Hetergeneity in Human Cpital Accumulation and Educational Returns in Urban and Rural China

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Abstract

After the start of opening up policy in 1978, China has experienced significant growth in people's living standard. But income inequality between urban and rural area has also increased dramatically during the last forty years. With the labor market reform, education has played an increasingly important role in this economic dynamic. This paper studies the heterogeneity in the human capital accumulation process in urban and rural area. Specifically, this paper studies the determinants of educational attainment and different educational returns for urban and rural ordinarily residents respectively. Financial constraint is more important for rural area. Intergenerational human capital transfer shows equal importance with father's education outweighs mother's education in urban area. Educational return for rural ordinarily resident is systemically lower than that of their urban counterpart, with the educational return estimated to be insignificantly different from zero. This paper concludes that the dichotomous urban rural labor market alongside with the segregated educational system lowers educational attainment in rural China.

1 Introduction

After the start of opening up policy in 1978, China has experienced significant growth in people's living standard with real GDP increasing 50 folds after 40 years(World Bank, 2015). But as the same time, the income inequality has also aggravated with GINI coefficient reaching over 0.45(NBS, 2016). Furthermore, social mobility has been stagnating in the past decade in China (Fan et al., 2014). Understanding what are the underlying factors that are driving the increasing inequality has been the focus of academic researches and policy enactment. Since the resume of nation wide college entrance examination, China has undergone considerable educational policy changes. With the gradual change of wage setting structure of labor market and increasing demand of high skill labor, education has played an increasingly important role in China. Education has not only become a mechanism designed to acquire human capital, but also served as a signal in China's labor market, where labor

demand is outnumbered by labor supply due to its large population. Then understanding what are the determinants of education acquirement is important for both understanding the existing pattern of income distribution and future prediction.

At the same time, China has a unique household registration system that separate people's identity based on their origin of birth. Specifically, the household registration system divide people into urban and rural status. In accordance with this system, the educational system and labor market is also divided in this dichotomous way. There's an extensive literature that has calculated the determinants of education and educational returns (Brauw and Giles, 2005; Yang, 2005; Fang, et al. 2012;). The estimates range from 5 percent to 20 percent, with a general increasing trend and are more consistent for educational returns in the last two decades. But there has been minimal amount of literature focusing on the difference between urban and rural area. Then the estimate of educational returns can be in general misleading and not a comprehensive description of current condition in China's educational system.

This paper studies differences in determinants of educational attainment in urban and rural area and educational returns in these two areas respectively Specifically, we focus on the effect of parents' income and intergenerational human capital transfer. The theoretical framework adopted is the canonical three-period overlapping generations model. With this specification, this paper uses the two stage least square estimation to compute educational returns. This paper uses two sets of instrumental variables to resolve the issue of endogeneity: the first set of instrumental variables are parents' educational attainment; the second set of variable is the correlation of education and income within parents' community of residence.

This paper finds that parent's income is more important in individual's educational attainment than urban area. Intergenerational human capital is important for both urban and rural area, with urban area demonstrating a pattern where father's education is significantly more important. The instrumental variable method yields an educational returns around 14 percent in urban area and a value which is insignificantly different from zero in rural area. This paper concludes that the expected returns of education is important for individual's educational investment decision. Rural area suffers from systemic bias in labor market, which in turn affect parents' educational investment decision. Minimal educational returns hamper the acquirement of education in rural area.

2 Literature

2.1 Background

After the start of the opening up policy, income inequality has been increasing significantly. Kahn and Riskin (1998) uses a household survey data from Chinese Academy of Social Sciences to study the urban rural income divergence from 1988 and 1995. During this period, income inequality increased with a GINI coefficient over 0.45. Wage differentials and net subsidies are two major income inequality sources. Furthermore, Meng and Kidd(1997) studied the labor market reform, during which the wage determination structure underwent significant change through the introduction of market mechanism. They argue that the new system has in a certain degree free up firms' hiring and dismissal decisions. The role of human capital was increasingly important though seniority was still the single most important determinant of wage. After 2000, as the degree of marketization increases, returns to medium and high skill labor have gradually converged to their actual marginal product(Heckman and Yi, 2012).

Multiple researches have also confirmed this relationship between human capital and income differences in China(Zhang et al., 2007; Gao et al., 2008; Guo, 2017). Specifically, Fan, et al. (2014) study the intergenerational income and education mobility. They have found there is a decline in China's social mobility. Their analysis shows that although the increasing returns to human capital create incentive in the investment in human capital, increase in educational costs, increasing inequality and education policy distortion have exacerbated the problem of education inequality. Thereafter, it's crucial to understand the underlying human capital accumulation in China.

There has been a wealth of researches devoted to the study of human capital accumulation process in China. But in general the results are not of good quality and there is an existence of extensive endogeneity problem in their econometric specification due to the lack of comprehensive household survey data and structural model to understand the underlying household decisions in the investment of human capital. Towards that aspect, Qin et al. (2014) built an overlapping generations model to study the impact of intergenerational human capital transfer on income mobility in China. They identify a structural model to understand the human capital accumulation process and adjust for potential endogeniety problem. Their results show that the income mobility is underestimated if excluding the direct transfer of human capital. But they still omit some important aspects of the human capital accumulation process, for example, parents' investment in their offspring's human capital. Attanasio (2015) developed a more comprehensive human capital accumulation model. In this model, human capital is determined by 1) genetic and non-genetic

intergenerational human capital transfer; 2) investment of resources and time in human capital accumulation; 3) environment variables including school, peer interaction and education policies.

2.2 Heterogeneity in Human Capital Accumulation

A salient drawback of current researches on human capital accumulation has been that most of them have paid little attention to the heterogeneity in different regions of China. Urbanization rate now is around 52.6 percent in China, which means there are still more than half billion people living in rural China(Lu and Wan, 2014). Among all the people living in China, there are over 20 million people who still don't have urban identity due to the demanding requirement of the household registration system, which is also called *Hukou*. Urban residents and non-urban rural urban migrants have access to very different social welfare system, which involves children's different access to schooling. These evidences show that there exists large heterogeneity in the current demographic of China and a simple representative agent model will not suffice to paint the whole picture.

2.2.1 Intergenrational Human Capital Transfer

In general, the education accumulation process is determined by three factors: genetic factor(Plug, 2004), parental behaviors(Bjorklund et al., 2004) and environmental factors (Bauer and Riphahn, 2007).

