The Growth of Wage Inequality in Urban China, 1988 to 1999[1]

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Abstract

Using annual urban household survey data from 6 provinces in different regions of China, we analyze the rapid increase in inequality of China's urban wages from 1988 to 1999. We describe inequality trends and decompose the changes into those due to changes in the distribution of worker attributes and those due to changes in the returns to those attributes. We find that rising returns to unobserved skills, growing regional wage disparities, and rising returns to education explain most of the inequality increase.

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1. Introduction

Since economic reforms began in 1978, China has experienced one of the fastest increases in income inequality in the world.[2] Although transition economies in Eastern Europe also saw rapid growth in inequality, none have yet reached China's level of inequality.[3] Inequality trends in China reflect fundamental changes in the way labor is allocated and rewarded in China's transitional economy. China has moved from a socialist planned economy with fixed wage scales and virtually no labor mobility to a market-based system featuring a dynamic non-state sector and an increasingly open labor market. China's largely successful rapid economic and social transformation make changes in China's wage inequality over this period of particular interest, especially given the tension between widening disparities and the government's consistent espousal of a socialist ideology. However, in contrast to the U.S. where growing wage inequality has been studied in great detail, there has been surprisingly little analysis of rising inequality in China using detailed micro-level data over time.[4] In light of the fact that China accounts for roughly 20 percent of the world's population, understanding the nature and causes of China's recent growth in inequality is critical for understanding changes in world inequality.

In this paper, we analyze the changes in wage inequality that have occurred in China's urban areas from 1988 to 1999 using annual household data from six provinces

[2]The World Bank (1997) finds that China's overall gini coefficient grew from 0.288 in 1981 to 0.388 in 1995, and that the rate of increase was similar in urban and rural areas. The gini coefficient rose 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.

[3]See Rutkowski (2001) for an updated review of inequality trends in Central Europe.

[4] An important exception is the set of studies from the China Income Project based on surveys in 1988 and 1995 (Riskin et al., 2000).

provided by China's National Statistical Bureau. We focus on wages rather than earnings in order to better evaluate the performance of the formal labor market and to better assess explanations related to changes in labor supply and demand. Despite some limitations which we discuss below, the large-sample repeated cross-sectional data makes it possible to go considerably beyond existing studies in describing and analyzing the sources and timing of wage inequality changes in post-reform China.

The overall change in the distribution of wage income is illustrated in Figure 1, which plots kernel density estimates for the years 1988, 1992, 1994, 1997, and 1999. It is clear from this figure that mean incomes have increased steadily, and the distribution around the means has flattened considerably. The most noticeable change in the distribution occurred between 1992 and 1994. Table 1 reports summary wage inequality measures by year for our dataset, which we describe in greater detail below. By any measure, wage inequality increases significantly from 1988 to 1999, consistent with earlier studies. The gini coefficient increases from 0.244 to 0.359, the coefficient of variation from 0.486 to 0.752, the standard deviation of log wages from 0.456 to 0.658, and the Theil entropy index from 0.102 to 0.221. The timing of greatest increase varies somewhat across measures, which is to be expected since each weights different parts of the distribution differently. However, in general the inequality measures confirm the pattern seen in Figure 1. Increases in inequality are greatest from 1992 to 1994, and are also substantial from 1997 to 1999.

Our goal in this paper is to describe and evaluate the sources of growing wage inequality in urban China. In section 2, we first introduce the labor market and broader economic changes likely to affect wage inequality to form testable hypotheses about the

sources of wage inequality growth. After describing the data in section 3, in section 4 we first document the overall trends in the income distribution from 1988 to 1999. We then examine within-group inequality, defining groups by education, experience, region, and ownership, and find that the trend in different types of within-group inequality are very like that of overall income inequality. In section 5, we present the building blocks of our decomposition analysis of the changes in wage inequality. We examine trends in observable characteristics of the labor force (quantity changes), changes in the returns to observable characteristics such as education and experience, and finally changes in the quantity and price of unobservable characteristics. This leads us to a formal decomposition analysis of the relative importance of these different factors. In section 6, we conduct additional tests to examine the effect of supply and demand factors on wage inequality. Section 7 concludes.

2. Economic reform and the labor market

In transition economies, the dominant factor influencing wage outcomes has been the reform of labor market institutions, which accompanied reforms that promoted open product market competition, greater managerial autonomy, and eventually the restructuring of state-owned enterprises, involving massive layoffs. China introduced markets for outputs and inputs to most of the industrial sector in the mid-1980s, but nearly all urban jobs continued to be allocated by government labor bureaus at least until the early 1990s. Government assignment of urban jobs continued in some areas throughout the 1990s. Decentralization reforms gave greater decision-making autonomy and pay incentives to enterprise managers in the mid-1980s, and allowed state firms to hire workers to short-term

contracts rather than provide permanent employment (Groves et al., 1995). However, even by the early 1990s, employment decisions within state-owned firms showed little responsiveness to changing market conditions (Benjamin, Brandt, and Yuen, 2001). There was substantial liberalization of the economy during the rapid growth episode following Deng's southern trip in 1992, when many workers left state employment to jump into the ocean (*xiahai*) and many state-owned units expanded into a range of commercial activities. Finally, beginning in 1997, the government moved forward with aggressive restructuring and privatization of state-owned enterprises, leading to substantial layoffs, retirements, and exits from the labor force (Giles, Park, and Cai, 2003). From 1997 to 2001, over 45 million laborers left the state sector, and the labor force participation rate fell significantly.

Together, these changes have fundamentally altered how the labor market operates in urban China. These institutional changes rightfully receive greatest attention in explaining rising returns to education and skills during the reform era. Unfortunately, this focus obscures the importance of other processes that also may have had large effects on wage inequality. In the U.S., explanations for rising wage inequality have focused on three factors: skill-biased technical change, international trade, and labor market institutions (Katz and Autor, 1999). Evidence that rising inequality is associated with growing returns to skill, both observed and unobserved, even within relatively narrowly defined sub-sectors of the economy have led many to conclude that skill-biased technical change is the main culprit (Juhn, Murphy, and Pierce, 1993; Bound and Johnson, 1992). China, like the U.S. has seen rising skill premiums despite the fact that the workforce has become much more educated over time. New technologies have been introduced rapidly, with foreign direct investment in

China accounting for a substantial share of fixed investment capital. China has also seen a dramatic increase in trade's share of GDP, which would be expected to increase the premium to low-skilled workers if China's exports are intensive in low-skilled labor. Finally, despite the aforementioned reforms, evidence suggests that substantial barriers to labor mobility remain. These include restrictions on residential mobility, high nonwage benefits linked to employment in the state sector, and discrimination against labor migrants.

It is nearly impossible to identify the separate effects of these various factors on wage inequality. Nonetheless, this paper attempts to document the stylized facts of China's remarkable growth in wage inequality, and to the extent that the data allow, begin assessing the likely relative importance of different sets of factors.

3. Data

We use wage data from annual urban household surveys (UHS) conducted by the National Bureau of Statistics (NBS) from 1988 to 1999. The NBS urban sample frame includes households in all urban areas, including cities of all sizes, and is designed to be representative at the provincial and national levels. The data includes all NBS survey households from six provinces: Beijing, Guangdong, Liaoning, Shaanxi, Sichuan, and Zhejiang.[5][6] These six provinces are roughly representative of China's different regions. Beijing is in North-Central China, Guangdong and Zhejiang are coastal provinces, Liaoning is in the Northeast, Shaanxi is in the Northwest, and Sichuan is in the Southwest.

Wages are defined to include base wages, bonuses, and subsidies, and excludes

[5] All members of the households are included in the survey.
[6] Although Beijing is a city, it enjoys the same administrative status as a province. We call it a province in this paper to simply terminology.

capital and transfer incomes. These data are based on self-recorded diaries reported monthly, and so are likely to be more accurate than recall surveys. However, the NBS only includes annual wages in the data files and working hours are not reported. This precludes the possibility of constructing hourly wage rates as is common in many analyses in other countries. To reduce bias from variation in labor hours worked, we exclude individuals who are most likely to be part time workers, including students, the disabled, re-employed retired workers, workers younger than 16 and older than 60,[7] and self-employed workers. We note that for prime-age adults, full-time work is the dominant form of employment and self-employment is relatively uncommon. We further exclude all workers earning less than half of minimum wage.[8] Applying these criteria yields a sample 80,312 workers over the 12 years. Table 2 describes the sample distribution and Table 3 presents some descriptive statistics of the sample. We deflate incomes using provincial urban CPIs, with all incomes reported in terms of 1988 yuan. Wherever appropriate, we weight the sample based on the sampling rate for each province, i.e., sample size divided by urban labor force, and by the number of working-age adults in the sample, to correct for bias from household rather than individual sampling.

The data have several limitations which should be kept in mind in interpreting results. First, the NBS urban survey is restricted to households that have urban residence permits (*hukou*), so does not include migrants working in cities.[9] The survey also excludes

[7] Age 60 is official retirement age for male managers. Female workers retire at 50 and male workers and female managers at 55.
[8] Juhn et al. (1993), Katz and Murphy (1992) and Katz and Autor (1999), among others, also apply this sample exclusion rule. Although China started implementing a minimum wage system since 1995, we have information on minimum wages only for the last two years, 1998 and 1999. Because China experienced rapid growth rate of real incomes in our data period, we discount the average of real minimum wage in 1998 and 1999 by the wage growth rate between an earlier year and 1998-99 to derive the implied minimum wage in previous years.
[9] Because urban resident permits are under strict ration allocation in our data period, the survey effectively

workers residing in rural areas who are engaged in wage employment. This sampling approach results from China's unique administrative separation of urban and rural residents, which NBS surveys using separate sampling frames and questionnaires. However, since most wage employment is in urban areas and most wage workers are urban residents, the data should accurately capture major changes in wage inequality. But strictly speaking, the results apply only to China's registered urban residents.

Another limitation is that we do not have data before 1988, even though China's economic reforms began in 1978. NBS did not rejuvenate its national survey apparatus until the mid-1980s and 1988 is the first year for which the sample and questionnaire data were comparable to later years. We note that nearly all of the major changes to China's labor allocation system occurred after 1988, as did many of the other changes described above (e.g., trade and FDI growth), so that the data should capture the main period of wage inequality increase.

4. Trends in wage inequality

In this section, we first provide an overall description of wage inequality. We then divide the sample into groups and examine changes in within-group and between-group wage inequality.

4.1. Overall trends

Figure 2 describes the wages from 1988 to 1999 for different parts of the skill distribution in 1988. Real annual wages at the 10^{th} percentile, the median, and the 90^{th}

follows a relatively fixed group of people, which helps to rid of effects on inequality caused by changing composition of the population.

percentile all increased during the past 12 years but the rates of increase were different. The 90th percentile more than tripled, increasing from 2,864 yuan in 1988 to 8,697 yuan in 1999 (in 1988 yuan), while earnings at the median more than doubled, increasing from 1,704 yuan in 1988 to 3,431 yuan in 1999. Earnings at the 10th percentile increased only by a half, from 910 yuan in 1988 to 1,391 yuan in 1999.

Figure 3 plots the annual percent growth in real wages from 1988 to 1999 for each percentile of the wage distribution. All percentiles experienced wage gains during the period, but higher percentiles experienced larger wage gains. Thus, inequality has not been a story of the rich getting richer and the poor becoming poorer, but rather the rich getting richer faster than the poor. To put the magnitude of these differences in perspective, consider that Juhn et al. (1993) found that the difference in wage growth at the top and bottom of the U.S. wage distribution to be about 45 percent from 1964 to 1988, or less than two percent per year. Our Figure 3 shows that in China this annualized difference was about eight percent per year, or four times greater than in the U.S.

