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Educational Inequality in China: The Intergenerational Dimension*

John Knight, Terry Sicular, YUE Ximing

I. Introduction

The intergenerational distribution of education has received less attention from economists than has the intra-generational distribution. Yet the degree of intergenerational transmission of education—the transfer of educational outcomes from parents to children—is an important determinant of the distribution of education among households at any point in time. This, in turn, influences the distribution of income among households.

There are two concepts of intergenerational mobility. One focuses on aggregate mobility, that is, the extent to which the average education of one generation exceeds that of the previous generation. In the aggregate, economic growth, household incentives, and the policies of the state can all serve to promote mobility. A second concept focuses on mobility at the microeconomic level, that is, the extent to which the education of an individual depends on, or is related to, the education of her parents. In this case, state policies that equalize educational opportunities may be offset by the tendency for children of better-educated parents to receive more education than children of less well-educated parents.

In this chapter we examine both concepts of mobility. The CHIP 2007 survey contains information about the education of the parents of the household head and of the spouse of the household head, including parents who are not present in the household. Consequently, the dataset contains matched information on one's own and one's parental education for a large and relatively complete sample. We use this information to analyze the intergenerational mobility of education in both the aggregate and at the microeconomic level. As our sample spans individuals born over a long period of time—from the 1930s through the 1980s—we can trace the evolution of this relationship in response to changes in policies and other factors over more than half a century since the founding of the People's Republic of China (PRC).

II. Literature

In many and diverse countries the parents' education has been found to be a powerful positive determinant of their children's education, thus reducing the extent of household intergenerational educational mobility (see, for instance, Bowles [1972] for the United States; Couch and Dunn [1997] for the United States and Germany; Lillard and Willis [1994] for Malaysia; Thomas [1996] for South Africa; Knight and Sabot [1990] for Kenya and Tanzania; Binder and Woodruff [2002] for Mexico; and Hertz et al. [2007] for an international summary).

This can be the case even when education is heavily subsidized. For instance, in the United Kingdom in 1995, 80 percent of young people from households classified by the father's occupation (likely to be closely correlated with education) as being in the highest social class (out of five classes) were enrolled in higher education. By contrast, only 12 percent of those in the lowest social class were enrolled in higher education. Yet, at that time, access to higher education was effectively free for poor students (National Committee of Inquiry into Higher Education 1997).

In their comprehensive survey of the legacy of educational inequality, Hertz et al. (2007) provide comparable estimates based on an analysis of national household surveys in forty-two countries over a fifty-year period. Specifically, they report the estimated coefficients from simple regressions of a child's education on the parents' average years of education; they also calculate the correlation coefficients between these two variables. They report both the regression coefficients and the correlations for all ages pooled and also for five-year birth cohorts. For most countries, the regression coefficient falls over time, i.e., the cohort-specific effects of the number of years of the parents' education on the number of years of their child's education is higher for older cohorts and lower for younger cohorts. In contrast, the correlation coefficients display no

significant time trend, i.e., across cohorts, the variation in the parents' education is associated with an unchanged proportion of the variation in the child's education. Some of the plausible explanations for these patterns are examined below in the discussion of our results for China.

Is the same true for China? Existing studies suggest that this may be so. Knight and Li (1993) find that in 1988 (based on data from the first CHIP survey) spatial considerations—both regional and rural-urban—were important determinants of educational attainment in China. Other than age, the most important factor influencing a person's years of schooling was whether he or she lived in a rural or an urban area. This is due to the separate administration and funding of rural and urban education, and also due to the differences in opportunity costs and prospective economic returns. It is also found that the education of parents assisted the education of their children. In both urban and rural areas the mother's education was more important than the father's, and in rural areas the education of both parents had a greater effect on the education of daughters than on that of sons, suggesting that female education is more discretionary. The transmission of education from one generation to another was strengthened by the tendency of the educated to intermarry.

Knight, Li, and Deng (2009), using the rural sample of the 2002 CHIP survey, examine the determinants of enrollment in middle school and high school. They find that dropping out from middle school was more likely if the child was from a household in the lowest quintile of income per capita and if the mother was poorly educated. Continuing to high school was more likely when there was higher household income per capita, with more years of education of both the father and of mother, and if the household was not credit-constrained. The household income level and the parents' education improved performance at school, thus increasing the chances of receiving more education. The authors argue that a vicious circle of both parental income-

poverty and parental education-poverty held back the post-primary education of the next generation.

Sato and Li (2007) use the rural sample of the CHIP 2002 survey to examine the influence of class background (*chengfen*) on the education of offspring. They find that the offspring of landlord or rich-peasant families (as officially classified) are likely to have more education than the offspring of other families, even after controlling for parental education, family wealth, and other household characteristics. They attribute this effect in the post-reform period to an education-oriented family culture, possibly a reaction to the class-based social discrimination of the pre-reform era. Moreover, they find important cohort effects, depending on government policies at the time that the child is of school age. For instance, in the pre-Mao and post-Mao periods, a lower proportion of children of landlord and rich-peasant families, as compared to children of other families, had six or fewer years of education, and a higher proportion had 9 or more years of education. By contrast, in the mid-Mao period (affecting children born in the 1945-59 period) 54 percent of the former had six or fewer years of education, compared with only 38 percent of the children of poor-peasant households, and 22 percent of the former had nine or more years, compared with 38 percent of the latter.

III. Education Policies and Trends in China

China's educational policies have passed through distinct phases over time, each with different implications for the relationship between the education of the parents and that of their children. In some periods the aim has been to pursue universal access to basic education. These periods are characterized by broad-based expansion of enrollments and rising levels of educational attainment. One would expect a weak relationship between parental education and child

educational attainment during these periods. In other periods, educational policies have been shaped by the goal of training skilled labor to support economic growth. During these periods, enrollments and progression rates dipped, reflecting an emphasis on quality and selectivity rather than universal access, and one might expect a strengthening of the relationship between parental and child education, depending on the criteria for selection and other relevant factors. Here we provide a brief survey of policy changes and trends most relevant to the intergenerational transmission of education, with a focus on primary and secondary education.[1] Our survey covers the period from 1950 until the mid-2000s, the time frame covered in our empirical analysis.

The early years of the PRC (1949-52) saw the recovery of the educational system and steps in the direction of nationalization of schools. At this time, the government articulated the goals of popularizing education and eliminating illiteracy (Hannum 1999). Both formal and alternative schooling expanded rapidly. From 1949 to 1952 enrollments in primary school rose from 24 to 50 million, in secondary school from 1.26 to 3.15 million, and in tertiary school from 117,000 to 191,000 (Ministry of Education, Department of Planning 1984, pp. 22-23; Hannum 1999, p. 196). These numbers include many older students, reflecting an effort to increase the levels of education of adults as well as of children.

With the First Five-Year Plan (1953-57) China embarked on its first comprehensive, Soviet-style economic plan. Education was an integral part of this plan (Ministry of Education, Department of Planning 1984, p. 9). Rapid industrialization was the central national goal, and training the skilled workers needed for rapid industrialization took priority (Hannum 1999; Löfstedt 1980, p. 79). Resources were directed to secondary and higher levels of education and to specialized and technical training. At this time, government funding for schools was largely limited to urban areas; rural primary schools were funded by rural communities. As Hannum

(1999, p. 197) writes, “In short, the priority placed on rapidly developing urban higher-level education limited the resources available for basic educational expansion; allocation of resources for basic education prioritized small numbers of urban ‘key-point’ schools likely to produce quick results.”

Although the number of secondary and tertiary educational facilities grew, expansion of enrollments, especially at the senior secondary and university levels, was hampered by a shortage of individuals with sufficient prior schooling. The number of senior middle school graduates fell short of the enrollment targets for higher education (Niu 1992, pp. 24-25). Students who had not completed senior secondary school were recruited for university; as a result, the number of university entrants exceeded the number of senior secondary school graduates (Thøgersen 1990, p. 22).

During the First Five-Year Plan period, due in part to the shortage of skilled workers, members of the former elite social classes were not prevented from attending primary school or progressing on to secondary school or university (Niu 1992, p. 19). Efforts were made, however, to expand access for those with worker and peasant class backgrounds, and preferential policies were adopted for children of party cadres (Niu 1992, pp. 25-27).

Figure 4.1 shows trends over time in net enrollment rates in primary school and in progression rates from primary to junior secondary and from junior secondary to senior secondary school. The primary net enrollment rate increased from 49 percent in 1952 to 54 percent in 1955. In 1956-57 the primary net enrollment rate jumped to above 60 percent. At this time there was no obvious change in education policies, but rural areas underwent dramatic institutional changes that affected the demand for education. Starting in 1955, China embarked on a campaign to raise the degree of collectivization in rural areas to a higher level. Rural

households were organized into “advanced” agricultural producer cooperatives, typically encompassing more than 100 families, characterized by collective ownership of land, farm tools, and livestock, and in which the farm distributed income to households on the basis of labor days or work points.

[Insert Figure 4.1 about here]

The speed of institutional transformation was rapid. By 1955, less than 1 percent of rural households in China belonged to advanced agricultural producer cooperatives; the other 99 percent either engaged in standard household farming or participated in smaller-scale mutual aid teams and cooperatives where the land and other assets were still privately owned. By December 1956, 88 percent of rural households belonged to advanced agricultural producer cooperatives. Most of the remaining 12 percent were in farms, but of a less “advanced” nature. Thus in the space of eighteen months, household farming and private ownership had effectively disappeared (Riskin 1987, p. 86; Walker 1966, p. 35).

In the new institutional context, the contribution of children to household income was substantially reduced, with implications for the demand for schooling. In addition, rural schools were funded by the rural communities, and the advanced cooperatives had the capacity to mobilize the resources needed to build and support schools. Thus the supply of schools expanded. The result was a marked increase in both the number of primary schools and primary school enrollments (see Figure 4.1) (Ministry of Education, Department of Planning 1984, pp. 20-21).

In the 1950s there were few secondary schools located in the rural areas (Thøgersen 1990, p. 22), so trends in secondary school enrollments at that time reflect the situation in urban schools, which were largely government-funded. Enrollments in secondary schools of all types,

including regular junior and senior secondary schools as well as specialized secondary schools, rose annually during the First Five-Year Plan, reaching 7.1 million by 1957. Enrollment in regular junior secondary schools, which accounted for more than 70 percent of secondary school enrollments, more than doubled from 2.2 million in 1952 to 5.4 million in 1957 (Ministry of Education, Department of Planning 1984, pp. 22-23). Progression rates to junior secondary school increased steadily from 30 percent in 1953 to 45 percent in 1957 (Figure 4.1). Progression rates to senior secondary school also increased but were variable, probably reflecting changes from year to year in the intake of older students.

With the launch of the Great Leap Forward in 1958, educational priorities shifted to the left. Universal access to primary education became a central goal, as did the extension of higher levels of education to rural townships and counties (Löfstedt 1980, p. 96). The expansion of rural schooling was facilitated by a reorganization of the advanced agricultural producer cooperatives into communes, a larger and even more "advanced" socialist form of collective organization that typically encompassed 5,000 households (Riskin 1987, p. 123). Alternative approaches to education were encouraged, including shortening and combining different levels of schooling and combining work with school (Hannum 1999). The educational agenda now became more politicized in terms of both curriculum and its emphasis on mass education for the proletariat rather than the elites.

Enrollments in all levels of school rose dramatically. Primary school enrollments increased from 64 million in 1957 to more than 90 million in 1959. Secondary school enrollments jumped from 7 million to over 12 million (Ministry of Education, Department of Planning 1984, pp. 22-23). As shown in Figure 4.1, the primary school net enrollment rate rose

from 62 percent to 80 percent, and the junior secondary progression rate increased from 44 percent to 62 percent. The senior secondary progression rate also rose substantially.

With the failure of the Great Leap and the ensuing famine in 1960 and 1961, enrollment and progression rates plunged. The focus of China's educational policies reverted to the training of skilled manpower and a focus on quality rather than quantity (Löfstedt 1980, p. 102). By 1962 the economy had stabilized and the education system began to recover. Emphasis was placed on the development of schools at the secondary and tertiary levels, and the rates of progression to junior and senior secondary schools rose. The effects of these policies were most evident in the urban areas, where progression rates to junior secondary school were 90 percent or higher, and to senior secondary school about 40 percent. In the rural areas the progression rates were lower, less than 30 percent for junior secondary schools and less than 10 percent for senior secondary school.[2] Rural students' access to secondary and higher levels of education was affected by the low quality of rural primary education; secondary and tertiary schools were mainly located in the urban areas (Niu 1992, p. 56; Thøgersen 1990, p. 26).

At this time a two-track system of education was used to balance the objective of universal schooling with the need to train skilled workers. The government invested in a system of state-funded and high-quality key schools (Niu 1992, p. 45; Thøgersen 1990, p. 26). Entry to key schools and universities was based in part on political criteria, so that children of former capitalists and landlords were screened out, and in part on academic performance, thus benefiting the children of cadres, the intelligentsia, and the middle classes (Niu 1992, p. 50; Thøgersen 1990, p. 26).

Educational policies again shifted to the left in the late 1960s with the launch of the Cultural Revolution. Political struggles during the peak years of the Cultural Revolution (1966-

69) brought chaos to the educational system. Universities were closed, as were many secondary and primary schools, especially in the urban areas. Elitism was criticized, and the system of key schools was abolished (Thøgersen 1990, p. 28). In addition, egalitarian wage structures were adopted in both urban and rural areas, reducing the financial returns to investments in education. Data on educational trends during this period are incomplete, but available information indicates that progression rates declined markedly (Figure 4.1).

In 1970 the government took steps to restore and reconfigure the educational system. Primary and secondary schools reopened and the government adopted policies to promote rural education, especially at the secondary level. At this time, funding and administration of primary and secondary schools were the responsibility of urban work-units and rural collectives (Hannum et al. 2008, p. 217), although the government provided some subsidies to help pay teachers' salaries (China Education Almanac Editorial Department 1984, pp. 98-99). Schooling was largely free for households (Hannum et al. 2008, p. 217). The school curriculum emphasized political and ideological education in a uniform ten-year program (five years primary, three years junior secondary, and two years senior secondary). Academic achievement was downplayed, and class origin, political attitude, and education through labor were emphasized (Hannum 1999, p. 199; Niu 1992, p. 59; Thøgersen 1990, p. 27).

Although the Cultural Revolution era has been criticized for the decline in the quality of education and the disruption of tertiary education, the data reveal that the 1970s were characterized by high primary enrollments and a remarkable expansion of secondary education, especially in the rural areas. Primary school net enrollments reached 90 percent, and progression to junior and senior secondary schools also rose markedly (Figure 4.1). At their peak in 1976-

77, rural progression rates to junior and senior secondary schools had risen as high as 90 percent and 70 percent, respectively.

After the death of Mao, China once again changed course. Economic growth became the overriding goal. Educational policies emphasized quality and academic content rather than mass education and politics. In 1977-78 the key schools and national universities were reopened, with admission based on academic achievement (Niu 1992, pp. 75, 81). In 1981 senior secondary school was lengthened to three years (Central Education and Scientific Research Institute 1983, pp. 614-615). Concerns about the quality of education prompted the shutting down of many rural secondary schools (Hannum et al. 2008, p. 219; Pepper 1990, p. 97). Barriers to schooling based on political criteria and class origin were removed (Niu 1992, pp. 81-83).

