

PMMA Network Session Paper

Education Expansion and Wage Inequality in China: Investigation Using Urban Household Surveys, 1988-2002

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*A paper presented during the 5th PEP Research Network General Meeting,
June 18-22, 2006, Addis Ababa, Ethiopia.*

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Investigation Using Urban Household Surveys, 1988-2002

May 12, 2006

Revised Proposal for PEP

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Abstract

China has experienced rapid increase in inequality since the beginning of economic reforms. Preliminary evidence shows that rising returns to education is an important contributor to rising inequality. In the light of the rising importance of education in determining earnings, expanding educational opportunities for the public may be an important policy tool for reversing or slowing down the rise in inequality.

The aim of this project is to deepen the understanding of the interplay between educational expansion and wage inequality in urban China. In-depth empirical analysis will be focus on three issues. First, describe changes in wage inequality that have occurred in China's urban areas from 1988 to 2002. Secondly, we conduct a counterfactual decomposition to explore the impacts of education distribution and the returns to education on the wage inequality, especially for the workers who are at the lower tail of the wage distribution. Finally, investigate changes in inequality in educational attainment. We mainly concern the access to college education.

Motivations and Objectives

Since economic reforms began in 1978, China has experienced one of the fastest increases in income inequality ever recorded.¹ Understanding the nature and causes of China's growth in inequality is critical for understanding world inequality, not only in the light of that china is emerging as a major player in the world economy, but also because it provides insight into the inequality dynamics of transition and development.

China has also witnessed great advances in education, which include nearly doubling of the proportion of college-educated workers among prime-age men (from 17.3% in 1988 to 32.3% in 2002 in our urban sample) during the past 15 years.²

¹ The World Bank (1997) finds that China's overall gini coefficient grew from 0.288 in 1981 to 0.388 in 1995, from 0.176 to 0.275 in urban areas and from 0.242 to 0.333 in rural areas. Khan and Riskin (1998) report that the overall gini coefficient grew from 0.382 in 1988 to 0.452 in 1995, from 0.233 to 0.332 in urban areas and from 0.338 to 0.416 in rural areas. Using National Statistical Bureau data covering 18 years from 1978 to 1995, Li, Zhao and Zhang (1997) found that the Gini coefficient increased from 0.16 to 0.28 in urban areas and from 0.21 to 0.34 in rural areas.

² The education expansion is much more tremendous in the following years due to the education policy which is aimed at increasing the number of college/university students. According to the statistics report released by the Education Ministry, the number of college/university graduates grew from 1,337,250 in year 2002 to 1,877,500 in

According to the human capital theory (Becker, 1964), education is an investment in human capital, which yields a return in the form of enhanced future wages. Due to the positive relationship between education and wages, education is a potentially efficient instrument to reduce wage inequality, especially by improving the position of the least skilled. Consequently, in the light of the rising importance of education in determining earnings, and given the current situation of increasing inequality in most developed (OECD, 1995) and developing societies,³ expanding educational opportunities for the public may be an important policy tool for reversing or slowing down the rise in inequality.

Some Western decision-makers have portrayed schooling as the best tool to erode the supposedly globalization-related forces that increase wage inequality. As Ashenfelter and Rouse (2000, p. 111) put it, “the school is a promising place to increase the skills and incomes of individuals. As a result, educational policies have the potential to decrease existing, and growing, inequalities in income”.

But education expansion can be inequality-increasing or inequality-reducing, depending on the quality of the education, changes in the distribution of education in the labor force (i.e. the composition effect) and changes in the price of the increasing educational attainment. It also depends on the nature of expansion- i.e. whether access is equitable or not.⁴

In this project we’re going to ascertain how wage distribution was affected by advances in education during the sample period using a newly-proposed decomposition technique. Thus, the study not only contributes to our understanding of wage dispersion in the world’s most populous country, but also sheds light on the relationship between education expansion and changes in wage inequality, an issue that cannot be settled on theoretical grounds.

Did the impressive educational gains occurring during the transition period make a troubling situation even worse, or did they serve to reduce inequality? If the latter, have these changes been large enough to warrant a vision of education as the great equalizer? These are

year 2003, increased by 40.4% (Source: www.moe.edu.cn).