Intergenerational human capital transfer is one of the most important factors affecting human capital accumulation process. Qin, et al.(2014) has demonstrated that there have been strong evidence showing that human capital can be directly transferred from parents to their offsprings. Existing literatures have paid increasing attention to the heterogeneity in human capital determination process for different cohort of people. Cobb-Clark and Nguyen(2010) studied different intergenerational education mobility for Australian born residents and immigrants. They have shown that non-English speaking background immigrants(NESB) have more education advantages than their English speaking background. And NESB have significantly higher intergenerational education mobility for those have high education parents. There are also other studies that have been focusing on the differential intergenerational human capital transfer among immigrants(Bauer and Riphahn, 2007; Jensen and Rasmussen, 2011). But there are relatively few researches on the heterogeneity of human capital transfer in China. Among the scarce of literatures, Zhou and Xu(2017) focus on the effect of different environment on the intergenerational transmission of education between rural-urban migrants and urban residents. Specifically, they argue that the *hukou*

system hampered the investment of education investment of urban-rural migrants and hence reducing their intergenerational education mobility. Firstly, because of the lack of welfare support of rural elderly, rural-urban households have to make more transfer to their parents, which reduces the investment of children's education. Secondly, barriers of labor market caused by the *hukou* system creates a wedge in rural-urban migrants' labor income hence reducing future returns of education. Though they control for multiple environment factors, the study consistently shows a significant role of intergenerational transmission of education on children's human capital accumulation process. But due to the lack of information on time allocation and education attainment, their study is constrained in their dependent variable selection and focus only on effects of environment factors.

2.2.2 Financial Constraints

Among all the determinants, parental behaviour is also very important. Parents are the major agents of making human capital investment decisions. In general, the education investment decision is a cost benefit analysis. For rural households, financial constraint is one of the most important constraints on human capital accumulation. On the benefit side, parents don't have reliable information on the returns of further education (Jensen, 2010), this is especially true for the urban rural system segregated by the *hukou* system. Thus, there is uncertain returns to investment in children's education for rural households. Also the competitive high school entrance exam has prohibited rural students from entering better high school and this further discourages their parents make further education investment (Liu et al. 2012). But the more important reason that hinders rural households from investing in their children's education is financial constraint(Yi, et al. 2012). It is estimated that the cost of sending a child to high school is about 10 to 15 times of the annual per capita income in rural China(Gansu Daily, 2007). Liu et al.(2009) have conducted a more accurate estimation of this cost. It is estimated that the direct cost(tuition and out of pocket cost) is around 1659 dollars for three year high school education. The opportunity cost of additional three years of education is about 5055 dollars. In total, the cost of high school education for a common rural household is nearly 70 times per capita income for someone who was at the poverty line.

Genetic factor is hard to measure. Plug (2004) uses adoptee data from the Wisconsin Longitudinal Survey to separate effects of genetic factors on children's education. They have found out that the father child correlation in education is significantly positive. But for our potential dataset, we lack of the exogeneity of genetic and other relevant factors, such as demographic information like income.

2.3 Discussion

In general, there have been considerable constraints in existing literature on human capital accumulation process of China. Firstly, these structural models tend to ignore heterogeneity among households. Qin et al. (2014) used a representative household model and assume equal discount rate and altruistic parameter, which is why they ignore household investment in education. In this paper, we are trying to build a model with heterogeneous household and we are also trying to adopt this model to specify it in an empirical microeconometric model. Secondly, regional differences, specifically the rural urban divergence, have been ignored by most of these studies. Heckman (2005) shows that urban and rural residents faced a highly different labor market. Moreover, Fan et al. (2014) shows that income and education mobility is much lower in economic disadvantaged area. Yet most of the studies have ignored this difference or focus solely on one area without considering the difference between these two areas. Lastly, current studies have predominantly been focusing on the quantity of human capital. However, China has highly unequal allocation of education resources and there is a significant difference in cross-regional human capital quality (Heckman, 2005). It will create large measurement error if one were to consider a person of 12 years of education in Beijing is the same as the other person from a small town in Gansu. This paper is going to utilize a more comprehensive dataset - China Family Panel Studies, which contain information on relative rank of the schools the interviewees attended, to address this issue. Furthermore, the cognitive test conducted in this survey can in a certain degree separate genetic reason from other socioeconomic features to avoid endogeneity issue.

3 Theoretical Model and Hypothesis

3.1 Theoretical Model

In general the theoretical model that is used to generate the econometric specification is overlapping generations model. Essentially, we assume that parents maximize their lifetime utility and their children' future discounted income. This prototype model follows from Qin(2014).

This paper uses a overlapping generations model with three periods and two generations.

Following the traditional human capital literature, we use a additively separable three period utility function in logarithm form:

$$U(c_1, c_2, c_3^c) = log(c_1) + \beta log(c_2) + \beta^2 log(c_3) + \beta^2 \alpha log(c_3^c)$$

In the first period, we assume the individual's consumption is entirely determined by their parents, then we can reduce the utility function in the following form:

$$U(c_2, c_3^c) = log(c_2) + \beta log(c_3) + \beta\alpha log(c_3^c)$$

In the utility function, c_t denotes the consumption at period t. c_3^c denotes the consumption of the individual's child. In particular, we follows the specification of Qin, et.al (2014), where the consumption is another additive terms that is added to the utility function. Another variation can be made to consider transfer from one's offspring. In which we would consider the substitution between saving and investment in human capital.

Now we have the following budget constraint:

$$\begin{aligned} c_2 + s_2 + i_t &\leq y_2 \\ c_3 &\leq (1 + r_t)s_2 \end{aligned}$$

We can then form the lifetime budget constraint :

$$c_2 + i_2^p + \frac{c_3}{1 + r_3} \leq y_2^p$$

Additionally, we assume that one's income is a function of their human capital and other types of capital (for example, one's family's wealth, network effect) and the law of human capital is determined by the investment of human capital and parent's human cpaital.

$$\begin{aligned} y_t^c &= A_t^c (h_t)^\gamma (k_t)^{1-\gamma} \\ h_{t+1}^c &= B_t^c (i_t^p)^{1-\sigma} (h_t^p)^\sigma \end{aligned}$$

A_t^c stands for the productivity factor that incorporates information such as ability, motivation, labor market condition and labor wedge caused by discrimination. B_t^c stands for the productivity of educational investment, which can be affected by regional educational policy, school environment, community environment etc.

The critical assumption in this paper is that children's human capital is directly determined by parents' educational investment.

Notice, for different regions of China, γ, which represents the contribution of human capital to one's income, may differ. In general, the urban labor market is more complete, which means that human capital has higher returns. For the law of motion of capital, A_t stands for the productivity of investment and parents' human capital. In Qin's(2014) paper,

they assume that A_t is independently and identically distributed. But in general, we will consider A_t as a function of one's innnate ability and environment effect, for example quality of education at different schools.