Figure 4 depicts the trend of wage inequality by reporting log wage differentials between the 90th and 10th percentiles, the 90th percentile and the median, the 75th percentile and the 25th percentile, and the median and the 10th percentile. Using the 90th and 10th percentiles as an example, wage differentials are calculated as $\ln(W_{90}) - \ln(W_{10})$. By all of these measures, the rise in wage inequality was substantial. The 90th-10th percentile log wage differential increased from 1.15 in 1988 to 1.83 in 1999. Comparing the 90-50 and 50-10 differentials, we find that at the beginning of the period, the lower half of the income distribution had more dispersion than the top half, but this reversed after 1991. The 50/10

differential rose briefly in 1994 and again after 1997, approaching the level of dispersion in the top half of the distribution. In China, 1994 was a year of relative slowdown and monetary tightening, and 1997 saw the beginning of major state-owned enterprise restructuring.

From Figure 4, we see that inequality rose most rapidly from 1992 to 1994 but that the rising trend continued until the end of the data period. In Figure 5, we break down the percentile wage growth reported in Figure 3 into sub-periods, and see again that by far the most rapid increase in inequality occurred during the 1992 to 1994 period. The first period, 1988 to 1992 also saw relatively greater gains at the top end of the wage distribution. The most recent period, 1997 to 1999, has seen noticeably smaller gains for the bottom part of the distribution, and a general trend of the richer getting richer, except for at the very top end of the distribution.

Table 4 presents additional measures of wage inequality for 5 different years: 1988, 1992, 1994, 1997, and 1999. Measured by the standard deviation of log annual wages, we find continuous increases in inequality, especially from 1992 to 1994 (0.50 to 0.63), when nearly all wage percentile differentials widen sharply. For example, the log wage differences between the 90^{th} and 10^{th} percentiles jump from 1.33 to 1.73 in these two years, accounting for 58 percent of the total increase from 1.15 in 1988 to 1.83 in 1999. There is little change in many of the percentile differentials from 1994 to 1997, but a resumption of divergence across the board from 1997 to 1999.

4.2. Within and between group trends

Next, we move beyond overall wage inequality to examine how inequality has changed within groups and between groups of the population. We are interested in knowing whether inequality has increased more in certain groups than in others, and whether changes in between-group differences have been more or less important to overall trends than changes in within-group inequality. There are, of course, many ways to divide the working population into groups. In this section, we define groups using a number of criterion, each of which has salience for understanding labor market changes over time: experience, education, gender, region, ownership, and occupation.

Experience

Because our data do not report actual work experience, we follow the literature and define experience as potential experience, calculated as age minus years of schooling minus 6. This is probably a good approximation for urban China where the labor force participation rate has been very high for both male and female workers. We group workers into four experience groups: 1-10 years, 11-20 years, 21-30 years, and 31-40 years. Figure 6 presents annual average growth rates of real wages from 1988 to 1999 for each wage percentile of each experience cohort. One way to interpret this type of figure is to view the slope of the lines as reflecting within-group inequality growth and the mean distance between lines as between-group differences. In Figure 6, each line is upward sloping, signifying that inequality rose within each experience cohort. Also, lines for younger cohorts lie above those for older cohorts, so younger cohorts experienced larger wage increases than older cohorts at every percentile. These differences were greater at the lower

percentiles, suggesting faster growing youth premiums among the poor.[10] At the median percentiles, the gap between the youngest cohort (1-10 years) and the oldest cohort (30+ years) is 0.03, meaning that the annual growth rate of wages for the youngest cohort is 3 percentage points higher than the oldest cohort over the period. If older cohorts earn more than younger cohorts, this should reduce overall wage inequality.

Figure 7 plots the trend of the 90th and 10th percentile wage differential for the four experience groups. Younger cohorts exhibit greater wage dispersion over time but the gap with other cohorts declined, suggesting that the poorest members of the youngest cohort had larger wage gains relative to other cohort members than the poorest members of higher experience cohorts. This is consistent with the slope differences in Figure 5. Also, in line with the upward slopes in Figure 5, Figure 6 shows that wage inequality increased for each experience cohort. The period of most rapid inequality growth was 1992 to 1994, coinciding with the overall trend.

Education

The trends in wage differences within and between educational groups are both increasing. The upward slopes of the lines in Figure 8 illustrates that within each educational group, inequality has increases tremendously. Also, wages of the median worker with college education and above grew by 6.3% over the period, which is 1.6 percentage higher than the growth rate of the median junior high school graduate, widening wage inequality. Figure 9 shows that wage differentials within educational groups increased rapidly in the early 1990s.

[10] Note that this is different from the U.S. experience in 1963-1995 (Autor and Katz, 1999)

Rising educational premiums might also help explain the increase in within-experience group wage differences is rising returns to educational attainment. It is less likely that rising experience premiums can explain increases in within-education group differences, because experience premiums have generally fallen over time. To explore these possibilities, Figures 10 and 11 examine wage changes within education-experience cohorts. For simplicity, we restrict attention to the interaction of two cohorts--a younger experience cohort (1-10 years) and an older experience cohort (21-30 years), and two education groups--college and above, and high school. For each education-experience group, we again plot annual real growth in wages against percentile rankings within the group's wage distribution.

One striking aspect of Figures 10 and 11 is that all of the lines are upward sloping, suggesting that inequality is increasing even within groups of individuals with similar education and experience. For the younger experience cohort, for most of the wage distribution, the group with college education and above experienced higher wage growth than the senior high group, although the difference is substantial only for the top 25 percent of the distribution (Figure 10). For the older experience cohort, the college educated group had higher wage growth than the senior high group at both ends of the distribution, and similar growth in the middle wage range (Figure 11). Overall, the education premiums within experience groups are positive but much lower than for the whole population. Thus, education can account for some but not all of the increase in within-experience group inequality.

Gender

In Figure 12, we graph real annual growth wages by percentile broken down by

gender. Not surprisingly, we find growing inequality for both men and women as seen in the upward slopes of both lines. Interestingly, the growth in inequality is greater for women than men, perhaps because of new opportunities for women in the labor market, or selection effects related to labor force participation. In Figure 13, we plot the mean real wages of men and women. The wages show a similar pattern of increase, without a pronounced increase or decrease in the gender gap.

Region

Figure 14 plots the annual real wage growth rate for each province for different percentiles of the wage distribution. Again, all of the lines are upward sloping which indicates that inequality has increased within each province. This is confirmed in Figure 15, which also shows that the rapid rise in within-region wage inequality occurred mainly after 1992.

What is even more striking in Figure 14 is the large mean differences in growth rates across provinces, with Guangdong's wage growth far greater than the other provinces at every percentile. Guangdong's median real wage growth rate has been a remarkable 9.6% over the entire period. Zhejiang is the second fastest growth province, followed by Beijing, Sichuan, Liangning and Shaanxi. The median real wage growth rate of the slowest growing province, Shaanxi, was 3.7%, nearly 6 percentage points lower than Guangdong. Because the growth rate rankings correspond exactly with the rankings of wage levels across provinces, growing regional wage differences are likely to significantly increase overall wage inquality growth.

Ownership

Many people point to dismantling of the state sector as a key to freeing up the labor market, so it is worthwhile to look carefully at wage patterns by ownership type. Figure 16 plots average annual rate of real wage growth for workers in the three ownership categories. At every percentile of their respective wage distributions, the state-owned units gained over their collective counterparts. At the median distribution for both, the difference is 1.7 percentage points. In non-public enterprises, workers in the lower half of the distribution had higher wage growth than collective workers, but the upper half had lower growth rates, except for the very top five percent. Figure 14 also confirms the growing wage dispersion within state-owned and collective units. Take the state-owned units for example, For the state sector, wages of the 10^{th} percentile grew by 2.1%, while wages of the 90^{th} percentile grew by 9.9%. The pattern for non-government enterprises is very different: the poorest 25 percent of workers had higher wage growth than the rest of the distribution, except for the top 5 percent.

Figure 17 plots 90^{th}-10^{th} percentile log wage differences for workers belonging to three different ownership categories: state-owned units, urban collectives and non-public ownership. Because the sample size for the non-public group was very small before 1992, we focus on the period 1992 to 1999. The figure shows that at the beginning of the period, wage inequality was very large within the non-public sector, but declined dramatically over time. On the other hand, inequality within state-owned units and collective enterprises went up steadily. One explanation for this convergence is institutional development in the labor market in the 1990s, which over time equalizes the returns to unobserved skills across sectors, even though at this point we have yet to control for other observable worker

attributes. In our sample, the percentage of workers employed in the non-public sector increased from only 3.1% in 1992 to 11.4% in 1999 (Table 3). For publicly owned enterprises, reforms freed up wage-setting restrictions, allowing for greater wage dispersion reflecting productivity differences. This interpretation is consistent with the finding that the returns to education increased as rapidly in the state-sector as in the non-public sector (Zhang and Zhao, 2002). However, it could also relect growing differences in the economic performance of state-owned enterprises over time, which could increase wage dispersion of a random nature if workers are not mobile.

Occupation

Next, we look at inequality trends by occupation type. We focus on two types of workers, manual workers and technicians, which roughly correspond to blue collar and white collar workers, respectively. [need note on definition, and percent of sample accounted for by each group in beginning and end years] Figure 18 presents annual wage growth by percentiles, separately by occupation. First, we note again that inequality increased significantly within each occupation group. Overall, except for the lowest 10 percent of the distribution, technicians gained relative to manual workers. The gain was larger for workers at higher percentiles. Figure 19 shows that overall wage dispersion measured as log wage differential between 90^{th} and 10^{th} percentiles was larger among manual workers than among technicians. but the increase in inequality was much faster for technicians. These patterns are consistent with rising returns to skilled workers, and are unambiguously inequality increasing.

Unobserved skills

Emerging from within group analyses is a general pattern that there has been substantial increase in inequality within nearly all groups. This points to increasing importance of unobservable skills. By definition, unobservable skills cannot be measured directly. Here we follow the methodology of Juhn et al. (1993) who define unobserved skills to be the residuals from a regression of the logarithm of wages on a flexible specification of education and experience terms.[11] To account for substantial regional labor market segmentation in China, we also include regional dummy variables and allow them to interact flexibly with education and experience. The goal is to extract all of the "observable" information from the wage data, so that the residual can more justifiably be considered to reflect unobserved skills.

Table 5 presents the standard deviations of the residuals as well as various measures of residual inequality over time. The standard deviation increased substantially, from 0.33 in 1988 to 0.47 in 1999. The rise in residual inequality holds for all measures of inequality. As for overall inequality, the largest growth in residual inquality also occurred between 1992 and 1994. This suggests that unobservable factors are increasingly important in determining wages. Given the rapid changes in the labor market, this is not surprising since market mechanisms will increasingly reward workers by their productivity instead of (observable) credentials. This should not only be reflected in wage setting within firms, but also in employment choices, since more able, entrepreneurial workers are more likely to find employers that reward such characteristics.

One potential objection to this interpretation is that the result is not due to rising

[11] We run separate regressions for male and female workers, each consisting of education dummies, a quartic of potential experience fully integrated with education and regional dummy variables. We omit job type variables because they are endogenous to job choice which is likely to be correlated with unobserved attributes.

prices of unobservable skills but to rising dispersion of unobserved ability over time due to larger ability dispersion within recent market entrants. To evaluate this hypothesis, we examine whether more recent cohorts have larger wage inequality compared to older cohorts independent of general rise in wage inequality over time. To do this, we examine changes in wage inequality within synthetic cohorts where inequality is represented by log wage differences between workers at 90^{th} and 10^{th} percentiles. In Table 7, we present inequality by birth cohorts at an interval of six years. We follow a certain birth cohort by moving horizontally from left to right and follow an experience group by moving upward along a diagonal. Within a birth cohort, the increase in inequality over time is due to two effects: age/experience effect and time effect. The former arises because when a cohort becomes older or more experienced, inequality within the cohort may change. Within an experience group, the change in inequality is also due to two effects: cohort effect and time effect. The former may arise because each year the group comes from a different birth cohort and these cohorts may have different inequality due to larger dispersion of ability. Because the time effect is present in both directions, by comparing changes along the horizontal line and the diagonal, we can eliminate the time effect.

