UNIVERSITY OF ALBERTA
FACULTY OF ARTS
Department of Economics

Working Paper No. 2011-23

# The Supply and Demand Factors Behind the Relative Earnings Increases in Urban China at the Turn of the 21st Century

**Hang Gao**
**University of Alberta**

**Joseph Marchand**
**University of Alberta**

**Tao Song**
**University of Alberta**

Revised September 2012

# The Supply and Demand Factors Behind the Relative Earnings Increases in Urban China at the Turn of the 21st Century

HANG GAO JOSEPH MARCHAND * TAO SONG

University of Alberta

revised September 2012

**Abstract**

All of the demographic and skill groups in China's urban labor market received increases in their real earnings from the mid-1990s to the early 2000s. This paper analyzes these relative earnings increases with respect to the relative supply and demand changes for each of these imperfectly substitutable labor inputs. The relative movements of both supply and demand were consistent with the relative earnings increases across experience groups, but only the relative demand movements were consistent across education groups, and neither of the movements could help explain the gender differences.

Keywords: China, earnings, labor demand, labor supply, transitional economies.

JEL codes: J20, P23, P31.

* Marchand: Corresponding author. Department of Economics, University of Alberta, 7-29 HM Tory, Edmonton, AB, Canada, T6G 2H4. Phone: 780-492-9425. E-mail: joseph.marchand@ualberta.ca.

# 1 Introduction

At the turn to the 21st century, China's economy and its labor market have undergone tremendous change from its planned origin, toward a more open and competitive market structure. This transition began in 1978 with the "reform and opening up" policy movement. Prior to 1978, China had virtually no labor market to speak of, as wages and employment were determined by the government, rather than by the forces of the market mechanism (Knight and Song, 1995). While much of the initial reform had taken place by the late 1980s, all of the firms remained state-owned. This was soon followed by the rapid privatization of firms in the late 1990s, to the extent that the share of GDP from the private sector overtook that of the public sector. When China joined the World Trade Organization (WTO) in 2001, its labor market had already been significantly restructured, and globalization introduced a new phase of changes in the early 2000s. With all of these substantial reforms taking place, the period encompassing the mid-1990s and the early 2000s is a very interesting time in China's economic history, especially with regards to its labor market.[1]

This transition has produced an urban labor market with rapidly increasing earnings across different groups of workers, though some of these groups experienced larger relative increases than others. Much of the previous literature had studied these relative group-specific changes by decomposing earnings in various ways. Although the decompositions are useful in understanding certain aspects of labor markets, such as discrimination, they do not help in explaining the underlying mechanisms causing the changes. This paper contributes to the literature by taking a different approach. It analyzes the market mechanisms behind the relative earnings changes in urban China and studies whether or not and to what extent these relative earning changes are driven by competitive forces. More specifically, this study matches these relative earnings changes to the relative changes in the supplies and demands across all of the imperfectly substitutable labor inputs by applying the empirical framework of Katz and Murphy (1992) on data from the 1995 and 2002 urban surveys of the Chinese Household Income Project (CHIP). It further adds an innovation to the methodology by using changes in firm ownership as the within-industry variation, rather than the commonly used occupational variation, in order to establish a framework

which is more suitable for mainland China.[2]

This study finds that approximately half of the observed changes in relative earnings are consistent with the relative supply and demand movements. This consistency with both relative movements holds across experience groups. However, only the relative demand movements are shown to be consistent with the increase in relative earnings across education groups, while neither movement could explain the differential earnings increases between the genders. Moreover, individuals are shown to be acquiring more skills overall, as the relative labor supply shifted toward a more educated workforce. The relative demand shifts show that firms in China are increasingly favoring skills rather than experience in their prospective workers. Lastly, significant portions of these relative demand shifts were found to come from the privatization effect, which has polarized the workforce towards both ends of the education distribution, as well as the globalization effect, which is shown to better match the relative earnings increases across the education groups.

# 2 Factors Behind the Labor Supply and Demand Movements in Turn-of-the-Century China

The relative movements in labor supply and labor demand in China at the turn to the 21st Century are the result of a combination of factors, ranging from the effects of government imposed policies which expanded education, to market liberalization, to firm privatization. On the labor supply side, the most significant factor has been the transition toward a more educated workforce, displayed for the entire population from 1990 to 2000 in Figure 1. During this period, the percentage of the population with less than an elementary education was reduced by half, from 30 to 15 percent. This is attributable to a compulsory system of education implemented in 1986, requiring every school-aged child to receive at least nine years of education. While the number of elementary school graduates was only slightly reduced by less than 4 percent, the number of middle school and high school graduates increased by 45 percent and 38 percent, respectively. The largest growth, however, was among the college graduates, who went from making up 1.4 percent of the population in 1990 to 3.6 percent in 2000, an increase of over 150 percent. The end of the cultural revolution in 1976, leading to opportunities for younger cohorts to continue their studies,

and an expansion in higher education during the late 1990s, have both contributed to this increase.

(insert Figure 1 here)

On the labor demand side, the two most significant factors were the increase in international trade and the rapid privatization of firms. China's economy has undergone tremendous growth over this period, much of which has been induced by export-oriented industrialization due to its liberalization of trade. As Figure 2 shows, the value of China's exports in local currency has more than doubled from 1995 to 2002. The largest year-to-year increase over the period occurred from 2001 to 2002, right after China became a member of the WTO. This increased international trade led to a large expansion among export-oriented industries, causing a shift in labor demand primarily between industries. The increase in exports required more workers to participate in production, increasing labor demand in those export-oriented industries, while possibly reducing labor demand in other industries. Though the overall effect of globalization on labor demand is ambiguous, it is plausible that it significantly shifted the workforce between industries.

(insert Figure 2 here)

The rapid transition toward the privatization of firms is also a very important factor on the labor demand side, causing the workforce to change within industries rather than between them. Prior to 1978, wages were set by the government and life-long employment was guaranteed. Since then, several large changes have driven the transition towards privatization. State-owned enterprises (SOEs) began to falter in the late 1980s, so in order to mitigate this problem, Chinese officials implemented a large-scale labor retrenchment. Enterprises were given more authority to hire and fire workers over this time, meaning that firms could now determine the number of workers they employed at a given wage rate. During this reform, SOEs began to massively lay off their surplus workers (Dong, 2003). The right of SOEs to set their own wages was passed in 1994.[3] At the same time, China also promoted the rapid development of the private sector as a complement to the public economy, and privately-owned firms were encouraged to grow. In 1999, a constitutional amendment was even passed, accepting private enterprises as the second most important economic component after the SOEs. Figure 3 shows how these changes affected employment between firm ownership types from 1995 to 2002 in urban China. The number of

employed persons in SOEs decreased by 36 percent, from 112.6 million to 71.63 million, while the level of employment in the private sector more than doubled, from 20.45 million to 42.67 million.