³ There is a wealth of US-based literature on this issue: among others, see Lee (1999), Gottschalk (1997), Blau and Kahn (1996), Juhn et al. (1993) and Katz and Murphy (1992). For Europe, see Leuven et al. (1997). For China, see Park et al. (2004).

⁴ We are concerned with the question of whether rising inequality in China is associated with unequal access to educational opportunities. More recently, a growing proportion of college students must fund their own educational expenses (Hannum, 2004; Heckman, 2004). There’s a sharp acceleration of schooling expenditures in the past decade (Fleisher and Wang, 2005; Heckman, 2005). The tuition and fees for college education increased from 100-300 ¥ in 1980s to 4000-6000 ¥ in year 2002. We’re mainly concern the college education in this project.

among the questions addressed in this study.

Also, we try to answer questions concerning the inequality of education, i.e. whether there is inequality in the provision of and access to education or in educational attainment. We'll address the following questions. How have the relative importance of variables that determine the probability of college attendance changed? Is there evidence that the degree of sorting into college according to net benefit has changed in the reform period? Has the sorting gain narrowed or widened? If it has widened, is this because more able students are now able to attend college due to reduced favoritism? If it has narrowed, is this consistent with efficient sorting with an increased proportion of qualified college graduates graduating from college? Is there evidence of increased influence of borrowing constraints on college attendance (Carneiro and Heckman, 2002)?

Our analysis draws on the datasets come from fifteen consecutive annual surveys of urban households which are conducted by the Organization of Urban Socio-Economic Survey, which belongs to the National Bureau of Statistics of China. The main tasks of this project are

(1) Documenting the trends in wage inequality over the transition period

(2) Estimating selection and sorting effects on the evolution of the private return to college graduates during China's reform between 1988 and 2002 to see if there exists borrowing constraints on college attendance.

(3) Decomposing the rising wage inequality to examine whether education expansion contributes to wage inequality reduction or not.

Scientific Contributions and Policy Relevance

- Wage inequality has been the most significant and widely-studied developments in the labor economics. The broad pattern has been the increasing of wage inequality in most developed (see, for example, Autor and Katz, 1999) and developing countries, as measured by either the variance or the gap between upper and lower quantiles of the wage distribution.

The increase in wage inequality is typically described as arising in two ways: increasing wage differentials associated with observed worker characteristics such as education and experience, and increased dispersion conditional on these characteristics. The first, known as "between-group inequality," has increased as a consequence of changes in the distribution of

characteristics, and especially changes in the economic returns to these characteristics. For example, increases in the economic return to schooling have been an important factor working to increase overall wage dispersion. The second, known as within-group or “residual inequality,” is – by definition – not directly linked to changes in the distribution of covariates or their returns, though increases in residual inequality are sometimes said to reflect increasing returns to “unobserved skills” (as in Juhn, Murphy, and Pierce, 1993).

A common way of summarizing the changes in the return to education and experience is to either present estimates from a Mincer-type equation, or to report standard wages differentials such as the college-high school gap and the gap between older and younger workers. Similarly, residual or within-group inequality can be summarized by various measures of the distribution of residuals (the variance or the 90-10 gap) for all workers.

In this project, different from the previous literature, we use quantile regression (Bushinsky, 1994) to describe the within-group or “residual inequality” (see, Angrist, Chernozhukov and Fernandez, 2006, forthcoming in *Econometrica*) since QR coefficient can easily be used to construct a measure of within-group or “residual inequality”. Within-group wage dispersion is captured by the differences in quantile returns, for they represent the wage differential between individuals in the same group but located at different quantiles.

- In addition to document the changing of wage inequality, we also intend to interpret the evolution of wage inequality.

Preliminary evidence⁵ shows that rising returns to education is an important contributor to rising inequality. But we wonder whether the large shifts in labor force composition contribute to the changing of wage distribution, especially the upper and lower tail.

As highlighted in an insightful paper by Thomas Lemieux (2005), the canonical Mincer (1974) earnings model implies that earnings trajectories may tend to fan out (become more dispersed) as workers gain labor market experience (see also Heckman, Lochner and Todd 2003). And hourly wage dispersion is typically higher for college graduates than for less-educated workers. Consequently, changes in the distribution of education or experience of the labor force may give rise to changes in earnings dispersion.