From Table 7, we can see that changes along the diagonal and the horizontal lines are quite similar. Take the 1968-72 market entry cohort for example, the 90^{th}-10^{th} percentile log wage differential increased from 1.26 in 1989 to 1.93 in 1994 and 1.86 in 1999, and the differential for new market entrants increased from 1.26 in 1989 to 2.07 in 1994 and 1.76 in 1999. Patterns for other birth cohorts are similar. The bottom two rows of the table present the average change across all birth cohorts and experience groups. As is shown, on average,

the changes in inequality within birth cohorts between 1989 and 1994 was 0.65, and that within all experience groups in the same period was 0.71. Between 1994 and 1999, within birth cohort change was 0.06 and within experience group change was 0.09. These numbers show that not only are the magnitudes of within birth cohorts and experience groups similar to each other, the timing of the changes is also similar.

This result means the age/experience and birth cohort effects are either both close to zero or equal to each other. As we have seen in Figure 6, at various cross sections, older groups actually have smaller wage inequality than younger groups. Over time, for nearly all age/experience groups, the rise in inequality was similar, with the only exception for new market entrants who had a slower growth. For new market entrants to have larger dispersion in unobservable ability, their wage inequality should have increased faster instead of smaller. Therefore, we conclude that the large increase in dispersion of residual wage is not due to increased dispersion of unobserved quality, but to an increase in the price of unobservable skills.

5. Accounting for rising wage inequality

A main message of Section 4 is that wage inequality has increased significantly overall and within nearly every sub-group of the population. Differences between groups defined by education, region, and occupation have also grown substantially. In this section we introduce a multivariate framework to more clearly identify the contributions to growing inequality due to different observable and unobservable worker attributes. The effect of any given factor can be decomposed into two parts: quantity effects and price effects. The former arises because of changes in the distribution of attributes in the population of workers.

For example, there could be greater inequality in educational attainment which widens disparities if there is a positive return to education. The latter may arise because of changes in the value attached to different characteristics, e.g., higher returns to education over time. We examine these two effects in turn and then decompose the overall changes in inequality into changes in observable and unobservable quantities and prices.

5.1 Quantity effects

How have characteristics of the labor force changed over time, and can these changes help explain growing inequality? Table 3 provides summary information on key sample characteristics. The average age (and potential experience) of the population has increased over time, from 36.8 to 39.4, which could be due to changing demographics associated with China's strict one-child family planning policy. Aging of the sample could also be a cause, although this is unlikely given NBS's periodic rotation of sampled households. With fewer young workers who make relatively less than older workers and so are at the tail of the wage distribution, this change is likely to reduce inequality.

There is a very dramatic increase in the educational attainment of the workforce. The share of workers with college education or above increased from 12 percent in 1988 to 26.8 percent in 1999 while those with junior secondary and primary education fell from 41 and 11.8 percent to 26.2 and 3.7 percent over the same period. These changes put much more of the distribution in the higher end, compared to a previous distribution centered strongly around junior and senior high school education, which could widen inequality. This is especially true if college premiums are high.

The gender and regional distribution changes relatively little over time and so are not expected to contribute substantially to inequality. The percentage of men increases very slightly from 51.1 to 52.7 percent over the 11 years. The sample is weighted to account for changes in provincial urban populations over time. There is slightly faster growth in the labor force size of richer provinces than poorer provinces, which should increase inequality. Finally, in terms of job types, in our sample we see only a small reduction in the size of the state sector, a decline in the collective sector, and an increase in the non-public sector. Since the non-public sector, which includes joint ventures, generally has higher wages, this change should be in inequality-increasing. We defer discussion of occupation and sector changes to later.

5.2 Price effects

In addition to changes in quantities, changes in prices of skills can also influence inequality trends. For example, the returns to education in urban China have increased dramatically from 1988 to 1999 (Table 6).[12] Due to the positive correlation between wages and education, this is likely to raise inequality. In this section, we compute the prices of education and other attributes, defining the prices as coefficients from wage regressions estimated for each year. We estimate two specifications for log wages. The first includes educational dummy variables, potential experience, experience squared, a gender dummy, and regional dummy variables as regressors. The second adds job-related dummy variables for ownership, occupation, and sector.

[12] See more detailed discussion in Zhang and Zhao (2002), who use the same data set but apply somewhat different sample restriction criteria.

Results from both specifications show clearly that the returns to education have risen rapidly, with the largest increases for college education and above. With primary school education and below as the reference group, the coefficients for junior high school declined over time, those for senior high school increased slightly, those for technical school increased by 20 percentage points over the 11 years, and those for college and above increased by 31 percentage points.[13][14] The coefficients, or prices, in each year are plotted in Figure 21.

In contrast to education, returns to potential experience declined over time (also see Figure 22). The marginal return to a year of experience (evaluated at sample means) declined from 2.0% in 1988 to 1.3% in 1999. The declining importance of potential experience can be seen from age-earnings profiles for male and female workers in Figures 23 and 24. The wages for both male and female workers were monotonically increasing with age at the beginning of the period. However, by 1999, the age-earning profiles became more concave, with largest increases occurring in the early period of the work life, and then flattening out by age 30.

Table 6 also shows that gender wage gap has increased in our data period. Controlling for education, experience and regional differences, men earned 10.5% more than women in 1988, increasing to 13.1% in 1999. Growing regional wage differences can be seen in Figure 25, which plots coefficients of provincial dummy variables with Sichuan being the reference province. We can see that Guangdong is the richest province and leads

[13] If we use years of schooling as a continuous variable in the model (not shown in the paper), the coefficient increases from 4.3% in 1988 to 9.9% in 1999.
[14] Zhang and Zhao (2002) shows the rising returns to education are robust across experience cohorts, gender, and within regional and ownership groups.

other provinces in income growth. Guangdong is followed by Zhejiang and Beijing, which also gained relative to Sichuan province in the 1990s. The northeastern province Liaoning stagnated in the period relative to Sichuan, while the northwestern inland province Shaanxi fell behind.

Next we examine wage differences due to job attribute variables included in the second specification. The coefficients of gender, education and experience are all reduced in comparison to the specification excluding job attribute variables, as expected. Coefficients for the three sets of dummy variables are plotted in Figures 26-28. Compared to state-owned units, workers in urban collectives suffered wage losses over the period (Figure 26). The sample sizes for non-public enterprises were too small before 1992 to have much meaning, but after 1992, the non-public sector consistently paid higher wages than state-sector workers.[15] Figure 27 plots coefficients of five occupations relative to manual workers. The ranking of wages is as follows: cadres working in government agencies and managers of enterprises, technicians, office clerks, sales staff, and low-level service personnel. The only clear trend is that retails sales and low-level service seem to have lost out in the late 1990s. This may reflect the intensification of competition in retail trade and services in that period.

Figure 28 shows that there were significant changes in relative wages across sectors over the period. The most notable gaining sectors were education, arts and media, and government (including semi-government organizations), which are sectors that have a high concentration of college graduates. Transportation, and post and telecommunications, two

[15] Caution is needed when interpreting these results – we do not have information on non-wage benefits such as housing, pension and health care in this data set. As is shown in Zhao (2002), total earnings including non-wage benefits were still higher in the state-sector for unskilled workers in the mid-1990s.

sectors that traditionally enjoy monopoly powers and higher salaries, also gained in the 1990s, which also may partly be due to improved technology in those sectors. The only sectors that did not show any wage gain over manufacturing was retail, food, and logistics.

5.3 Decomposition of the changes in wage inequality

Next, we decompose the changes in wage inequality into quantity and price effects, following the methodology in Suen (1997) and Juhn et al (1993). The quantity effects are changes in the distribution of worker attributes over time, and the price effects are changes in the returns to those attributes. We first estimate cross-sectional regressions of the log real annual wages on regional dummies, a gender dummy, education dummies, and experience and experience squared. The estimated equation can be written as follows:

$$Y_{it} = X_{it}\beta_t + u_{it} \quad (1)$$

Here, Y_{it} is the log of real annual wages for individual i in year t. X_{it} is the vector of worker characteristics described above (or quantities), β_t are the regression coefficients (or prices), and u_{it} are unobservable returns to skill that are uncorrelated with the X_{it}. As in Suen (1997), we decompose the error term into two parts: the standard deviation of the residuals (σ_t) and the normalized residuals with mean zero and variance equal to one (θ_{it}). The former can be considered a price, the latter a quantity.[16] Then equation (1) can be re-written as follows:

$$Y_{it} = X_{it}\beta_t + \sigma_t\theta_{it} \quad (2)$$

[16] Wing Suen (1997) has criticized this decomposition method, arguing that it is only reasonable if the standard deviation of the residuals is independent of the percentile ranks of the workers. We have examined the distribution of the residuals and find that the residuals at the 10th, 50th, 90th percentiles have similar standard deviations.

In each year, we decompose log wage differentials at the 90th-10th, 90th-50th, and 50th-10th percentiles of the wage distribution. Each wage differential can be expressed as follows:

$$\Delta Y_t = \Delta X_t \beta_t + \sigma_t \Delta \theta_t \quad (3)$$

where ΔY_t is the log wage differential in year t, ΔX_t is the vector of the average differences in observable characteristics between workers at the two percentiles, $\Delta X_t \beta_t$ is the inner product of the vector of differences in the observable characteristics and the vector of their corresponding returns, $\Delta \theta_t$ is the average difference in percentile rankings of the residuals, and $\sigma_t \Delta \theta_t$ is the product of the standard deviation and the average difference in percentile rankings.

The change in wage inequality between two years t and t' can be expressed as follows:

$$\Delta Y_{t'} - \Delta Y_t = (\Delta X_{t'} - \Delta X_t)\beta_t + \Delta X_{t'}(\beta_{t'} - \beta_t) + (\Delta \theta_{t'} - \Delta \theta_t)\sigma_t + \Delta \theta_{t'}(\sigma_{t'} - \sigma_t) \quad (4)$$

The first term on the right hand side captures the effect on wage differentials of changing distributions in observable characteristics given fixed prices. The second term is the effect of changing prices of observable skills holding constant the distribution of observable skills. The third term measures the effects of changes in the average percentile rankings of wage residuals given a fixed price of unobserved skills, and the final term represents the effects of changes in the price of unobservable skills holding the distribution of those skills fixed.

Decomposition results are presented in Table 8. We present results for the 90th-10th, 90th-50th, and 50th-10th wage percentile differentials for the period 1988 to 1999, as well as the results for the 90th-10th wage percentile differential for four sub-periods. Each percentile

group is defined to include all individuals within 10 percentile rankings. For example, the 90th percentile includes individuals with percentile rankings ranging from 80 to 100. In panel A, we present results for the specification described above, and in panel B, we add additional variables for ownership, occupation, and industry to see if changes in the distribution of job types and the returns to different jobs explains a substantial share of inequality growth. We recognize that the coefficients on these variables must be interpreted with caution since they are endogenous to job choices which may reflect individual unobservable characteristics.

We focus first on the results in panel A of Table 8. First, examining the changes in the log wage differentials (first row), we find that most of the total increase in wage inequality as measured by the 90th-10th percentile wage differential (0.712) occurred in the top half of the distribution (0.452 change in the 90th-50th wage percentile differential compared to 0.259 for the 50th-10th percentile log wage differential), and a majority of the increase from 1988 to 1999 occurred during the 1992-1994 period (0.378), followed by the 1988-1992 period (0.213).

Second, all of the increase in inequality is attributable to changes in prices. Changes in quantities actually reduced the 90th-10th percentile wage differential over this period (-0.099 for observables and -0.027 for unobservables), but were overwhelmed by changes in prices (0.554 for observables and 0.284 for unobservables). The most important price changes contributing to wage inequality growth were the increase in regional wage differences, which alone accounted for a majority of the 90th-10th percentile log wage differential growth from 1988 to 1999 (0.472). Regional differences grew especially fast in

the top half of the wage distribution, and especially in the earliest periods (0.271 from 1988 to 1992 and 0.152 from 1992 to 1994). The second most important observable price factor was education, which accounted for 0.097, or 13.6 percent, of the total 90^{th}-10^{th} percentile wage inequality growth. Unlike the regional wage differences, the effect of changes in the returns to education was most pronounced in the most recent period, 1997 to 1999, which is consistent with the large recent increases in the returns to education (Zhao et al., 2002). Among the quantities, changes in experience had a substantial negative effect on inequality growth (-0.248), especially during the first two periods (1988 to 1994).