(insert Figure 3 here)

# 3 Construction of the Labor Inputs

## 3.1 Data Source

The Chinese Household Income Project (CHIP) serves as the data source for this study due to its representativeness of individuals living in urban China and its coverage of the late 1990s and early 2000s time period through its 1995 and 2002 waves. These data are among the most commonly used micro data sets for studies on the labor market aspects of mainland urban China. The surveys were conducted and facilitated by a joint project of the Institute of Economics of the Chinese Academy of Social Science, the Asian Development Bank, and the Ford Foundation. The Chinese National Bureau of Statistics also provided assistance, given that the CHIP sample is based on a larger survey of individuals conducted by that agency. The CHIP sample sizes were kept consistent between the 1995 and 2002 waves, with 21,698 individuals (from 6,934 households) for the 1995 survey and 20,632 individuals (from 7,000 households) for the 2002 survey.[4]

The geographical coverage of the urban CHIP survey spans over as many as ten provinces and two directly-controlled municipalities, representing a total of 69 Chinese cities.[5] These ten provinces were chosen primarily for their representativeness of the various urban regions of China, with Shanxi and Gansu representing the northwestern region of the country, Anhui, Henan, and Hubei representing the central region, Sichuan and Yunnan representing the southwestern region, and Liaoning, Jiangsu, and Guangdong representing the coastal region. In addition to the provincial coverage, some directly-controlled municipalities (DCMs) are also used to represent the highest level of cities which are under the direct control of the Central Government of China. Beijing, the capital of China, represents the three DCMs of Beijing, Shanghai, and Tianjin, and a city in the Sichuan province, Chongqing, became an additional representative DCM in 1997.

This study focuses on China between the 1995 and 2002 waves, because this particular period is arguably one of the most dynamic economic times in any developing country in modern history.

While previous studies on developed countries have used similar methodologies over longer periods of time (ex. Katz and Murphy, 1992), this is not necessary for China given the tremendous amount of change taking place over a shorter period, driven by its privatization reform in the mid to late 1990s and its trade liberalization prior to its entrance to the WTO in 2001. Therefore, evaluating over the 1995 and 2002 surveys will capture these transitions and their effects on the labor demand of different groups of workers. In addition, only the 1995 and 2002 survey years contain the particular variables necessary to conduct a proper analysis of the labor market, such as years of schooling, years of work experience, and working hours, which are not available in the inaugural 1988 survey, and the annual earnings variable and industry group definitions are only comparable between these two years.

## 3.2 The Labor Inputs

This study examines the relative changes to the Chinese urban labor market by separating individuals into various demographic and skill groups, which are defined over the characteristics of gender, years of schooling, and years of work experience.[6] Each group can be considered as an imperfectly substitutable input to production with any other group. In the aggregate sample, the two gender groups are somewhat unbalanced, with 54.4 percent being male and 45.6 percent being female. This may reflect a relatively higher labor force participation among males or a general bias in the Chinese population towards boys and away from girls, partly magnified by the one-child policy instituted in 1980.

The four education groups, defined from years of schooling, are of varying size.[7] The least educated group, with less than 9 years of schooling (i.e. less than high school), below what is now considered compulsory, makes up 16.6 percent of the sample. The second education group, with 9 to 11 years of schooling (i.e. some high school), is 35.5 percent of the sample. The third and largest group, with 12 to 15 years of schooling (i.e. high school graduates), possibly having some college exposure or a professional degree, is 41.3 percent of the sample. The fourth and most educated group, with 16 or more years of schooling (i.e. college graduates), make up a small but important 6.6 percent.

The four experience groups, constructed from years of work experience, are closer in size. New

entrants to the labor market, with 0 to 9 years of work experience, make up 16.4 percent of the sample. The next group, with 10 to 19 years of experience, is the largest at 36.6 percent. The third group, with 20 to 29 years of work experience, is 29.6 percent of the sample. The most experienced, with 30 or more years of work, make up a slightly higher percentage than that of the new entrants at 17.5 percent. Very few workers had zero years or more than 42 years of experience in this survey, most likely due to internship opportunities and the statutory retirement age, respectively.

# 4 Real Earnings, Relative Supply, and Relative Demand in China's Urban Labor Market

## 4.1 Changes in Real Earnings

Many of the previous studies examining earnings changes across groups of individuals in mainland China have done so by comparing estimates obtained from Mincerian equations or by decomposing earnings using the Blinder-Oaxaca method (see, for example, Appleton, Song, and Xia, 2005; Bargain, Bhaumik, Chakrabarty, and Zhao, 2009; Démurger, Fournier, Shi, and Zhong, 2006; Hauser and Xie, 2005; Zhang, Zhou, Park, and Song, 2005). The current study takes a different approach. Given that labor supply and labor demand determine the equilibrium wages paid to a particular labor input within a competitive labor market, the relative changes in these wages should then be consistent with the relative movements of the supplies and demands across different types of imperfectly substitutable workers. From this perspective, the closer these relative supply and demand movements are to explaining the relative changes in the earnings of different workers, the closer the market mechanism is to determining the earnings in urban China.

(insert Table 1 here)

The empirical methodology used in this study begins by first calculating the changes in workers' earnings among the different demographic and skill groups. Annual earnings are defined as cash payments in the CHIP survey and are denoted in nominal terms. In order to convert the reported nominal annual earnings into a real value, the nominal value is divided by the CPI in 2002 while

using 1995 as the base year. Then, the log change in real earnings, $\Delta ln(w_k)$, is calculated between 1995 and 2002 for each labor input group, $k$, in order to create a comparison of the growth differences in earnings between groups. The three columns of Table 1 display these average real earnings differences in both levels and log changes among men and women, among education levels, and among experience levels.

The average real earnings increase over the entire sample was around 49 percent (not shown in Table 1), providing a general picture of the rapid earnings growth in urban China, with an annual increase of roughly 7 percent. Démurger, Fournier, Shi, and Zhong (2006) also show a similar, dramatic rise in real earnings in China between these years. Comparing this growth in average earnings to that of another large developing country, India, the Chinese rate is more than 130 percent of India's rate over this period (Bargain, Bhaumik, Chakrabarty, and Zhao, 2009). This growth rate seems even larger when compared with that of a developed country. For example, the respective rate between 1995 and 2002 is around 11 percent in Canada, which is less than one quarter of China's earnings growth.[8]

Although the real earnings are shown in Table 1 to have increased from 1995 to 2002 across all demographic and skill groups, some of these groups experienced larger relative increases than the others. For example, while the average real earnings of men and women had each increased over this period, males have both a higher level of earnings and a higher growth in earnings than females. The relative earnings increase in the form of a 0.515 log change for males is higher than that of the 0.479 log change for females. This gender growth gap is consistent with other results found in the literature. As the previous studies have shown, men's earnings in China continuously grew between 1988 and 2002, while the returns for women only began to increase in the mid-1990s (Bargain, Bhaumik, Chakrabarty, and Zhao, 2009). In addition, the gender gap became larger in 2002 than it had been in 1995, as Appleton, Song, and Xia (2005) showed that the gap was 15 percent in 1995 and 19 percent in 2002. Because women's earnings continued to grow at a relatively slower rate than that of men's, the increase in this gap is not surprising.