⁵ Gustafsson and Li (2000), Knight and Song (2002), Park, Song, Zhang and Zhao (2004).

These compositional effects are distinct from the standard price effects that are often invoked to explain fluctuations in earnings inequality. Holding market prices constant, changes in labor force composition can mechanically raise or lower residual earnings dispersion simply by changing the employment share of worker groups that have more or less dispersed earnings. Similarly, changes in workforce composition can also raise or lower overall earnings dispersion by increasing or reducing heterogeneity in observed skills (education and experience), a point emphasized by Juhn, Murphy and Pierce (1993).

To do this, we will apply Quantile-JMP decomposition technique proposed by Machado and Mata (2005) and extended by Autor, Katz and Kearney (2005) to evaluate the role of education expansion and changing returns to education to the expansion of upper- and lower-tail inequality over the period 1988-2002.

- In the light of the rising importance of education in determining earnings,⁶ progress in education has often been placed high in the list of policy proposals designed to change the unequal state of affairs. While higher education is the path to individual opportunity, mobility, and civic and cultural participation in the new knowledge economy, for many students systemic inequality remains a powerful barrier to attaining the higher education. Maybe out of political consideration, among equally prepared college applicants, those from the specified minorities and the specified cities (include Beijing, Shanghai and some border areas) are more likely to be admitted. With a sharp acceleration of schooling expenditures⁷ in the past decade (Fleisher and Wang, 2005; Heckman, 2005) those from wealthier families are more likely than others to take a college entrance exam and enroll.

This proposal mainly concerns the access to college education. Since education expansion can be inequality-increasing or inequality-reducing, depending on the quality of the education and the nature of expansion- i.e. whether access is equitable or not.

Fleisher (2005) used the first, second, and third waves of the Chinese Household Income Project (CHIP) conducted in 1989 (CHIP-88), 1996 (CHIP-95), and 2003 (CHIP-2002) to

⁶ There is evidence that in the past 15 years, returns to schooling in China have increased dramatically (Zhang and Zhao, 2002; Li, 2003, Yang, 2005). Zhang et al. (forthcoming) shows the rising returns to education are robust across experience cohorts, gender, and within regional and ownership groups.

⁷ More recently, a growing proportion of college students must fund their own educational expenses (Hannum, 2004; Heckman, 2004).

estimate selection and sorting effects on the evolution of the private return to schooling for college graduates during China's reform period. They found evidence of substantial sorting gains under the traditional system, but gains have diminished and even become negative in the most recent data. They took this as evidence consistent with the growing influence of private financial constraints on decisions to attend college as tuition costs have risen and the relative importance of government subsidies to higher education has declined. Heckman and Li (2004) also focused on this topic.

In this project, we want to reexamine this question using another urban household dataset cover every year during that period to see if anything different and to examine if there really exist strong evidence on the existence of credit constrain. If access to schooling is available only to the financially, politically, and geographically advantaged, the bulk of China's population will be excluded from full participation in the growth of human capital and the income it produces. This will cause larger inequality. If there is no evidence on the existence of credit constrain, it may indicate more able students are now able to attend college due to reduced favoritism.

- Education has long been seen as a powerful force with the potential to increase opportunity and promote social mobility. Thus educational expansion is considered to be one of the key development objectives and is expected to be an important equalizer. Policies aimed at increasing educational attainment can be expected to raise average earnings but also wage inequality due to the wage risk associated with educational investments. It is, therefore, disheartening to find that such expansion may increase inequality. However, the dilemma associated with expansion of education seems less acute than that of the more general growth-equality tradeoff, and may even suggest a set of attractive policy options. If a developing country is committed to achieving an egalitarian society, it should emphasize educational policies that aim for educational expansion along with equal access to education in place of its various direct redistributive policies. Particularly, policies aim to advance children from less well-off backgrounds to access higher education may be able to break generational cycles of deprivation and encourage economic growth.

Emphasis on equity may not necessarily conflict with the objective of economic growth. While redistributive policies tend to be detrimental to economic growth, educational

expansion and equal access to education have been identified as major factors contributing to economic growth by many studies. Growth with equity has been demonstrated by the experiences of Japan, Taiwan, and South Korea just to name a few. All three countries have emphasized educational expansion and equal access to education in their economic development process.