Trends in education at this time were affected not only by the new education policies, but also indirectly by policy reforms in other areas. In the early 1980s China abandoned its experiment with collective farming. Decollectivization took place rapidly: by 1983 household farming had returned to most of the country, with consequences for both the demand for and the financing of rural schooling. The costs of education that had been borne collectively were shifted to the rural households (Hannum, Park, and Cheng 2007), and the opportunity costs of schooling rose as children could now contribute to household farming.

In the mid-1980s China carried out a fiscal decentralization, which had negative consequences for financing education. New measures clarified responsibilities for administration and financing, and encouraged governments at all levels to develop multiple sources of funding for education. In urban areas, district and city governments were responsible for primary and secondary schools, respectively; in rural areas, county governments were responsible for senior secondary schools, townships were responsible for junior secondary

schools, and villages were responsible for primary schools. Key-point schools and universities were managed by the central and provincial governments.

Following the fiscal decentralization, government budgetary revenues began a long decline, and local governments increasingly turned to extra-budgetary forms of financing to support public services (Fock and Wong 2008). School funding was more dependent on surtaxes, tuition and fees, profit-oriented school enterprises, and community fund raising (Hannum et al. 2008, pp. 220-224; Tsang 2001, pp. 3-4; Fock and Wang 2008). Urban areas and richer rural localities were better able to generate financial resources, whereas poor rural areas lagged. Educational funding became more unequal (Tsang 2001; Fock and Wong 2008), with implications for access to and quality of education.

These developments contributed to changes in schooling patterns, especially at the secondary level. In the 1980s national progression rates to junior secondary school dropped from about 90 percent to below 70 percent, mainly reflecting changes in rural China, where the proportion of children continuing to junior secondary school fell below 60 percent. Progression rates to senior secondary school declined by half, from 70 percent to 35 percent. Again the decline was most severe in the rural areas, where the senior secondary progression rate fell from 65 percent to about 10 percent. Even in urban areas progression to senior secondary schools declined substantially, from 90 percent to about 50 percent.

Concerns about rising educational inequality prompted the 1986 promulgation of the Compulsory Education Law, under which nine years of compulsory education (six years primary school plus three years junior secondary school, or five years primary school plus four years junior secondary school) would become universal, but implementation occurred gradually and differentially depending on the level of local capacity (Hannum et al. 2008, p. 220; Wang 2003;

Xing 2007). A gradual recovery in the rate of progression to junior secondary school followed. In the rural areas, however, implementation of the law was hampered by ongoing fiscal constraints at county- and lower-level governments (Tsang 2001).

In 1994 a tax reform and fiscal recentralization strengthened the central government's fiscal capacity. Following this reform, government revenue began to recover, but insufficient central-local transfers exacerbated fiscal inequalities at the local level. In many rural areas local governments were unable to meet their expenditure obligations (Fock and Wong 2008; Wong and Bird 2008). In 1995 the government issued a new education law that clarified the responsibilities of the different levels of government, with local governments responsible for secondary education and below, and implemented a local educational surtax to provide more funding for local education (Wang 2003). Nevertheless, regional inequality in the public financing of education remained high, and regional inequality in secondary-school enrollment rates persisted (Dollar 2007, pp. 11-12, 26-27; Li, Park, and Wang 2007; Wang 2003).

China's educational trends began a turnaround in the mid-1990s. At this time, the private returns to education, which had been low by international standards, began to increase (Cai, Park, and Zhao 2008, pp. 185-187). In rural areas, rising returns to education were at first associated with the expansion of off-farm wage employment, initially in township and village enterprises and then later through migrant jobs. Studies have found a positive association between years of education and off-farm wage employment and earnings (de Brauw et al. 2002; de Brauw and Rozelle 2007; Zhao 1997; Zhang, Huang, and Rozelle 2002, Knight, Li, and Deng 2010). Some recent analyses have also found evidence of rising returns to education in agriculture, the result of the market reforms and the growing commercialization of agriculture,

but even as late as 2002 the returns to a year of education in farming were only 4 percent (Knight, Li, and Deng 2010.).

In urban areas "brain workers" received little if any more pay than "hand workers" under the egalitarian central planning. Reforms in the employment system, wage structure, and urban enterprise management allowed wage differentials to emerge and expand, with the result that returns to education rose, especially after the early 1990s (Fleisher and Wang 2005; Zhang and Zhao 2007). The 1988 CHIP survey shows an earnings premium of college education over primary education in urban China of only 15 percent, whereas the 2002 CHIP survey shows a premium of 82 percent (Knight and Song 1993, 2008). Zhang and Zhao (2007) find that the returns to education in urban China rose from 4 percent in 1988 to 11 percent in 2003, with most of the increase occurring in 1992-94 and 1997-99. These developments likely affected the demand for education.

In the late 1990s and 2000s the government adopted a series of new measures to strengthen education. In 1999 the government announced that it would expand nine-year compulsory education (targeting the poor areas) and increase secondary and tertiary enrollments (Tsang 2000, p. 588). In the early 2000s the government increased central funding to support rural compulsory education and to reduce primary and junior secondary education costs borne by rural households (Hannum et al. 2008; World Bank 2007). In 2001 payment of teachers' salaries was shifted from the village to the county, and the central government implemented transfer payments to help local governments cover the costs of compulsory education (Fock and Wong 2008). In 2003 the central government announced the "Two Exemptions, One Subsidy" policy, under which the government would pay the costs of textbooks and school fees and would provide subsidies for boarding. This program was initially aimed at poor families in central and

western China (Hannum et al. 2008, p. 244; World Bank 2007, p. 5). In 2006-7 the government announced central budgetary funding to finance the elimination all tuition and fees for none years of compulsory rural education (Dollar 2007, p. 17; Hannum et al. 2008, p. 244).

These changes in the returns to education and in government education policies were accompanied by substantial increases in the progression rates to junior and senior secondary school. The progression rate from primary to junior secondary school surpassed 90 percent in 1995, and increased further to 95 percent in 2000 and nearly 100 percent in 2005. The progression rate from junior to senior secondary school rose from 45 percent in the early 1990s to 50 percent in the mid-1990s, 60 percent in 1993, 70 percent in 1995, and over 80 percent in 2008. The progression rate from senior secondary school to tertiary schooling also rose substantially, from less than 30 percent in the early 1990s to over 70 percent in the mid-2000s (NBS 2009).

This brief survey reveals how the substantial changes over time in Chinese government policies and goals affected educational outcomes, with implications for the intergenerational transmission of education. Based on this history, we identify several hypotheses regarding educational outcomes in rural and urban areas. For the rural areas, we propose that three key factors affected the intergenerational transmission of education. The first is government policies to popularize schooling. These policies occurred in several waves – at the primary level in the 1950s and 1960s, the junior secondary and to some degree senior secondary levels in the 1970s, and again the junior secondary and senior secondary in the 1990s to the 2000s. The second factor is the private cost of, and returns to, education, which were affected by changes in the organization of farming (collective versus household), and by reforms that strengthened the link

between earnings and education. The third is public financing of schools, which affected the supply and quality of rural schools, as well as the costs borne by households.

In urban areas, public (or quasi-public) funding of schools was relatively generous, and levels of education were consistently higher than those in rural areas. From the 1950s onward, primary and junior secondary schooling were widespread, so that the point at which educational inequalities became apparent was senior secondary school or later. For much of the time, access to secondary and post-secondary education in urban China was rationed. Access to senior secondary school was rationed from the late 1950s through the 1980s, and tertiary education remained rationed at least until the end of the 1990s. The key factor determining intergenerational transmission is the criteria used to select who continues into senior secondary and tertiary schools. These criteria changed over time, at times emphasizing academic achievement, and at other times emphasizing politics, with predictable consequences for the role of parental education.

IV. Theory and Methodology

The education of children is influenced by various factors, one of which is the education of their parents. We postulate that

$$e = e(a, p, a^p, y^p, f; X) \qquad (1)$$

where e is the years of one's own education, a is one's own unobserved genetic "ability," p is the observed years of education of the parents, a^p is the unobserved genetic "ability" of the parents, y^p is the income of the parents at the time of potential educational investment in the child (unlikely to be observed), f is the unobserved non-genetic, non-education family background,

such as a socially acquired "ability," and X is a vector of other observed and unobserved determinants, such as gender, educational policies and opportunities, and community influences.

The education of the parents can causally influence the education of the child through several channels, ceteris paribus. One channel is the possible effect of the parents' education on family attitudes toward education, on personal confidence, motivation, and ambition, and on knowledge about the potential returns to education. Furthermore, more educated parents can provide out-of-school human capital and a stimulating home environment that will improve their children's chances of success, especially in an educational system where continuation in school is rationed and based on school performance. Third, parental education can generate higher incomes: the higher incomes of more educated parents in turn help to overcome the credit constraints on investment in their children's education. This implies that the full effects of the parents' education on the child's education can only be measured if income is omitted from the estimated equation.

Of particular interest to policy-minded economists is the causal effect of p on e. Parental education p, however, is likely to be endogenous: it might be influenced by a^{p}, f, and other unobservables. The econometric problem is to separate the causal effect of p from the non-causal association between e and p. Policy prescriptions require measurement of the causal effect. Otherwise, for instance, the consequences of a policy to raise or equalize the educational outcomes of the next generation cannot be predicted accurately.

Various methodologies have been used in the literature to measure the causal effect of parents' education in the likely presence of associated unobserved variables (Lochner 2008). One is to examine the educational differences between cousins whose mothers or fathers are identical twins, on the assumption that the educational differences will not be the result of differences in

the parental abilities or environments (for instance, Behrman et al. [1999] for India and Behrman and Rosenzweig [2002] for the United States). However, we cannot use this approach with our dataset. A second methodology is to study adopted children, on the assumption that parental genetic influences will be absent (Björkland, Lindahl, and Plug 2006 for Sweden). Again, this approach is ruled out by the nature of our data.

A third methodology is to use instrumental variables, i.e., to find a variable or set of variables that is closely associated with the parents' education but does not have an independent influence on the child's education; in that way one can measure the effect of exogenous variations in the parents' education on the child's education. Examples of instruments used for this purpose include changes in the age of compulsory schooling (for instance, Black, Devereux, and Salvanes [2005] for Norway, and Oreopoulos, Page, and Stevens [2006] for the United States).

Here we confine our analysis to simpler methods that measure non-causal associations. The association—whether conditional on observed determinants or unconditional—between the education of one generation and the next is interesting in itself, regardless of the set of forces it might reflect. Moreover, the degree of association has implications for educational inequality, and thus also for income inequality. It does not matter whether the association between the parents' education and the child's education is due to income or due to genetic or socially acquired abilities. The observed variable, education, serves as a proxy for the family endowments that contribute to educational and income inequalities.

Here we use the terms "educational persistence" and "educational transmission" interchangeably to denote the association between the education of one generation of a household and the next, irrespective of whether that association indicates the causal effect of

parental education. The weaker the degree of educational persistence or transmission, the greater will be the degree of intergenerational educational mobility within the household.

Our empirical methodology follows that of Hertz et al. (2007). We estimate simple regressions of one's own education on parental education, in some cases with additional explanatory variables. The regressions are estimated for the entire sample and separately for the rural and urban samples. In order to analyze changes over time, we also estimate the regressions separately for each five-year birth cohort. Our choice of five-year cohorts to some extent is arbitrary, but a five-year span is long enough to ensure that each cohort has a sufficient number of observations to support a regression, and short enough to allow us to observe the changes over time associated with the different policy periods in China.

From the regressions we obtain an estimated coefficient on parental education, which we will refer to as β, and also the correlation between one's own education and the parental education, which we will refer to as ρ. The β's measure "grade persistence," and the ρ's measure "standardized persistence" (Hertz et al. 2007). These two measures are linked by the formula

$$\rho = \beta * (\sigma_p / \sigma_o) , \qquad (2)$$

where σ_p and σ_o are the standard deviations of parental and one's own education, respectively. From this equation we can see that the correlation coefficient is "standardized" by the ratio of the standard deviations for the two generations. Thus, for instance, ρ will rise relative to β if a variation in the parents' education can explain more of the variation in the child's education, ceteris paribus, i.e., if the standard deviation of the child's education falls relative to that of her parents.

Although the β's, and ρ's do not identify causality, they quantify the persistence of interpersonal inequality in education from one generation to the next. With respect to

educational mobility across generations, lower values of β and ρ, i.e., less persistence, would be associated with greater mobility.

V. The Data

Empirical analysis of the intergenerational transmission of education requires matched information on one's own and the parental education. Household surveys are often not well suited to such analysis because they typically contain matched information only when both generations reside in the same household. The 2007 CHIP questionnaire, however, contained questions about the education of the parents of the household head and of the spouse of the household head, including parents who were not present in the household at the time of the survey. This makes possible an analysis of the intergenerational transmission of education with a large and relatively complete sample.

The 2007 CHIP dataset contains variables on years of completed education and level of education. Level of education measures whether or not the individual has ever attended that level of education. For example, if the stated level of education is primary school, then that individual has attended, but may or may not have completed primary school.[3] Data on years of completed education and level of education are available for individuals who resided in the household at the time of the survey. For parents who were not resident members of the household, the CHIP dataset only contains information on the level of education. For these parents, we must translate the levels of education into years of completed education. Categorical variables on education levels are common in the literature, and researchers typically translate them into a continuous variable on years of education by making some simple assumptions. Here we follow a standard approach, as explained in the Appendix to this chapter.

In our analysis we confine our sample to individuals born before 1985. Our sample thus contains only individuals who completed school (in China the standard age for graduation from post-secondary four-year institutions is 22). We exclude younger individuals so as to avoid censored information on years of education for those who may still be in school. We use data from the 2007 CHIP rural and urban surveys but not from the separate migrant survey because relevant data for the migrant sample are incomplete and the migrant sample is difficult to incorporate into our analysis. Consequently, the urban component of our analysis includes only individuals with formal urban household registration (*hukou*). Migrants, however, are present in the analysis, because the rural survey contains individuals engaged in short-term migrant work, and the urban survey also contains individuals who originated in rural areas.

In assembling the matched data for one's own and parental education from the CHIP datasets, we encountered several data issues. Most of these are minor and discussed in the Appendix to this chapter, but two specific data issues deserve mention here. First, the urban sample contains individuals who originated from and received schooling in rural China. These individuals include the members of the rural population who were most successful in school. Indeed, education has been a path out of the countryside, because rural youth who gain entrance to university are eligible for nonagricultural *hukou*. In order to avoid the bias that would arise if we excluded this group from the rural sample, we reclassify as rural those urban residents who received their primary and secondary educations in rural areas. The specifics of the reclassification are explained in the Appendix to this chapter.

Second, the distribution of individuals in the 2007 CHIP dataset between urban and rural areas and by age (i.e., the proportions of people born in different years) is not representative. We correct for this in our analysis by using weights that reflect the shares of the urban and rural

populations, and of individuals born in different years, from the NBS 1% population sample survey conducted in 2005. Again, details are provided in the Appendix to this chapter. Note that these weights differ from those used in other chapters in this volume.

Table 4.1 shows the unweighted and weighted summary statistics for the matched sample of individuals and parents used in our analysis. The sample spans a long historical period. The oldest individuals were born in 1930, and the youngest in 1984 (as discussed above, the sample is restricted to individuals born in or before 1984). The oldest parents were born in the 1860s. The mean educational attainment in the sample is 8.7 years. After weighting to adjust the birth year and urban/rural shares to match those in the population, the mean falls to 7.3. Education levels are lower in rural than in urban areas. The urban-rural education gap (weighted) is 3.3 years. Education levels are also lower for girls than for boys, and more so in rural than in urban areas. Average parental education (weighted) is 4.2 years, lower than one's own education and again lower in rural areas and for females.