Both the level and the growth rate of real earnings increase monotonically when moving up the education scale. While the earnings of the least educated group increased by the smallest

amount with a 0.276 log change, high school graduates and college graduates both saw their earnings rise by the most, with a 0.540 and a 0.542 log change respectively, which is more than double the growth of the least educated. The differences in the levels of average earnings between education groups in 2002 were a consequence of these differences in the growth rates from 1995 to 2002. Moreover, college graduates were also starting from a significantly higher level of average real earnings. These results are consistent with the finding in the literature that the returns to schooling have increased from the late 1980s to the early 2000s period in China, with much of this rise being attributed to the wage premium paid to workers with college degrees (Appleton, Song, and Xia, 2005; Bargain, Bhaumik, Chakrabarty, and Zhao, 2009; Hauser and Xie, 2005; Zhang, Zhou, Park, and Song, 2005). If the returns to education are increasing over time, then the higher earnings growth rates for more educated workers should be expected, as shown in Table 1.

As was observed for the gender and education groups, real earnings have also increased within all of the experience groups from 1995 to 2002 and have done so differentially between these groups. Interestingly, though the real earnings levels rise with more years of experience, the growth in real earnings decreases with more years of experience. The 0.637 log change for those with the least amount of experience of 0 to 9 years is followed in size by a 0.525 log change for those with 10 to 19 years of experience. Even so, the experience group with the least amount of growth was not the very experienced with 30 or more years, but rather the group with 20 to 29 years of experience, as those with 30 or more years of experience had a 0.478 log change in earnings while those with 20 to 29 years of experience had a 0.420 log change. This pattern is similar to the inverse U-shape relationship between earnings and years of experience posited by Appleton, Song, and Xia (2005). They suggested that highly experienced workers have been over-paid since the existence of the planned economy, but that less experienced workers' earnings have begun to catch up since the wage structure reforms in 1979. This growth then intensified in the early to mid-1990s. Therefore, the pattern across experience groups shown in Table 1 is reasonable.

## 4.2 Changes in Relative Labor Supply

The relative movements of supply and demand for each labor input are now analyzed to ascertain whether these movements coincide with the relative increases in earnings. In order to translate the

supply and demand theory into empirical results, a method is adopted which is largely referenced from Katz and Murphy (1992). If China's labor outcomes are now following the mechanisms of the market on the mainland, then all of the relative earnings changes in China should be due to the relative supply and demand movements across different types of imperfectly substitutable workers.

Within this subsection, the demand curve is assumed to be fixed in place or stable, which would imply that the relative changes in labor supply are considered as the lone reason for the relative earnings changes among the various labor inputs. It is also assumed in this subsection that the demand curve is negatively sloped.[9] Under these assumptions, an outward shift in supply would lead to a decrease in earnings, whereas an inward shift in supply would lead to an increase in earnings. Given that all of the labor input groups received an increase in their earnings and that the supply movements are relative, what is of utmost interest in this study is the consistency of the patterns between the relative earnings increases and the movements in the relative supplies across the groups of labor inputs, with the expectation of a negative correlation between them. This supply-side analysis is similar to that of Gottschalk and Smeeding (1997), who applied a comparable technique within a cross-national context using data from the Luxembourg Income Study.

Because earnings are measured in annual terms, the ideal labor supply variable would be defined from a direct survey question asking for an individual's annual working hours. For a survey where this question is not directly asked, like the CHIP, annual working hours can be constructed by multiplying together the individual responses for average work hours per day, average work days per week, and average work weeks per year. The CHIP survey unfortunately contains only the first of these three responses: average work hours per day. Nevertheless, the construction of annual work hours remains the same, with the assumption that every individual works an average of 5 days per week and an average of 50 weeks per year. Therefore, even though this labor supply variable has been aggregated up to annual terms, it will only vary by the average daily work hours of each individual. According to the survey, the average work hours were 7.76 hours per day in 1995 and 8.20 hours per day in 2002, around the standard 8 hour workday which is quite common

in China, with small standard errors on both numbers.[10]

The total relative change in labor supply is calculated as the log change in the annual work hours for each labor input group as a share of the total annual work hours supplied across all workers in the survey. This is given in the following equation:

$$\Delta S_k^{total} = \Delta ln \left( \frac{H_k}{\sum_k H_k} \right) \tag{1}$$

where the log change in total relative labor supply is denoted as $\Delta S_k^{total}$ and $H_k$ represents the hours worked for each labor input group, $k$. Table 2 displays the log changes in the relative labor supply shares for each of the demographic and skill groups,along with the log changes in real earnings carried forward from Table 1. The pattern in the relative labor supply movements will be considered as either consistent or inconsistent with the relative earnings increases within the gender, education, and experience groups. For this reason, the vertical patterns of the relative earnings increases and the relative supply movements within each group should be compared, rather than analyzing the changes for any one input in isolation.

(insert Table 2 here)

The relative labor supply in urban China has shifted away from female workers and towards male workers between 1995 and 2002, with the female share decreasing by a -0.073 log change and the male share increasing by a 0.060 log change. These relative supply movements are the opposite of what is expected given that the relative earnings increases between the genders favor males. A relative reduction in the labor supply share of women may mean a lower number of hours per female worker, a lower number of female workers, or a combination of both, which may have been caused by certain cohort effects. For example, women may be their reducing hours due to child bearing or rearing, or due to increased household income created by their male spouse's expanded labor market opportunities decreasing their need to work more hours. Also, less women may be in the labor force altogether due to the differential statutory retirement rules between the genders. This negative relationship between female labor supply and earnings is also found by Li and Zax (2003).

There are relative decreases in supply for the least educated groups and relative increases

in supply for the highest educated groups. Individuals with less than a high school education experienced the largest relative reduction in their labor supply, with a -0.326 log change, whereas the relative labor supply of those with some high school education also decreased but by a smaller amount, with a -0.101 log change. These relative supply decreases in the lower half of the education distribution may be explained by the effects of compulsory schooling. For individuals in the upper half of the education distribution, the relative supply of high school graduates increased by a 0.142 log change and the increase in the relative supply of college graduates was a substantial 0.470 log change. These relative supply increases possibly signal a rise in the overall level of educational attainment in urban China over the 1995 to 2002 period due to the cohort effects of the end of the cultural revolution and the higher education expansion which began in 1999. Overall, these relative supply movements are the exact opposite of what is predicted by the market, given the increasing pattern in the relative earnings with education.

The gender-education results suggest the same general pattern, but now the magnitudes of the relative supply changes for females are larger than those for males. For the least educated group, the female share of relative supply was reduced by much more than that of males, with a -0.521 log change versus a -0.158 log change respectively. For those with some high school education, the relative supply of females decreased, while that of males actually increased by a small amount. For the most educated college graduates, the relative supply of females increased by a tremendous amount, with a 0.665 log change, and with a male relative supply increase of just over half of that. It is possible that a "quantity versus quality" tradeoff is happening in the education of children in China. Due to the one child policy, parents may have been more willing to provide a better education for their daughters than in the past, and this could partially explain the relative jump of highly educated female labor supplies and the relative decrease in lower educated females.