To sum up, we have the following theoretical model:

$$\begin{aligned} U(c_2, c_3^c) &= log(c_2) + \beta log(c_3) + \beta\alpha log(c_3^c) \\ s.t. & c_2 + s_2 + i_t \leq y_2 \\ & c_3 \leq (1 + r_t)s_2 \\ & y_t^p = A_t^p (h_t)^\gamma (k_t)^{1-\gamma} \\ & h_{t+1}^c = B_t^c (i_t^p)^{1-\sigma} (h_t^p)^\sigma \end{aligned}$$

And thus we can formulate the Lagrangian as following:

$$\begin{aligned} L[c_2^p, c_3^p, i_2^p,] =& log(c_2^p +)\beta log(c_3^p) + \beta\alpha log(A_t^c (h_t)^\gamma (k_t)^{1-\gamma}) \\ & + \lambda(y_2^p - c_2 + i_2^p + \frac{c_3}{1 + r_3}) + \eta(A_t (i_t^p)^{1-\sigma} (h_t^p)^\sigma - h_{t+1}^p) \end{aligned}$$

I omit the first order conditions and instead write out the formulation of educational investment in the second period.

$$i_2^p = \frac{\alpha\beta\gamma(1-\delta)}{1 + \beta + \alpha\beta\gamma(1-\delta)} y_2^p$$

Now we can express the partial derivatives:

$$\begin{aligned} \frac{\partial h_3^c}{\partial y_t^p} &= B_t^c (1-\sigma)(i_2^p)^{-\sigma} h_2^{p\sigma} \frac{\alpha\beta\gamma(1-\delta)}{1 + \beta + \alpha\beta\gamma(1-\delta)} > 0; \\ \frac{\partial i_2^p}{\partial h_t^p} &= \frac{\alpha\beta\gamma(1-\delta)}{1 + \beta + \alpha\beta\gamma(1-\delta)} \frac{\partial y_2^p}{\partial h_t^p} > 0 \\ \frac{\partial h_3^c}{\partial h_t^p} &= \sigma B_t^c (i_t^p)^{1-\sigma} (h_t^p)^{\sigma-1} + (1-)\sigma) B_t^c (i_t^p)^{-\sigma} (h_t^p)^\sigma \frac{\partial i_2^p}{\partial h_t^p} > 0 \end{aligned}$$

Essentially, this model predicts that educational investment is affected by the magnitude of altruism, parents' patience, the relative importance of educational investment. This model predicts that the labor market condition and educational investment productivity doesn't affect educational investment. This is a counter intuitive prediction, since the standard microeconomic conclusion tells us returns of investment matters. This prediction comes from the fact that we are using the log utility representation. Specifically, we are assuming

that children's income comes into parents' utility function in a log utility form. For the standard analysis, this will mean that the income and substitution effect cancels out. Log utility has elasticity of substitution equal to one. If we were to change the inter temporal elasticity of substitution, then the conclusion may change. We now consider the linear utility case, which has intertemporal elasticity of substitution equal to 0.

We now have the first order condition expressed in the following form:

$$\alpha\beta\gamma(1-\delta)A_3^c[B_3^c(h_2^p)^\delta]^\gamma(i_2^p)^{(1-\delta)(\gamma-1)-\delta}\frac{y_2^p-i_2^p}{1+\beta}=0$$

We can't solve for the closed form solution for i_2^p. But we can exploit the implicit function theorem to find the relationship between variables of interests and educational income.Firstly define $F(i_2^p,A_3^c)=\alpha\beta\gamma(1-\delta)A_3^c[B_3^c(h_2^p)^\delta]^\gamma(i_2^p)^{(1-\delta)(\gamma-1)-\delta}\frac{y_2^p-i_2^p}{1+\beta}$ Then we should have the following:

$$\begin{aligned}
\frac{\partial F(i_2^p,A_3^c)}{\partial i_2^p} =&\alpha\beta\gamma(1-\delta)[B_3^c(h_2^p)^\delta]^\gamma(i_2^p)^{(1-\delta)(\gamma-1)-\delta}\frac{y_2^p-i_2^p}{1+\beta}>0\\
\frac{\partial F(i_2^p,A_3^c)}{\partial A_3^c} =&\alpha\beta\gamma(1-\delta)[(1-\delta)(\gamma-1)-\delta]A_3^c[B_3^c(h_2^p)^\delta]^\gamma(i_2^p)^{(1-\delta)(\gamma-1)-\delta-1}\frac{y_2^p-i_2^p}{1+\beta}\\
&-\alpha\beta\gamma(1-\delta)A_3^c[B_3^c(h_2^p)^\delta]^\gamma(i_2^p)^{(1-\delta)(\gamma-1)-\delta}\frac{1}{1+\beta}<0\\
\frac{\partial i_2^p}{\partial A_3^c} =&-\frac{\frac{\partial F(i_2^p,A_3^c)}{\partial i_2^p}}{\frac{\partial F(i_2^p,A_3^c)}{\partial A_3^c}}>0
\end{aligned}$$

Now we can see that educational returns increase when labor market condition improves meaning educational return increases. This is intuitive, since the higher the expected returns of education for parents, the more they are going to invest in their children's educations. Notice, the linear utility function is an extreme case to consider since we assume a intertemporal elasticity of substitution is infinity. But in general we should have the following generalization:

Lemma 1. [1] When $0\leq$ intertemporal elasticity of substitution $\theta<1$, $\frac{\partial i_2^p}{\partial A_3^c}<0$; When intertemporal elasticity of substitution $\theta=1$, $\frac{\partial i_2^p}{\partial A_3^c}=0$; When intertemporal elasticity of substitution $\theta>1$, $\frac{\partial i_2^p}{\partial A_3^c}>0$;

I'll omit the proof here. But the general idea is simple: when intertemporal elasticity is big, the consumption smoothing behavior (in this case the agent will smooth not only

[1]The standard CRRA utility function takes the form $U(c)=\frac{c^{1-\frac{1}{\theta}}}{1-\frac{1}{\theta}}$. Here *theta* represents the intertemporal elasticity of substitution.

her consumption but also her child's future consumption) is minimal and thus when educational return is lower, they will decrease their investment. When intertemporal elasticity is small, she has strong urge to smooth consumption and hence she will increase educational investment when educational return is lower.