Methods

The project consists of three parts. In the first part we analyze the changes in overall and residual wage inequality that have occurred in China's urban areas from 1988 to 2002. In the second part, we estimate selection and sorting effects on the evolution of the private return to schooling for college graduates during China's reform between 1988 and 2002. In the final part, we examine the linkage between education and wage inequality, and conduct a counterfactual decomposition to show at the different part of the wage distribution how much of the rising wage inequality can be explained by the changes of education distribution and changes in the returns to education. The details of the empirical methodology are given below.

Part 1. Rising wage inequality in urban China

Our objective in this part is to partially fill the gap in basic facts concerning inequality in rural China. The centerpiece of our work is the use of a nationally representative household survey that has been collected continuously from 1986 to the present (here only year 1988-2002 is involved), covering most of the reform period. By using a common household survey across years, we are able to address a number of important methodological and measurement issues associated with estimating the extent of inequality at a point in time and comparing inequality across time periods.

An outline of this part is as follows. We begin with a review of the existing literature on urban inequality, highlighting data and conceptual issues that we focus on in our work. We then describe our main data set, based on a consecutive annual surveys conducted by China's National Bureau of Statistics (NBS). Included in this description is a summary of how we

define and measure wage and education consistently across time periods between 1988 and 2002. We then summarize various features of the wage distribution for selected years in this time span. Specifically, we show results for average wages, and a variety of measures of wage inequality. We show that while average wages have undeniably risen, so has inequality.

After describing the overall distribution, we then describe the wage inequality between and within educational levels to explicitly explore the interplay between education and wage inequality. Our central approach combines OLS with quantile regression (Bushinsky, 1994). Estimation by OLS assumes that the marginal effect of schooling on wages is constant over the conditional wage distribution. In contrast, the use of quantile regression allows us to model the effects of schooling at different points of the wage distribution. By combining OLS and quantile regression we can decompose the impact of school qualifications on wage inequality into two channels: between-groups inequality and within-groups inequality. OLS returns to education are a measure of between-groups inequality, for they represent the average difference between education groups. Differences in quantile returns are a measure of within-groups inequality, for they represent the wage differential between individuals in the same group but located at different quantiles.

Part 2. Rising wage inequality: Role of Education Distribution and Returns to Education

As described in the introduction, education as an investment in human capital is an important determinant of wages and their distribution. The linkage between education and wages has been studied intensively. However, the evidence on the effect of education on wage inequality remains ambiguous. This section intends to establish their link, especially to shed light on the question how education affects the inequality of wages in the different parts of wage distribution. A counterfactual decomposition is to be conducted to explore the impacts of education distribution and the returns to education on the wage inequality, especially for the workers who are at the lower tail of the wage distribution.

Recent research has revealed that education has a greater effect upon the wages of individuals at the top of the wage distribution than upon wages of individuals at the bottom of that distribution. In other words, more educated individuals experience more unequal wage distributions, and this seems to have been exacerbated during the 1980s. These results suggest

that education may have a second effect on wage inequality. By increasing the number of educated workers, a pressure is certainly exerted that decreases the wages of these workers. But, if more educated individuals experience greater wage spreads, increased educational levels may also contribute to an increase in wage inequality. The net result of these two effects is certainly an empirical question and constitutes the major motivation for this paper. We will pay special attention to the effect of change educational distribution on the different part of wage distribution.

Methods

In this part we will apply Quantile-JMP decomposition technique proposed by Machado and Mata (2005) and extended by Autor, Katz and Kearney (2005) to evaluate the role of education expansion and changing returns to education to the expansion of upper- and lower-tail inequality over the period 1988-2002.

Under the convenient (but economically unappealing) partial equilibrium assumption that aggregate quantities of skills in the labor market do not affect skill prices, we can use the conditional quantile model to simulate the impact of changing composition or prices on distribution of wages.

We define the coefficient vector $\hat{\beta}(50)$ as our measure of between-group inequality, and we refer to it as $\hat{\beta}^b \equiv \hat{\beta}(50)$ ($\hat{\beta}^b$ serves a role akin to $\hat{\beta}_{OLS}$ in a conventional Oaxaca-Blinder decomposition). Following this logic, we define a measure of within-group inequality as the difference between the estimated coefficient vector $\hat{\beta}(\theta)$ and the median coefficient vector $\hat{\beta}^b$: $\hat{\beta}^w(\theta) \equiv [\hat{\beta}(\theta) - \hat{\beta}^b]$ $\theta \in (0,1)$.