In terms of work experience, the relative supply share of the most experienced group grew dramatically with a 0.275 log change, while the relative supply shares of the least two experience groups decreased by a -0.041 and a -0.154 log change. This pattern in the relative supply movements across experience groups is almost fully consistent with the pattern in the relative earnings increases, as those who had the largest increases in earnings had a reduction in their relative sup-

ply and those with the smallest earnings increases had an increase in their relative supply. This drop in the relative labor supply of new entrants was most likely caused by either the one-child policy reducing the relative supply of young workers who would have been coming into the labor market or the higher education expansion encouraging the young to go back to or to continue their schooling.

Interestingly, stronger gender differences arise when examining the gender-experience disaggregation. This is true for the relative supply patterns, as well as for the relative earnings increases. For example, three of the relative supply changes across the female experience groups are negative, as compared with only one for males. While the magnitudes of the supply reductions for the least experienced are virtually the same between genders, with a -0.146 and a -0.163 log change for females and males, the relative labor supply increase is roughly twice as large for males as it is for females for the most experienced, with a 0.322 and a 0.146 log change respectively. Overall, the consistent pattern in the relative supply movements across experience groups with their relative earnings increases again holds for the most part, with the exception of the most experienced females. Though their relative supply change is positive, unlike the other female experience groups, the magnitude of this change and their relative earnings increase is equal to that of the least experienced females. This exception is not what is expected by the market mechanism with a stable labor demand.

## 4.3 Changes in Relative Labor Demand

It is conceivable that the supply movements might not explain the entire story of the earnings increases, even for those groups where the relative supply changes were consistent with the relative earnings changes. In addition, it is likely that the assumption of a fixed labor demand curve would not hold in a fast growing, developing economy like that of China over this period. Therefore, the relative labor demand movements will now also be compared with the relative earnings movements.

Similar to the previous subsection, one curve of the supply and demand framework will be held in place, while the other is allowed to move freely. In this subsection, the labor supply curve is fixed, and the relative changes in labor demand will serve as the lone reason for the relative earnings changes of the various labor inputs. Because the movements in labor demand will be

along a positively sloped labor supply curve, the correlation between the labor demand changes and the changes in real earnings should be positive.[11] Therefore, an inward shift in demand would lead to a decrease in earnings, whereas an outward shift in demand would lead to an increase in earnings. Given that all of the labor input groups received an increase in their earnings and that the demand movements are relative, it is the consistency of the patterns between the relative earnings increases and the movements in the relative demands across the groups of labor inputs that is of interest.

The labor demand response would ideally be obtained from an establishment-level survey asking for the employment information from the firms themselves, regarding how many workers they employed and how many hours these workers worked. The CHIP survey data are instead collected at the individual-level and thus provide only the responses of the individual workers. However, through the aggregation of these responses by industry and firm ownership type, the total number of hours that employees require their employees to work may be inferred, which can then be considered as their total labor demand at the industry and firm ownership level. Because this labor demand variable is defined in terms of aggregate hours, a reduction in this demand could be due to layoffs or cuts in the hours per worker by firms, and an increase in this demand could be due to the addition in worker numbers or in hours per worker.

The fixed coefficient, total demand shift index proposed by Katz and Murphy (1992) is used for the demand side measurement in this study. As was done for the relative changes in real earnings and labor supply, the relative labor demand changes are analyzed between genders, education levels, and experience levels. Now, however, there are two additional sources of variation, industry and firm ownership type, which are incorporated into the demand side calculations. Consider the following equation for the total changes in relative labor demand:

$$\Delta D_k^{total} = \sum_{ij} \left( \frac{E_{ijk}}{\sum_{ij} E_{ijk}} \right) \cdot \left( \frac{\Delta E_{ij}}{E_{ij}} \right) \tag{2}$$

where $i$ denotes the industry, $j$ denotes the firm ownership type, $k$ denotes the skill and demographic group, $E_{ij}$ indicates the total employment of cell $ij$ as a percentage of all labor inputs, $E_{ijk}$ indicates group $k$'s share of the employment in cell $ij$, thereby making $\Delta D_k^{total}$ the total relative

demand shift index for the labor input of group $k$ in cell $ij$. Note that the $k$ groups are defined in the same manner as in the earnings and supply side calculations, in order to maintain consistency throughout the paper and for the comparison of results.

One of the strengths of this total demand shift index of Katz and Murphy (1992) is that it can be decomposed into between industry and within industry shifts, making the total shift the sum of these two components. This decomposition will help to disentangle the different demand-side factors behind the total demand changes in China over this period. As Katz and Murphy (1992) and Katz and Autor (1999) describe in their analyses, international trade was a significant factor behind the between industry shifts of the U.S. from the mid-1970s to the mid-1990s. This is also very likely the case for China from the mid-1990s to the early 2000s, as its exports had increased substantially and it had obtained WTO membership during this time period. The between industry change in relative labor demand is given by:

$$\Delta D_k^{between} = \sum_i \left( \frac{E_{ik}}{\sum_i E_{ik}} \right) \cdot \left( \frac{\Delta E_i}{E_i} \right) \tag{3}$$

where the variation is now by industry, $i$, and the imperfectly substitutable labor input group, $k$. This *between* industry component of demand will be driven by trade through the variation in trade openness across industries, so that labor demand will not be affected by trade in the same way in every industry. Some industries, like manufacturing, had become more open to trade leading up to China's WTO membership, but other industries had not. The industries which are more open to trade are expected to demand more workers relative to other industries, affecting the relative demand for workers between industries. There are a total of twelve industries used from the CHIP data.[12]

For the within industry component of demand, an important departure is made from the original methodology. Whereas Katz and Murphy (1992) had used occupational variation to calculate their within industry shifts, this study uses the ownership structure of the firm for this purpose.[13] This is done in order to incorporate the economic transition from public to private ownership which was happening in China during this time period. As Figure 3 had shown earlier in the paper, there was a rapid transition of the workforce from employment in public sector firms

to employment in private sector firms at the aggregate level from 1995 to 2002. In this study, firm ownership is simplified into two types: state-owned and privately-owned.[14] Therefore, it is straightforward to infer that the within industry demand shift index should be interpreted as the relative shift of labor demand within the same industry across these two firm ownership types. The within industry change in relative labor demand is defined as:

$$\Delta D_k^{within} = \sum_j \left( \frac{E_{jk}}{\sum_j E_{jk}} \right) \cdot \left( \frac{\Delta E_j}{E_j} \right) \tag{4}$$

where the variation is now by firm ownership type, $j$, and the labor input group, $k$. Under the within industry component, any changes which are taking place can be attributed to the privatization effect on labor demand. All of the results of the labor demand analysis are presented in Table 3, with the log changes in real earnings carried forward from Table 1. The three sets of columns under the log changes in relative demand contain the relative changes in the between industry component, the within industry component, and then the total change.