[Insert Table 4.1 about here]

The difference in weighted mean years of education between parental and one's own education is a crude measure of aggregate educational mobility in China. Overall, the weighted mean of years of education increased by 3.1 years, a 74 percent increase between the two generations. That is, on average individuals have 3.1 more years of education than their parents. The intergenerational absolute gain in education applies in both the rural and the urban areas, but it is larger in the urban areas. In the rural areas the increase between generations is 2.8 years, and in the urban areas it is 3.5 years.

A. Aggregate Educational Mobility

Aggregate mobility refers to average mobility, that is, changes in mean levels of education. Some studies, such as Hertz et al. (2007), examine the effect of the average years of the parents' education on the child's education. Others distinguish the effects of the father's and mother's education and/or the effects on the son's and daughter's education. The choices depend partly on the hypotheses to be tested and partly on complications such as the possibility of positive or negative interactions between the spouses' education levels or the possibility of "marriage sorting," i.e., the educated tend to marry the educated. We begin, like Hertz et al. (2007), with a description of the aggregate educational mobility for China as a whole, and then we explore the patterns for different sectors, cohorts, and genders.

1. Intergenerational Educational Mobility: Overall, and by Urban-Rural and Birth Year

It is well known that average levels of education in China have increased over time. This reflects government measures to popularize primary and secondary schooling, as well as the rising private returns to education in recent years.

Rising average education is evident in the 2007 CHIP data. Table 4.2a provides an unweighted cross-tabulation of one's own versus one's father's level of education; Table 4.2b provides the same for one's own versus one's mother's level of education.[4] Each cell of the table contains the number of individuals in the sample with the levels of one's own and one's father's (or mother's) education shown in the row and column headings. The second number in each cell is the percentage of all individuals in the sample whose fathers (mothers) have the level of education shown in that row's heading. The bottom number in each cell is the percentage of all individuals in the sample whose own level of education is shown in that column heading. Thus, for example, the first cell tells us that there are 895 individuals in the sample with one's own education and one's father's education both at level 1 (no schooling). This group

constitutes 9.4 percent of the 9,503 individuals in the sample whose fathers had no schooling, and 65.7 percent of the 1,363 individuals in the sample who themselves had no schooling.

From the far right columns in the tables we can see that the most common educational level of fathers is primary school (39 percent) and of mothers no schooling (41 percent); from the bottom rows we can see that the most common level of one's own education is junior middle school (40 percent). In only 8 percent of the cases is the child's level of education lower than the father's, in 27 percent it is the same, and in 66 percent it is higher. For mothers these proportions are 3 percent, 19 percent, and 78 percent, respectively. Thus, two-thirds or more of the individuals in the CHIP sample had higher levels of education than their parents.

[Insert Table 4.2a about here]

[Insert Table 4.2b about here]

Educational mobility in China has changed over time. This can be seen in Figures 4.2-4.4, which show the relationship between one's own and parental education for individuals born from 1930 to 1984. Each dot plots the average own education for individuals in that birth year against the average education of their parents. Figure 4.2 is the national sample, Figure 4.3 is the rural sample, and Figure 4.4 the urban sample. All figures use weighted data. Note that the dots for birth years prior to 1941 form a lower cluster than those for later birth years. This discontinuity occurs because we do not have separate population shares for individuals born before 1941, thus the weight for these early birth years is aggregated (see also the Appendix to this chapter).

[Insert Figure 4.2]

[Insert Figure 4-3]

[Insert Figure 4-4]

The figures reveal a strong positive association between parental education and one's own education. Moreover, the association is closely linked to the year of birth: younger individuals have more educated parents and are themselves more educated. The dots lie well above the 45-degree line, reflecting that on average one's own education is higher than that of the parents. Ignoring the earliest cohorts (for which the number of observations is small and may not be representative), we see that one's own education is generally three to four years higher than their parents education. These patterns are not necessarily due to a causal relationship between parental and child education, however, as they are also affected by government policies that expanded the provision of education to both parents and children over time.

A distinction can be made between urban and rural China. Whereas in both cases the relationships are above the 45-degree line, the urban dots (Figure 4.4) tend to be higher than the rural dots (Figure 4.3), reflecting that the extent to which one's own education exceeds that of the parents is larger in urban areas than in rural areas. This pattern likely is due to government policies that have provided more, and better subsidized, education to urban children than to rural children, with funding from higher tiers of government. Rural education has been more dependent on local funds provided by households, villages, and townships: demand-side factors would thus play a larger role for this group. Differences and changes over time in the prospective returns to education might also help to explain our contrasting results for the urban and rural areas.

Interestingly, the relationship between parental and one's own education in rural areas is distinctly steeper for those born between 1941 and 1960. That is, the extent to which one's own education exceeds that of the parents rose very rapidly for the cohorts that reached school age from the late 1940s through the 1950s and 1960s. This is especially true for the rural population.

This pattern reflects, on the one hand, the very limited access to education in rural areas prior to 1950, and, on the other hand, the emphasis that the government placed on achieving universal primary education during the early planning period. Indeed, for the pre-1960 rural birth cohorts, one's own average schooling climbs rapidly to five to six years, the average length of primary school at the time.

Progress in average education beyond primary levels continues for later rural birth cohorts, but at a much slower pace, as indicated by the flatter slope. For individuals born after 1959, the slope is flatter than the 45-degree line, indicating that an additional year in the average parental education is associated with slightly less than an additional year in the average of one's own education.

The urban pattern shows rapid gains in education for early cohorts born prior to 1940, but later cohorts average more than six years of education. This pattern reveals that primary education was already widespread for urban residents in all but the oldest age groups, and consequently government policies promoting universal primary education in the 1950s had less impact in urban areas than in rural areas. For urban cohorts born after 1940, the relationship between one's own and parental education shown in Figure 4.4 is a bit flatter than the 45-degree line, indicating that an additional year of parental education is associated with slightly less than an additional year of one's own education. As for the rural sector, such a pattern may reflect many factors, and is not necessarily due to a direct causal relationship between parental education and the child's education.

2. Intergenerational Educational Mobility: Mothers, Fathers, Sons, and Daughters

Table 4.3a shows the average years of the sons' education by the educational levels of their fathers and mothers. The columns are sorted according to the level of the fathers' education, and

the rows according to that of the mothers'. Each cell in the table gives the average years of education for sons whose parents have the levels of education shown in the row and column headings. The cells on the diagonal give the sons' average years of education when both parents have the same level of education. For example, when both parents are uneducated (the upper left-hand cell, father and mother both at education level 1), the average education of the son is 6.2 years; when both parents are educated beyond high school (level 5), the son's average is 12.3 years.

[Insert Table 4.3a about here]

The effect of increasing one parent's education is similar regardless of which parent is considered. For instance, looking across the columns of row 1 (i.e., raising the father's education while holding the mother's education constant at level 1), a son's education increases by 5.3 years, and looking down column 1 (i.e., raising the mother's education while holding the father's education constant at level 1), the increase is 4.4 years. The results for a daughter (Table 4.3b) are similar, although the equivalent calculations show the daughter's education to be less sensitive to that of the father (4.4 years) and to be more sensitive to that of the mother (6.2 years). The same pattern is found in the range of the father's education irrespective of the mother's education (the final row) and of the mother's education irrespective of the father's education (the final column). Although the trend is weak, it appears that "like father, like son; like mother, like daughter" (Thomas 1994).

[Insert Table 4.3b about here]

The extent of intergenerational transmission of education may be accentuated by the phenomenon of "marriage sorting," i.e., the educated tend to marry the educated. Indeed, correlations between the levels of the mother's and father's educations are relatively high in the

CHIP sample. The (weighted) correlation for the total sample is 0.61, but slightly lower for the rural sample (0.56) than for the urban sample (0.61). Further evidence of marriage sorting is the high share (weighted) of individuals whose parents have the same level of education -- 60 percent -- and the much lower share whose parents' education differs by more than one level -- 11 percent. In other words, for 89 percent of individuals, the father's and mother's education levels are either the same or differ by no more than one level.

In the presence of positive marriage sorting, including the mothers' and fathers' education separately in a regression equation can cause the estimated β coefficients to be a misleading indication of intergenerational educational persistence because people with well-educated fathers are also likely to have well-educated mothers. This point is discussed further below.

B. Educational Mobility: A Microeconomic Analysis

The transmission of education from one generation of the household to the next is of particular interest in the case of China, where the government for much of its recent history has emphasized mass education, with policies that increased access to education for children of the poor and the less well educated and, during some periods, limited access to education for children of former elites. Such policies would, in theory, reduce the intergenerational transmission of education. Do the data reveal a relatively low degree of educational transmission?

In this section, we discuss micro-level estimates of educational persistence between generations, i.e., the β's and ρ's discussed in Section IV, with an eye to understanding the extent to which one's own education in China is associated with the parental education. Owing to marriage sorting, which can bias the coefficients when the mothers' education and the fathers'

education are included separately in the regression equation, in most specifications we use the average years of the education of the mother and father as a measure of parental education. In analyses that combine all ages, the sample includes individuals from all birth years. Owing to the small number of observations for individuals born before 1940, cohort-specific parameters are estimated only for individuals born in or after 1940.

1. All Cohorts Combined

[Insert Table 4.4 about here]

Table 4.4 reports estimates from OLS regressions predicting one's own education as a function of the average years of the individual's mother's and father's education. Some specifications include dummy variables for the urban vs. rural sector and for male vs. female. The first three columns give estimates for the pooled urban and rural samples, the next two columns give estimates for the rural sample only, and the last two give estimates for the urban sample only.

In all cases the β's are positive and significant at the 1 percent confidence level. The simplest base equation for the sample as whole (column 1) gives an estimate of β equal to 0.51. This estimate can be compared with the estimates for other countries. Hertz et al. (2007, p. 15) provide estimates of β for 42 countries, ranging from 0.40 or less for Malaysia, New Zealand, and Ukraine to 1.00 or more for Egypt, Pakistan, and Brazil. If we rank the 42 countries from highest to lowest β, our estimate of β for China puts it below the middle, between Estonia and Denmark, and higher than the United States (at 0.46). Therefore, despite the apparently egalitarian educational policies during the Maoist era, by international standards educational persistence in China was not exceptionally low.

Educational policies and outcomes in China have been substantially different in the urban and rural areas. A dummy variable denoting rural residence is included in the regressions reported in column 2. The coefficient on this dummy variable is negative and significant (-2.2). Its inclusion raises the R^2 and substantially reduces the coefficient on the parents' education to 0.41. These results suggest that the intergenerational persistence in education is related to rural-urban differences. The further addition of a dummy variable denoting that the child is male (column 3) barely affects the other coefficients, but it is positive and significant at 1.3. This indicates that gender does not govern the degree of persistence, but on average males have more education than females.

In the separate urban and rural regressions (columns 4-7), the β's are all in the range of 0.40-0.42, lower than that for the pooled base case (column 1) and similar to the estimates from pooled regressions that include a rural dummy variable (columns 2 and 3). Thus, separate regressions for the rural and urban samples further reinforce the conclusion that the urban-rural divide contributes to the intergenerational persistence.

For rural China the coefficient on the parents' education in the base regression (column 4) is 0.42. This is not altered when a gender dummy is included (column 5). The urban coefficient is only marginally lower, at 0.41 in the base case and 0.40 when a gender dummy is included (columns 6 and 7). The coefficient on the dummy variable denoting that the child is male is substantially smaller for the urban than for the rural sample, indicating that on average the education gap between men and women in urban China is smaller than that in rural China, after controlling for the parental education.

[Insert Table 4.5 about here]

Table 4.5 reports the results from regressions that differentiate between men and women. Columns 1 and 2 give the estimates for men and columns 3 and 4 give the estimates for women. The coefficient on the parents' education in all cases is positive and significant at the 1 percent level. For men it has a value of 0.45, but is reduced to 0.36 when a rural dummy is included; for women it has a higher value, 0.55, and again it is reduced by the addition of a rural dummy but it is still higher than that for men. These estimates reveal that educational persistence is greater for daughters than it is for sons in both urban and rural areas.

Thus, the children of educated parents tend to have more years of education than the children of uneducated parents, but the effect is stronger in the case of daughters. The education of girls may be more "discretionary" than that of boys. The social norms in rural society require that a daughter transfer her allegiance to her husband's family when she marries, whereas a son remains in the village and takes responsibility for his parents in their old age (Hannum 2005). Expenditure on a daughter's education is thus a form of consumption good, whereas expenditure on a son's education is more like an investment good.

2. By Birth Cohort

Figures 4.5-4.7 show estimates of the β and ρ coefficients for each of the five-year birth cohorts. Figure 4.5 shows the estimates for the total sample, Figure 4.6 for the rural sample, and Figure 4.7 for the urban sample. As the number of individuals born in the early years is small, we do not show the estimates for cohorts with birth years in or before 1940. The estimates are derived from a simple OLS regression in which the dependent variable is years of one's own education and the explanatory variable is the parents' average education. The β's measure the effect of an additional year of the parents' education on one's own education, while the ρ's are the correlations between the two variables.

[Insert Figure 4-5 about here]

[Insert Figure 4-6 about here]

[Insert Figure 4-7 about here]

Since educational policies and outcomes have differed between rural and urban areas, in Figures 4.6 and 4.7 we begin with a discussion of the separate sectors. For the rural subsample (Figure 4.6) both β and ρ are low for the first three cohorts (1940-44, 1945-49, and 1950-54), that reached school age during periods when primary schooling was expanding rapidly. For the 1955-59 cohort the coefficients remain low. This group would have completed primary school in the late 1960s through the early 1970s, when primary education was widespread in rural China. The β and ρ's increase for the 1960-64/1965-69 cohorts, who would have completed primary school in the 1970s. This is when the first generation of rural children began to progress beyond primary school to junior and senior secondary school. Parental education thus appears to have played a role influencing who were the first children to continue past primary school.

The coefficients take another step upward for the 1970-74 cohort. This is the generation that completed primary school in the early 1980s, a period when the average progression rates dropped sharply. During the 1980s the importance of parental education in rural China reached its peak, with a β of 0.3. Thereafter, as new policies supported the recovery of secondary and higher levels of education, the coefficients decline to about 0.2, still higher, however, than those for the cohorts born in the 1950s. The correlation coefficients follow a similar pattern.

For the urban subsample the estimated coefficients are volatile (Figure 4.7). The impact of the Cultural Revolution, however, is clear: the coefficients are relatively low and declining for the three cohorts that would have reached high-school age during the Cultural Revolution

(1950-54, 1955-59, and 1960-64). For these Cultural Revolution cohorts, parental education had a relatively small effect on one's own education. For the initial post-Cultural Revolution cohort (born in 1965-69, completing high school in 1977-82) , the β's and ρ's increase, but then they decrease as urban secondary and tertiary education were re-established in the 1980s. Thereafter, (for cohorts born from 1970 onward) the importance of parental education increases, probably reflecting the rising costs and performance-based selectivity of post-secondary urban education.

For the pooled sample of rural and urban individuals (Figure 4.5), changes in the coefficients across cohorts reflect trends in the underlying urban and rural samples, with more weight on the more populous rural populations. Higher coefficients for the combined sample than for the separate rural and urban subsamples reflect barriers between the two sectors that heighten educational persistence: the lack of mobility from the less-educated rural sector to the more-educated urban sector increases intergenerational persistence.

3. Educational Mobility of Uneducated Households

In some households parents have little or no education. To what extent can their children break out of "educational poverty"? We explore this question by means of Table 4.6, which provides estimates for three categories of individuals from "education-poor" households: those in which both parents have no education, in which one parent has no education and the other has only primary education, and in which both parents have only primary education (columns 1-3, respectively). We compare individuals from such households to those from "education-rich" households (column 4), defined as households where both parents have at least a middle-school education.