The (correctly specified) conditional quantile model provides a complete characterization of the distribution of w as a function of three components: the distribution of covariates $g(x)$, the vector of between-group prices, $\hat{\beta}^b$, and the matrix of within-group (residual) prices $\hat{\beta}^w$. Then $f_i(\hat{w}_i) \equiv f(g_i(x), \hat{\beta}_i^b, \hat{\beta}_i^w)$.

The observed change in inequality between any two periods, t and τ can be decomposed into three components using the following sequential decomposition. Let

$\Delta Q_\theta = Q_\theta(f_\tau(w)) - Q_\theta(f_t(w))$ equal the observed change in the θ th wage quantile between periods t and τ . We define:

$\Delta Q_\theta^x = Q_\theta(f(g_\tau(x), \hat{\beta}_t^b, \hat{\beta}_t^w)) - Q_\theta(f(g_t(x), \hat{\beta}_t^b, \hat{\beta}_t^w))$ as the contribution of changing quantities (labor force composition) to ΔQ_θ . We define $\Delta Q_\theta^b = Q_\theta(f(g_\tau(x), \hat{\beta}_\tau^b, \hat{\beta}_\tau^w)) - Q_\theta(f(g_t(x), \hat{\beta}_t^b, \hat{\beta}_t^w))$ as the marginal contribution of changing between-group prices to ΔQ_θ . And, we finally define $\Delta Q_\theta^w = Q_\theta(f(g_\tau(x), \hat{\beta}_\tau^b, \hat{\beta}_\tau^w)) - Q_\theta(f(g_t(x), \hat{\beta}_t^b, \hat{\beta}_t^w))$ as the marginal contribution of changing within-group prices to ΔQ_θ .

Notice that this decomposition sums to the total observed change $\Delta Q_\theta^w + \Delta Q_\theta^b + \Delta Q_\theta^x = \Delta Q_\theta$. This is an important advantage over the JMP procedure, in which the “residual price and quantity component” must be estimated as a remainder term after the other two components are calculated.

Part 3. Inequality in Education in Urban China (optional)

Because education is an essential determinant of wages, the distribution of education will affect the distribution of wages. Therefore, before discussing the linkage between education and wage inequality, this part intends to answer questions concerning the inequality of education, i.e. whether there is inequality in the provision of and access to education or in educational attainment. Limited by our datasets, we mainly concern the access to college education.

Access to college and concomitant economic gain depends not only on current financial resources, but also on the ability to achieve high test scores and on cognitive and other attributes produced in earlier family and educational contexts. Thus, higher educational attainment depends recursively on earlier access to publicly and privately supported education at lower levels as well as on the capacity to borrow funds from family and other sources to pay direct and indirect college costs (Carneiro and Heckman, 2002; Hannum, 2004). If access

to all levels of schooling is available only to the financially, politically, and geographically advantaged, the bulk of China's population will be excluded from full participation in the growth of human capital and the income it produces. More recently, a growing proportion of college students must fund their own educational expenses (Hannum, 2004; Heckman, 2004). The proportion of the population privileged to attend college has been and remains very small by almost any standard, despite a sharp acceleration of schooling expenditures in the past decade (Fleisher and Wang, 2005; Heckman, 2005). The proportion of the population aged 20 and above with a college degree was less than 3.2% in 1993 and grew to 3.5% in 2000 according to the 1993 and 2000 population censuses, respectively (National Bureau of Statistics of China, 1994 and 2002).

In this part we will estimate the returns to college education in urban China from 1988 to 2002, paying particular attention to sorting and selection issues. We address the following questions. How have the relative importances of variables that determine the probability of college attendance changed? Is there evidence that the degree of sorting into college according to net benefit has changed in the reform period? Has the sorting gain narrowed or widened? If it has widened, is this because more able students are now able to attend college due to reduced favoritism? If it has narrowed, is this consistent with efficient sorting with an increased proportion of qualified college graduates graduating from college? Is there evidence of increased influence of borrowing constraints on college attendance (Carneiro and Heckman, 2002)?