(insert Table 3 here)

Female workers were in slightly higher relative demand between 1995 and 2002 at the expense of their male counterparts, with the relative demand for females growing slightly with a 0.025 log change and declining slightly for males with a -0.023 log change. That said, the relative demand shifts are not consistent with the relative earnings increases between the genders, as it would be expected that those in higher relative demand would have received a higher earnings increase. In addition, these total changes in relative demand by gender were dominated by the between industry shifts. If international trade induces the reallocation of labor across industries, this would be reflected in the relative demands between them. In this case, women might be entering industries previously dominated by men, like manufacturing, or as previous studies have shown, the overall employment may have shifted towards female-dominated industries in urban China during this time (Appleton, Song, and Xia, 2005). Though the magnitudes of the privatization effect are small for both genders, with only a -0.006 log change for females and a 0.002 log change for males, this relative demand pattern is consistent with the relative earnings increases.

The total relative demand has shifted in favor of the most educated workers during this period.

These relative changes are negative but small for the less than high school educated, those with some high school, and the high school graduates, with log changes of -0.013, -0.046, and -0.034 respectively. College graduates, however, have seen their total relative demand greatly increase, with a 0.276 log change over this period. While the pattern in total relative demand across the education groups is consistent with their relative earnings increases, the magnitudes of the negative changes are quite similar. The between industry relative changes are even more consistent with the relative earnings increases for these groups, in that moving from the least educated to the highest, the demand change goes from strongly negative to weakly negative, and then from weakly positive to strongly positive, while the earnings increases grow larger in magnitude with more education. That said, the larger magnitudes of the between industry shifts show that they are only the dominant component for the less educated, while the within industry shifts are shown to be the dominant component for the more educated.

The within industry relative demand changes by education display an entirely different pattern altogether. Here, the least educated group (less than high school) and the most educated group (college graduates) display large positive relative demand changes, with 0.134 and 0.164 log changes respectively, while the modestly educated groups (those with some high school and high school graduates) each show negative relative demand changes, with -0.017 and -0.075 log changes respectively. This U-shape pattern in the within industry component of the relative labor demand change can be characterized as "polarization by privatization". As firm ownership in China increasingly switches from public to private, the need for the least and most educated is relatively increased. This may be because more workers with lower education levels were needed in lower-end, labor-intensive firms, and more highly educated workers were needed in the high-end, skilled firms. At the same time, the need for those with modest amounts of schooling has relatively decreased, as privatization may have disproportionately caused more semi-skilled workers to be displaced. If this "polarization by privatization" trend continues as China continues to grow, it may restrain the creation of a middle class and further divide the population between the lowest and highest classes, thereby increasing the overall level of inequality.

Disaggregating the education trends by gender reveals that males appear to be driving this

general trend in the total relative changes in demand. Among the most educated, the relative demand for female workers had increased by a 0.027 log change, whereas for males, it had increased by a 0.346 log change. Further, females do not appear to be experiencing declines in relative demand for the middle education groups like that of males, but also do not appear to be generating the large relative increase in demand among college graduates. The least and most educated groups have between industry changes of the same sign and magnitude for both females and males, with -0.147 and -0.146 log changes respectively for the least educated and with 0.073 and 0.093 log changes respectively for the most educated. However, for those with some high school and those with some college, the relative between industry changes of the genders are of different signs and/or magnitudes.

For the privatization-driven within industry component, there is a differential gender effect at every education level. For those with no high school education, the shift toward privatization favored females to males by a two-to-one margin, with a 0.191 versus a 0.094 log change. Females with some high school exposure experienced a slight drop in relative demand, while males had almost no change. Males underwent a larger relative reduction in within industry demand than females for those with some high school education by four-to-one, with a -0.121 versus a -0.029 log change. The largest difference in within industry demand takes place for college graduates with relative demand for males increasing by a 0.252 log change whereas it is decreasing for females by a -0.045 log change. Therefore, the results suggest that the "polarization by privatization" phenomenon was driven by the relative changes for the most educated males and the least education females. Lastly, the between industry shifts are the dominant demand component for less educated males and more educated females, while the within industry shifts are the dominant demand component for less educated females and more educated males.

The total changes in relative labor demand with regards to the experience groups are quite straight-forward. The two least experienced groups have seen their respective relative demands increase by 0.257 and 0.137 log changes respectively, while the two most experienced groups have seen their relative demands decrease by -0.213 and -0.217 log changes respectively. This would imply that the firms over this period from 1995 to 2002 are increasingly looking for those with newer

skills, thereby discounting the value of experience in the labor market. Though the between and within industry components each follow this same overall pattern, the increase in relative demand for the inexperienced and the decrease in relative demand for the experienced is mainly driven by the dominant component of the privatization movement in firm ownership. This overall relative demand pattern is also consistent with the relative earnings increases across the experience groups. The total relative demand changes, even when split by gender, underline the general finding which showed that firms in China are increasingly looking for new skills and not experience in their prospective workers. The total relative demand pattern is shown to still be driven by the within industry movement toward firm privatization over this period for each of the genders, with relative demand increases for the least experienced males and females and relative demand decreases for the most experienced. That said, females and males do differ in the lesser-in-magnitude between industry shifts, with the relative demand for males decreasing at every experience level and the relative demand for females increasing for all but one experience group.

# 5 Conclusion

This paper analyzes the relative movements in the supply and demand of workers in the Chinese urban labor market, in order to determine whether or not and to what extent they are consistent with the relative earnings increases across groups of workers at the turn to the 21st Century. By using the framework developed by Katz and Murphy (1992), it identifies the changes in real earnings, relative supply, and relative demand across all demographic and skill groups. This is the first paper to analyze the underlying demand and supply mechanisms of the urban labor market in mainland China using this methodology. It also offers an innovation by using the changes in firm ownership as the within-industry variation, rather than the commonly used occupational variation, in order to establish a framework which is more suitable for China during this period.

All of the demographic and skill groups in China's urban labor market received substantial increases in their real earnings from the mid-1990s to the early 2000s, though these real earnings increases were not uniformly distributed across the gender, education, and experience groups. For example, males received larger earnings increases than females. Also, the earnings increases

become larger in magnitude when moving from the less educated to the more educated workers. Across the experience groups, the earnings increases were negatively correlated with the experience level of workers, with the least experienced group receiving the largest earnings increase.

With regards to labor supply, the workforce in China has increasingly become more male, more educated, and more experienced over the 1995 to 2002 period. Overall, the relative labor supply changes were consistent with the relative earnings increases across all of the experience groups, but they were not consistent across gender or education groups. The gender-education disaggregation shows that the education trends in the relative supply changes were more pronounced for females than for males, with larger relative decreases in the least educated and larger relative increases for the most educated. For the gender-experience disaggregation, the relative supply changes are shown to be more negative for females among the moderately experienced groups and more positive for males in the most experienced group.