As the sample is divided according to the education of the parents, the regression equations do not include the parental education as an explanatory variable. The differences

between these groups are captured by the differences in the estimated coefficients of the constant term and the dummy variables. The first four columns do not differentiate among birth cohorts, and the constant terms measure the average education of urban women (the omitted category for the dummy variable). The last four columns include dummy variables for birth cohorts, and the constant terms measure the average education of urban women born in 1940-44 (the omitted categories for the dummy variables).

[Insert Table 4.6 about here]

The estimated coefficients shown in column 1 of Table 4.6 indicate the following average education levels for individuals whose parents had no education: urban women 6.0 years, urban men 7.7 years, rural women 3.7 years, and rural men 5.5 years. If one or both parents attained primary schooling (moving to columns 2 and 3), the average education rises, the rural disadvantage increases, and the male advantage decreases. Overall, a shift from no education to primary schooling for one or both parents reduces the educational poverty of the children.

Column 4 shows the results for education-rich households. Children from education-rich households, especially girls, have considerably more education than those from education-poor households. For this group, the education of rural women averages 11.1 years, 5.1 more years than that for rural women with uneducated parents. Similarly, the education of rural men from education-rich households averages 11.7 years, 6.5 more years than that for rural men with uneducated parents. For urban women the gap between education-rich and education-poor households is 2.1 years, and for urban men it is 1.0 years. The difference between the education levels of women and men is larger for individuals from education-poor households, i.e., educated parents invest more equally in the education of boys and girls.

Education levels have increased over time, and this influences the differences between individuals from education-rich and education-poor households. We control for historical shifts by introducing dummy variables for the five-year birth cohorts. Columns 5-8 correspond to columns 1-4, respectively, but now the regressions include dummy variables for birth cohorts. The 1940-44 birth cohort, the first cohort to receive an education after the founding of the PRC, is the omitted category.

These estimates reveal that education increased as we move from older to younger cohorts from both education-poor and education-rich households. For the most recent cohort, 1980-84, a person from an education-poor household has 3.5 to 4.2 more years of education than a similar person born in 1940-44. The corresponding figure for a child from an education-rich household is 4.4 years. In other words, compared to the 1940-44 cohort, education levels among the 1980-84 cohort rose both for children of education-poor and education-rich households, but somewhat more for the latter. Thus the absolute gap in years of education between the two groups widened slightly.

[Insert Table 4.7 about here]

Table 4.7 shows the difference in years of education between the education-poor (both parents with no education) and the education-rich (both parents with a middle-school education or higher), by cohort. The differences are calculated using the estimated coefficients in columns 5 and 8 of Table 4.6. The numbers shown in Table 4.7 are for urban women, but the pattern is the same for men and for the rural sample (see the note to the table).

In all cohorts, individuals from education-poor households have fewer years of education than those from education-rich households. The education gap is largest for earlier cohorts. The

gap narrows to about 3 years for the 1950-54 cohort, where it remains, more or less, for all ensuing cohorts.

In other words, the schooling gap between individuals from education-rich and education-poor households narrowed for cohorts educated in the 1950s and early 1960s, probably reflecting a combination of educational policies and household choices. Educational conditions in later periods apparently did not further reduce this gap. It is remarkable that even the Cultural Revolution, which affected those cohorts born from the mid-1950s through the 1960s, did not reduce the average education gap between individuals from education-rich and education-poor households.

C. Educational Inequality

Educational persistence has implications for educational inequality. If educational persistence is high, and if the distribution of education among parents is unequal, then educational inequality will be transmitted from generation to generation. Educational policies that expand educational opportunities for children of less-educated parents in principle can reduce inequality in educational attainment. To shed light on these concerns, we provide estimates of educational inequality in China across cohorts and measure the contribution of parental education to inequality in one's own education.

1. Educational Inequality

Rising levels of education have been associated with declining inequality in the distribution of education, at least for some measures of inequality. This can be seen in Figures 4.8-4.10, which show changes in inequality of years of education for nine five-year birth cohorts from 1940-44 through 1980-84.[5]

As measured by the Gini coefficient (Figure 4.8), inequality for all three groups (total, rural, and urban) fell from older to younger cohorts. The decline is greatest and ongoing in rural China, although steeper through the 1960-64 cohort and more gradual thereafter. In urban China the Gini declines gradually from older to younger cohorts, with a distinct dip below the trend for the 1950-54, 1955-59, and 1960-64 birth cohorts. Inequality in rural education is generally higher than inequality in urban education but the difference narrows over time. For the youngest cohorts, urban and rural levels of inequality in education are about the same. The squared coefficient of variation (CV^2) in Figure 4.9 shows trends that are very similar to those for the Gini.

[Insert Figure 4.8 about here]

[Insert Figure 4.9 about here]

[Insert Figure 4.10 about here]

By construction, both the Gini coefficient and the CV^2 fall as the mean value rises, ceteris paribus. The declines in these measures of educational inequality shown in Figures 4.8 and 4.9 are associated with increases in the mean years of education in China (as shown in Figures 4.2-4.4). The standard deviation (SD) is not mean-dependent. Insofar as absolute differences in the number of years of education are the criteria for evaluation (and not their relative distances from the mean), the SD is a useful measure of inequality. As discussed later, the standard deviation of education may be relevant if we are interested in the impact of educational inequality on income inequality.

As shown in Figure 4.10, by this measure inequality of education overall and in rural areas fell slightly across cohorts that entered school before the late 1970s, but it remained fairly constant for more recent cohorts. For the most recent cohort inequality appears to decline

slightly. The SD for urban areas closely follows the national trend, except for the 1950-54, 1955-59, and 1960-64 cohorts. For these three Cultural Revolution cohorts, the SD dips below the national trend.

Together, Figures 4.8, 4.9, and 4.10 imply that the decline in educational inequality across cohorts largely reflects rising mean levels of education over time, rather than a narrowing in the absolute differences in years of education. The decline in educational inequality has been greatest in rural China, and especially for cohorts born before 1965 who benefited from the expansion of rural primary education in the 1950s and early 1960s, followed by the expansion of rural secondary education in the 1970s. Later cohorts entered primary school in or after the mid-1970s, and decisions about their continuing to higher levels of education took place during the post-Mao period. Educational inequality for these cohorts remained unchanged, except for those born after 1980 who may have benefited from the educational reforms of the 1990s.

For urban China, Figures 4.8-4.10 reveal clearly the impact of the Cultural Revolution. Cohorts born in 1950-54, 1955-59, and 1960-64 reached high-school age in the 1965-79 period, at which time urban secondary and post-secondary schooling was disrupted and governed by political criteria. These cohorts were also affected by the "sent-down youth" program, which sent secondary-school-age urban youth to farms and factories for "real-world education."

2. The Contribution of Parental Education to Educational Inequality: Methodology

To what extent has inequality of parental education contributed to this observed inequality in education? We answer this question using a regression-based inequality decomposition. Several methods of regression-based inequality decomposition are available. We use the straightforward method for the Gini coefficient as outlined in Morduch and Sicular (2002). The first step in the decomposition is estimation of a regression equation. Table 4.4 contains

estimates of the determinants of one's own education for China as a whole using the regression equation

$$e_i = \alpha + \beta p_i + \delta u_i + \gamma g_i + \varepsilon_i \qquad (3)$$

where e_i is years of own schooling, p_i is the parents' average years of schooling, u_i is a dummy variable that equals 1 if the individual is an urban resident, g_i is a dummy variable that equals 1 if the individual is female, and ε_i is the residual. Table 4.4 also contains estimates of alternative specifications without the urban and gender dummy variables, and for urban and rural samples separately.

The second step is to use the regression results to calculate how much of the dependent variable— years of own education—is contributed by the explanatory variable of interest—in this case, parental schooling. The amount of own education contributed by parental education can be calculated for each individual in the sample, and it is equal to the estimated regression coefficient on parental education times the level of parental education

$$\hat{e}_i^p = \beta p_i \quad . \qquad (4)$$

The third step is to calculate the share of inequality in one's own education contributed by parental education. The share of inequality contributed by parental education can be written as the weighted sum of the $\hat{e}_i^p$'s given by Equation (4). For the Gini coefficient, the share of inequality contributed by parental education s_{Gini} is

$$s_{Gini} = \frac{2}{n\mu^2} \frac{\sum_{i=1}^{n} \left(i - \frac{n+1}{2}\right) \hat{e}_i^p}{G}, \qquad (5)$$

where G is the Gini coefficient for years of own schooling, n is the number of individuals in the population, μ is the mean years of own schooling, and i is each individual's rank in the

distribution of years of schooling, with individuals arranged in ascending order of years of schooling such that $e_1 \leq e_2 \leq e_3 \leq \cdots \leq e_n$.[6]

Using formula (5) we calculate the contribution of parental education to inequality of one's own education. In this calculation, we use estimates of $\hat{e}_i^p$ based on the regression results for Equation (3) reported in Table 4.4 that include dummy variables for urban vs. rural residence and for gender. We also calculate the contribution of parental education separately for the urban and rural samples, using the regression equation that includes a dummy variable for gender.

3. The Contribution of Parental Education to Educational Inequality: Findings

Table 4.8 presents the estimates of inequality in education, inequality in education associated with parental education, and the share of inequality in education contributed by parental education (s_{GInt}).[7] The first column shows that inequality in education is higher in rural China than it is in urban China, and national inequality in education is between that in each of the two sectors, but closer to that in the rural areas. The second column reveals that the portion of one's own education associated with parental education (as estimated by $\hat{e}_i^p$) is distributed more equally than one's own education. On balance, then, the transmission of parental education tends to moderate inequality in education. This is especially true in rural China.

[Insert Table 4.8 about here]

The third column gives the share of inequality in education contributed by parental education. Parental education contributes 19 percent of educational inequality in China as a whole as well as 20 percent in urban China. The contribution of parental education in rural China is lower, 13.7 percent, reflecting the more equal distribution of parental education and the ongoing emphasis on universal access to schooling in the rural areas. These estimates indicate

that although differences in parental education do play a role, in China most of the inequality in education is not associated with inequality in parental education.

Figure 4.11 shows shares of inequality associated with parental education by cohort. The contribution of parental education to educational inequality increased from about 3 percent for cohorts born in the 1940s (educated in the 1950s) to 11-12 percent for cohorts born in the late 1970s and early 1980s (educated during the post-Mao era). The contribution increases consistently across cohorts except for the Cultural Revolution cohorts (born in 1950-54 and 1955-59). The overall level of inequality in education, however, declined, so this pattern indicates that parental education is contributing an increasing share of smaller values.

[Insert Figure 4.11]

[Insert Figure 4.12]

Figure 4.12 disaggregates urban and rural China. The share of inequality contributed by parental education has generally been lower in rural China than in urban China. For rural residents born before 1960, the contribution of parental education to educational inequality is exceedingly low, only about 2 percent. This pattern is consistent with the rapid expansion of access to primary and then secondary education for rural cohorts that completed their schooling in the 1950s, 1960s, and 1970s. The contribution of parental education rises for the next several cohorts, reaching a maximum of 10 percent for those born in 1970-74, the group that completed education in the late 1970s through the 1980s, when progression to junior and senior secondary school in the rural areas fell. For more recent cohorts, the share of educational inequality contributed by parental education has declined markedly, reflecting new policies to increase government funding for education and to increase access to secondary schooling.

In urban China the share of inequality due to parental education is variable, reflecting political and policy shifts. For the 1940-44 cohort that completed school in the 1950s, the share of educational inequality contributed by parental education is only 3 percent. It jumps to 12 percent for the 1945-50 cohort that completed school in the early 1960s, and then falls to 6-7 percent for the Cultural Revolution generation. The contribution of parental education increases again for the 1965-69 cohort, the first group affected by the educational reforms of the early post-Mao years, at which time selectivity was high and based on academic performance. As the reforms continued, the importance of parental education initially declined, but then increased to about 12 percent for the two most recent cohorts that completed their education in the 1990s.

VI. Conclusions

The transmission of education across generations is a general phenomenon found in every society. China is no exception. Our estimates suggest that educational transmission in China is slightly below the average among a group of 42 countries for which comparable estimates are available. The degree of educational persistence from one generation to the next has implications for the persistence of other outcomes, such as income and social status. It provides a guide to the inequality of opportunities as opposed to the inequality of income. In some countries—the United States as a possible example—high income inequality may be tolerated because of the perception that equality of opportunity is sufficient. Now that China has relatively high income inequality, there is a case for strengthening policies to reduce educational inequality.

Our analyses of intergenerational educational persistence using the 2007 CHIP data yield several relevant findings. In the aggregate, levels of education have risen across generations from parents to children. This general result is not surprising. A closer analysis by cohort

reveals that the gains are the largest for rural individuals born prior to 1960, reflecting the rapid expansion of primary education in the rural areas in the first decades of the PRC. The educational policies during that period provided educational opportunities for rural children, many of whose parents had received little or no education. Accordingly, inequality in schooling declined markedly across the early birth cohorts born prior to 1965.

Educational inequality for later cohorts remained relatively constant, whether measured by the Gini coefficient or by the education gap between individuals from education-poor and education-rich households. The gap in years of education for these two groups declines across the early cohorts, but remains between 2.5 and 3.0 years for those cohorts born after 1960.

Decomposition of inequality reveals that for recent cohorts the contribution of parental education to inequality in education increased. But recent measures promoting universal nine years of compulsory education appear to have reversed this trend in rural China. We do not observe such a reverse for the urban sample, even though the latest cohorts in our analysis should have benefited from the rapid expansion of tertiary education since the late 1990s.

Our regression analyses reveal that the intergenerational persistence of education in China is associated with the differences between the rural and urban sectors. Transmission of education from parents to children in China as a whole is not low by international standards, but when we examine the urban and rural sectors separately, the level of transmission differs notably. We conclude that a key contributor to intergenerational educational persistence in China is the urban-rural divide, which segregates the education-poor from the education-rich across generations.

Finally, our analyses show that intergenerational educational transmission and mobility changed across policy periods, but not always in the ways expected. We find that in rural areas

the expansion of primary schooling in the 1950s and 1960s, and of secondary schooling in the 1970s, reduced educational persistence, i.e., it increased educational mobility from one generation to the next. Collectivization in the late 1950s also contributed to this pattern. Policy changes after Mao's death, including decollectivization, led to marked declines in progression to secondary school. Thus, during the early reform period educational mobility declined and parental education became increasingly important to the educational inequality in rural China. It is possible that the decline in mobility was exacerbated by demographic trends, because at this time large numbers of children born during post-Great Leap baby boom reached school age, creating competition for available spaces. In the mid-1990s rising returns to education and new government policies supporting universal nine years of compulsory education appear to have reversed these trends.

In urban areas we find that changes in politics and policies caused substantial variability in educational mobility over time. Not surprisingly, the Cultural Revolution is associated with reduced educational inequality and increased educational mobility. Such is also the case for the periods of the First Five-Year Plan and the Great Leap Forward. The early 1960s are characterized by notably less educational mobility. Educational persistence increased during the post-Mao era, especially for the generations educated since the late 1980s. Findings such as these open up new areas for exploration and hypothesis testing.

Studies of schooling in China and elsewhere have found that the mother's schooling is an important determinant of the educational investment in daughters. This pattern is present in our estimates of intergenerational educational persistence. An additional year of the mother's education has a relatively large effect for women, and this is true in both the rural and urban

sectors. The education of a son appears to be more sensitive to that of the father than to that of the mother. It is possible, therefore, that parental role models are gender-specific.