Methods

Our method takes into account both heterogeneous returns to schooling and self-selection based on anticipated returns, following the method developed in Heckman, Ichimura, Todd, and Smith (1998) and Fleisher et al. (2004).

We set up the following model of wage determination by schooling choice:

$\ln Y_1 = \mu_1(X, U_1)$
 $\ln Y_0 = \mu_0(X, U_0)$, where a subscript indicates whether the individual is in the schooled state (1) or the unschooled state (0). Y is income, X is observed heterogeneity, and U is unobserved heterogeneity in wage determination. In general, the functional forms can have a nonlinear component, and $U_1 \neq U_0$.

The schooling choice comes from the following latent dependent model:

$$S^* = \mu_s(Z) - U_s$$

$S = 1$ if $S^* \geq 0$, where S^* is a latent variable whose value is determined by an observable

component $\mu_s(Z)$ and a unobservable component U_s . A respondent will only attend college (i.e. $S=1$) if this latent variable turns out to be nonnegative.

In the empirical work, Z is a vector of variables that help predict the probability of attending college. It includes parental education, parental income, number of children (siblings), gender, ethnic group, and birth year dummies. On the other hand, X is a vector that holds explanatory power on wages. In the benchmark setting, this includes work experience, work experience squared, gender, ethnic group, ownership, industry, and location. Z and X can share some common variables, but Z must also possess unique variables for the model to be identified.

In the first step, a probit model is used to estimate the $\mu_s(Z)$ function. The predicted value is called propensity score, \hat{P}_i , where the subscript i denotes each individual. The second step adopts a semi-parametric procedure in which local linear regressions are used. Fan (1992, 1993) develops the distribution theory for the local linear estimator of $E(Y|P=P_0)$, where Y and P are random variables.

We first estimate $E(\ln Y|P)$ and $E(X|P)$ with the above procedure. Then we run the double residual regression of $\ln Y - E(\ln Y|P)$ on $X - E(X|P)$. The result is consistently estimated coefficients of the linear components of the model, β .

Define the nonlinear component residual as $U = \ln Y - \beta X$. Use local linear regression again to estimate $E(U|P)$ and its first derivative. This first derivative is the marginal treatment effect (MTE) which we are interest of.

Data Sources

Data used in this paper come from fifteen consecutive annual surveys of urban households conducted by China's National Bureau of Statistics from 1988 through 2002. The

data was collected by the Organization of Urban Socio-Economic Survey, which belongs to the National Bureau of Statistics of China.

Our data in use covers major cities and towns, sampling according to the proportions of population in different areas at the same time. Furthermore, the family type and employment structure of the sample are inspected carefully to keep the representativeness and coherence of the data over years. The income and expenditure data in this survey are based on self-recorded diaries reported monthly, and so are likely to be more accurate than recall surveys.

The urban sample frame includes households in all urban areas, including cities of all sizes. It is designed to represent the provincial and national levels. The data set we use in this paper includes six provinces: Beijing, Guangdong, Liaoning, Shaanxi, Sichuan, and Zhejiang. These six provinces are roughly representative of China's different regions. Beijing is a rapidly growing municipality in North-Central China, Guangdong and Zhejiang are dynamic economic provinces, standing in the Eastcoastal and South-coastal areas. Liaoning is a heavy-industry province in the Northeast. Shaanxi and Sichuan are relatively less developed provinces in the Northwest and Southwest respectively. Since Chongqing became municipality in 1997, we exclude it from Sichuan province in all our research in order to keep consistency through all these years 1988-2002.

Two caveats concerning data limitations should be made up front. First, our data do not have information on working hours. Wages are annual data rather than hourly or weekly data. Although hourly data might be more accurate in reflecting the labor market behavior, we've conducted certain controls to rectify it. Another caveat is that we are not able to account for labor earnings in non-wage benefits such as housing, health care benefits and pension. If non-wage benefits are positively or negatively related to wage earnings, the omission is expected to under- or over-estimate the wage inequality. It is not obvious how this will affect observed trends.