On the labor demand side of the market, it is shown that firms increasingly favor females, college graduates (especially those which are male), and the less experienced (especially those which are female). Overall, the relative labor demand changes were consistent with the relative earnings increases across education groups (especially between industries) and across experience groups (especially within industries). However, these relative demand changes cannot help explain why the relative earnings increases were higher for males than for females. In addition, privatization was found to be the dominant factor in the relative demand shifts for the more educated groups and for all of the experience groups, while globalization was found to be the dominant factor in the relative demand shifts for both genders and the less educated groups. An interesting outcome of privatization was that it has polarized labor demand toward the least and most educated, and away from those in the middle of the education distribution, which may lead to an overall increase in inequality.

Altogether, the relative movements in labor supply and demand were shown to be consistent with the relative earnings increases for approximately half of the labor input groups analyzed. The differential increases in relative earnings across experience groups can be explained by both relative movements, while the differential changes across education groups can only be explained by

relative demand. Neither relative movement could explain the differential changes across genders. The expansion of education on the supply side, as well as trade liberalization and the privatization of firms on the demand side, have been important drivers of the relative earning changes in urban China at the turn of the century and may continue to have a strong influence on the labor market of China in the future.

# Notes

[1]For a more in depth discussion of these changes in China's labor market, see Cai, Park, and Zhao (2008).

[2]Lam and Liu (2011) used similar techniques to analyze the dynamics of the Hong Kong labor market. However, they use only occupational changes as their within industry variation and only focused on males, while the present study uses public-private shifts and compares males and females respectively. In addition, the "one country, two systems" principle makes the labor market of Hong Kong drastically different from that of mainland China.

[3]A detailed time line of the wage reforms can be found in Démurger, Fournier, Shi, and Zhong (2006).

[4]For more information on the 1995 and 2002 CHIP surveys, please see Li, Luo, Wei, and Yue (2008). For more information on the inaugural 1988 CHIP survey, please see Khan, Griffin, Riskin, and Renwei (1992). Note that none of these surveys contain sample weights.

[5]Only individuals with a reported household registration (or hukuo) inside one of these urban areas are included this study.

[6]Appendix Table A1 provides the detailed cell counts and the number of individuals that make up each cell under each of the combinations of the gender, education, and experience groupings.

[7]If its value is missing, an individual is assigned a number of schooling years based on their highest degree obtained. These include 16 years of schooling for those who have at least a college degree, 15 years for those with a professional degree, 12 years for those with at least a high school or technical school degree, and 9 years for any other response.

[8]The Canadian earnings growth is based on data retrieved from Statistics Canada, CANSIM II series, September 2010.

[9]In general, the overall linear relationship between the changes in log real earnings and the log changes in the demands over all individuals in the CHIP data across the combined 1995 and 2002 waves is a negative one, which would be expected for a downward-sloping labor demand curve. The estimate on this demand relationship in the CHIP data is -0.068 , with a standard error of 0.073.

[10]Chinese workers are primarily full-time employees. However, some cases of part-time work and extreme overtime are present in the CHIP data. While these observations are not excluded from this study, these outliers should not drastically alter the estimation either way. Moreover, self-employed workers are included with all of the other workers throughout the analysis, as there is no way to distinguish them from the rest of the sample.

[11]In general, the overall linear relationship between the changes in log real earnings and the changes in the log supplies over all individuals in the CHIP data across the combined 1995 and 2002 waves is a positive one, which would be expected for an upward-sloping labor supply curve. The estimate on this supply relationship in the CHIP data is 0.101, with a standard error of 0.054.

[12]These industries are defined according to the 1995 CHIP survey and include: agriculture, animal husbandry, fishing, and water conservancy; manufacturing; mining, geological survey, and prospecting; construction; transport, communications, postal service, and telecommunications; commerce, restaurants, catering, materials supply, and warehousing; real estate, public utilities, personal services, and consulting services; health, physical culture, and social welfare; education, culture, arts, and broadcasting; scientific research and technical services; finance and insurance; and government, party organizations, and social organizations. These industries are kept consistent with the 2002 CHIP survey, by aggregating several of the more specific 2002 industries back to the 1995 format.

[13]That said, the results using occupational variation as the source of within industry variation were also calculated by the authors and can be provided upon request.

[14]The state-owned category contains all of the SOEs at the central, provincial, and local levels, the urban collectives, and, following the reform of the SOEs in 1998, all of the state share-holding companies. The privately-owned category contains all of the private enterprises, individual enterprises, foreign-owned companies, and sino-

foreign joint venture enterprises. Any public-private designations are divided between these two categories based on the ownership concentration. In this case, the company is considered to be a state-owned enterprise if the state owns 50 percent or more of the company's shares.

# References


Appleton, Simon, Song, Lina, Xia, Qingjie, 2005. Has China crossed the river? The evolution of wage structure in urban China during reform and retrenchment. Journal of Comparative Economics 33, 644-663.

Bargain, Olivier, Bhaumik, Sumon K., Chakrabarty, Manisha, Zhao, Zhong, 2009. Earnings differences between Chinese and Indian wage earners, 1987–2004. Review of Income and Wealth 55, 562-587.

Cai, Fang, Park, Albert, Zhao, Yaohui, 2008. The Chinese Labor Market in the Reform Era. In: Brandt, Loren, Rawski, Thomas G. (Eds.), China's Great Economic Transformation, Cambridge University Press, pages 167-214.

Démurger, Sylvie, Fournier, Martin, Shi, Li, Zhong, Wei, 2006. Economic liberalization with rising segmentation in China's urban labor market. Asian Economic Papers 5, 58-103.

Dong, Xiao-yuan, 2003. China's urban labor adjustment: A literature review. Working paper, East Asia Human Development Sector Unit, World Bank.

Gottschalk, Peter, Smeeding, Timothy M., 1999. Cross-national comparisons of earnings and income inequality. Journal of Economic Literature 35, 633-687.

Hauser, Seth M., Xie, Yu, 2005. Temporal and regional variation in earnings inequality: Urban China in transition between 1988 and 1995. Social Science Research 34 (1), 44-79.

Katz, Lawrence F., Autor, David, H., 1999. Changes in the wage structure and earnings inequality. In O. Ashenfelter and D. Card, eds., Handbook of Labor Economics, Volume 3A, North-Holland, 1463-1555.

Katz, Lawrence F., Murphy, Kevin M., 1992. Changes in relative wages, 1963-1987: Supply and demand factors. Quarterly Journal of Economics 107 (1), 35-78.

Khan, Azizur R., Griffin, Keith, Riskin, Carl, Renwei, Zhao, 1992. Household income and its distribution in China. China Quarterly 132, 1029-1061.

Knight, John, Song, Lina, 1995. Towards a labour market in China. Oxford Review of Economic Policy, 11, 97-117.

