling for the families with below-average income, but political identity for households with above-average income.

Why is there such a shift in the leading contributor from educational to political identity? One explanation lies in the fact that as the initiator of the market reform, the Chinese Communist Party plays an increasingly important role in the transition process. However, due to the incompleteness of the market economy, collusion between wealth and politics

is easily formed and developed. Rich families are possibly more able to invest in children's political identity, which generates earning premium in the new era. This argument is supported by the empirical evidence in Ichino *et al.* (2011) that party affiliation has stronger explanatory power than education in determining intergenerational mobility. It also echoes the findings in Chen *et al.* (2010) that social mobility decreases as economic institutions becomes more open in China, because elites can invest in their children to take advantage of the economic reform. Therefore, the investment in child's political identity through parental privilege in economic status is indeed a transmission of economic capital to political capital. The consequence is not only the convergence of the privileged identity (educational, occupational, and political identities), but also the increase of intergenerational inequality.

What is worth mentioning is that parental investment in children's identity and the intergenerational transmission of identity are not always bad. The investment in schooling improves the human capital of the labour force. The emphasis on political identity encourages participation in politics. However, both of them require open economic and political institutions. After all, the production of wealth and the redistribution and transmission of wealth are two different processes.

3.8 Conclusion

In this paper, I investigate the degree and mechanism of intergenerational income transmission along with China's economic transition and development. Using a retrospective data set from urban China, I discover two sets of findings. First, intergenerational income persistence is increased along the economic transition and across income groups. On the dimension of time series, the intergenerational elasticity (IGE) of income increases by 40% for cohorts educated before and after the market reform, from 0.32 to 0.44. On the dimension of income category, the IGE in households with above-average income even reaches 0.52 in the post-reform era. It is 56% higher than the corresponding one in the lower half income category.

Second, I examine the channels of intergenerational income transmission, and innovatively investigate the contribution from political and occupational identities in addition to education. I find that in the pre-reform era, education acts as a leading contributor to intergenerational income persistence in both poor and rich families. Along with the economic transition and development, nevertheless, parents from various income groups invest in differentiated ways, but exactly in the child's intermediating variable which generates the highest return. Specifically, families with below-average income invest in children's schooling, as was circumstance before the market reform. Households with above-

average income in the post-reform era invest in a new channel, political identity, which is the leading contributor in the new era. Working in the state-owned sector contributes less to intergenerational income persistence in the post-reform era than that in the pre-reform era. The results remain robust taking the correlation between educational and political or occupational identities into account.

The findings shed light on the necessity of intensifying China's current reforms. As the empirical evidence shows, the leading contributor to intergenerational income persistence shifts from educational to political identity among families with above-average income along with the economic transition. It calls for more open economic and political institutions to provide equal opportunities for individuals, especially those from poor families.

One caveat of this research is that the results present correlation rather than causality. The decomposition method cannot address the endogeneity problem originating from unobserved common factors affecting parental and children's income. This problem is open to investigation in future research.