To focus on how wages are determined in the labor market, we restrict our sample to workers engaged in wage employment. Following standard practice, we exclude employers, self-employed individuals, retirees, students, and household workers. Moreover, as China's Labor Law explicitly sets the minimum working age at 16, we exclude all those younger than

16. Although most of males retire at age 60 and females at age 55, many retired earlier due to the reconstruction of industries. So we restrict the working age to be below 55 for males and below 50 for females. For each sample year there still more than 5 thousand observations left. Wages are defined to include base wages, bonuses, and subsidies, and other labor-related income. Thus all kinds of employed income are included as earnings. All wages are adjusted by the CPI index of the six provinces (1988 as the base year), so that all wages reflect real wages. The education measure includes seven degree categories, ranging from below elementary school to college.

When we come to investigate the impact of unequal access to college education, we have to set much more restrictive criterion to get the desired observations.

In China, an individual who was born in 1962 and started school at age 7 would be a senior in upper middle school in 1978 facing the choice of going to college or starting to work. So we limit all of our samples to individuals born after 1961 in order to avoid the complicating effects of educational policy during the Cultural Revolution, when many youths were sent to the countryside for “rectification” (or “re-education”), and colleges and even middle schools were either closed or nonfunctioning. The upper birth-year cutoff eliminates observations born too late to have entered college in China’s education system (for the probit equations) and too late to have completed college (for the wage equations).

Another sample limitation is based on our need for family background information such as parental education and parental income. Thus, our sample is restricted to working individuals who are living in a household with their parents (for the probit equations) and who have positive earnings in the surveyed year (for the wage equations). As specified in the model, we only include two education groups: 3 or 4-year college and upper middle school.

Dissemination strategy

The results of the project will be disseminated through several channels. First, we seek opportunities to present them in conferences, both domestically and internationally. These academic venues include but are not limited to China’s Economists Annual Conference, PEP meetings and workshops, and Annual Conferences by the International Association of Feminist Economists (IAFFE) and by Chinese Economists Society (CES). We will strive to

publish our research papers in recognized Chinese and English economic journals. Policy consultation seminars and workshops by the government and lectures on campus are also among the means through which our research outcomes are disseminated.

Research Team and Capacity Building

The research team is comprised of two members:

- Xiaohua Li (principal agent, Zhejiang University)
- Yaohui Zhao (Professor, China Center for Economic Research, Peking University)

Miss Xiaohua LI is currently a Ph. D candidate, majored in microeconomics and labour economics, in Zhejiang University and has worked in wage structure and human capital investment for more than five years and worked with professors from Peking University and Chinese University of Hong Kong as research assistant. She has considerable experiences in field research and data processing and has involved in a number of research projects in recent years. Her Ph. D dissertation is entitled “*Wage Inequality and Return to Skills in the Transitional Urban China: Causes and Consequences*”.

Yaohui Zhao is a professor at the China Center for Economic Research of Peking University. Professor Zhao has done research in the field of labour economics since 1988 when she was the PhD candidate of Chicago University and worked with international and bilateral organizations such as National Bureau of Economic Research, World Bank, Asian Development Band and Ford Foundation as expert.

Professor Zhao and Xiaohua LI got to know each other through the Economic Research Training and Mentoring Program for Chinese women economists, sponsored by the Ford Foundation, in 2002. Professor Zhao was the research mentor for Xiaohua Li, who was the student of the training program. If Xiaohua LI can get this financial support, she will have more opportunities to visit Peking University or Chinese University of HongKong. Thus Prof. Zhao can give her a face-to-face supervision. They are frequently exchange opinions and research ideas through emails and long distance calls.

Xiaohua LI will also be consulting and collaborating with Prof. Junsen Zhang at the Chinese University of Hong Kong. Prof. Zhang will serve as an external resource person for this project and generously permitting me using the datasets mentioned above to undertake

this proposal.

Despite the progress, my research has been constrained by the lack of adequate time and resources. The supports from the PEP of IDRC will enable me to carry out in-depth analysis of this important topic with advanced empirical methods. With the grants from PEP, I'm able to acquire additional data and spend a few months in Peking University working closely with Professor Zhao on this project. While Professor Zhao has played an important role in encouraging and helping me develop the present research proposal, I will carry out the project and present the research outcomes at PEP meetings.

The research and international collaboration will help me, a young scholar; acquire advanced research techniques, contributing significantly to the capacity building for the institutes we are affiliated with. After graduation from Zhejiang University, I will join the faculty of the School of Economics in Zhejiang University, teaching microeconomics and labour economics. The benefits of the support from PEP will be appreciated dearly by Zhejiang University and its students.