We also note the substantial contribution of the returns to unobserved skills to rising wage inequality. Increased variance of the residuals increased the 90^{th}-10^{th} log wage differential by 0.284, or 40 percent of the total increase. This increase was particularly pronounced in the second period, 1992 to 1994, and dissipated to less than one percent in the last period, 1997 to 1999.

In panel B of Table 8, we do the same decomposition, but add three job-related variables to the specification: ownership, occupation, and industry. These variables test whether changes in the distribution of job types in the economy or in the relative returns to different jobs can help explain the inequality increase. For the most part, the results are similar to those for the simpler specification. Quantity changes in job characteristics negatively affect inequality, while changes in the relative returns to different job characteristics contribute positively to inequality. Of the three job-related variables, the price effects are strongest for industry (0.043), followed by occupation (0.023) and ownership (0.016). The combined price effects are 0.082, or 11.5 percent of the increase in

the 90^{th}-10^{th} percentile log wage differential. The gains are concentrated in the 1992 to 1994 period. The lack of an ownership effect suggests that labor market changes largely encompassed the state sector over this period, so that flows of workers out of the state sector and changes in the state-nonstate wage differentials were not key determinants of overall wage inequality growth. Comparing panels A and B, we see that the inclusion of the job variables reduces the effect of changes in the return to education somewhat, from 0.097 to 0.068, but has little effect on regional price changes. The contribution of changes in the return to unobservable skills falls from 0.284 to 0.253.

6. Conclusions

In this paper we have documented an enormous increase in wage inequality among urban workers in China during the period 1988 to 1999. We highlight some of the main findings and then offer some final thoughts on remaining questions and directions for future research. Key findings are the following:

- Most of the inequality increase occurred in the top half of the wage distribution, with wage growth of the rich and highly educated growing particularly rapidly.
- The period of most rapid inequality increase was 1992 to 1994 when China substantially liberalized economic activity and experienced high growth. The most recent period, 1997 to 1999, has also seen substantial increases in inequality.
- There was a substantial increase in within-group inequality which is robust to numerous group definitions. The returns to unobservable skills as measured by regression residuals explains much of the increase in overall inequality.

- The wage inequality increase is due entirely to changes in the returns to worker attributes over time. Quantity effects are negative, if anything, dominated by changes in the distribution of experience. The main price effects are growing regional differences and higher returns to education.
- Many of the changes in inequality have occurred within the state sector as well as the non-state sector. Inequality has not been driven by a collapse of the state sector and large labor flows to the non-state sector.

There remain important unanswered questions about the recent growth in urban wage inequality in China. First, what explains the rapid rise in returns to unobserved skill? Does this reflect reform of labor market institutions or skill-biased technological change (as in the U.S.)? Second, and related to the first, what is the reason for rising returns to education over time and the specific erratic pattern of this increase in China? What are the specific barriers or factors that can explain such large and growing regional wage differential in China? What specific policy and environmental factors explain the rapid inequality increase episode of 1992 to 1994? In this paper, we have documented a number of provocative stylized facts which we hope will help define the agenda for future research using other datasets.

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Table 1. Trends in Inequality, 1988 to 1999.

Year	1988	1989	1990	1991	1992	1993
Coefficient of variation	0.486	0.546	0.512	0.535	0.630	0.662
Standard deviation of logs	0.456	0.498	0.469	0.477	0.489	0.553
Gini coefficient	0.244	0.266	0.251	0.262	0.274	0.310
Theil entropy measure	0.102	0.124	0.110	0.119	0.138	0.169

Year	1994	1995	1996	1997	1998	1999
Coefficient of variation	0.701	0.682	0.732	0.743	0.766	0.752
Standard deviation of logs	0.624	0.597	0.630	0.629	0.646	0.658
Gini coefficient	0.340	0.328	0.346	0.346	0.355	0.359
Theil entropy measure	0.197	0.185	0.208	0.210	0.220	0.221

Source: NBS, Urban household survey, 1988-1999.

Table 2. Sample Size and Regional Distribution.

Year	Total Observations	Beijing (%)	Liaoning (%)	Zhejiang (%)	Guangdong (%)	Shaanxi (%)	Sichuan (%)
1988	6,620	8.1	24.3	10.2	19.7	16.1	21.6
1989	6,336	8.0	23.2	9.6	21.2	16.1	21.9
1990	6,915	8.8	22.6	9.5	21.3	16.1	21.7
1991	6,869	9.0	22.7	9.7	21.2	15.9	21.5
1992	7,291	9.4	24.2	10.5	23.8	8.6	23.5
1993	7,013	9.4	23.8	10.3	24.6	8.4	23.5
1994	6,745	9.0	23.2	10.2	25.9	8.6	23.1
1995	6,823	8.6	22.8	10.4	26.1	9.1	23.0
1996	6,647	8.4	22.5	10.3	27.1	8.7	23.0
1997	6,638	8.4	21.7	10.5	27.5	8.8	23.1
1998	6,328	8.4	21.7	11.0	27.0	8.7	23.2
1999	6,087	8.6	20.9	11.2	27.0	8.9	23.4

Source: NBS, urban household survey, 1988-1999.

Table 3. Descriptive Statistics.

				Education (%)					Ownership (%)		
Year	Annual earnings (yuan)[a]	Male (%)	Age (years)	College and above	Special school	Senior high	Junior high	Primary school	State-owned unit (%)	Urban collective (%)	Non-public enterprise (%)
1988	1845.8	51.1	36.8	12.0	11.6	23.5	41.0	11.8	75.0	24.3	0.7
1989	1804.3	51.7	37.1	12.6	12.4	26.2	38.5	10.4	76.3	22.7	1.0
1990	1954.9	51.2	37.6	14.1	13.2	25.4	37.7	9.6	77.3	21.5	1.2
1991	2101.7	51.7	37.5	15.7	13.0	26.0	35.7	9.6	79.0	19.9	1.1
1992	2650.9	51.5	37.7	18.0	13.8	26.6	33.6	7.9	76.8	20.2	3.1
1993	2925.4	51.7	38.1	18.7	13.5	26.9	34.1	6.8	76.4	19.9	3.6
1994	3377.1	52.0	38.2	20.6	14.3	27.0	32.3	5.7	76.8	17.4	5.8
1995	3473.6	51.9	38.4	21.4	13.8	28.7	30.6	5.5	78.1	15.1	6.8
1996	3600.9	52.4	38.9	22.3	14.0	27.9	30.9	4.9	77.9	15.1	7.0
1997	3760.4	52.2	39.1	22.8	13.5	28.5	30.6	4.6	77.4	14.8	7.8
1998	4054.5	52.5	39.3	24.4	14.7	28.6	28.2	4.1	76.9	14.3	8.7
1999	4533.3	52.7	39.4	26.8	15.0	28.4	26.2	3.7	74.9	13.7	11.4

Source: NBS, urban household survey, 1988-1999.

a: in 1988 yuan.

Table 4. Wage Inequality for Selected Years.

	1988	1992	1994	1997	1999
Standard deviation of log wages	0.46	0.50	0.63	0.65	0.68
Percentile differentials:					
90-10	1.15	1.33	1.73	1.71	1.83
90-75	0.26	0.41	0.45	0.47	0.46
90-50	0.52	0.72	0.89	0.92	0.93
75-50	0.26	0.31	0.44	0.45	0.47
75-25	0.55	0.62	0.87	0.86	0.93
50-10	0.63	0.61	0.84	0.79	0.90
50-25	0.29	0.31	0.43	0.42	0.45
25-10	0.34	0.30	0.41	0.37	0.45
Observations	6620	7291	6745	6638	6087

Source: NBS, urban household survey, 1988-1999.

Table 5: Inequality of Residual Wages, 1988-1999

	1988	1992	1994	1997	1999
Standard deviation	0.33	0.35	0.44	0.47	0.47
Percentile differential:					
90-10	0.79	0.86	1.14	1.23	1.20
90-75	0.19	0.21	0.26	0.30	0.29
90-50	0.40	0.43	0.55	0.61	0.61
75-50	0.21	0.22	0.29	0.31	0.32
75-25	0.39	0.43	0.60	0.62	0.63
50-10	0.39	0.43	0.60	0.62	0.59
50-25	0.18	0.21	0.30	0.32	0.31
25-10	0.21	0.22	0.29	0.30	0.29
Observations	6620	7291	6745	6638	6087

Note: Residuals are calculated from regressions of logarithm of wages on a very flexible specification of education and experience. See footnote x for details.

Table 6. Wage regression coefficients, selected variables, 1988 to 1999

Dependent variable: log(annual wage)

Year	Male (ref: female)	College and above (Ref: primary and below)	Technical school (Ref: primary and below)	Senior high (Ref: primary and below)	Junior high (Ref: primary and below)	Potential experience[a]	Potential experience squared
A. Parsimonious specification: Without controlling for occupation, industry and ownership							
1988	0.105	0.397	0.297	0.259	0.145	0.049	-0.001
1989	0.122	0.436	0.355	0.278	0.172	0.046	-0.001
1990	0.116	0.416	0.350	0.255	0.135	0.048	-0.001
1991	0.128	0.392	0.322	0.235	0.141	0.043	-0.001
1992	0.133	0.410	0.309	0.218	0.120	0.036	-0.001
1993	0.141	0.450	0.325	0.252	0.141	0.036	-0.001
1994	0.148	0.632	0.500	0.350	0.193	0.030	0.000
1995	0.127	0.576	0.440	0.329	0.177	0.032	0.000
1996	0.137	0.554	0.403	0.306	0.148	0.035	0.000
1997	0.155	0.509	0.412	0.289	0.122	0.035	-0.001
1998	0.137	0.597	0.443	0.279	0.110	0.034	0.000
1999	0.131	0.716	0.505	0.327	0.128	0.038	-0.001
B. Full specification: Controlling for occupation, industry and ownership							
year	Gender	College	Special	Senior	Junior	Exp	Exp2
1988	0.078	0.237	0.158	0.169	0.097	0.046	-0.001
1989	0.098	0.300	0.236	0.200	0.122	0.044	-0.001
1990	0.086	0.238	0.188	0.158	0.083	0.046	-0.001
1991	0.112	0.247	0.192	0.157	0.093	0.043	-0.001
1992	0.112	0.235	0.166	0.127	0.071	0.037	-0.001
1993	0.116	0.276	0.182	0.159	0.088	0.037	-0.001
1994	0.117	0.376	0.284	0.217	0.128	0.031	0.000
1995	0.100	0.412	0.297	0.253	0.146	0.035	-0.001
1996	0.106	0.374	0.238	0.208	0.104	0.039	-0.001
1997	0.121	0.276	0.208	0.162	0.044	0.037	-0.001
1998	0.110	0.368	0.251	0.175	0.053	0.037	-0.001
1999	0.106	0.449	0.285	0.203	0.072	0.040	-0.001

Source: BNS urban household survey, 1988-1999

Regression model also include regional dummy variables.

a: Defined as age minus years of school minus 6.