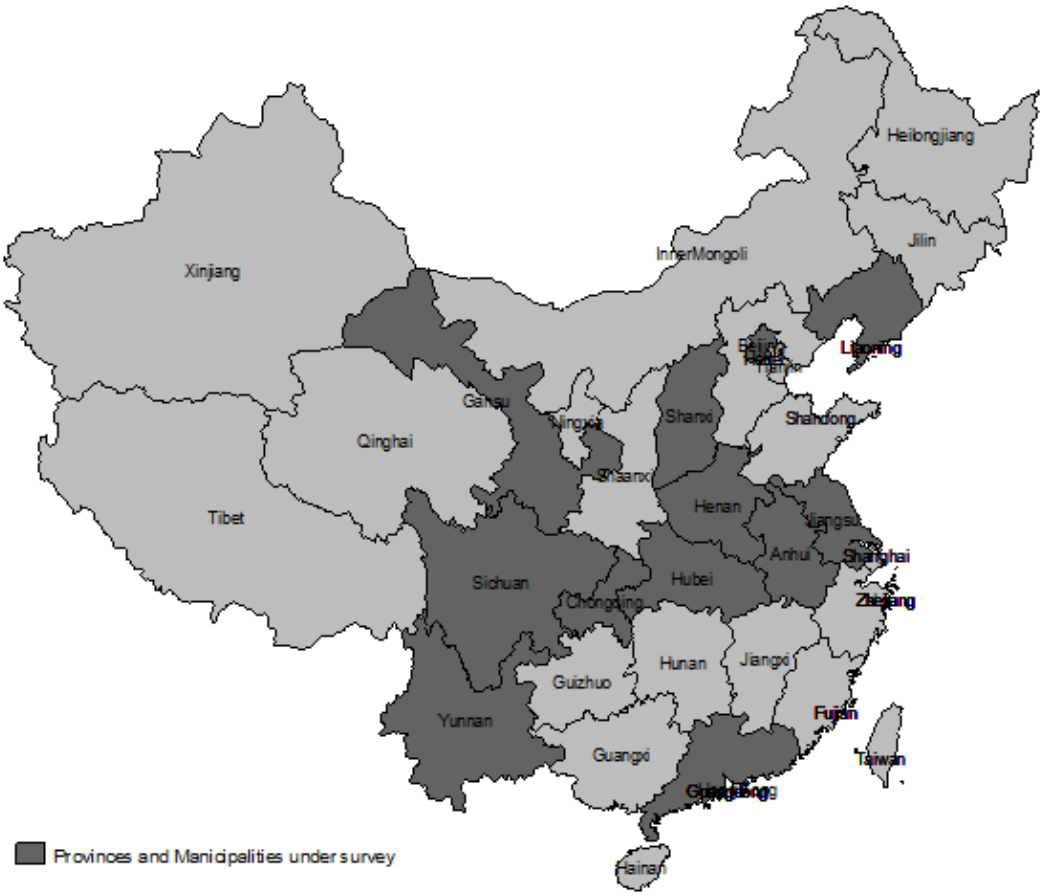


Figure 3.1: Provinces and Municipalities under the Chinese Household Income Project (CHIP)

Notes: The provinces and municipalities under the Chinese Household Income Project in 1995 survey are: Beijing, Liaoning, Shanxi, Jiangsu, Anhui, Henan, Hubei, Sichuan, Gansu, Yunnan, and Guangdong. Chongqing is included in the 2002 survey as a municipality which was separate from Sichuan Province in 1998.

Table 3.1: Summary Statistics

	Mean (standard deviation)	
	Early cohort	**Late cohort**
Annual child's income[a]	6628.004	8939.762
	(5,783.354)	(7,622.202)
Annual family income[b]	9331.364	15432.46
	(5,887.859)	(11,384.180)
Child's schooling years	11.644	12.448
	(2.642)	(2.667)
Child's party membership	0.118	0.091
(Communist Party = 1)	(0.323)	(0.288)
Child's occupation	0.914	0.743
(state-owned sector = 1)	(0.281)	(0.437)
Child's gender	0.705	0.6
(male = 1)	(0.456)	(0.490)
Child's age[c]	29.523	25.462
	(4.298)	(2.353)
Father's age[d]	57.14	53.28
	(4.683)	(4.548)
Observations	627	821

Notes: Children are at least 23 years old, and have worked for at least three years before the survey wave, in order to capture their lifetime income.
Income is converted to the 2002 RMB using Consumer Price Index. Specifically, in the early cohort, child's annual income of RMB 6,628 equal to USD 800 in 2002 price. Annual family income of 9,331 equals USD 1,127. In the late cohort, RMB 8,940 is equivalent to USD 1,080. RMB 15,432 is equal to USD 1,864.
[a] Child's income refers to annual income in the survey wave.
[b] Parental income refers to the summation of father's and mother's annual average income in the preceding 3 years (at least) of the survey wave.
[c] Child's age refers to the age in the survey wave.
[d] Father's age refers to father's average age in the preceding 3 years (at least) of the survey wave.

Table 3.2: Estimates for Intergenerational Income Elasticity and Intergenerational Income Correlation in China's Transition Period

Panel A. All children			
	Early cohort[a]	**Late cohort**[a]	**Difference**
	(1)	(2)	(3)
Intergenerational income elasticity	0.315***	0.442***	0.127*
	(0.063)	(0.044)	(0.077)
Intergenerational income correlation[b]	0.231***	0.336***	0.105*
	(0.046)	(0.034)	(0.057)
Panel B. By income group			
	Lower 50% income group[c]	[difference][d]	**Upper 50% income group**[c]
early cohort[a]	0.215*	*0.23*	0.445***
	(0.123)	*(0.154)*	(0.103)
[difference][e]	*0.116*		*0.073*
	(0.147)		*(0.133)*
late cohort[a]	0.331***	*0.187**	0.518***
	(0.084)	*(0.113)*	(0.083)

Notes: Robust standard-error estimates are in parentheses, and are clustered by households. * Significant at 10%; ** significant at 5%; *** significant at 1%. Income is converted to the 2002 RMB using Consumer Price Index.