We have provided two measures of the degree of intergenerational educational transfer, the regression coefficient and the (partial) correlation coefficient in equations predicting the child's education from the parents' education. Which measure is preferable? This requires a normative judgement. Is our interest in educational differences (in years) or educational differences in relation to the mean level of education in society? Note that an additional year of education has a constant proportionate effect on income in the (conventional) semi-log income function. Thus the regression coefficient may be the more relevant measure if our ultimate concern is the distribution of income, and the correlation coefficient may be the more relevant if we are focused on the distribution of education.

For policy purposes it is important to measure the extent to which the relationship from the parents' education to the child's education is causal. If it is merely an association, for instance if the parents' education serves as a proxy for genetic or socially acquired family “ability,” or for environmental factors such as location, the policy implications are likely to be different and may well be weak. If it is a causal relationship, it represents yet another positive externality that stems from educational expenditures: this effect is unlikely to be taken into account by decision-making households.

Given that our primary concern is inequality, we have not attempted to measure the causal effect of the parents' education. Our data do not permit an analysis of first-generation twins or second-generation adoptees, each of whom might be capable of eliminating the effects of genetic transmission. The challenge therefore is to find good instruments and variables that

are well correlated with the parents' education but do not have a direct effect on the child's education. This might be found in the timing and location of policies on compulsory education.

Since the 1980s, income inequality in China has increased substantially. Income inequality is typically associated with unequal investments in schooling—poorer households invest less than richer households in the education of their children. Moreover, studies have found that rising returns to education have also contributed to recent trends in inequality (Gustafsson, Li, and Sicular 2008; Knight, Li, and Deng 2009, 2010), such that, ceteris paribus, better-educated parents have more income and thus invest more in their children's education. We would therefore expect to find an increase in the importance of parental education and reduced educational mobility for cohorts educated in recent years. Such is indeed the case for our urban sample. For the rural sample, however, after an initial decline, educational mobility appears to have recovered.

Our findings for rural China suggest that recent policies supporting universal nine years of compulsory education have been effective. More generally, there is a case, based on equity, for policies to achieve greater equality of educational opportunity, irrespective of whether there is a causal effect of the parents' education on the child's education. Indeed, it may be that education policy can offer the best cure for the socially and economically acquired household characteristics that create inequality in its educational and other forms among the next generation.

An obvious policy would be to ensure greater equality of educational opportunities across localities, in particular, across the rural-urban divide, but also across cities, counties, and villages, because different local income levels produce differences in the quantity and quality of the provision of education. It is also likely that many poor households suffer from credit

constraints (Knight, Li, and Deng 2009). Credit constraints can be addressed by ensuring that school funding relies less on fees paid by households and local communities, and more on central and provincial funding. This indeed is an important theme in recent policy reforms promoting universal nine-year compulsory education in rural China.

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Appendix

Data Issues

In this Appendix we describe several data issues and our treatment of them. First, some problems arise in identifying the parents of the head of the household and of the spouse of the head of the household in urban households. In the 2007 CHIP dataset information on the education of the parents of the head of the household and of the head's spouse is collected for parents who reside in the households and for parents who are not present in the households (including those who are deceased). For all current household members, including parents who reside in the household, the relationship to the head is asked as part of the basic information collected on current household members. In the urban questionnaire this information groups the parents of the head of the household and of the spouse of the head of household together and does not distinguish whether they are parents of the head of household or of the spouse of the head of household.

A separate section of the questionnaire asks questions about the education of parents who are not present in the household; this section does distinguish between the parents of the head of the household and the parents of the spouse of the head of the household, so the problem only exists for the parents of the head of the household and the parents of the spouse of the head of the household who reside in urban households. In some cases, additional information in the survey allows us to identify whether the parents are the parents of the head of the household or of the spouse of the head of the household. For the remaining cases, we do not have matched information for the head (or spouse) and his or her parents. We drop these observations from the analysis. The number of these observations is small because there are relatively few multi-generation families in urban China. Of the 5,000 urban households in the CHIP sample, only

401 (8.0 percent) report parents of the head of household and of the spouse of the head of the household residing in the household. These households contain 397 heads and 335 spouses (some households report no head, and others report no spouse). After using other available information in the survey, we are left with 147 household heads for whom we have no information about their fathers' education, and 145 for whom we have no information about their mothers' education. The corresponding figures for the spouses are 109 and 119. Thus, information on one or both parents' education is missing for fewer than 3 percent of the heads and spouses in the CHIP urban sample. Given these relatively small numbers, we believe that dropping these observations will not substantially affect our results.

Second, the CHIP urban survey contains individuals who originated in rural areas and thus who were educated in rural areas. These individuals can be identified using variables in the dataset that identify individuals who have changed from agricultural to nonagricultural *hukou* and, if so, the year when the change took place. Using this information together with the year of birth and years of education, we reclassify as rural any individual who would have completed school prior to the year when he or she converted to a nonagricultural *hukou*. Individuals who attended university are reclassified as rural if they would have completed secondary school prior to the year when they converted to a nonagricultural *hukou*.[8] In this way, we reclassified as rural 1,455 individuals in the urban sample. This group of reclassified individuals makes up 11.84 percent of the urban sample and 6.12 percent of the rural sample (here the urban and rural samples sizes refer to the sample sizes after reclassification).

Third, the 2007 CHIP sample does not reflect the composition of the underlying population in terms of its sectoral and age distributions. We reweight the CHIP sample using the shares of China's population born in each year in each of the rural and urban sectors from the

2005 NBS 1% sample population survey. Unless otherwise stated, all estimates, tables, and figures are calculated using these weights.

For birth years prior to 1940, the NBS only gives a single, aggregated population share. Our sample contains some individuals born before 1940. For these individuals we therefore use weights based on the aggregated population share of all birth years prior to 1940.

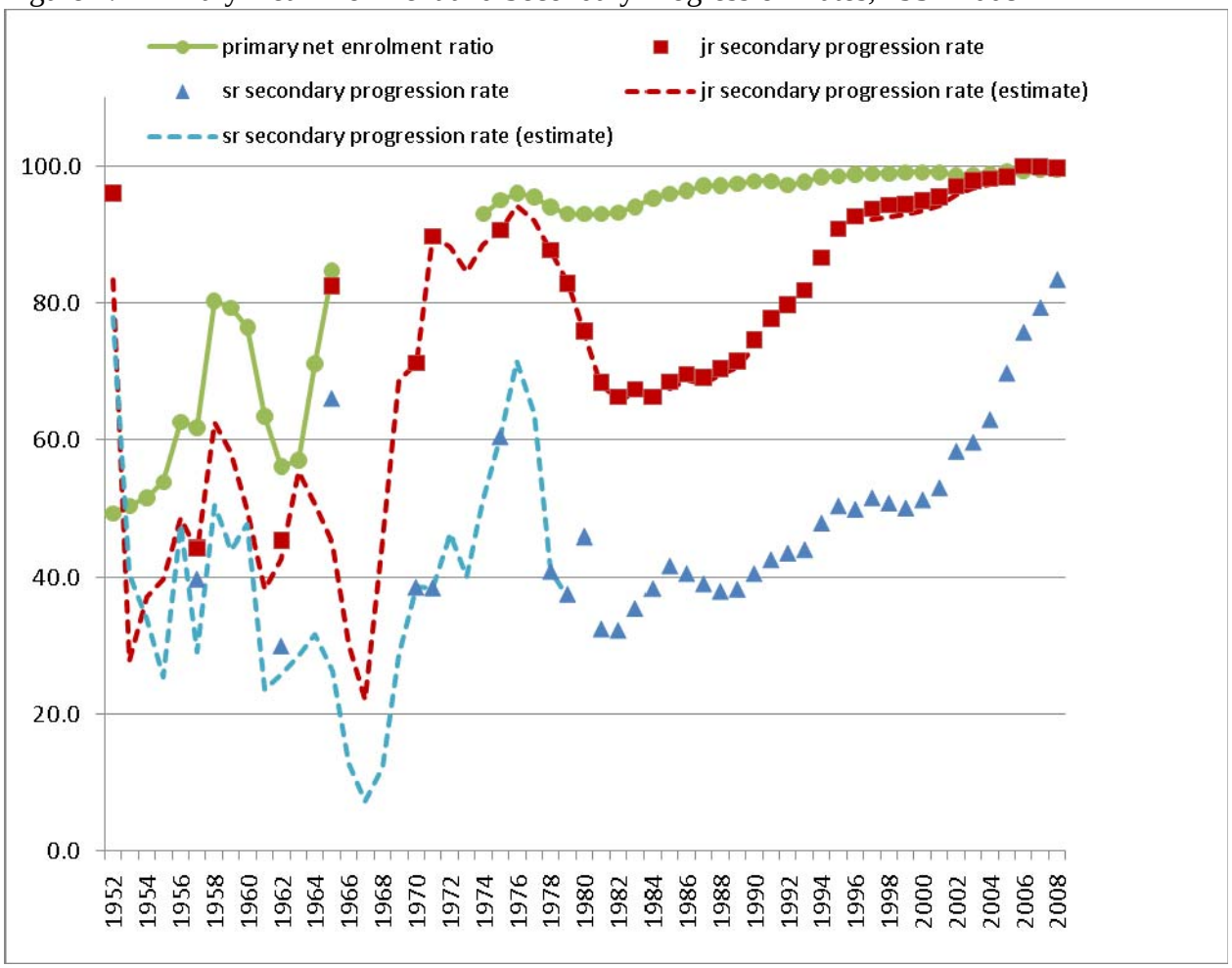
Note that our weights do not reflect provincial or regional (eastern, central, western, and large municipality) population shares. In this regard, and in our use of age-based weights, our weights differ from those used in the other chapters in this volume. The reason for this is that we have reclassified as rural those urban residents who received schooling in rural areas, and we only know whether their place of schooling was urban or rural, not their region or province of origin.

Table 4A.1 about here

Table 4A.2 about here

Table 4A.3 about here

Figure 4.1 Primary Net Enrollment and Secondary Progression Rates, 1952-2008

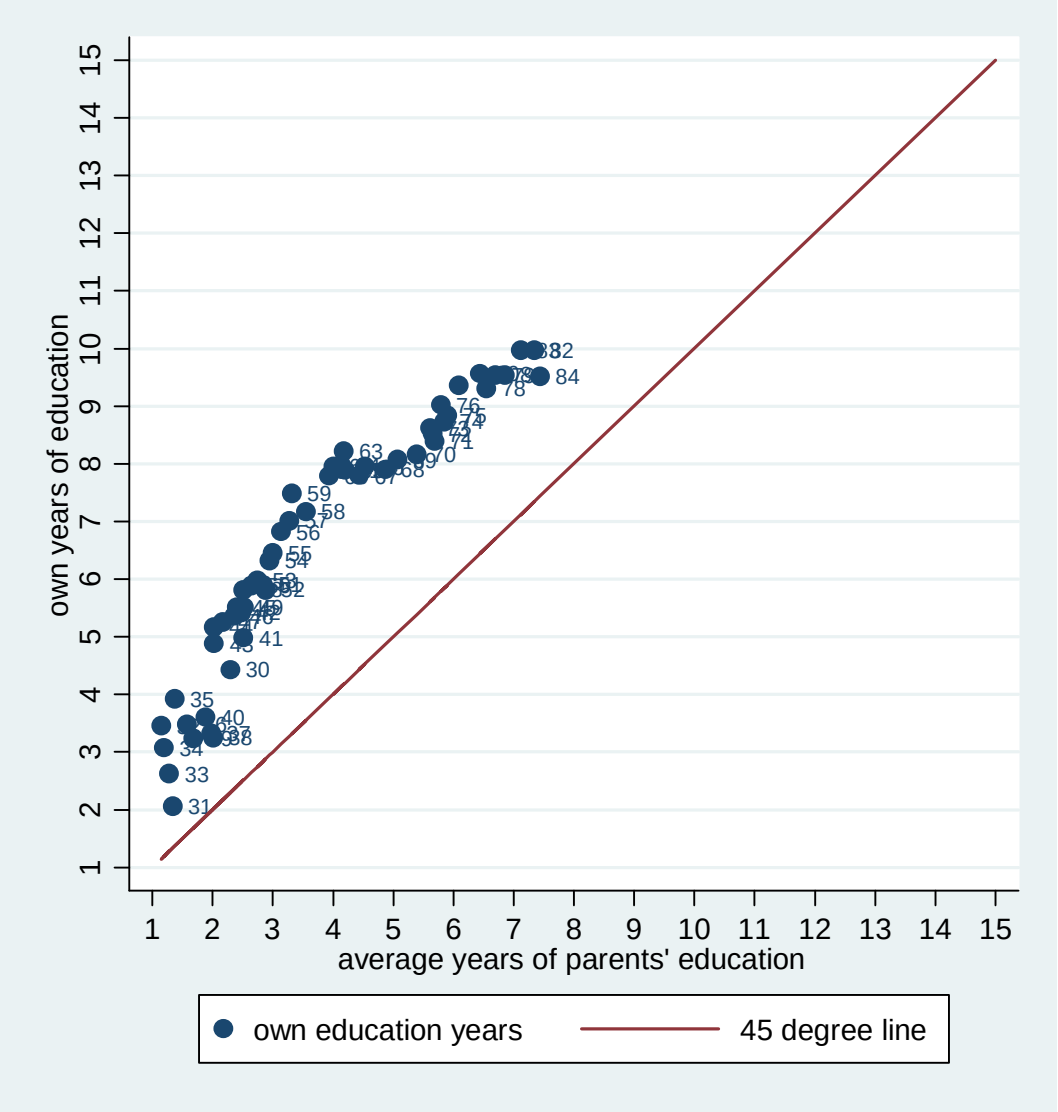


Notes:

1. The primary net enrollment rate is equal to the number of primary-school-age children enrolled in primary school divided by the number of primary school-age children in the population.
2. Progression rates are calculated as the number of entrants to the given level of schooling divided by the number of graduates from the prior level of schooling. These data are from the same year, i.e., entrants to school in August/September are divided by graduates who finished school several months earlier, i.e., in June/July of the same year. The senior secondary school progression rate includes entrants to technical secondary schools.
3. Progression rates to junior and senior secondary school for the years prior to 1978 are only published for selected years. For the 1950s to the 1970s, we have calculated estimates using published data on the numbers of graduates from and entrants to general junior and senior secondary schools. These estimated progression rates (dotted lines) in most cases are similar to the available published progression rates (squares and triangles).

Sources:
NBS (1996, 2001, 2009); Ministry of Education, Department of Planning (1984, 1991); Ministry of Education, Department of Development and Planning (2008).

Figure 4.2 One's Own Years of Education and Average Years of Education of Parents, Total Sample



Note : All figures based on the CHIP survey data are calculated using urban, rural, and birth year population weights.