Table 7: Changes in Inequality by Cohort, 1988-1999

A. 90-10 Wage Differentials			
Birth year	1989	1994	1999
1978-82			1.76
1973-77		2.07	1.87
1968-72	1.26	1.93	1.86
1963-67	1.10	1.85	1.82
1958-62	1.07	1.62	1.93
1953-57	0.98	1.60	1.74
1948-52	0.93	1.63	1.79
1943-47	0.92	1.63	1.61
1938-42	0.90	1.50	1.68
1933-37	0.84	1.42	
1928-32	0.89		
Average Changes within Cohorts and Experience Levels			
Average Change	1989-94	1994-99	
Within Cohorts	0.65	0.06	
Within Experience Levels	0.71	0.09	

Table 8-A. Decomposition of Changes in Wage Inequality, 1988 to 1999

Percentile differentials:	90-10	90-50	50-10	90-10	90-10	90-10	90-10
Periods:		1988-1999		1988-1992	1992-1994	1994-1997	1997-1999
Log wages	0.712	0.452	0.259	0.213	0.378	0.036	0.085
Quantity changes (observables):	-0.099	0.028	-0.126	-0.028	-0.015	-0.029	0.009
Region	0.127	0.078	0.049	0.106	0.026	-0.010	0.001
Gender	-0.010	-0.010	0.001	-0.005	-0.002	0.000	-0.004
Education	0.032	0.005	0.027	-0.007	0.030	-0.005	0.019
Experience	-0.248	-0.045	-0.203	-0.122	-0.069	-0.014	-0.007
Quantity changes (residuals)	-0.027	-0.065	0.038	-0.03	0.017	0.028	-0.048
Price changes (observables):	0.554	0.382	0.172	0.235	0.187	-0.023	0.117
Region	0.472	0.348	0.124	0.271	0.152	-0.009	0.061
Gender	0.005	0.001	0.004	0.006	0.003	0.001	-0.004
Education	0.097	0.034	0.063	0.009	0.039	-0.013	0.056
Experience	-0.020	-0.001	-0.019	-0.051	-0.007	-0.002	0.004
Price changes (residuals)	0.284	0.109	0.175	0.037	0.188	0.057	0.007

Table 8-B. Decomposition of Changes in Wage Inequality, 1988 to 1999

Percentile differentials:	90-10	90-50	50-10	90-10	90-10	90-10	90-10
Periods:		1988-1999		1988-1992	1992-1994	1994-1997	1997-1999
Log wages	0.712	0.452	0.259	0.213	0.378	0.036	0.085
Quantity changes (observables):	-0.117	0.030	-0.147	-0.040	-0.019	-0.049	-0.001
Region	0.129	0.078	0.050	0.106	0.026	-0.009	0.001
Gender	-0.007	-0.008	0.001	-0.004	-0.002	0.000	-0.003
Education	0.019	0.003	0.016	-0.004	0.018	-0.002	0.011
Experience	-0.220	-0.037	-0.182	-0.110	-0.062	-0.012	-0.004
Ownership	-0.020	-0.006	-0.014	-0.014	0.006	-0.006	-0.009
Occupation	-0.016	0.001	-0.017	-0.014	0.001	-0.009	0.005
Industry	-0.002	-0.001	-0.001	0.000	-0.006	-0.011	-0.002
Quantity changes (residuals)	-0.035	-0.071	0.036	-0.028	0.005	0.038	-0.057
Price changes (observables):	0.611	0.393	0.219	0.242	0.227	-0.012	0.144
Region	0.471	0.348	0.124	0.259	0.152	-0.014	0.079
Gender	0.005	0.001	0.004	0.007	0.001	0.001	-0.003
Education	0.068	0.024	0.044	0.007	0.022	-0.004	0.040
Experience	-0.015	0.000	-0.015	-0.043	-0.008	0.001	0.003
Ownership	0.016	0.002	0.014	0.000	0.016	0.006	-0.005
Occupation	0.023	0.008	0.015	0.007	0.013	-0.002	0.006
Industry	0.043	0.010	0.033	0.005	0.031	0.000	0.024
Price changes (residuals)	0.253	0.100	0.152	0.037	0.164	0.061	-0.001