Children are at least 23 years old, and have worked for at least three years before the survey wave, in order to capture their lifetime income. Additional regressors include child's age and squared age, parental age and squared age, child's gender, wave and provincial dummies.

[a] Early cohort refers to children born between 1949 (the foundation of the People's Republic of China) and 1970 (included). Late cohort refers to the case that children were born after 1970. They received education and worked in the post 1978 economic reform era.

[b] Intergenerational income correlation = intergenerational income elasticity$*\sigma_p/\sigma_c$, where σ_p and σ_c are the standard deviation of logarithm income of parents and children, respectively.

[c] Upper 50% income group refers to the scenario that parental income is in the upper 50% of their generation. Lower 50% refers to the case that parental income is in the lower 50% of their generation.

[d] The difference indicates difference of intergenerational income elasticity between lower and upper 50% income groups within each cohort.

[e] The difference indicates difference of intergenerational income elasticity between early and late cohorts within each income group.

Table 3.3: Relationship between Mediating Variables, Child's Income, and Parental Income in China's Transition Period

	Marginal Productivity of Parental Income[a] (δ)	**Income Regression** ln (child's income) (γ)		
	(1)	(2)	(3)	(4)
Panel A. Early cohort[b]				
ln (child's education)	0.090***	0.599***	0.568***	0.561***
	(0.022)	(0.129)	(0.128)	(0.130)
Child's party membership (Communist party=1)	-0.011		0.143**	0.142**
	(0.027)		(0.065)	(0.064)
Ownership of child's work unit (state=1)	0.044**			0.04
	(0.022)			(0.128)
Panel B. Late cohort[b]				
ln (child's education)	0.085***	0.443***	0.418***	0.417***
	(0.019)	(0.160)	(0.158)	(0.158)
Child's party membership (Communist party=1)	0.042*		0.150**	0.150**
	(0.024)		(0.072)	(0.072)
Ownership of child's work unit (state=1)	0.100***			0.002
	(0.036)			(0.056)
Observations	1,448	1,448	1,448	1,448

Notes: Robust standard-error estimates are in parentheses, and are clustered by households. * Significant at 10%; ** significant at 5%; *** Significant at 1%. Income is converted to the 2002 RMB using Consumer Price Index.
Children are at least 23 years old, and have worked for at least three years before the survey wave, in order to capture their lifetime income. Additional regressors include cohort dummy, wave dummy, provincial dummies, child's gender dummy, and interaction between cohort dummy and other dummies.
[a] Parental logarithm income refers to the average annual logarithm income of parents in the preceding 3 years (at least) of the survey wave.
[b] Early cohort refers to children born between 1949 (the foundation of the People's Republic of China) and 1970 (included). Late cohort refers to the case that children were born after 1970. They received education and worked in the post 1978 economic reform era.

Table 3.4: Account for the Contribution of Educational Attainment, Party Membership and Ownership of Work Unit to Intergenerational Income Elasticity in China's Transition Period

	contribution (percentage)	
	early cohort	**late cohort**
Educational attainment (schooling years)	0.05	0.036
	(15.9%)	(8.1%)
Party membership (Communist Party =1)	-0.002	0.006
	(-0.6%)	(1.4%)
Ownership of work unit (state=1)	0.018	0.0002
	(5.7%)	(0.05%)
Explained	0.066	0.042
Total	0.315	0.442
Percentage of explained	0.21	0.095

Notes: The contribution is calculated as the multiplication of the marginal product of parental income on each input of children and the corresponding returns to the input. For instance, the contribution in the northwest corner is calculated as follows: 0.09 (column 1 in Table 3.3) * 0.561 (column 4 in Table 3.3) = 0.05.