3.2 Hypothesis

Since rural area is more impoverish and the educational system is segregated, it's more costly for them to go to school. Because of the exorbitant tuition and opportunity cost, financial constraint is important for them. For urban area, since the living standard is higher and they are integrated in the educational system, financial constraint is less important. Furthermore, since urban area is more developed and has more diversity in human capital, intergenerational human capital transfer is more important. In general, the dichotomous urban rural system create barriers in China's labor market. Hence, educational returns are small for rural area since there exists a labor wedge in their wage and marginal product, which is represented by A_t^c above. Since we have $\frac{\partial h_2^p}{\partial A_3^c}$, then the educational return is lower for rural area. In turn, the lower the educational returns, the less parents are going to invest in their children's educaiton. With this logic specified, we form the following hypothesis:

1. H1: Financial constraint is more important in rural area than in urban area;
2. H2: Intergenerational human capital transfer is more important in urban area than in rural area;
3. H3: Educational return is lower in rural area than that in urban area;

4 Methodology and Data

4.1 Econometric Specification

We adopt the two stage least square model to study educational attainment determinants and educational returns. We use two sets of instrumental variables as the exogenous variation to identify the true educational return. We run the regression for the subsample of individuals with rural and urban identities repectively.

For the first stage regression, we have the following regressions:

$$Education_c^u = \beta_0^u + \beta_1^u Education_p^u + \beta_2^u Income_p^u + \beta_3^u Asset_p^u + \beta_4^u IV^u + \beta_5^u X^u + \epsilon_1^u \quad (4.1)$$

$$Education_c^r = \beta_0^r + \beta_1^r Education_p^r + \beta_2^r Income_p^r + \beta_3^r Asset_p^r + \beta_4^r IV^r + \beta_5^r X^r + \epsilon_1^r \quad (4.2)$$

The subscript p stands for parents and c stands for child. V is the instrument variables we choose. X stands for control variables such as age, gender.

For the second stage regression, we run a simple Mincer regression:

$$Income_c^u = \eta_0^u + \eta_1^u Education_c^u + \eta_2^u Exp + \eta_3^u Exp^2 + \eta_4^u X^u + \epsilon_2^u \tag{4.3}$$

$$Income_c^r = \eta_0^u + \eta_1^r Education_c^r + \eta_2^r Exp + \eta_3^r Exp^2 + \eta_4^r X^u + \epsilon_2^r \tag{4.4}$$

In the second stage regression, $Education_c$ is the predicted value in the first stage regression. Additionally, the Mincer regression contains each individual's working experience. Since in this paper we choose the sample between age 22 to 30 and most of them are out of school, then we can use age as the proxy for working experience.

The reason why we use the instrumental variable method is that education and income are intercorrelated. Specifically, in the above regression we have $Cov(Education_c, \epsilon_2) \neq 0$. In this estimation scheme, we may have a divergence from our theory. Our theoretical model predicts that there would be an upward bias in the estimation of educational returns for standard OLS model. If we take into account person's ability and motivation, we would have $Cov(A_3^c, B_2^c) > 0$. Then we know that educational returns will be biased by individual's ability. But Card(1999) summarized 9 studies of educational returns, and all but only one of them finds upward bias in the results. Instead, there is an extensive existence of downward bias in this estimation. Card interprets this as the effect of intervention, since policies like the nine-year compulsory education will increase the education for low ability families and hence distort the relation between educational returns and cost. Then in general, we can have either larger or smaller estimator for the 2sls method than the OLS estimation.

4.1.1 Instrumental Variable

In this paper, we select two sets of instrumental variables for educational attainment to study the educational returns. The first set of instrumental variables are parents' educational attainment. This is a typical instrumental variable to choose following previous literature (Qin, 2014). The basic assumption here is that parents' educational attainment affects children's future income only through their children's edcuation.

The second set of variable is the correlation coefficient of education and income within each interviewee's community. According to our theoretical model, parents make educational decisions based on the expected returns of education when the intertemporal elasticity is bigger than 1. Then when the expected educational return is higher, parents will invest more into their children's education. One way for parents to get information about educational returns is from their neighbors Then a higher correlation coefficient in their community will

lead to a higher expected educational returns. This number affects a person's income only through a person's education This is intuitive since correlation coefficient doesn't indicate the absolute level of an individual's income. Then we can consider this as an exogenous source of variation. The way we construct this index is through taking the correlation coefficient in the full sample for each community. The subsample observations all live in a community with at least 60 people surveyed in the dataset. The following is the distribution of the computed correlation coefficient in community level. The distribution is not skewed and has a moderate dispersion with the coefficient ranging from -0.297 to 0.919.