Figure 1: kernel density estimates

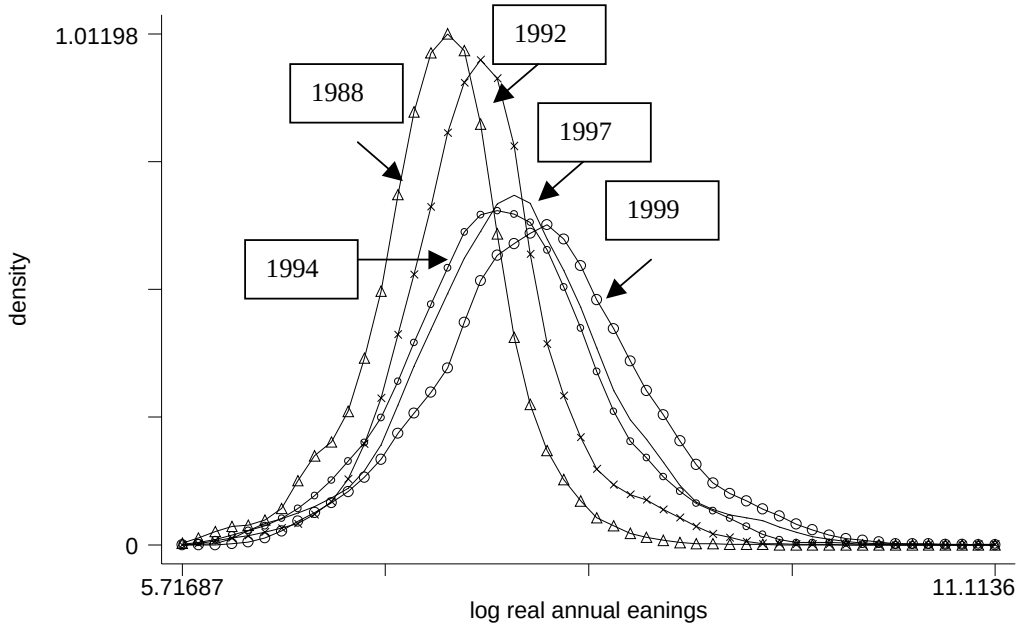

Figure 2. Real Annual Wages by Percentiles, 1988-99

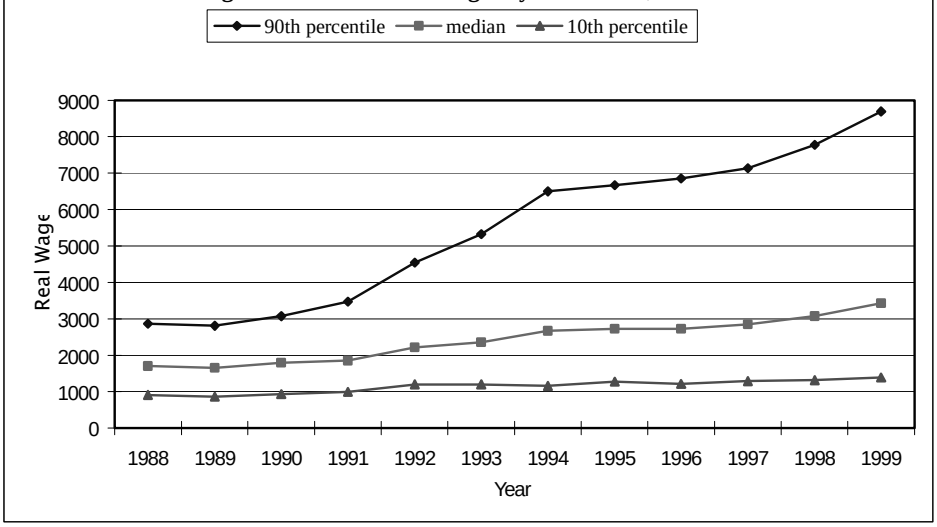

Figure 3. Annual Average Growth by Percentile, 1988-1999

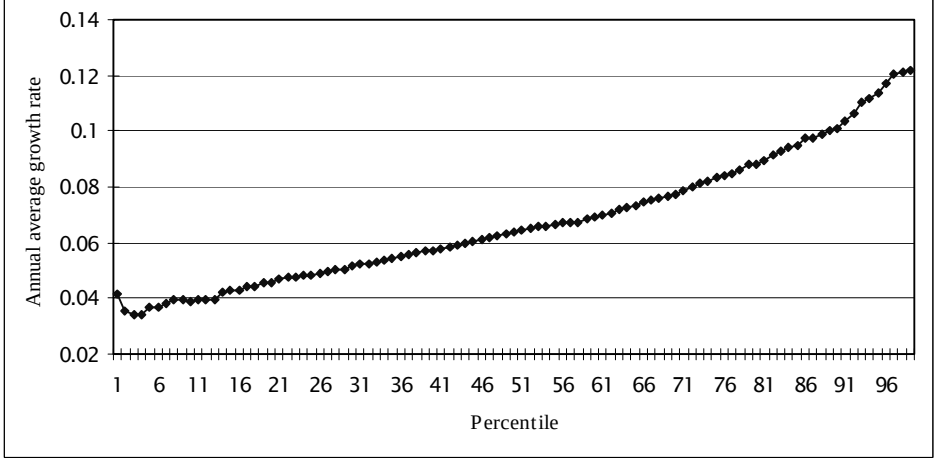

Figure 4. Log Wage Differentials by Percentiles, 1988-99

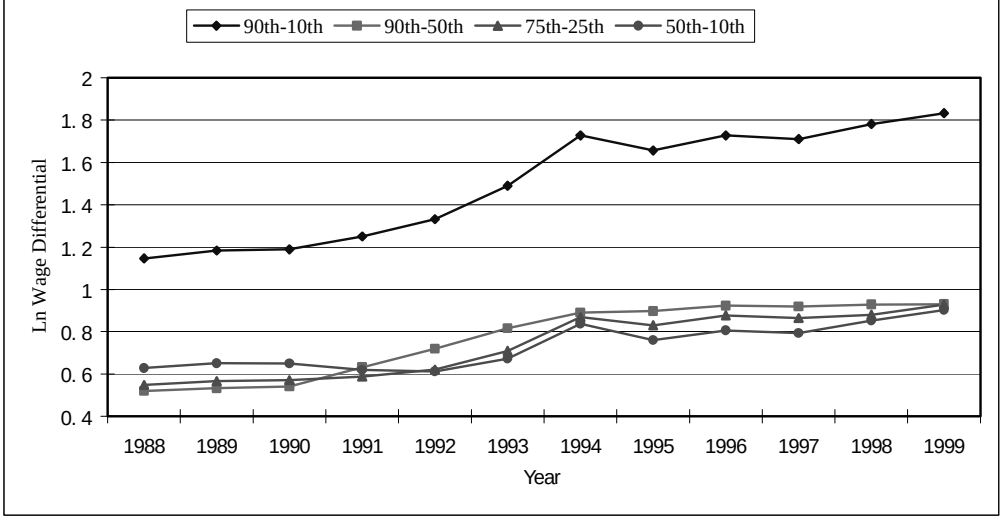

Figure 5. Annual Average Wage Growth by Percentiles

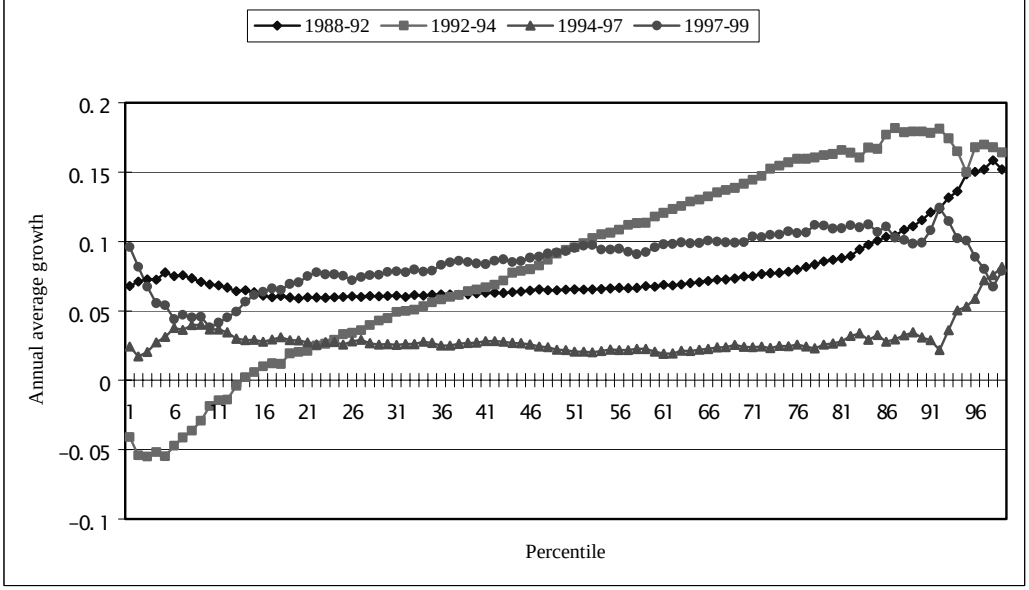

Figure 6. Annual Average Wage Growth by Percentile, 1988-99

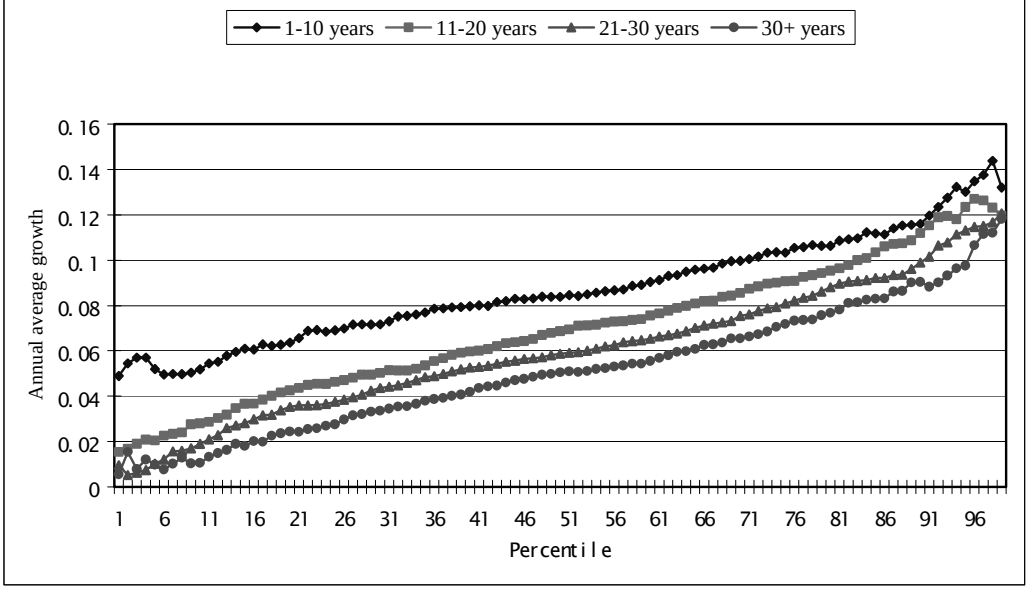

Figure 7. 90th - 10th Percentile log Wage Difference by Experience, 1988-99

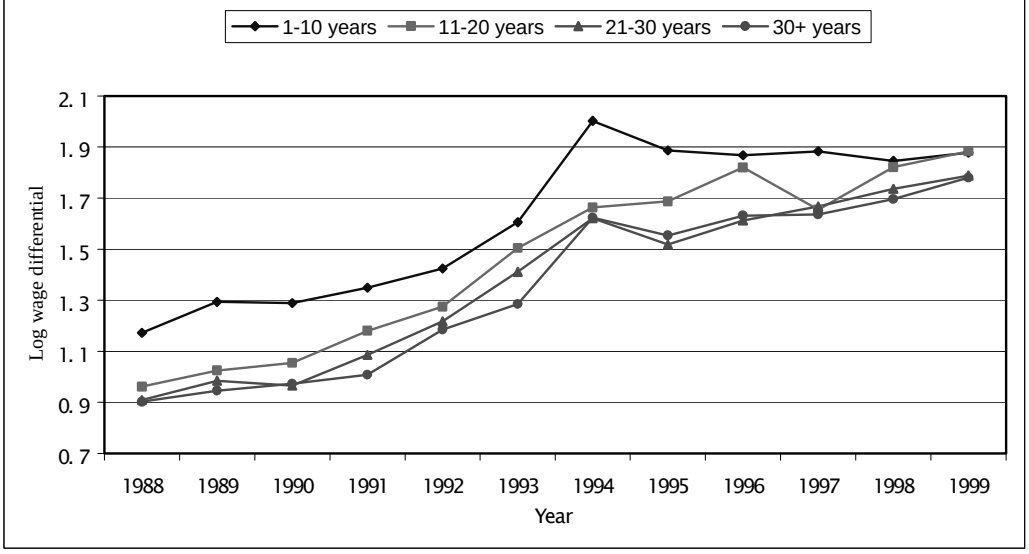

Figure 8. Annual Average Growth Rate by Percentiles, 1988-99

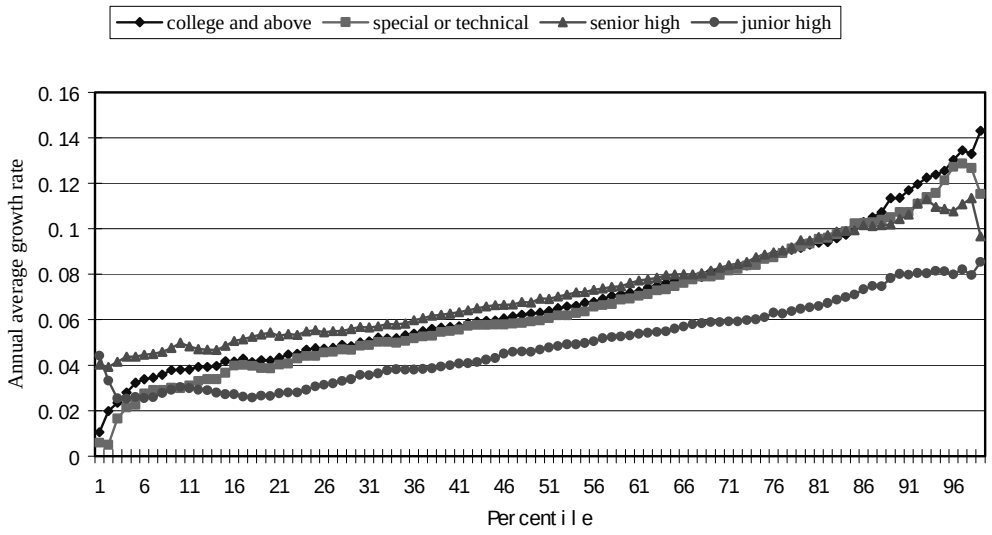

Figure 9. Ninetieth-Tenth Percentile Log Wage Differential, 1988-99