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- and Xiaoqing Song), *Journal of Comparative Economics*, 2005
- "Regional Inequality and Labor Migration in China," (with Justin Lin and Gewei Wang), *Economic Development and Cultural Change*, Vol. 52, No. 3, 587-604, April 2004.
- "The Decline of In-kind Wage Payments in Urban China," (with S. Li), *Journal of Chinese Economics and Business Studies*, Vol. 1, No. 2, 245-258, 2003
- "Causes and Consequences of Return Migration: Recent Evidence from China," *Journal of Comparative Economics*, Vol. 30, no. 2., 376-394, June 2002
- "Leaving the countryside: rural to urban migration decisions in China," *American Economic Review (papers and proceedings)*, Vol. 89, 281-286, May 1999
- "Labor migration and returns to rural education in China," *American Journal of Agricultural Economics*, Vol. 79, 1278-1287, November 1997.

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- "The Two-tier Labor Market in Urban China"(with X. Meng), *Journal of Comparative Economics*, (September 2001) 29: 485-504.
- "The Identification of Unobservable Independent and Spousal Leisure" (with Y.F. Fong), *Journal of Political Economy*, (February 2001) 109 (1):191-202.
- "Dowry and Wife's Welfare: A Theoretical and Empirical Analysis" (with W. Chan), *Journal of Political Economy*, (August 1999) 107 (4) : 786-808.
- "Returns to Education under Collective and Household Farming in China" (with T. Li), *Journal of Development Economics*, (August 1998) 56(2):307-335.
- "Gender Bias, Investments in Children and Bequests" (with J.B. Davies), *International Economic Review*, (August 1995) 36(3): 795-818.
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- "Mortality and Fertility: How Large is the Direct Child Replacement Effect in China?" *Journal of Population Economics*, (1990) 3: 303-314.

Appendix

Responses to the Referees' Comments

Comment 1-Scientific Contribution: The objectives of the study thus appear to be (1) to describe the trends in overall inequality over the transition period, (2) to examine if education contributes to wage inequality or not and (3) if it does, whether it is due to restricted access, specifically because of the credit constraint. *These objectives need to be stated clearly, and the logical relationship between them made more clearly.* That is, topic 2 (Inequality in education and social background) on page two of motivations and objectives follows from (is an explanation of) topic 3 (the contribution of education to inequality).

Response:

We agree with the referee that the objectives need to be stated clearly. These are restated in the proposal. Limited by our dataset, geographical and political disadvantage are not investigated in this proposal. Since the dataset has no information about any worker's residential place when he attended the college entrance examination, nor does the political information of his household.

Comment 2- Policy Relevance:

- **3.5% enrollment... “very small by any standard”**

Response: We thank the referee for drawing our attention to this point, but this point is only very indirect related to my centerpiece. So I'd like to drop this sentence to make my focus more clearly.

- **structure of college education and more details about the growing educational expenses**

Response: It is true that I'd better release more background information about these two points people may be interested of, but I intend to add it to the full version of my report of this project due to the space and time limitation.

- **Re-allocating public sector funds from college to primary may not be the appropriate policy response..... more appropriate response**

Response: The referee is right to point out this flaw. I agree this is a immature policy relevant suggestion. I've delete this paragraph in this new version and leave it to be an open question.

Comment 3- Methodology:

Response: Many thanks to the referee for his/her valuable comments. Yes, the methods sections should be more specific. In this new version I try to show it clearly and be more descriptive. Details please see the contexts.

Why the analysis is restricted to one education level (college education)?

Response: Theoretically the analysis can be done on every education level, but the analysis on college education could produce more valuable outputs and more

substantial influences. And the analysis is so complicated to do. So we choose the most typical one to explore.

Comment 4- Literature:

Response: We acknowledge the referees' concerns regarding literature. References in the list have been checked again. The suggested paper (Lam and Levison, 1991) is very instructive and I'm carefully considering the referee's suggestion.

Comment 5- Feasibility:

Response: Yes, I agree with the referee that I'm not very proficient in English writing. This hampers me to express my opinions fully and I'm trying to improve my writings.

Many Thanks and Good Luck to You!