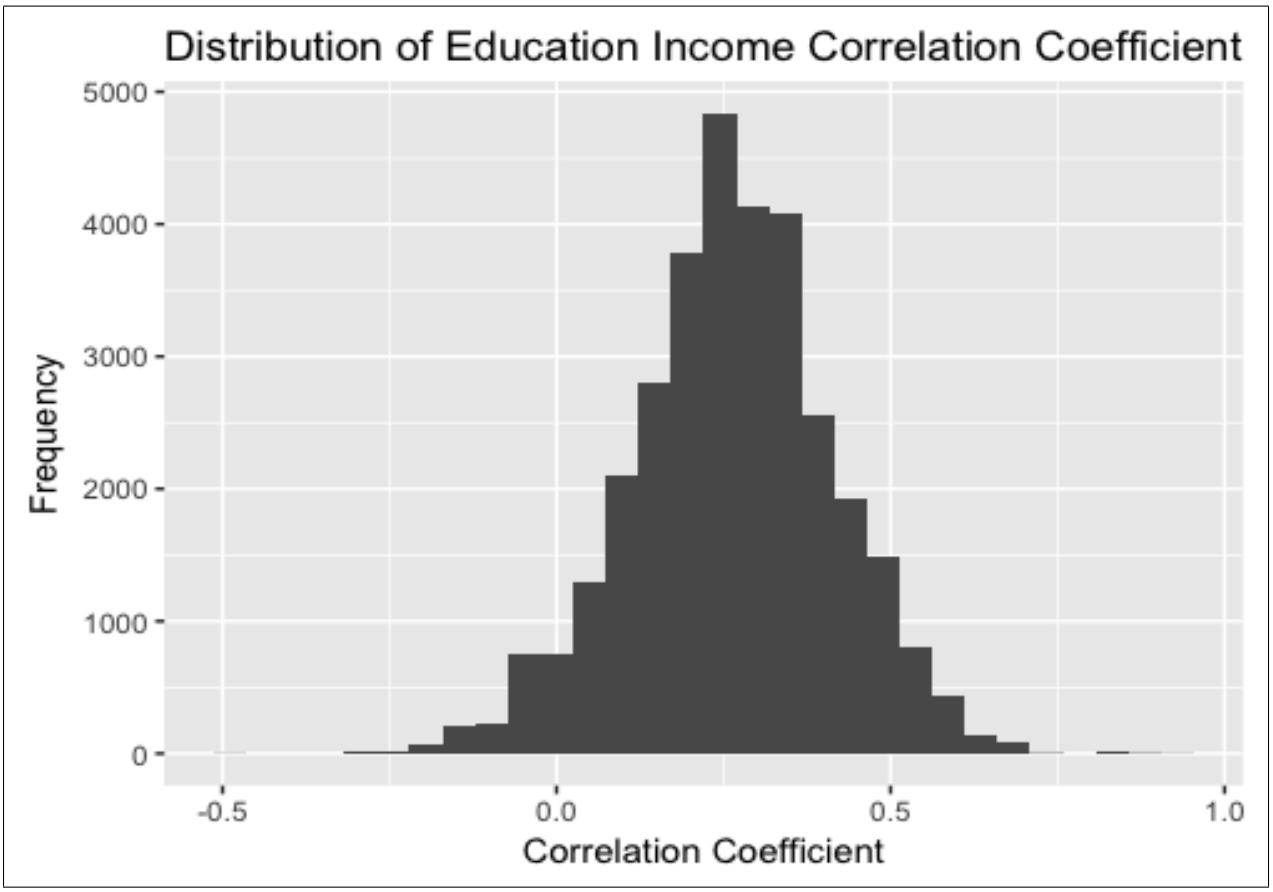

Figure 1: Correlation Coefficient of Education and Income Distribution

4.2 Data

In this paper we use the China Family Panel Studies (CFPS) as our primary dataset. China Family Panel Studies (CFPS) is a nationally representative, annual longitudinal survey of Chinese communities, families, and individuals launched in 2010 by the Institute of Social Science Survey (ISSS) of Peking University.

CFPS has three batches of data from 2010 to 2014. Since this is a relatively new

dataset, we can't construct a long panel to monitor an individual's education history and working history. But since this data data on interviewees' parents as well as information on community, this dataset still has advantages over other existing family survey dataset. Because of this limitation, it's hard for us to observe the income dynamics of a person. Hence we only select samples between age 22 and 30. There are two advantages for this subsample: 1) most of people with age over 22 years old are already out of schools and hence the educational attainment information is their terminating educational attainment; 2) most people with age under 30 still have one of two parents who is still working. Then we can in general obtain their parents' income; 3) most of people with age between 22 and 30 have parents who are in similar age cohort and thus their income is relatively comparable. In total, there are 35147 observations in the CFPS 2014 dataset. The subsample contains 6560 observations.

For parents income, we firstly compute the average annual personal income for each individual's parents in the three sampled period; then we compute the three-year average for their corresponding annual family personal income. The reason why we want to compute the family personal income is that for rural household who majorly conduct agricultural work, it's hard to ascribe each person their corresponding income. Then we take the median of these three values as our parents income.

4.3 Descriptive Statistics

The following are the descriptive statistics for rural and urban households respectively.

Table 1: Summary Statistics - Rural Househodls

Statistic	N	Mean	St. Dev.	Min	Max
Education Attainment(Year)	4,941	9.269	3.934	0	18
Father Education	4,206	6.455	4.051	0	16
Mother Education	4,168	4.054	4.124	0	16
Parents Income(Yuan)	3,302	6,108.015	6,879.969	−3.000	83,332
Parents Asset(Yuan)	3,515	278,768.100	539,084.700	−24.000	9,719,000
Personal Annual Income	4,936	13,730.730	19,400.990	0.000	210,000
Gender	4,942	0.519	0.500	0	1
Education Income Correlation	4,431	0.245	0.139	−0.297	0.820
Age	4,942	25.816	2.418	22	30
Health Status	4,939	2.354	1.059	1	5
Proportion of Migrant	4,554	37.584	21.687	0.000	90.000
Closest City	4,538	532.062	662.704	0	6,400

Table 2: Summary Statistics - Urban Househodls

Statistic	N	Mean	St. Dev.	Min	Max
Education Attainment(Year)	1,312	13.230	3.238	0	21
Father Education	1,121	9.088	3.889	0	18
Mother Education	1,115	7.511	4.590	0	18
Parents Income(Yuan)	993	12,352.670	12,980.860	−4.500	162,500.
Parents Asset(Yuan)	1,019	686,248.000	1,880,393	−70,000	34,084,688
Personal Annual Income	1,310	21,019.670	27,496.030	0.000	408,400
Gender	1,312	0.486	0.500	0	1
Education Income Correlation	1,155	0.303	0.151	−0.197	0.919
Age	1,312	26.186	2.454	22	30
Health Status	1,312	2.403	1.005	1	5
Proportion of Migrant	499	33.503	24.601	0	90
Closest City	510	527.988	753.392	0	6,400

As we can see, the educational attainment for individuals with rural identity whose

age is between 22 and 30 is 9.269 years, which is slightly above high school education; the counterpart in the urban area is 13.23 years, which is one year above high school. As for personal income, it is significantly lower for people with rural identity than that for urban identity. The same is true for parents' income, which shows a twofold difference for people with rural and urban identity. Parents' family asset has even a larger gap which shows that the average parents asset for urban household is about 2.5 times of that of rural household. In general, we can see that there is significant difference in educational attainment and income for rural and urban households in both generations. The following graph shows the density plot of family annual income per person.