Figure 4.3 One's Own Years of Education and Average Years of Education of Parents, Rural Sample

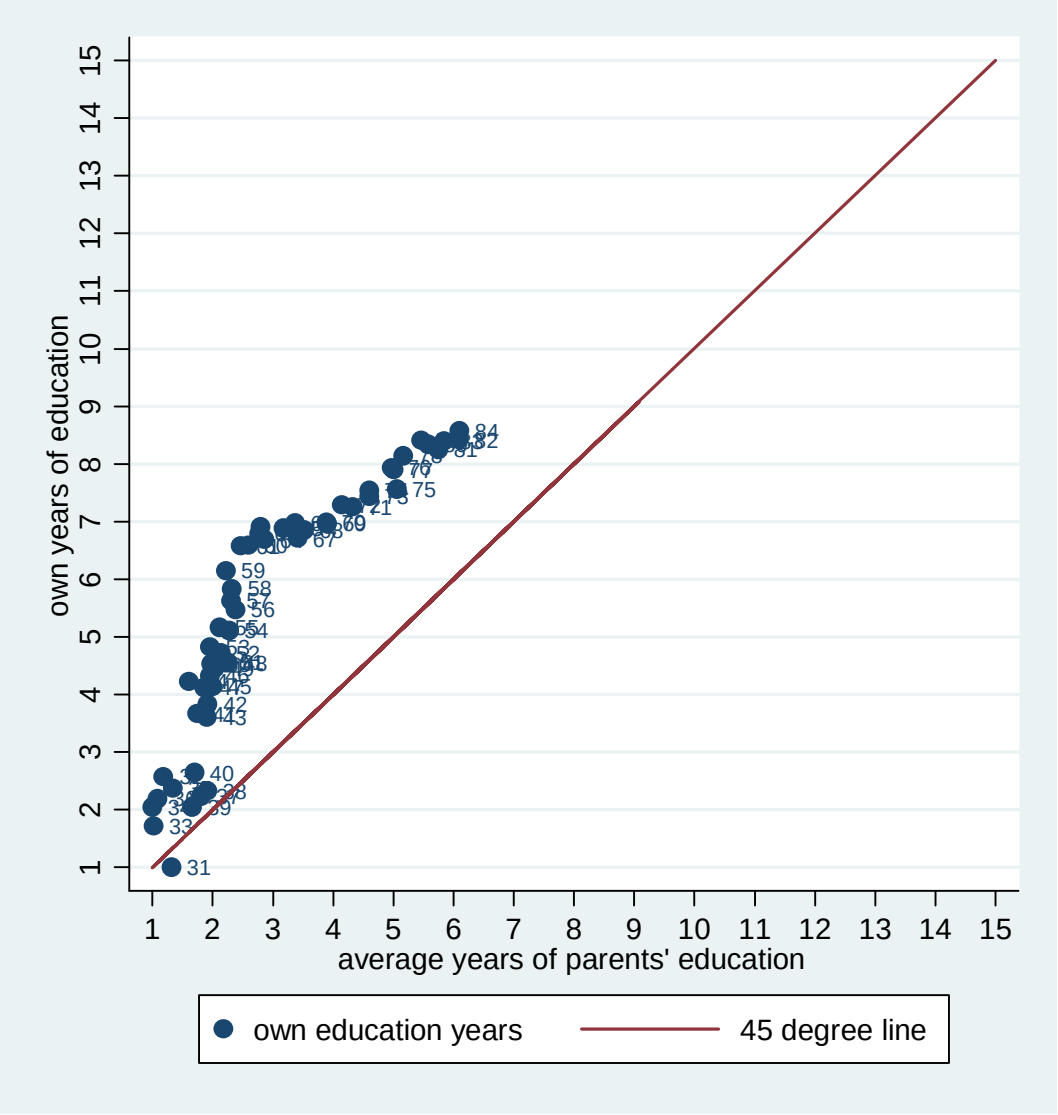


Figure 4.4 One's Own Years of Education and Average Years of Education of Parents, Urban Sample

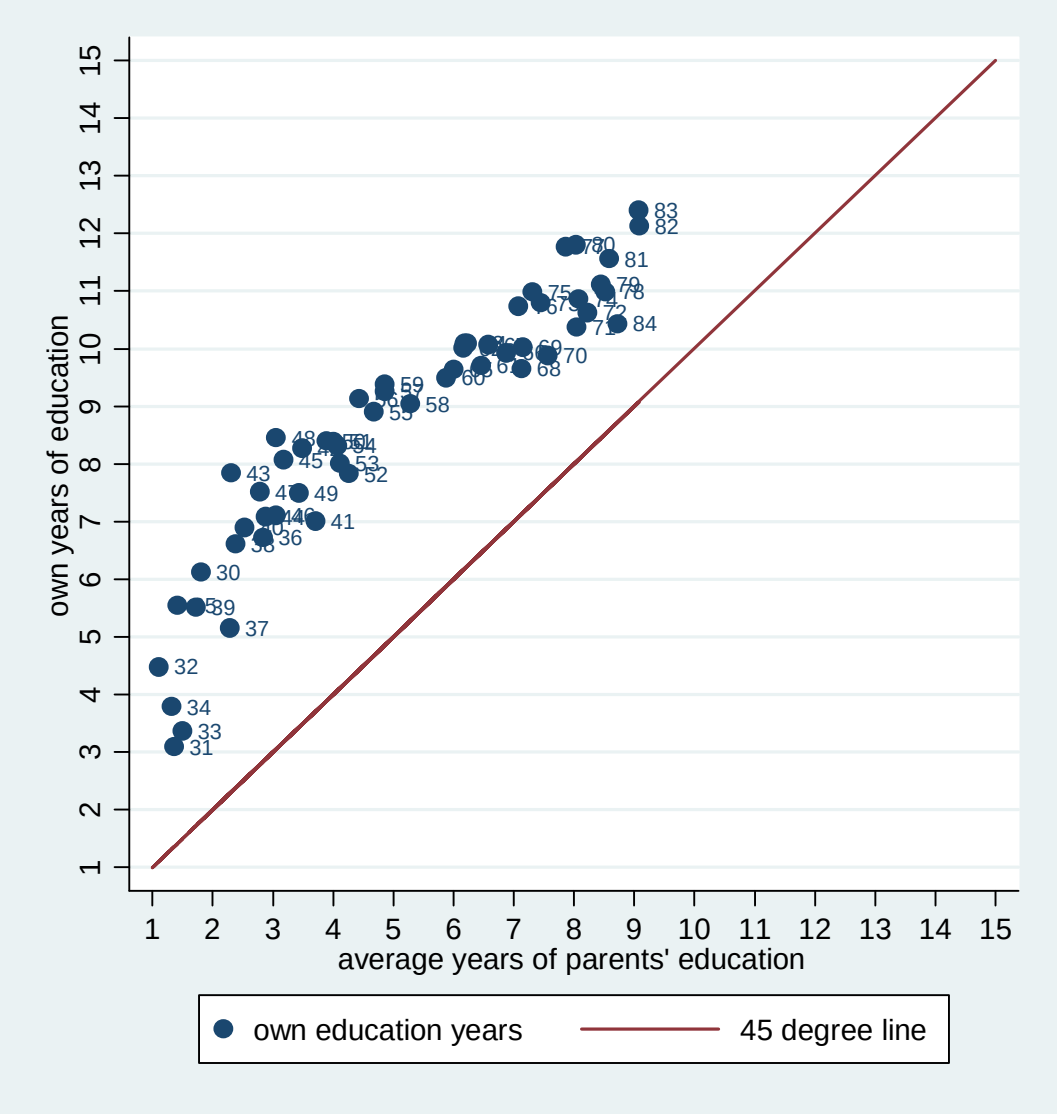


Figure 4.5 Regression Coefficients and Correlation Coefficients by Cohort, Total Sample

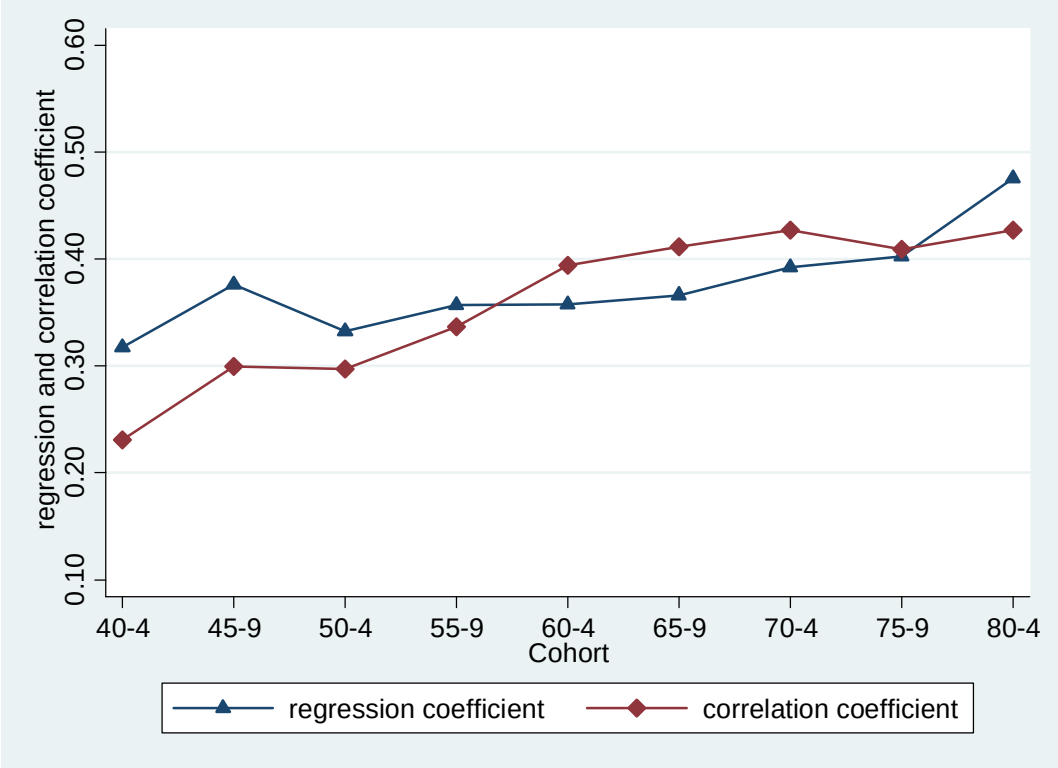


Figure 4.6 Regression Coefficients and Correlation Coefficients by Cohort, Rural Sample

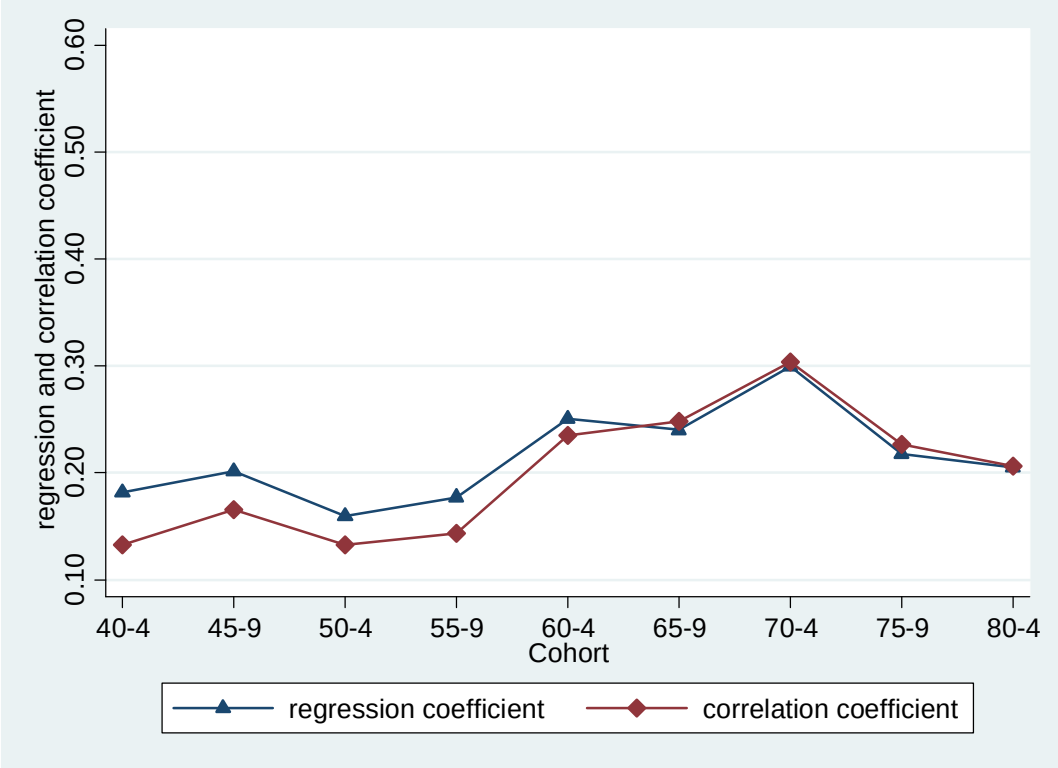


Figure 4.7 Regression Coefficients and Correlation Coefficients by Cohort, Urban Sample