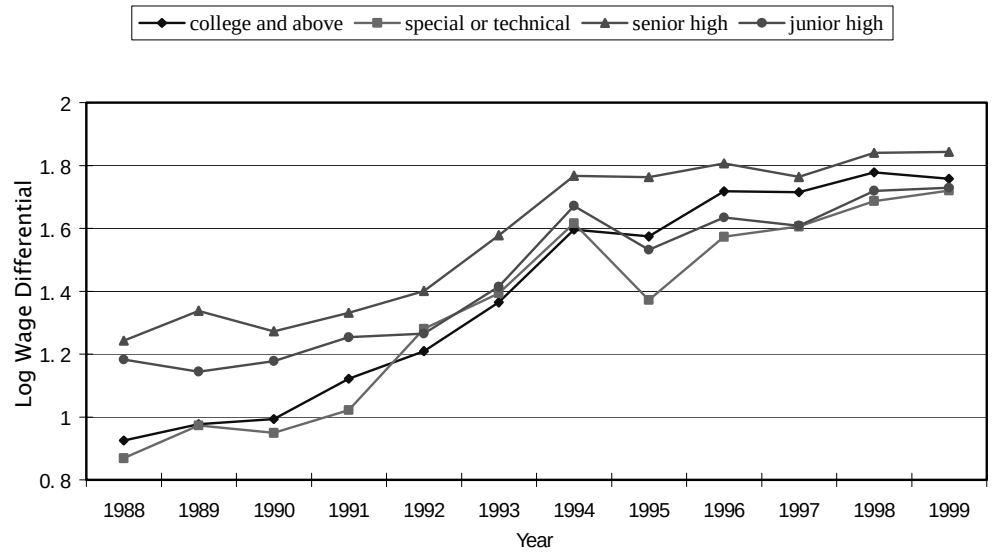

Figure 10. Annual Average Growth by Percentile, Experience 1-10 Years, 1988-99

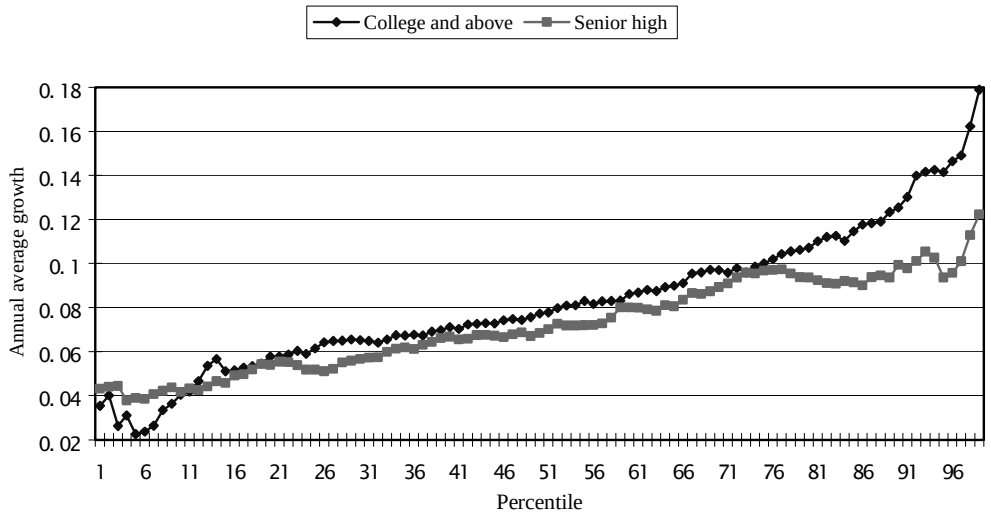

Figure 11. Annual Average Growth by Percentile, Experience 21-30 Years, 1988-99

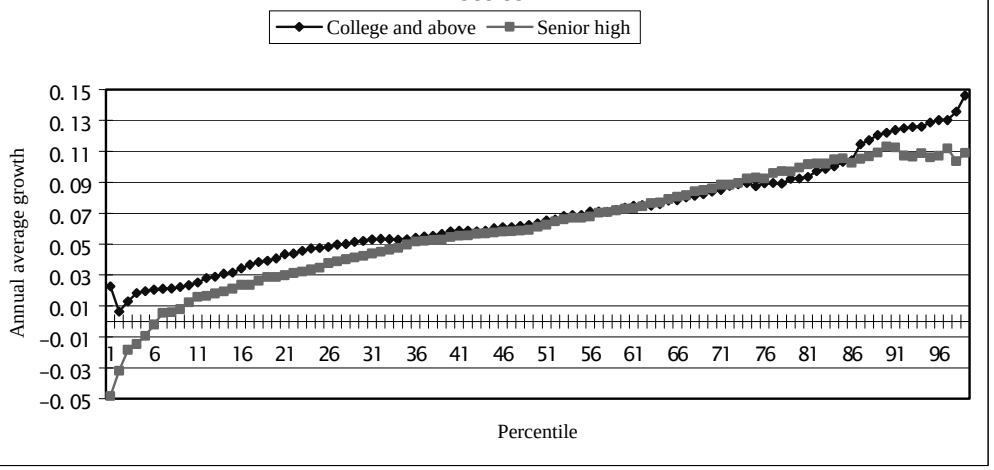

Figure 12. Annual Average Wage Growth by Percentile, 1988-1999

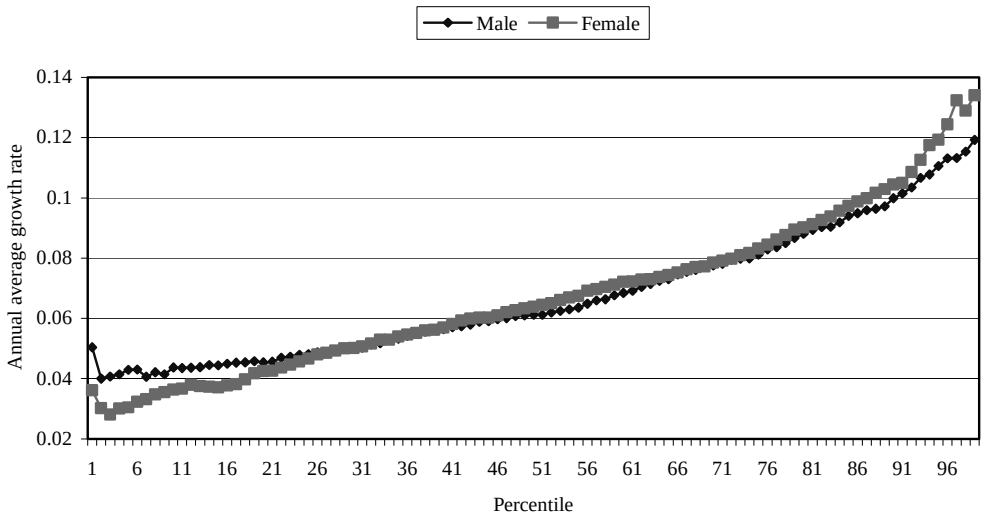

Figure 13. Real Wage by Gender, 1988-1999

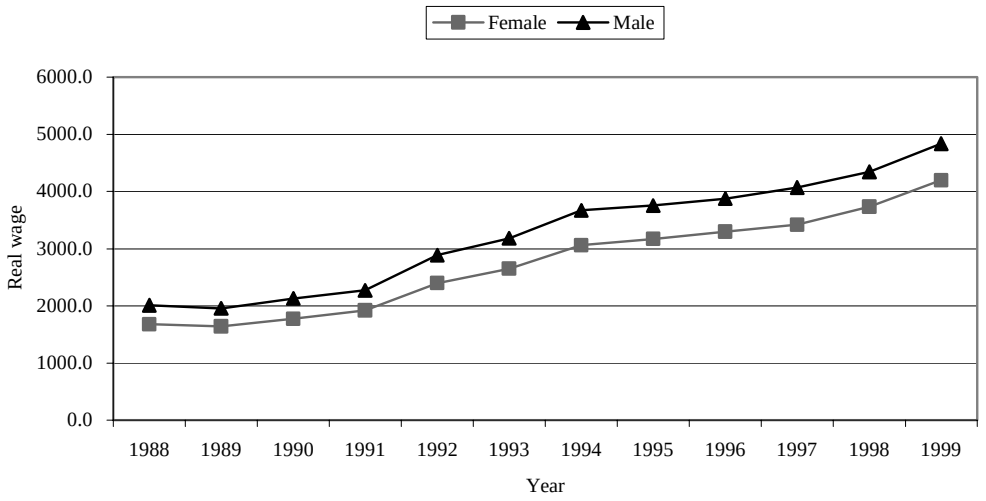

Figure 14. Annual Average Growth Rate by Percentile, 1988-99

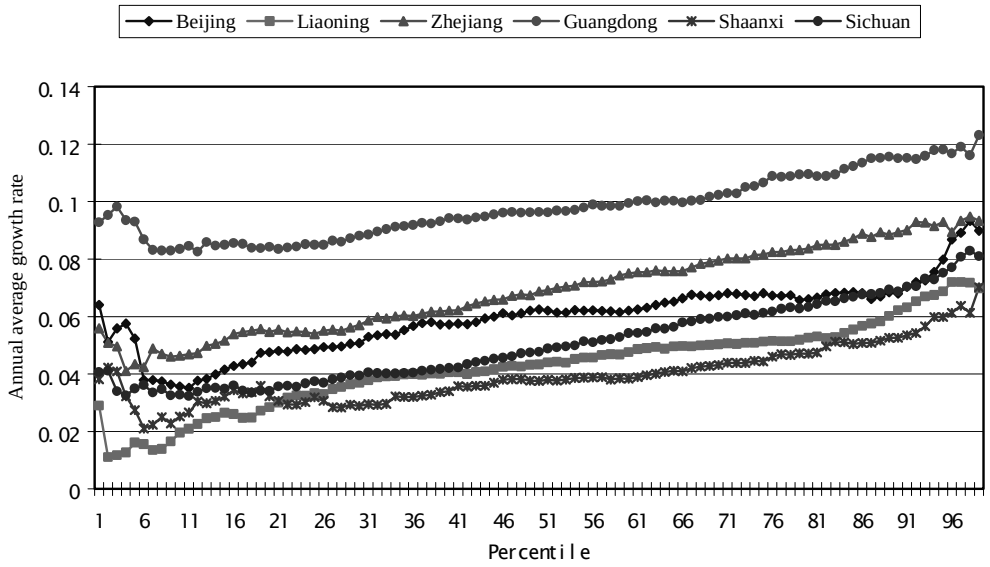

Figure 15. Ninetieth-Tenth Percentile Log Wage Differential, 1988-99

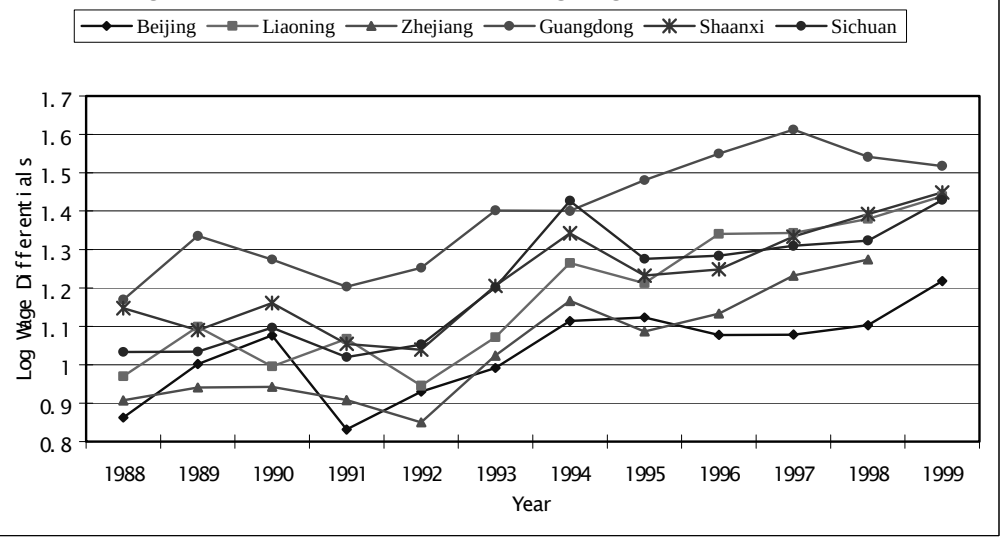

Figure 16. Annual Average Wage Growth Rate by Percentiles, 1992-99

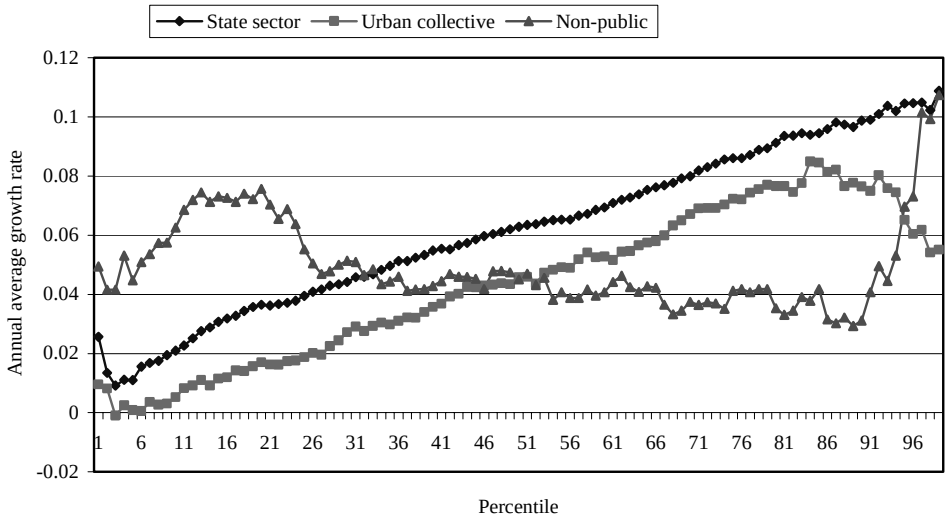

Figure 17. Ninetieth-Tenth Percentile Log Wage Differential, 1992-99

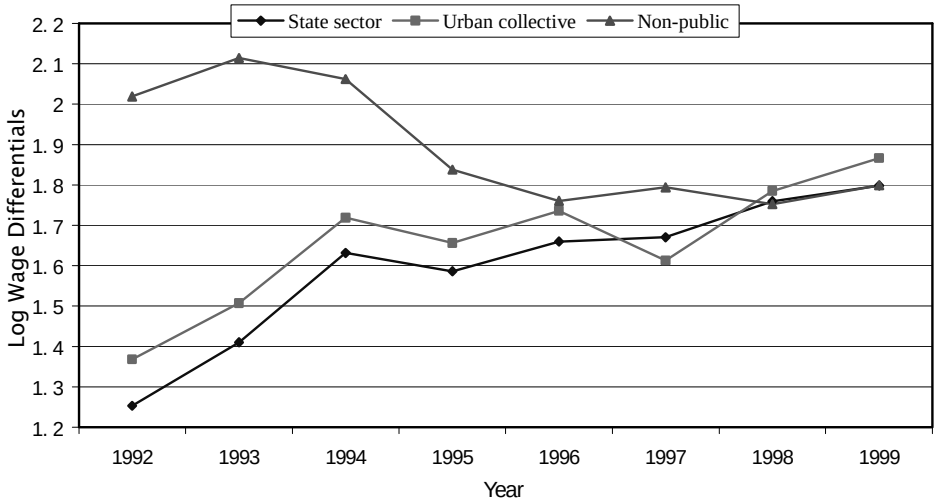