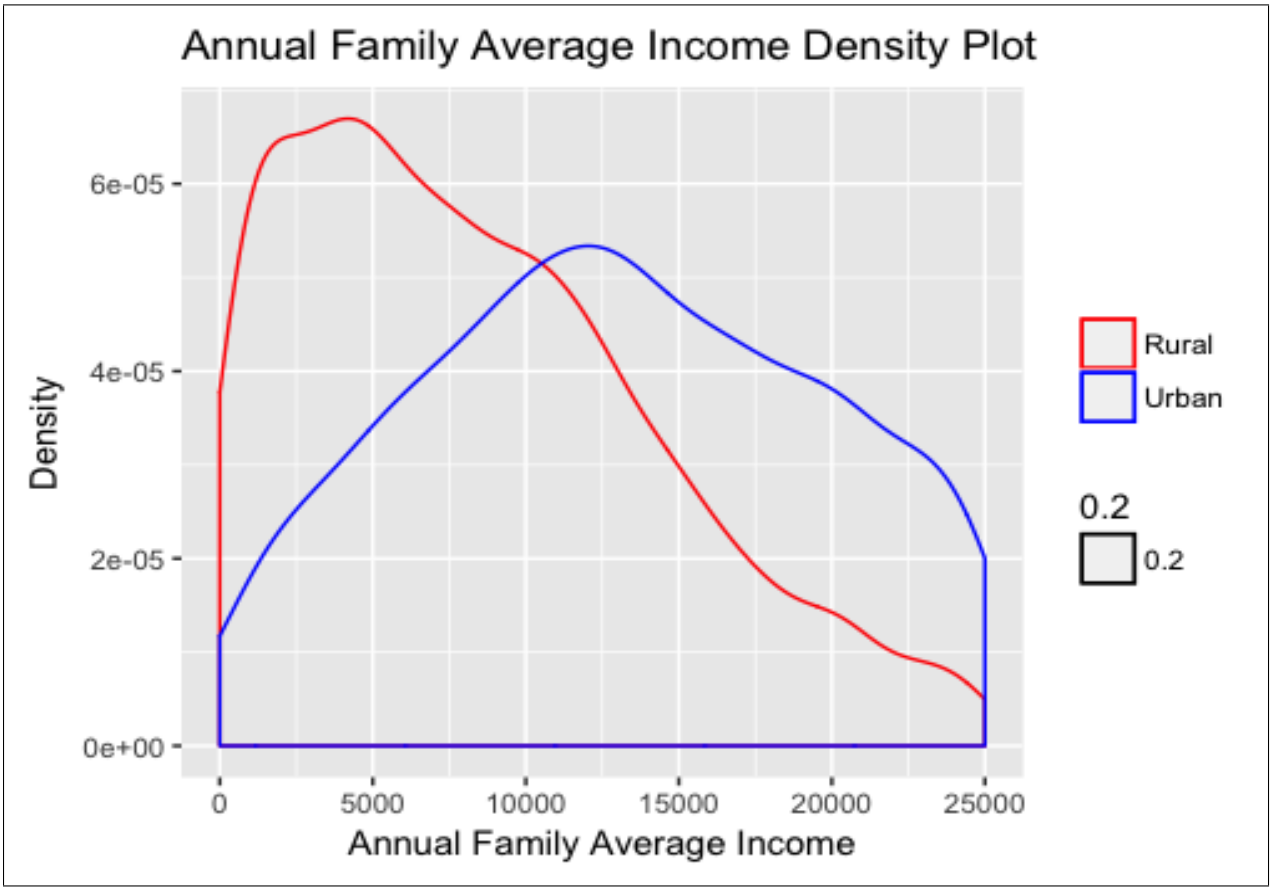

Figure 2: Annual Family Personal Income Density Plot

5 Results and Discussion

The two stage least square method yields a result that partially confirms our hypothesis. Parents' income, specifically parents' asset, is more important in rural area than in urban area. This indicates that financial constraint is an important factor that hampers the ac-

quirement of education in rural area. Intergenerational human capital transfer is important for both area. Educational return is significantly lower in rural area than in urban area.

5.1 First Stage Result

In Table 3, we show the regression result. The regression yields a consistent estimate of parents' education on children's education. For the rural subsample, one year increase in father's education leas to 0.15 - 0.17 year (for the three specification) increase in children's education; mother's education has a coefficient from 0.14 - 0.15 which is slightly lower than the effect of father's education For urban subsample, the effect of father and mother's education is not the same with father's education significantly more important education. The null hypothesis that father's education and mother's education has the same effect on children's education is rejected on 0.01 level. The intergenerational human capital transfer is important for both rural and urban area. But it's hard to conclude the relative importance. i conduct a two sample z-test, with null hypothesis that father's education is the same as in urban area than in rural area. The null hypothesis is rejected in the base model ((1) and (4)) on 0.1 significance level but not rejected for model (2) and (5).

Parents' annual income in 2014 is important in both urban and rural area. In model (2), a one log point increase in parents' annual income leads to 0.29 year increase in children's educational attainment; while for urban area it's 0.19 year increase. But the two-sample z-test does not yield a significant result for the hypothesis that parents annual income is the same for both regions. But for parents' family asset, rural area has a consistently significant coefficient in the rural subsample, while it's not significant, in fact close to zero, in the urban subsample. A one log point increase in parents' asset lead to a 0.327 year increase in children's educational attainment. The two sample z-test yield a significant result on 0.01 level and reject the null hypothesis that the effect of parents' income is the same in both subsamples. Furthermore, the effect of asset for rural area may be even larger since we are considering log transformation instead of absolute level. A one log point increase of asset in rural area is less than that for urban area, since the average family asset in urban area is 2.5 times of that in rural area. With the same amount of value increase in family asset, rural area will yield a even larger coefficient.

Correlation coefficient of education and income turns out to have significantly positive effect on education for both the urban and rural subsample. This effect is corroborates our theoretical model where correlation coefficient serves as a proxy for expected returns of education which in turn has a positive effect on parents' educational investment. Moreover, the effect of correlation coefficient is more important for rural area than for urban area.

One point increase in correlation coefficient leads to 5.224 years of increase in educational attainment while for urban subsample it's 1.446 years. This is intuitive for China for two reasons: 1) the basic community for rural area is village which has turn out to be a more interrelated types of network; 2) educational attainment is one of the few sources individuals to increase future income and hedge potential risk due to the lack of assets to invest, while for urban area housing market has turned out to be a reliable source of investment in recent years.

Savings rate of 2014 [2] is a variable that also has a positive effect on educational attainment. This is predicted by our theoretical model: when β increases, i_2^p also increases. But this effect is significant in only one regression. This may be a result of measurement error for income and expenditure data.

In model (3), I also add the distance to the closest city and proportion of people in the community who has migrated to assume jobs elsewhere, as well as the interaction terms with income. This is a preliminary check on the condition of labor market on the income effect on education. The result shows that as distance to the closest city increases, the effect of income increases but the effect of proportion of migrants decreases. This result doesn't fit our theoretical model if we follow the logic in Fang's (2012) paper. In their paper, they assume that proportion of migrant is a good indicator for the completeness of labor market. But this may not be true since this indicator may only demonstrate only the relative labor mobility but not the wage setting mechanism. Three potential explanations are posted below in the discussion section.