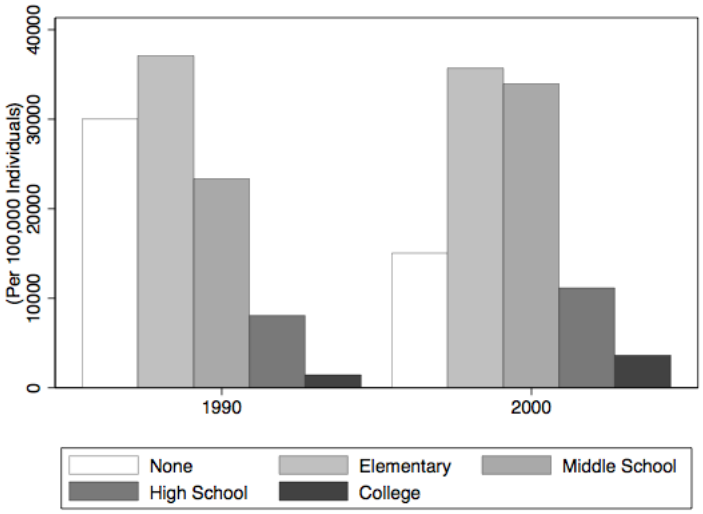
Lam, Kit-Chun, Liu, Pak-Wai, 2011. Increasing dispersion of skills and rising earnings inequality. Journal of Comparative Economics 39, 82-91.

Li, H., Zax, J., 2003. Labor supply in urban China. Journal of Comparative Economics 31, 795-817.

Li, S., C. Luo, Z. Wei, and X. Yue, 2008. The 1995 and 2002 Household Surveys: Sampling Methods and Data Description. Inequality and Public Policy in China, Cambridge University Press, New York, 337-353.

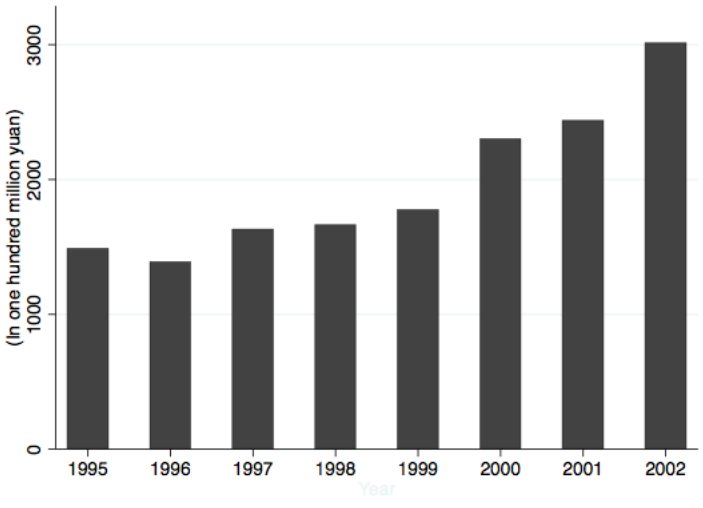
Zhang, Junsen, Zhao, Yaohui, Park, Albert, Song, Xiaoqing, 2005. Economic returns to schooling in urban China, 1988 to 2001. Journal of Comparative Economics 33, 730-752.

Figure 1: Number of Individuals by Level of Education



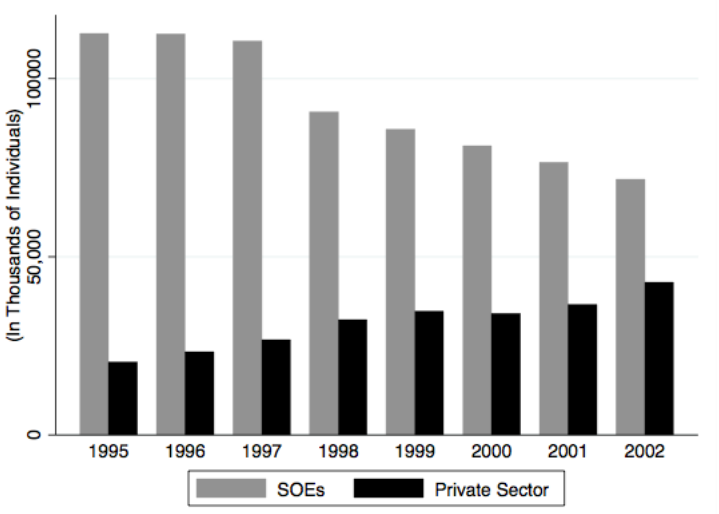

*Notes*: Data from the Chinese Population Census Public Report (I), No. 7 Education.

Figure 2: Total Value of Exports




*Notes*: Data from Table 17-4 of the 2003 China Statistical Yearbook.

Figure 3: Number of Employed Individuals by Firm Ownership Type




*Notes*: Data from Tables 5-4 and 5-16 of the 2003 China Statistical Yearbook.

Table 1: Average Real Earnings and Log Change in Earnings from 1995 to 2002 by Gender, Education, and Experience

| | Average Real Earnings | | Log Δ in |
|---|---|---|---|
| | 1995 Level | 2002 Level | Earnings |
| Gender: | | | |
| Female | 6,201.30 | 10,012.85 | 0.479 |
| Male | 7,373.73 | 12,338.25 | 0.515 |
| Education: | | | |
| 0-8 | 6,190.91 | 8,158.76 | 0.276 |
| 9-11 | 6,498.00 | 10,213.73 | 0.452 |
| 12-15 | 7,128.06 | 12,227.64 | 0.540 |
| 16+ | 9,283.43 | 15,969.95 | 0.542 |
| Experience: | | | |
| 0-9 | 4,936.33 | 9,336.06 | 0.637 |
| 10-19 | 6,272.31 | 10,603.58 | 0.525 |
| 20-29 | 7,521.94 | 12,442.80 | 0.420 |
| 30+ | 8,423.19 | 13,582.16 | 0.478 |

*Notes*: Authors' calculations of 1995 and 2002 Chinese Household Income Project data. Average real earnings are all shown in Chinese yuan.

Table 2: Log Changes in Earnings and Relative Labor Supply from 1995 to 2002 by Gender, Education, and Experience

| | Both Genders | | Females Only | | Males Only | |
|---|---|---|---|---|---|---|
| | Log Δ in Earnings | Log Δ in Supply | Log Δ in Earnings | Log Δ in Supply | Log Δ in Earnings | Log Δ in Supply |
| Gender: | . | . | 0.479 | -0.073 | 0.515 | 0.060 |
| Education: | | | | | | |
| 0-8 | 0.276 | -0.326 | 0.234 | -0.521 | 0.268 | -0.158 |
| 9-11 | 0.452 | -0.101 | 0.402 | -0.241 | 0.468 | 0.025 |
| 12-15 | 0.540 | 0.142 | 0.498 | 0.182 | 0.573 | 0.111 |
| 16+ | 0.542 | 0.470 | 0.567 | 0.665 | 0.546 | 0.376 |
| Experience: | | | | | | |
| 0-9 | 0.637 | -0.154 | 0.577 | -0.146 | 0.695 | -0.163 |
| 10-19 | 0.525 | -0.041 | 0.492 | -0.109 | 0.545 | 0.030 |
| 20-29 | 0.420 | 0.028 | 0.371 | -0.065 | 0.452 | 0.003 |
| 30+ | 0.478 | 0.275 | 0.578 | 0.146 | 0.440 | 0.322 |

*Notes*: Authors' calculations of 1995 and 2002 Chinese Household Income Project data.