Table 3.5: Relationship between Mediating Variables, Child's Income, and Parental Income by Income Group in China's Transition Period

	Marginal Productivity of Parental Income[a](δ)	**Income Regression** ln (child's income) (γ)		
	(1)	(2)	(3)	(4)
Panel A. Early cohort[b] & lower 50% income group[c]				
ln (child's education)	0.046	0.572***	0.541***	0.611***
	(0.038)	(0.181)	(0.182)	(0.189)
Child's party membership	0.005		0.148*	0.163*
(Communist party=1)	(0.055)		(0.087)	(0.087)
Ownership of child's	-0.018			-0.309
work unit (state=1)	(0.025)			(0.213)
Panel B. Early cohort[b] & upper 50% income group[c]				
ln (child's education)	0.07	0.520***	0.480***	0.445***
	(0.055)	(0.151)	(0.143)	(0.152)
Child's party membership	-0.003		0.167*	0.173*
(Communist party=1)	(0.054)		(0.095)	(0.095)
Ownership of child's	0.093			0.183
work unit (state=1)	(0.061)			(0.144)
Panel C. Late cohort[b] & lower 50% income group[c]				
ln (child's education)	0.114***	0.437***	0.431***	0.428***
	(0.036)	(0.136)	(0.136)	(0.139)
Child's party membership	-0.003		0.035	0.026
(Communist party=1)	(0.038)		(0.098)	(0.098)
Ownership of child's	-0.02			0.051
work unit (state=1)	(0.053)			(0.087)
Panel D. Late cohort[b] & upper 50% income group[c]				
ln (child's education)	0.021	0.308	0.272	0.286
	(0.033)	(0.229)	(0.224)	(0.222)
Child's party membership	0.077*		0.199**	0.211**
(Communist party=1)	(0.044)		(0.093)	(0.093)
Ownership of child's	0.077			-0.08
work unit (state=1)	(0.076)			(0.068)
Observations	1,448	1,448	1,448	1,448

Notes: Robust standard-error estimates are in parentheses, and are clustered by households. * Significant at 10%; ** significant at 5%; *** Significant at 1%. Income is converted to the 2002 RMB using Consumer Price Index.

Children are at least 23 years old, and have worked for at least three years before the survey wave, in order to capture their lifetime income.

[a] Parental logarithm income refers to the average annual logarithm income of parents in the preceding 3 years (at least) of the survey wave.

[b] Early cohort refers to children born between 1949 (the foundation of the People's Republic of China) and 1970 (included). Late cohort refers to the case that children were born after 1970. They received education and worked in the post 1978 economic reform era.

[c] Upper 50% income group refers to the scenario that parental income is in the upper 50% of their generation. Lower 50% refers to the case that parental income is in the lower 50% of their generation.

Table 3.6: Account for the Contribution of Educational Attainment, Party Membership and Ownership of Work Unit to Intergenerational Income Elasticity by Income Group in China's Transition Period (Percentage)

	Early cohort[a] ***Lower 50% income group***[b] (1)	**Early cohort**[a] ***Upper 50% income group***[b] (2)	**Late cohort**[a] ***Lower 50% income group***[b] (3)	**Late cohort**[a] ***Upper 50% income group***[b] (4)
Educational attainment (schooling years)	0.0281 (13.1%)	0.0314 (7.1%)	0.0486 (14.7%)	0.0059 (1.1%)
Party membership (Communist party = 1)	0.0008 (0.4%)	-0.0005 (-0.1%)	0.0001 (0.03%)	0.0163 (3.1%)
Ownership of work unit (state = 1)	0.0056 (2.6%)	0.0171 (3.8%)	-0.001 (-0.3%)	-0.0061 (-1.2%)
Explained	0.034	0.048	0.048	0.016
Total	0.215	0.445	0.331	0.518
Percentage of explained	0.158	0.108	0.145	0.031

Notes: Columns (1) - (4) present the contribution of each factor to the intergenerational income elasticity in the lower 50% of the income distribution in the early cohort, the upper 50% of the early cohort, the lower 50% of the late cohort, and the upper 50% of the late cohort, separately.

The calculation of contribution is based on Table 3.5. It is calculated as the multiplication of the marginal product of parental income on each input of children and the corresponding returns to the input. For instance, the contribution in the northwest corner is calculated as follows: 0.046 (column 1 in Table 3.5) * 0.611 (column 4 in Table 3.5) =0.0281.

[a] Early cohort refers to children born between 1949 (the foundation of the People's Republic of China) and 1970 (included). Late cohort refers to the case that children were born after 1970. They received education and worked in the post 1978 economic reform era.

[b] Upper 50% income group refers to the scenario that parental income is in the upper 50% of their generation. Lower 50% refers to the case that parental income is in the lower 50% of their generation.