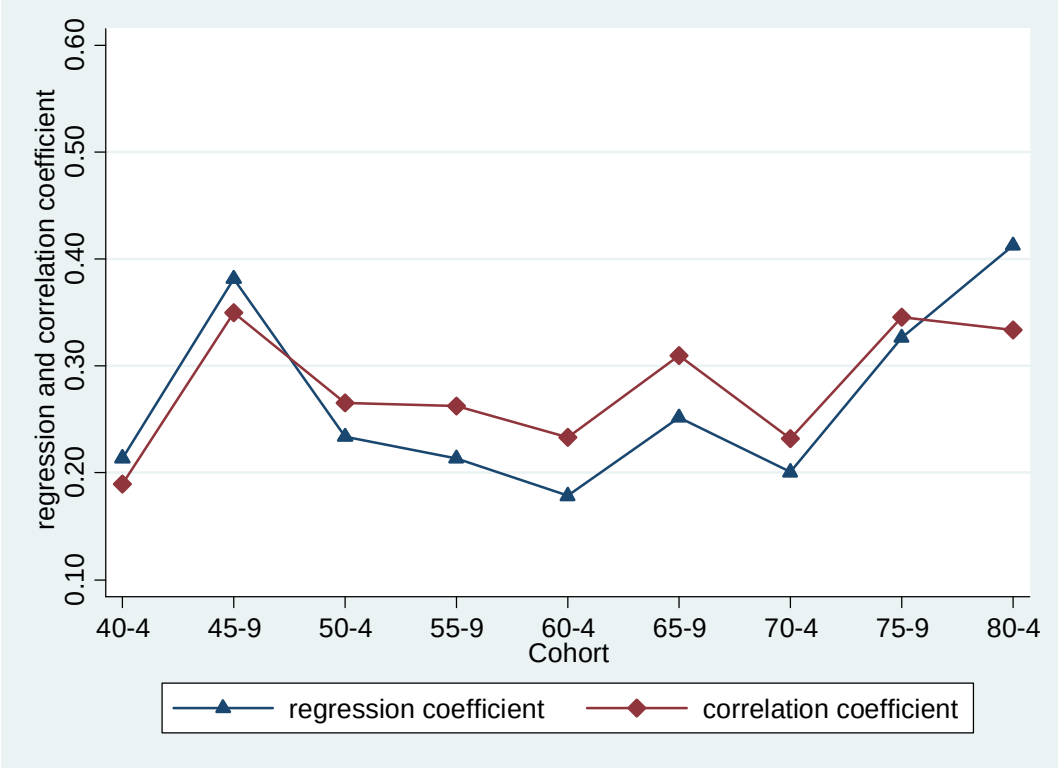


Figure 4.8 Gini Coefficients of Years of Education by Cohort

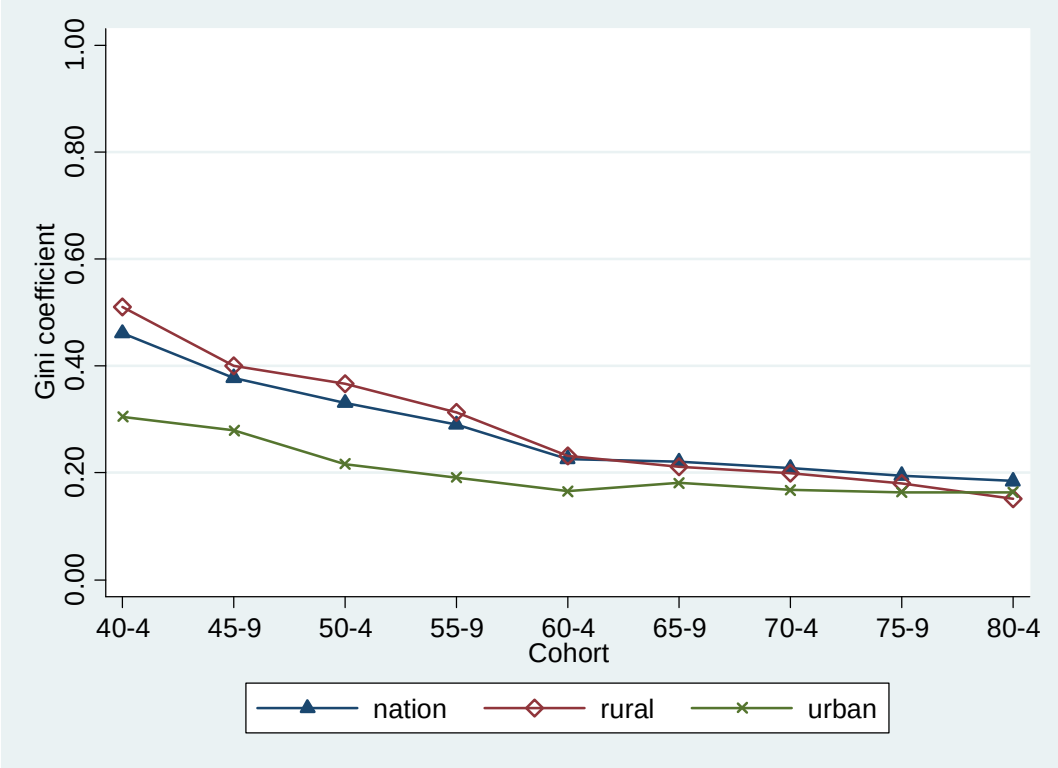


Figure 4.9 Squared Coefficients of Variation of Years of Education by Cohort

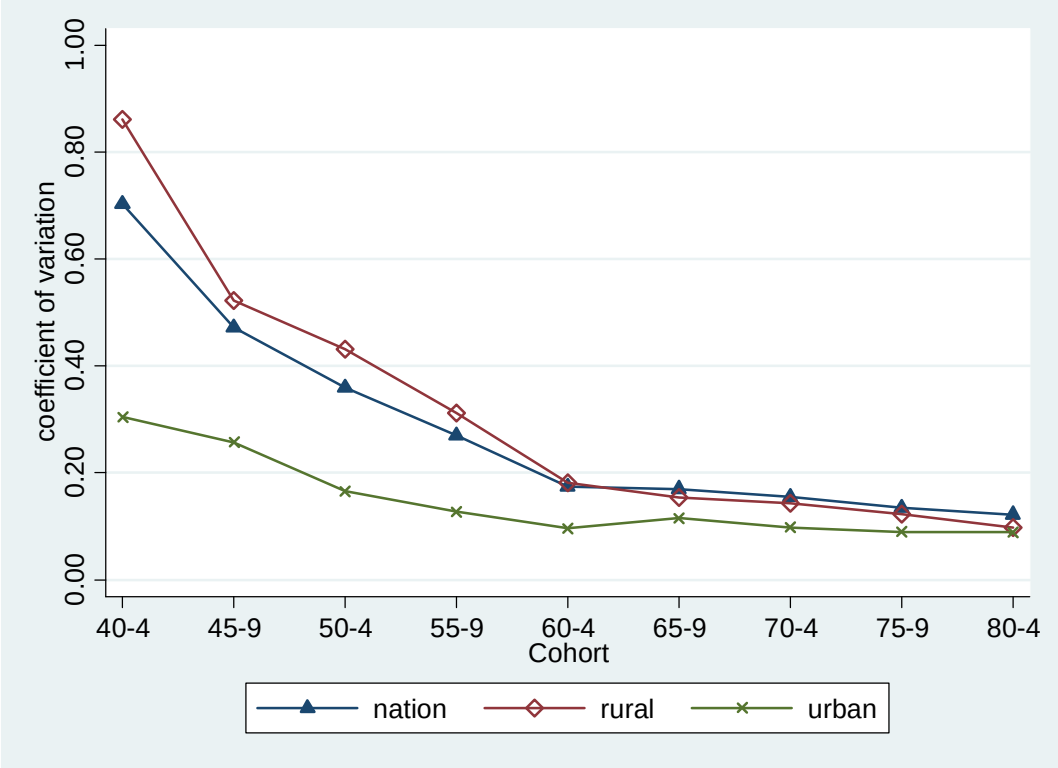


Figure 4.10 Standard Deviation of Education Years by Cohort

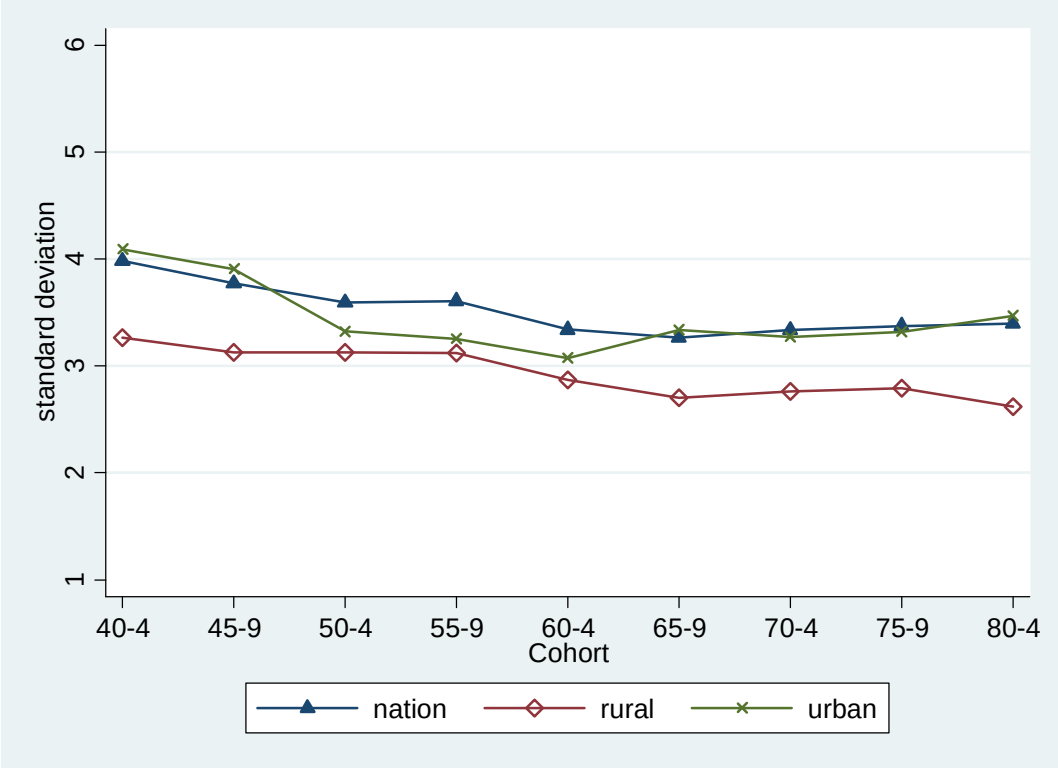


Figure 4.11 Contribution of Parental Education to Inequality in Years of Education by Cohort (%)

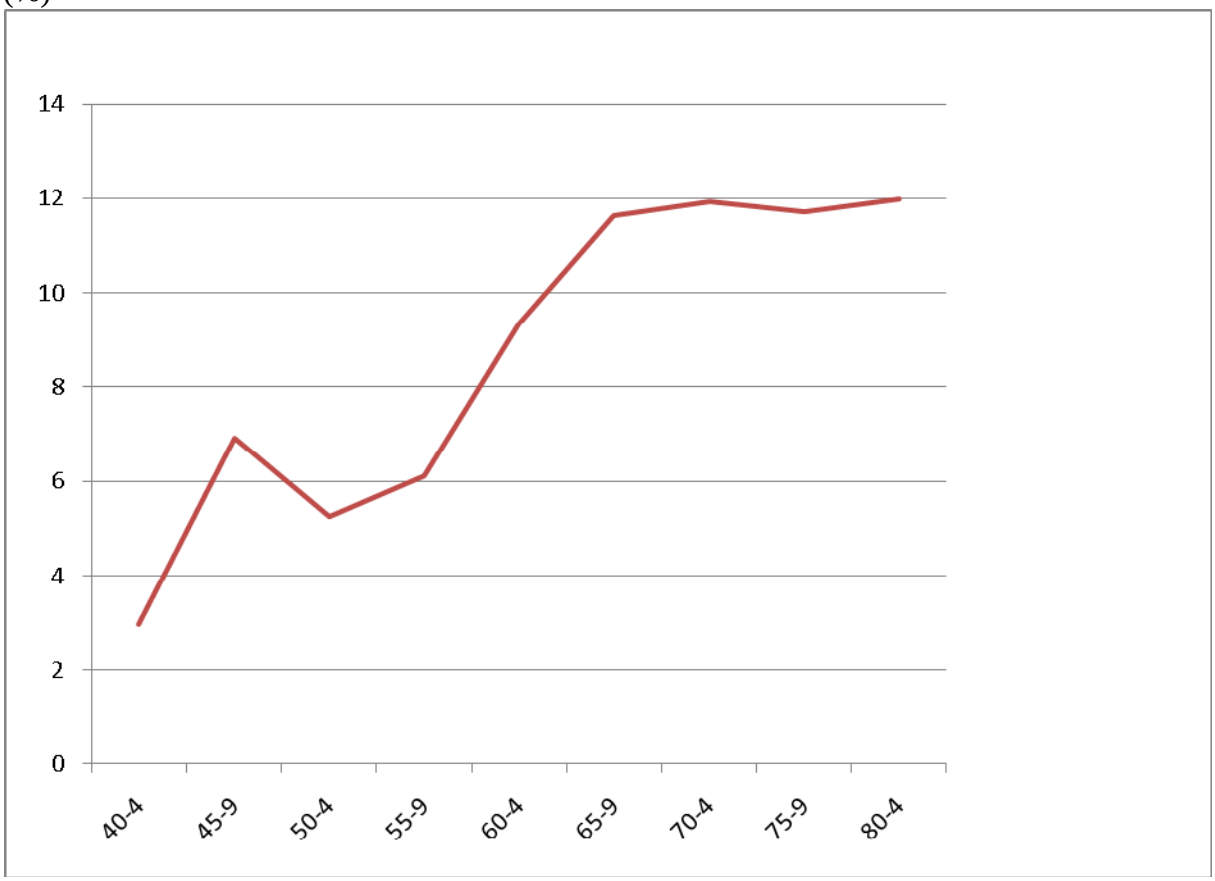


Figure 4.12 Contribution of Parental Education to Inequality in Years of Education by Urban vs. Rural and by Cohort (%)

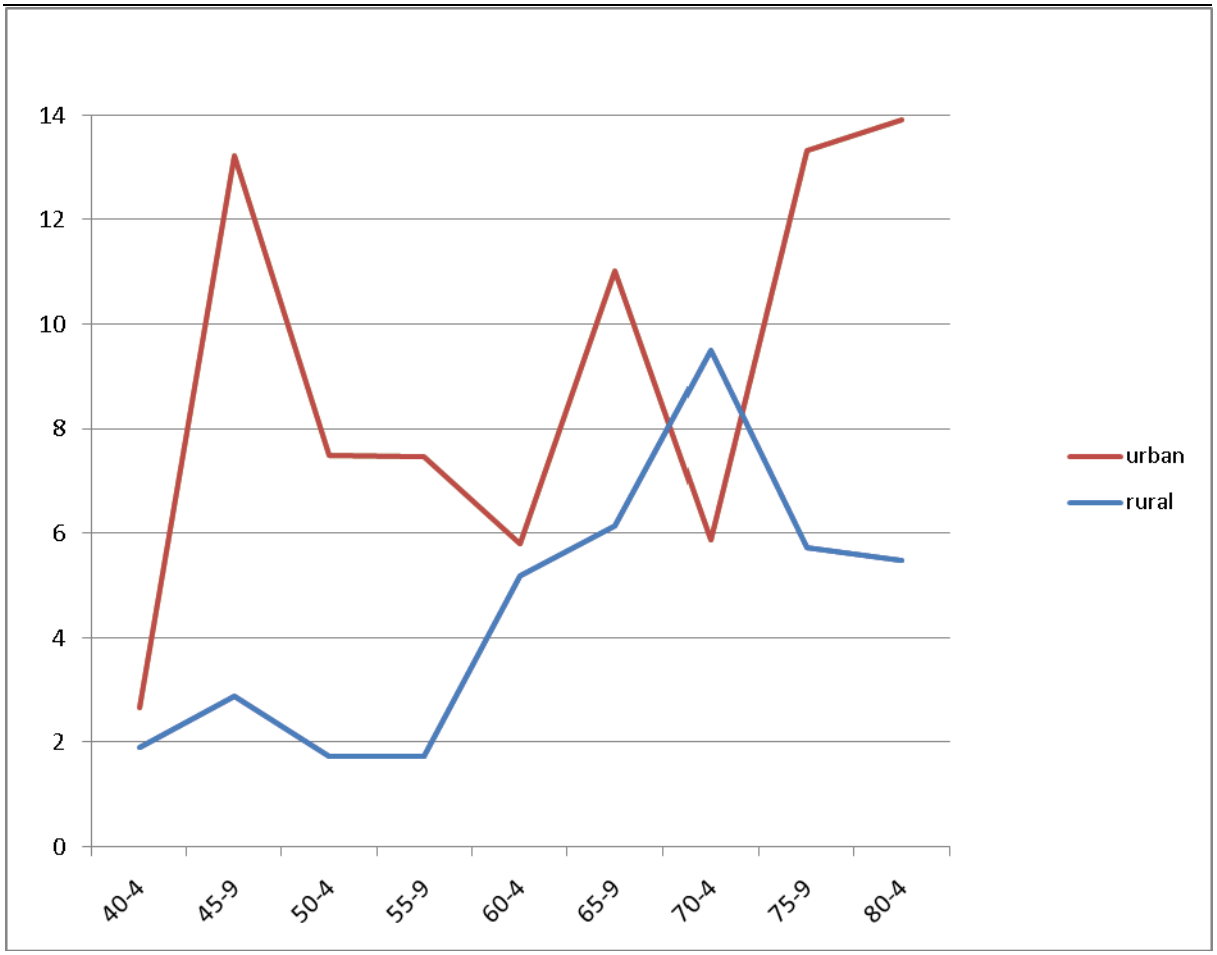


Table 4.1. *Descriptive statistics for matched individuals and parents in the 2007 CHIP used in the analysis*

	Number of Observations	Earliest birth year	Years of Education			
			Mean	SD	Mean, weighted	SD, weighted
Individuals						
Total	34292		8.7	3.81	7.3	3.96
Rural	23779		7.5	3.19	6.0	3.41
Male	12382	1930	8.1	2.81	6.9	3.04
Female	11397	1930	6.7	3.39	5.3	3.53
Urban	10513		11.7	3.47	9.3	3.96
Male	5306	1930	12.0	3.45	9.8	3.86
Female	5207	1930	11.4	3.47	8.9	3.99
Parents						
Total						
fathers	33291	1873	5.1	4.11	4.6	4.11
mothers	32867	1863	4.0	4.03	3.7	4.01
parents' avg	34292		4.6	3.73	4.2	3.73
Rural						
fathers	22638	1873	4.3	3.43	3.8	3.42
mothers	22106	1863	2.8	3.08	2.6	3.12
parent's avg	23779		3.6	2.96	3.2	2.98
Urban						
fathers	9372	1875	6.9	4.93	6.0	4.79
mothers	9590	1864	6.6	4.67	5.6	4.58
parent's avg	10153		6.8	4.34	5.8	4.26

Notes:

1. In the columns with weighted means and SDs, weights adjust the distribution of individuals across birth years in each of the urban and rural sectors to match their population shares given by the NBS 2005 1% population sample survey.
2. In rows giving average parental education, if one parent's years of education is missing, the average is set equal to the other parent's years of education.
3. In rows giving fathers' and mothers' education separately, the missing values are not replaced so that the descriptive statistics reflect the actual observations in the dataset.