[2] Savings rate is computed in the following fashion: $SR = \frac{2014Income - 2014Expenditure}{2014Income}$

Table 3: First Stage Regression Results

	Dependent variable:				
	Educational Attainment				
	Rural			Urban	
	(1)	(2)	(3)	(4)	(5)
Father Education	0.169***	0.156***	0.159***	0.216***	0.179***
	(0.017)	(0.017)	(0.018)	(0.027)	(0.029)
Mother Education	0.140***	0.153***	0.148***	0.047**	0.062***
	(0.016)	(0.017)	(0.017)	(0.023)	(0.024)
Log(Parents Income)	0.268***	0.290***	0.443***	0.200***	0.190**
	(0.051)	(0.053)	(0.104)	(0.075)	(0.075)
Proportion of Migrants			0.068***		
			(0.018)		
Distance to City			-0.002***		
			(0.001)		
Log(P Income) * Prop Migrant			-0.007***		
			(0.002)		
Log(P Income)*Distance			0.0002***		
			(0.0001)		
Log(Parent Asset)	0.379***	0.327***	0.244***	0.039	0.029
	(0.067)	(0.069)	(0.073)	(0.065)	(0.070)
Gender	-0.668***	-0.559***	-0.522***	-0.455**	-0.514**
	(0.137)	(0.142)	(0.145)	(0.194)	(0.202)
Age	-0.257***	-0.274***	-0.278***	-0.001	-0.007
	(0.027)	(0.028)	(0.029)	(0.040)	(0.041)
Parents Savings Rate	0.00002	0.00002*	0.00002	0.00001	0.00001
	(0.00001)	(0.00001)	(0.00001)	(0.00003)	(0.00003)
Education Income Correlation		5.224***	5.159***		1.446**
		(0.475)	(0.488)		(0.667)
Constant	8.536***	8.095***	7.884***	9.250***	9.510***
	(1.064)	(1.090)	(1.345)	(1.327)	(1.386)
Observations	3,117	2,792	2,654	938	834
Wu-Hausman		0.009***		0.11527	
R^2	0.161	0.198	0.215	0.129	0.131
Adjusted R^2	0.159	0.196	0.211	0.123	0.123

Note: *p<0.1; **p<0.05; ***p<0.01

5.2 Second Stager Result

In Table 4, I show the result of the second stage regression. I compare the OLS model and the instrumental variable model repsectively. For rural area, the effect of education is not significant in both of the OLS and IV model. The educational return is not considered not to be different from zero. For urban area, the result is different. The OLS model has a minimal educational return of one year increase in education leading to 0.03 log point (3 percent) increase in income. But for the IV model, the educational return is boosted to 0.144. This means that one year increase in education for people with urban identity will lead to 14.4 percent in crease in their annual income. The downward bias in educational return in the Mincer regression is consistent with Card's(1999) result. All of the other variables follows the standard Mincer regression prediction except for health status, where it has insignificant effect.

We also output the pooled regression to compare our result with previous literature. We use the weight provided by the survey and run a weighted regression since our subsample is unbalanced with urban subsample of size only one thirds of that for urban subsample. Educational return output by the IV method is 6.65 percent. This value is significantly different from zero. This result is consistent with previous literature and have slightly higher educational return because of the temporal effect (Appleton, 2005; Zhang, 2005).

5.3 Discussion

As the result shows, income turns out to be an important determinant for educational attainment in rural area. As a matter of fact, parents' assets are important for rural area but not for urban area. This results from two facts: 1) secondary educational institutions are integrated in urban area; for people with urban identity, the tuition for high school education is lower for urban residents; 2) furthermore, the opportunity cost is lower for urban residents since as we have shown in the second stage regression, people with urban identity has significantly lower income if they have lower than high school education; and the commuting cost and daily expenses are also lower for permanent residents. Intergenerational human capital transfer is important for both urban and rural area. There is no significant difference detected. But since we use a very rough estimate of human capital measurement, which is the educational year, this measure may underestimate the effect of human capital. For example, family environment is important for a child's education and educational attainment can't fully represent this variation. Also parents' major in college may also matter.

The most interesting results come from the second stage regression and the interaction terms in the first stage regression. In rural area, the educational return is minimal. This dif-

fers from previous literature where pooled regression has masked this rural urban dichotomy. For people with rural identity, 66.35% of the subsample has educational level lower than high school. Only 4.7 percent of people who has gone to college. For the job market side, only 40.5 percent of the people who have a job has formal contract, while for urban area this figure is 64 percent. The reason why education demonstrates a low return comes from the fact that most of the people in rural area either conduct agricultural work or they take on low skilled and informal jobs. On one hand, this lowers the marginal product of human capital, and on the other hand this lowers parents' expected educational returns, which in turn lowers parents' educational investment.People with rural identity is in the situation of a poverty trap, where labor market segregation restrict their educational returns and educational investment. This bad cycle propagate through different generations. Furthermore, when we compare the pooled regression and the urban and rural regression respectively, we get a result that the pooled regression has educational return in between the rural subsample regression and urban subsample regression. It has educational returns of 6.65 percent. We also conduct a Huasman-Wu test. The test reject the null hypothesis that the OLS model and IV model are the same for urban subsample. But it doesn't reject the null hypothesis for rural subsample. This essentially is saying that the rural subsample indeed has educational return that is statistically insignificant from zero. Then the 6.65 educational consists of the educational return for urban subsample and urban rural difference.

Combined with the second stage result, the interaction terms in the first stage yield an interesting result. In the first stage regression, as the distance of people's residential area to the closest city increase, the more they will want to invest their money. More people migrate to work in the city in the individual's community, the less effect income has on education. If one were to interpret proportion of migrant and distance t closest city as a complete measure for labor market completeness, the expected signs on the interaction terms should have been reversed (Fang, 2012). But the distance measure and the proportion of migrants only represents the labor mobility. An important feature of China's labor market is that rural labor is undervalued than their urban counterpart. This statement is shown by a two sample t test on the income of people with urban and rural identity and also by the minimal educational return for rural labor. Then a systemic discrimination is not incorporated in these two measures. Then the reversed signs of interaction terms can be explained by the following three theories:

1. For people who live in a village with large proportion of migrants who have gone to city to find jobs, they have a lower evaluation of educational returns since most of these migrants are low skilled labors. As a matter of fact, the phenomenon where children

got sent to city to work when they were 16 is not uncommon. Then this decrease the opportunity cost of not getting educated and hence parents would invest less in their children's education. On the other hand, when people live far away from cities, it's hard for them to enter labor market. Then this increase the opportunity cost of working. And in reality, getting education and entering college by taking the national college entrance examination is the only way for people in impoverishment to go to the 'big city'.