Table 3: Log Changes in Earnings and Relative Labor Demand from 1995 to 2002 by Gender, Education, and Experience

| | Both Genders | | | | Females Only | | | | Males Only | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Log Δ in | Log Δ in Demand | | | Log Δ in | Log Δ in Demand | | | Log Δ in | Log Δ in Demand | | |
| | Earnings | Between | Within | Total | Earnings | Between | Within | Total | Earnings | Between | Within | Total |
| Gender: | . | . | . | . | 0.479 | 0.032 | -0.006 | 0.025 | 0.515 | -0.025 | 0.002 | -0.023 |
| Education: | | | | | | | | | | | | |
| 0-8 | 0.276 | -0.147 | 0.134 | -0.013 | 0.234 | -0.147 | 0.191 | 0.044 | 0.268 | -0.146 | 0.094 | -0.052 |
| 9-11 | 0.452 | -0.028 | -0.017 | -0.046 | 0.402 | 0.010 | -0.057 | -0.046 | 0.468 | -0.063 | 0.015 | -0.048 |
| 12-15 | 0.540 | 0.040 | -0.075 | -0.034 | 0.498 | 0.084 | -0.029 | 0.055 | 0.573 | 0.006 | -0.121 | -0.115 |
| 16+ | 0.542 | 0.112 | 0.164 | 0.276 | 0.567 | 0.073 | -0.045 | 0.027 | 0.546 | 0.093 | 0.252 | 0.346 |
| Experience: | | | | | | | | | | | | |
| 0-9 | 0.637 | 0.046 | 0.210 | 0.257 | 0.577 | 0.085 | 0.250 | 0.335 | 0.695 | -0.039 | 0.186 | 0.146 |
| 10-19 | 0.525 | -0.002 | 0.140 | 0.137 | 0.492 | 0.003 | 0.074 | 0.078 | 0.545 | -0.010 | 0.176 | 0.165 |
| 20-29 | 0.420 | -0.017 | -0.195 | -0.213 | 0.371 | -0.056 | -0.260 | -0.316 | 0.452 | -0.033 | -0.136 | -0.170 |
| 30+ | 0.478 | -0.045 | -0.171 | -0.217 | 0.578 | 0.038 | -0.133 | -0.094 | 0.440 | -0.080 | -0.200 | -0.280 |

*Notes*: Authors' calculations of 1995 and 2002 Chinese Household Income Project data.

Table A1: Cell Counts for the Pooled 1995 and 2002 CHIP Data

| | Number of Cells | | Individuals per Cell | | |
|---|---|---|---|---|---|
| | Possible | Actual | Min | Avg | Max |
| Supply: | | | | | |
| By gender | 4 | 4 | 4,017 | 4,828 | 5,374 |
| By education | 8 | 8 | 519 | 2,414 | 4,092 |
| By experience | 8 | 8 | 1,361 | 2,414 | 3,756 |
| By gender and education | 16 | 16 | 153 | 1,207 | 2,234 |
| By gender and experience | 16 | 16 | 439 | 1,207 | 1,992 |
| Demand: | | | | | |
| By gender | 96 | 95 | 1 | 204 | 2,209 |
| By education | 192 | 180 | 1 | 108 | 1,632 |
| By experience | 192 | 183 | 1 | 106 | 1,629 |
| By gender and education | 384 | 350 | 1 | 55 | 852 |
| By gender and experience | 384 | 351 | 1 | 55 | 875 |

*Notes*: Authors' calculations of 1995 and 2002 Chinese Household Income Project data. Cells with zero observations are automatically dropped from the sample. This causes the possible and actual counts of the number of cells to differ.

# Department of Economics, University of Alberta
# Working Paper Series

http://www.economics.ualberta.ca/en/WorkingPapers.aspx

| |
|---|
| **2011-22:** Tariff Pass-Through and the Distributional Effects of Trade Liberalization – **Ural Marchand** |
| **2011-21:** The Effect of Parental Labor Supply on Child Schooling: Evidence from Trade Liberalization in India – **Ural Marchand**, Rees, Riezman |
| **2011-20:** Estimating the Value of Medal Success at the 2010 Winter Olympic Games – **Humphreys,** Johnson, Mason, Whitehead |
| **2011-19:** Riding the Yield Curve: A Spanning Analysis – **Galvani, Landon** |
| **2011-18:** The Effect of Gambling on Health: Evidence from Canada – **Humphreys,** Nyman, **Ruseski** |
| **2011-17:** Lottery Participants and Revenues: An International Survey of Economic Research on Lotteries – Perez, **Humphreys** |
| **2011-16:** The Belief in the "Hot Hand" in the NFL: Evidence from Betting Volume Data – Paul, Weinbach, **Humphreys** |
| **2011-15:** From Housing Bust to Credit Crunch: Evidence from Small Business Loans – **Huang, Stephens** |
| **2011-14:** CEO Turnover: More Evidence on the Role of Performance Expectations – **Humphreys,** Paul, Weinbach |
| **2011-13:** External Balance Adjustment: An Intra-National and International Comparison - **Smith** |
| **2011-12:** Prize Structure and Performance: Evidence from NASCAR – Frick, **Humphreys** |
| **2011-11:** Spatial Efficiency of Genetically Modified and Organic Crops – Ambec, **Langinier**, Marcoul |
| **2011-10:** Unit Root Testing with Stationary Covariates and a Structural Break in the Trend Function - **Fossati** |
| **2011-09:** CDS as Insurance: Leaky Lifeboats in Stormy Seas – **Stephens,** Thompson |
| **2011-08:** Game Attendance and Competitive Balance in the National Hockey League – Coates, **Humphreys** |
| **2011-07:** Rationalization in the Canadian Retail Gasoline Industry: The Role of Environmental Regulations – **Eckert, H; Eckert, A** |
| **2011-06:** Physical Activity and Health Outcome: Evidence from Canada – **Humphreys,** McLeod, **Ruseski** |
| **2011-05:** Dating U.S. Business Cycles with Macro Factors – **Fossati** |
| **2011-04:** Covariate Unit Root Tests with Good Size Power – **Fossati** |
| **2011-03:** New measures of the costs of unemployment: Evidence from the subjective well-being of 2.3 million Americans – Helliwell, **Huang** |
| **2011-02:** Childhood Determinants of Risk Aversion: The Long Shadow of Compulsory Education – **Hryshko,** Luengo-Prado, |
| **2011-01:** Will Biofuel Mandates Raise Food Prices? – **Chakravorty,** Hubert, Moreaux, Nostbakken |
| **2010-20:** Does the Retirement Consumption Puzzle Differ Across the Distribution: - Fisher, **Marchand** |
| **2010-19:** A Test of Monopoly Price Dispersion Under Demand Uncertainty – **Humphreys,** Soebbing |

**Please see above working papers link for earlier papers**