Table 3.7: Relationship between Mediating Variables, Child's Income, and Parental Income by Income Group in China's Transition Period: Robustness Test

	Marginal Productivity of Parental Income[a](δ)	**Income Regression** ln (child's income) (γ)		
	(1)	(2)	(3)	(4)
Panel A. Early cohort[b] & lower 50% income group[c]				
ln (child's education)	0.046	0.572***	0.541***	0.611***
	(0.038)	(0.181)	(0.182)	(0.189)
Child's party membership	-0.004		0.148*	0.163*
(Communist party=1)	(0.057)		(0.087)	(0.087)
Ownership of child's	-0.03			-0.309
work unit (state=1)	(0.026)			(0.213)
Panel B. Early cohort[b] & upper 50% income group[c]				
ln (child's education)	0.07	0.520***	0.480***	0.445***
	(0.055)	(0.151)	(0.143)	(0.152)
Child's party membership	-0.02		0.167*	0.173*
(Communist party=1)	(0.055)		(0.095)	(0.095)
Ownership of child's	0.084			0.183
work unit (state=1)	(0.060)			(0.144)
Panel C. Late cohort[b] & lower 50% income group[c]				
ln (child's education)	0.114***	0.437***	0.431***	0.428***
	(0.036)	(0.136)	(0.136)	(0.139)
Child's party membership	-0.019		0.035	0.026
(Communist party=1)	(0.039)		(0.098)	(0.098)
Ownership of child's	-0.04			0.051
work unit (state=1)	(0.052)			(0.087)
Panel D. Late cohort[b] & upper 50% income group[c]				
ln (child's education)	0.021	0.308	0.272	0.286
	(0.033)	(0.229)	(0.224)	(0.222)
Child's party membership	0.073*		0.199**	0.211**
(Communist party=1)	(0.043)		(0.093)	(0.093)
Ownership of child's	0.071			-0.08
work unit (state=1)	(0.076)			(0.068)
Observations	1,448	1,448	1,448	1,448

Notes: Robust standard-error estimates are in parentheses, and are clustered by households. * Significant at 10%; ** significant at 5%; *** Significant at 1%. Income is converted to the 2002 RMB using Consumer Price Index.

Children are at least 23 years old, and have worked for at least three years before the survey wave, in order to capture their lifetime income.

[a] Parental logarithm income refers to the average annual logarithm income of parents in the preceding 3 years (at least) of the survey wave.

[b] Early cohort refers to children born between 1949 (the foundation of the People's Republic of China) and 1970 (included). Late cohort refers to the case that children were born after 1970. They received education and worked in the post 1978 economic reform era.

[c] Upper 50% income group refers to the scenario that parental income is in the upper 50% of their generation. Lower 50% refers to the case that parental income is in the lower 50% of their generation.

Table 3.8: Account for the Contribution of Educational Attainment, Party Membership and Ownership of Work Unit to Intergenerational Income Elasticity by Income Group in China's Transition Period: Robustness Test (Percentage)

	Early cohort[a] ***Lower 50% income group***[b] (1)	**Early cohort**[a] ***Upper 50% income group***[b] (2)	**Late cohort**[a] ***Lower 50% income group***[b] (3)	**Late cohort**[a] ***Upper 50% income group***[b] (4)
Educational attainment (schooling years)	0.0281 (13.1%)	0.0314 (7.1%)	0.0486 (14.7%)	0.0059 (1.1%)
Party membership (Communist party = 1)	-0.0007 (0.3%)	-0.0034 (-0.8%)	-0.0005 (-0.2%)	0.0155 (3.0%)
Ownership of work unit (state = 1)	0.0094 (4.4%)	0.0154 (3.5%)	-0.0021 (-0.7%)	-0.0056 (-1.1%)
Explained	0.037	0.043	0.046	0.016
Total	0.215	0.445	0.331	0.518
Percentage of explained	0.172	0.097	0.139	0.031

Notes: Columns (1) - (4) present the contribution of each factor to the intergenerational income elasticity in the lower 50% of the income distribution in the early cohort, the upper 50% of the early cohort, the lower 50% of the late cohort, and the upper 50% of the late cohort, separately.

The calculation of contribution is based on Table 3.7. It is calculated as the multiplication of the marginal product of parental income on each input of children and the corresponding returns to the input. For instance, the contribution in the northwest corner is calculated as follows: 0.046 (column 1 in Table 3.7) * 0.611 (column 4 in Table 3.7) =0.0281.

[a] Early cohort refers to children born between 1949 (the foundation of the People's Republic of China) and 1970 (included). Late cohort refers to the case that children were born after 1970. They received education and worked in the post 1978 economic reform era.

[b] Upper 50% income group refers to the scenario that parental income is in the upper 50% of their generation. Lower 50% refers to the case that parental income is in the lower 50% of their generation.

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