Table 4.2a. *Cross-tabulation of one's own educational level by the educational level of the father*

Education level of father	Own education level					
	1	2	3	4	5	Total
1 No education	895	2762	3565	1701	580	9503
	9.42	29.06	37.51	17.90	6.10	100.00
	65.66	39.76	26.81	23.45	13.08	28.54
2 Primary	363	3390	5922	2474	901	13050
	2.78	28.98	45.38	18.96	6.90	100.00
	26.63	48.80	44.54	34.10	20.32	39.20
3 Middle	61	603	2863	1701	1211	6439
	0.95	9.36	44.46	26.42	18.81	100.00
	4.48	8.68	21.53	23.45	27.32	19.34
4 High	39	167	830	1083	1004	3123
	1.25	5.35	26.58	34.68	32.15	100.00
	2.86	2.40	6.24	14.93	22.65	9.38
5 Post-secondary	5	25	115	296	737	1178
	0.42	2.12	9.76	25.13	62.56	100.00
	0.37	0.36	0.86	4.08	16.63	3.54
Total	1363	6947	13295	7255	4433	33293
	4.09	20.87	39.93	21.79	13.32	100.00
	100.00	100.00	100.00	100.00	100.00	100.00

Table 4.2b. *Cross-tabulation of one's own educational level by the educational level of the mother*

Education level of mother	Own education level					
	1	2	3	4	5	Total
1 No education	1070	3886	5567	2311	703	13537
	7.90	28.71	41.12	17.07	5.19	100.00
	79.55	57.79	42.81	31.78	15.55	41.19
2 Primary	219	2596	5680	2632	1115	12242
	1.79	21.21	46.40	21.50	9.11	100.00
	16.28	38.61	43.68	36.19	24.66	37.25
3 Middle	25	164	1344	1409	1214	4156
	0.60	3.95	32.34	33.90	29.21	100.00
	1.86	2.44	10.34	19.38	26.85	12.65
4 High	28	64	337	736	1030	2195
	1.28	2.92	15.35	33.53	46.92	100.00
	2.08	0.95	2.59	10.12	22.78	6.68
5 Post-secondary	3	14	75	184	459	735
	0.41	1.90	10.20	25.03	62.45	100.00
	0.22	0.21	0.58	2.53	10.15	2.24
Total	1345	6724	13003	7272	4521	32865
	4.09	20.46	39.56	22.13	13.76	100.00
	100.00	100.00	100.00	100.00	100.00	100.00

Note: The numbers in Tables 4.2a and 4.2b are calculated without weights because the tabulations are done with integer values and cannot be done with fractional weights.

Table 4.3a. *Average years of education of son by levels of father's and mother's education*

Education level of mother	Education level of father					
	1	2	3	4	5	Total
1	6.15	7.30	8.47	8.38	11.43	6.68
2	7.91	7.69	8.96	9.88	10.94	8.10
3	9.69	9.64	10.16	10.94	11.90	10.27
4	9.73	10.16	11.16	10.82	13.58	11.07
5	10.58	11.69	12.84	12.31	12.34	12.19
Total	6.48	7.75	9.50	10.40	12.28	7.95

Table 4.3b. *Average years of education of daughter by levels of father's and mother's education*

Education level of mother	Education level of father					
	1	2	3	4	5	Total
1	4.39	5.69	7.20	7.42	8.81	4.94
2	7.12	6.52	7.94	9.34	9.44	6.97
3	8.95	8.62	9.43	10.62	11.42	9.51
4	8.59	9.57	10.41	9.99	12.53	10.20
5	10.63	8.67	11.62	10.79	12.98	11.32
Total	4.84	6.51	8.57	9.68	11.44	6.53

Note: The education levels of mothers and fathers given in the row and column headings are: 1 = no schooling, 2 = primary school, 3 = middle school, 4 = high school, and 5 = post-secondary school. These indicate the level of education attained. The cells contain the average years of education for individuals whose parents have the levels of education given by that row and column. Weights are used.

Table 4.4. *Regressions of one's own education as a function of the parents' average education, all birth cohorts combined*

	(1) Base specification	(2) Base with rural	(3) Base with rural and gender	(4) Rural only, base	(5) Rural only with gender	(6) Urban only, base	(7) Urban only, with gender
Parents' avg. years of education	0.509***	0.412***	0.407***	0.417***	0.416***	0.408***	0.402***
	(101.0)	(80.6)	(81.1)	(60.2)	(62.2)	(50.0)	(49.6)
Rural dummy		-2.230***	-2.235***				
		(-56.6)	(-57.9)				
Male dummy			1.303***		1.632***		0.757***
			(36.8)		(40.8)		(10.9)
Constant	5.124***	6.925***	6.349***	4.678***	3.933***	6.949***	6.627***
	(181.3)	(166.0)	(144.9)	(153.9)	(113.7)	(118.5)	(101.4)
Adj R2	0.229	0.295	0.322	0.132	0.189	0.192	0.201
Degrees of freedom	34290	34289	34288	23777	23776	10511	10510

* p<0.05, ** p<0.01, and *** p<0.001. Standard deviations are given in parentheses. The regressions are done with weights.

Table 4.5. *Regressions of men's and women's own education as a function of their parents' average education, all birth cohorts combined*

	(1) Men, base	(2) Men, base with rural	(3) Women, base	(4) Women, base with rural
Parents' avg. years of education	0.450***	0.361***	0.550***	0.448***
	(69.3)	(53.5)	(74.0)	(60.8)
Rural dummy		-1.893***		-2.542***
		(-36.3)		(-44.9)
Constant	6.073***	7.636***	4.358***	6.371***
	(163.6)	(136.3)	(106.1)	(107.5)
Adj R2	0.213	0.268	0.248	0.330
Degrees of freedom	17686	17685	16602	16601

* p<0.05, ** p<0.01, and *** p<0.001. Standard deviations are given in parentheses. The regressions are done with weights.

Table 4.6. *Regression equations: One's own education as a function of location, gender, and birth cohort for education-poor and education-rich households*

Variable	(1) Both parents no education	(2) One parent no education, one primary	(3) Both parents primary education	(4) Both parents middle school or higher	(5) Both parents no education	(6) One parent no education, one primary	(7) Both parents primary education	(8) Both parents middle school or higher
Rural dummy	-2.230***	-2.519***	-3.015***	-3.002***	-2.805***	-3.139***	-2.969***	-3.142***
	(-26.0)	(-24.0)	(-37.1)	(-28.5)	(-36.4)	(-32.6)	(-41.3)	(-30.6)
Male dummy	1.778***	1.450***	1.224***	0.564***	1.991***	1.551***	1.350***	0.520***
	(22.5)	(15.2)	(18.4)	(6.0)	(28.5)	(18.2)	(22.8)	(5.8)
1930-34 cohort					-2.176***	-3.654***	-1.372***	-0.535
					(-12.8)	(-12.2)	(-4.6)	(-0.6)
1935-39 cohort					-1.425***	-0.920**	-1.633***	3.412***
					(-9.7)	(-3.3)	(-8.5)	(4.6)
1945-49 cohort					0.455**	0.838***	0.707***	1.761***
					(3.2)	(3.7)	(4.0)	(3.6)
1950-54 cohort					1.128***	1.170***	0.891***	1.618***
					(8.3)	(5.6)	(5.3)	(3.7)
1955-59 cohort					1.980***	1.824***	1.801***	2.790***
					(14.2)	(8.8)	(11.0)	(6.9)
1960-64 cohort					2.870***	2.728***	2.605***	2.936***

					(19.6)	(13.4)	(16.2)	(7.7)
1965-69 cohort					2.718***	2.601***	2.712***	2.913***
					(18.1)	(13.0)	(17.4)	(7.8)
1970-74 cohort					3.065***	2.983***	2.957***	3.572***
					(17.1)	(14.1)	(18.9)	(9.7)
1975-79 cohort					3.916***	2.968***	3.431***	4.195***
					(15.2)	(13.4)	(20.7)	(11.4)
1980-84 cohort					4.173***	3.516***	4.034***	4.355***
					(10.8)	(13.1)	(22.5)	(11.9)
constant	5.956***	7.809***	8.871***	11.127***	5.192***	6.360***	6.668***	7.664***
	(75.0)	(79.1)	(114.2)	(154.6)	(43.0)	(34.1)	(43.6)	(21.5)
Adj R2	0.128	0.152	0.175	0.140	0.320	0.324	0.356	0.199
Degrees of freedom	8011	4389	7954	5265	8001	4379	7944	5255

* p<0.05, ** p<0.01, and *** p<0.001. Standard deviations are given in parentheses. The regressions are done with weights.

Table 4.7. Differences in one's own education between individuals whose parents have no education and individuals whose parents have a middle school or higher education, by cohort

Cohorts	Difference in years of education
1930-4	-4.1
1935-9	-7.3
1940-5	-2.5
1945-9	-3.8
1950-4	-3.0
1955-9	-3.3
1960-4	-2.5
1965-9	-2.7
1970-4	-3.0
1975-9	-2.8
1980-4	-2.7

Note: Calculated from the estimates in columns 5 and 8 of Table 4.6. The numbers shown are for urban women. The gap is smaller for all cohorts by 1.5 years for men and larger for all cohorts by 0.4 years for rural individuals.

Table 4.8. *Educational inequality and the contribution of parental education*

	Gini of education	Gini concentration ratio of one's own education derived from parental education ($\hat{e}_i^p$)	Contribution of parental education to inequality in one's own education (s_{gini})
National	0.301	0.244	19.0%
Rural	0.314	0.193	13.7%
Urban	0.233	0.186	20.0%

Note: Inequality is measured over completed years of education, using the Gini coefficient for one's own education and the Gini concentration ratio (pseudo Gini) for own education derived from parental education. The contribution of parental education to inequality in one's own education is calculated for the Gini using all cohorts and with weights. See the text for further explanation.

Table 4A.1. *Educational levels used in the analysis*

Code	Educational level
1	Illiterate and semi-illiterate
2	Elementary school
3	Junior high school
4	High school, inclusive of middle-level professional, technical, or vocational school
5	College and above

Note: Educational levels indicate attainment of that level of education.

Table 4A.2. *Conversion of educational levels in the rural questionnaires to codes and years of education used in the analysis*

Code in rural questionnaire	Educational level in rural questionnaire	Converted to	
		Level of education	Years of education
0	Never schooled	1	0
1	Graduated from five-year primary school	2	5
2	Attended but did not graduate from five-year primary school	2	3
3	Graduated from six-year primary school	2	6
4	Attended but did not graduate from six-year primary school	2	4
5	Graduated from two-year junior middle school	3	7
6	Attended but did not graduate from two-year junior middle school	3	6
7	Graduated from three-year junior middle school	3	9
8	Attended but did not graduate from three-year junior middle school	3	8
9	Graduated from two-year senior middle school	4	10
10	Attended but did not graduate from two-year senior middle school	4	9
11	Graduated from three-year senior middle school	4	12
12	Attended but did not graduate from three-year junior middle school	4	11
13	Graduated from vocational senior middle school (职业高中)	4	12
14	Attended but did not graduate from vocational senior middle school	4	11
15	Graduated from senior middle technical school (高中中技[小中专])	4	12
16	Attended but did not graduate from senior middle technical school	4	11
17	Graduated from specialized secondary school (中专)	4	12
18	Attended but did not graduate from specialized secondary school	4	11
19	Graduated from junior/specialized	5	14

	college (大专)		
20	Attended but did not graduate from junior/specialized college	5	13
21	Graduated from TV/correspondence/distance university (电大/函授/远程教育)	5	14
22	Attended but did not graduate from TV/correspondence/distance university	5	13
23	Graduated from university	5	16
24	Attended but did not graduate from university	5	15
25	Graduated from a master's degree program	5	18
26	Attended but did not graduate from a master's degree program	5	17
27	Graduated from a Ph.D. program	5	21
28	Attended but did not graduate from a Ph.D. program	5	20

Table 4A.3. *Conversion of educational levels in the urban questionnaire to codes and years of education used in the analysis*

Code in urban questionnaire	Educational level in urban questionnaire	Converted to	
		Level of education	Years of education
1	Never attended school	1	0
2	Anti-illiteracy class (扫盲班)	1	2
3	Primary school	2	6
4	Junior middle school	3	9
5	Senior middle school	4	12
6	Specialized middle school (中专)	4	12
7	Junior/specialized college(大学专科)	5	14
8	University	5	16
9	Graduate school	5	19

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[1] We do not discuss tertiary education because until very recently enrollments were low; nor do we discuss adult and non-formal education because policies in these areas are complex, and these forms of education are not well captured in the data.

[2]Separate urban and rural progression rates provided in the text are calculated using the numbers of graduates from rural (or urban) primary and junior secondary schools and the number of entrants into rural (or urban) junior secondary and senior secondary schools, as provided in Ministry of Education, Department of Planning (1984). Only students graduating from and entering regular secondary schools are included in these calculations; specialized and vocational secondary schools are excluded.

[3] This approach to defining the level of education is consistent with that taken by the NBS in its rural and urban household surveys.

[4] The number of observations in the two tables is slightly different owing to some missing data for the mother's level of education.

[5] We do not include those individuals born before 1940 in the analysis owing to the small number of observations for the oldest cohorts.

[6] Morduch and Sicular (2002) point out that decomposition of the Gini does not satisfy the property of uniform additions, which states that if a variable that determines one's own education is equal for all individuals, then that variable will be inequality-reducing and will have a negative contribution to overall inequality. The property of uniform additions will be relevant if parental education is relatively similar across individuals. In fact, levels of education in China have risen across the board over time, so we would expect that the uniform component of parental education will have increased across cohorts. Unfortunately, we cannot use alternative decompositions that satisfy this property as suggested by Morduch and Sicular (2002) because the formulae cannot be used with zero values, and some individuals in the CHIP sample have zero years of education.

[7] We carried out a decomposition for the squared coefficient of variation, which also did not satisfy the property of constant additions but nevertheless is a check on the Gini decomposition. The results were very similar to those for the Gini.

[8] The standard age for beginning primary school in rural China is 7. We add 7-plus years of schooling (up to a maximum of 12 years of schooling) to each individual's birth year to calculate the year when the individual completed pre-university schooling. If this year is earlier than the year of the *hukou* conversion, we reclassify the individual as rural. We also tried a second, simpler approach, which was to reclassify all individuals who changed from agricultural to nonagricultural *hukou*, regardless of whether or not they completed school prior to the conversion. The two approaches provide very similar results.