2. The logic in the first interpretation is based on the assumption that the regression estimator for income stands for marginal educational investment since income affects education through educational investment. But also this coefficient can be interpreted as the efficiency of educational investment. For village with higher correlation of education and income, if the educational investment shows a diminishing returns, then it would be less valuable for them to invest in education. The same argument can be carried to explain the interaction term with distance measure. But this argument is based on the assumption that the higher correlation between income and education, the higher the educational attainment for this specific community (hence the diminishing returns to investment takes effect). But this may not be true since firstly higher correlation doesn't imply higher educational attainment, secondly, the investment in education may not be linear per se.

3. The last explanation comes from our derivation of theoretical model. As we have shown in lemma1, lower intertemporal elasticity [3] indicates that $\frac{\partial i_2^p}{\partial A_3^c} < 0$. This formula says that the lower the productivity of human capital, the higher the educational investment is. This is true because if parent expect in the future the educational return is low, they will also expect the income of their education is low. Since children's future income enters parents' utility function, then the consumption smoothing (in this case income smoothing) behavior may take effect. When A_3^c decreases, parents will invest more to offset the negative shock. High intertemporal elasticity also indicates higher risk aversion for this case. This is a suitable interpretation for rural household particularly.

In general, the above three interpretations may contributing to understanding the effect of labor market on educational investment decision. The first interpretation fit the real situation in China more. If this is the true explanation for the effect of the interaction terms, then this indicates that the major constraint of labor market and rural urban dichotomy in China is not the limited labor mobility. In fact, although they will suffer from high living

[3] In the CRRA utitliy function specification, the intertemporal elasticity equals to the inverse of risk aversion. The lower the intertemporal elasticity, the more risk aversed the representative agent is.

expenses and inferior living standard, most people still choose to migrate and they can move whenever they want. But moving doesn't solve the identity issue. As long as they preserve their rural identity, there exists a systemic discrimination in labor market against them. This takes the most conspicuous form of earning less wages than their urban counterpart. Instead, the constraint lies exactly in this systemic bias in the labor market. With more prospect of earning equal wage and also more integrated educational system, rural household is going to have higher expected educational returns and less opportunity cost for education. Also in order to increase the chance of fair evaluation of rural labor, township enterprise can be an important outlet. These township enterprises are usually based in nearby town. They have strong relationships with rural communities and some of them are established by certain rural villages. This can create a fair chance for rural labor to get equal wage and reduce the opportunity cost of getting educated.

Table 4: Second Stage Regression Results

	Dependent variable:			
	Log(Annual Income)			
	Rural		Urban	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Education Year	-0.005		0.030**	
	(0.007)		(0.014)	
Predicted Education Year		0.026		0.144***
		(0.024)		(0.048)
Age	1.286***	1.475***	1.591***	0.955**
	(0.252)	(0.328)	(0.368)	(0.474)
Age^2	-0.024***	-0.027***	-0.028***	-0.016*
	(0.005)	(0.006)	(0.007)	(0.009)
Gender	0.425***	0.426***	0.242***	0.359***
	(0.056)	(0.083)	(0.080)	(0.105)
Health Status	0.021	0.062*	-0.023	-0.033
	(0.026)	(0.032)	(0.041)	(0.050)
Regional Variable (Omit)				
Constant	-7.849**	-10.666**	-12.890***	-14.112**
	(3.239)	(4.213)	(4.765)	(6.206)
Observations	2,525	1,482	851	520
R^2	0.048	0.074	0.104	0.188
Adjusted R^2	0.046	0.064	0.098	0.164
Note:				*p<0.1; **p<0.05; ***p<0.01

6 Conclusion

In this paper, I studied the major determinants of educational attainment and compare the educational returns in rural and urban China respectively. This paper finds that parents' income and asset are important in explaining educational attainment for people with

rural identity. But for urban household, income is less important in educational investment decision. Intergenerational human capital transfer is equally important in rural and urban China. But the lack of control for family environment leaves this conclusion uncertain and calls for future study to conduct relevant research on this aspect. Educational return is systematically lower for rural labor than for urban labor. Educational return for urban ordinarily resident is 14.4 percent while for rural ordinarily resident is insignificantly different from zero. The pooled regression demonstrates a modest educational return of 6.65 percent, which is consistent with previous literature. The pooled regression consists of the educational return within urban area and the rural urban difference. Lower educational return in turn affect rural households' educational investment decision. The systemic discrimination in labor market against workers with rural identity lowers parents' expected educational return. Unlike some of the previous literature's claim, labor mobility is not the major constraint in the current labor market in China. On one hand, limited opportunity of fair payment and low educational returns lower parents' expected returns of educational investment; on the other hand, together with labor mobility and lower opportunity of high quality education, it decreases the opportunity cost of working which causes people from rural area to enter labor market in a early stage without completing much education. This essentially follows the logic of a poverty trap.

Future development of rural human capital accumulation requires higher government investment in education. Local schools are important for rural household since this reduces the opportunity for education and slack the financial constraint facing rural households. Further policies should be implemented to integrate educational system in urban and rural area. Future labor market reform should focus on creating equal payment for rural migrants. One potential direction is to encourage local township enterprises since they are more integrated in the rural community environment.

In general, this paper is a preliminary study of rural and urban education and labor market relationship. Future research is called for on the study of intergenerational human capital transfer. CFPS is a high quality dataset. This dataset can be potentially exploited to study intergenerational human capital transfer by using the detailed documentation of the performance of children under 15 and parents' specific investment. More importantly, for parents with children under 15, CFPS document their expectation of their own child as well as their own studying behavior. Also this paper demonstrates an important between expected labor market outcome and educational attainment. In future research, regional labor market condition can be added as predictors to further explore this relationship.

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7 Appendix

Table 5: Pooled Regression

	Dependent variable:	
	Educational Attainment First Stage	Log(Annual Income) Second Stage
	(1)	(2)
Father Education	0.184***	
	(0.015)	
Mother Education	0.173***	
	(0.014)	
Log(P Income)	0.352***	
	(0.046)	
Log(P Asset)	0.238***	
	(0.054)	
Predicted Education		0.067***
		(0.015)
Gender	-0.730***	0.352***
	(0.122)	(0.060)
Health Status		0.048*
		(0.025)
Age	-0.170***	0.901***
	(0.025)	(0.251)
Savings Rate	0.00001	
	(0.00001)	
Education Income Correlation	4.987***	
	(0.405)	
Age^2		-0.016***
		(0.005)
Regional Variable Omitted		
Constant	6.364***	-5.440*
	(0.885)	(3.237)
Observations	3,626	1,951
R^2	0.242	0.082
Adjusted R^2	0.241	0.075
Note:		*p<0.1; **p<0.05; ***p<0.01