Figure 18. Annual Average Wage Growth by Percentiles, 1988-99

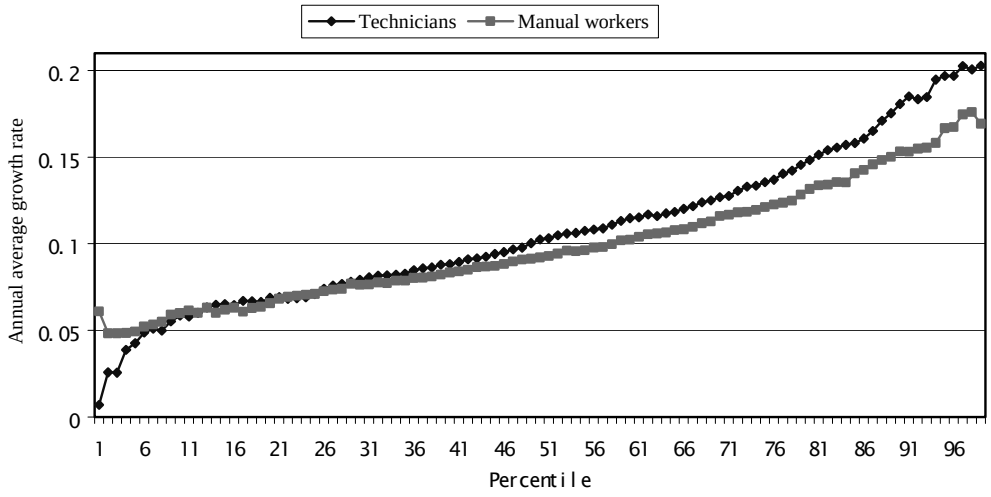

Figure 19. Ninetieth-Tenth Percentile Log Wage Differential, 1988-99

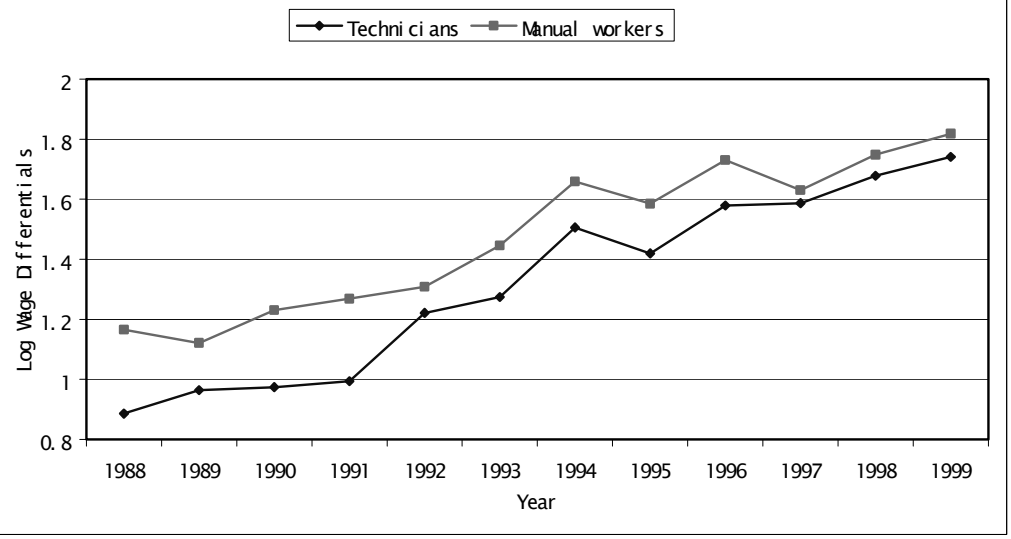

Figure 20. Annual Average Wage Growth by Percentiles, 1988-99

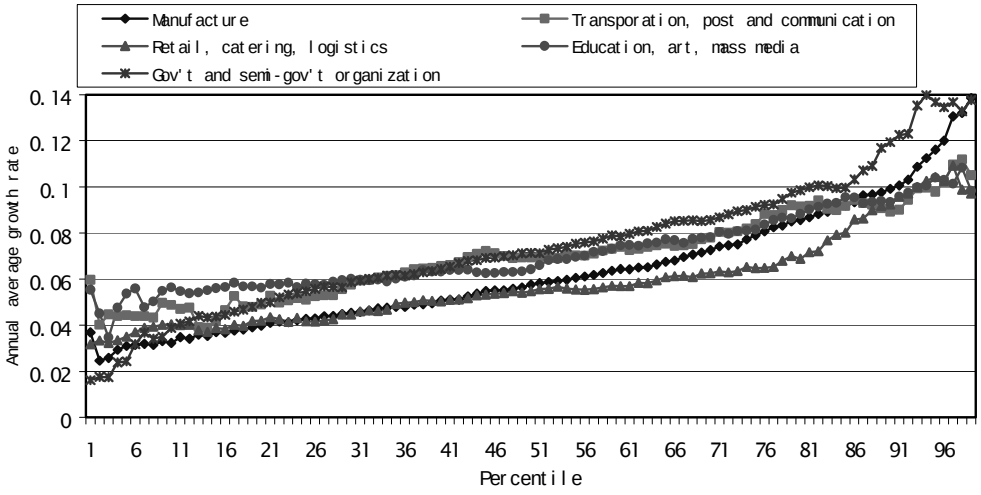

Figure 21. Returns to Education by Levels, 1988-99

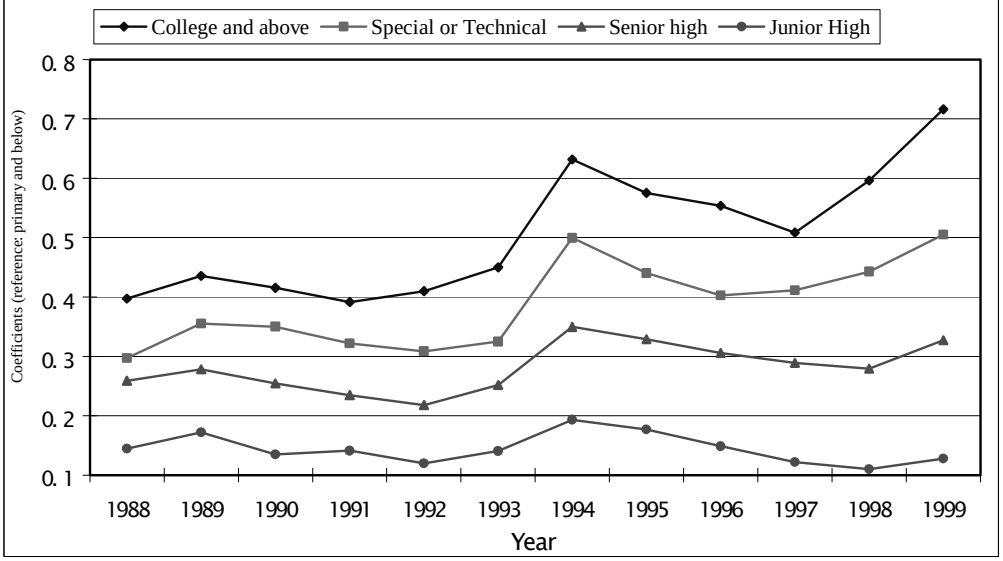

Figure 22. Returns to Potential Experience, 1988-99

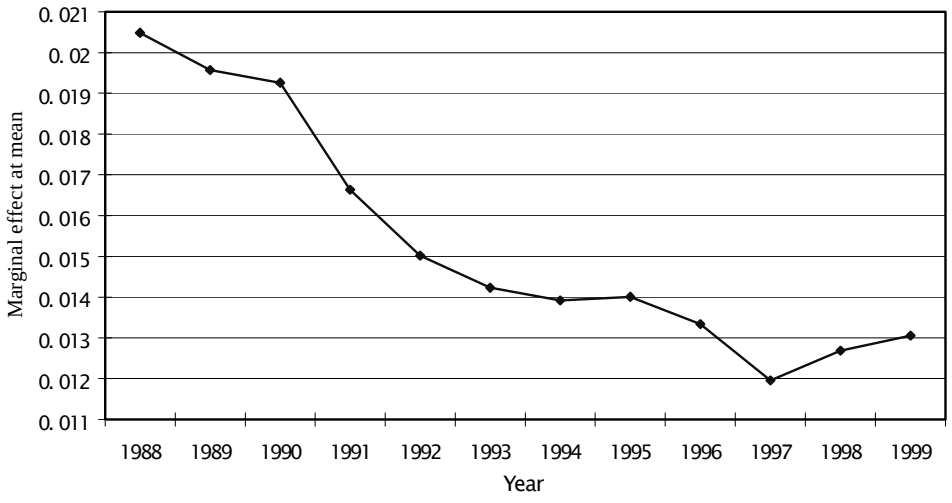

Figure 23. Age-Earning Profile, Male Workers

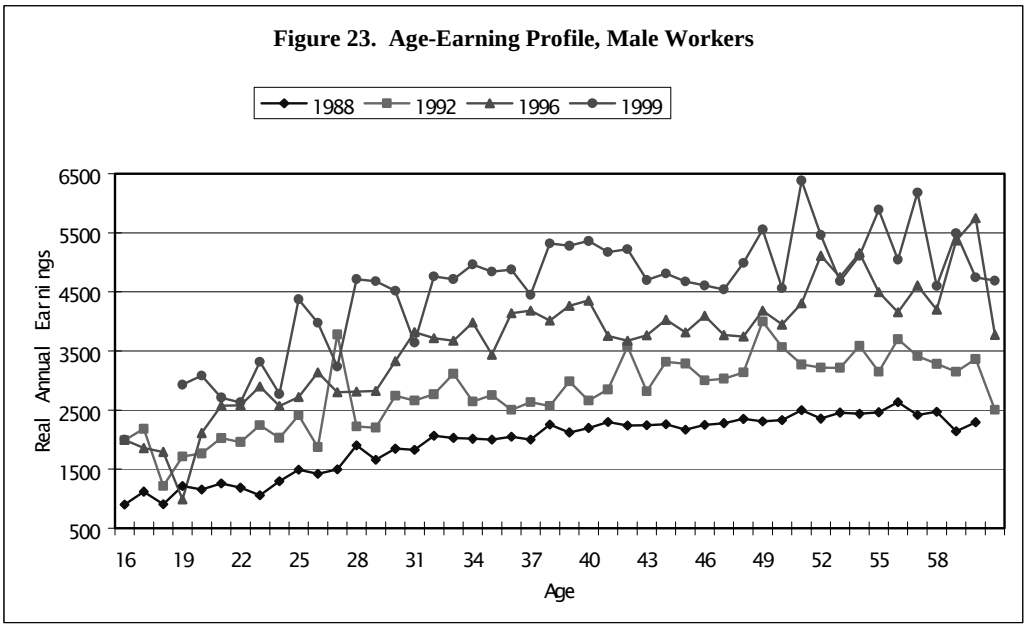

Figure 24. Age-Earning Profile, Female Workers

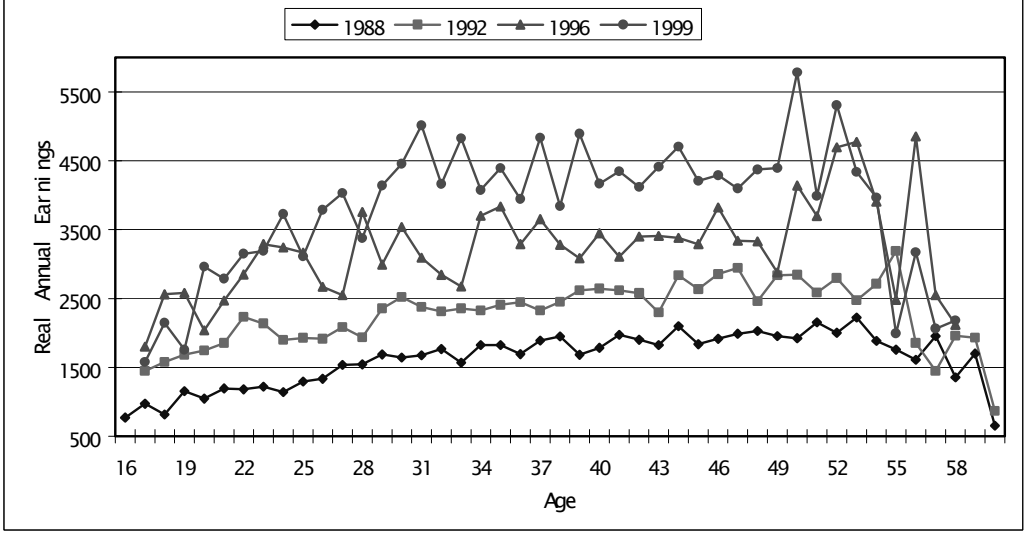

Figure 25. Coefficients of Provinces, Reference Sichuan, 1988-1999

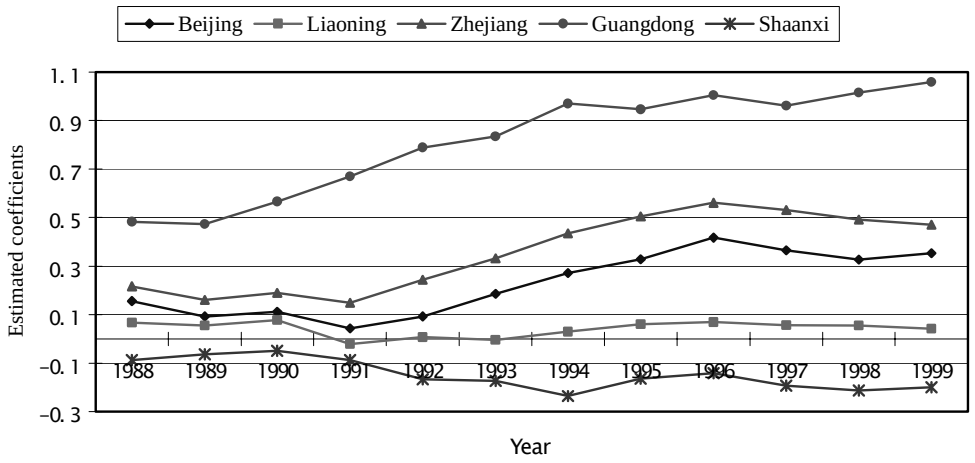

Figure 26. Coefficients of Ownership, Reference State-Sector, 1988-1999

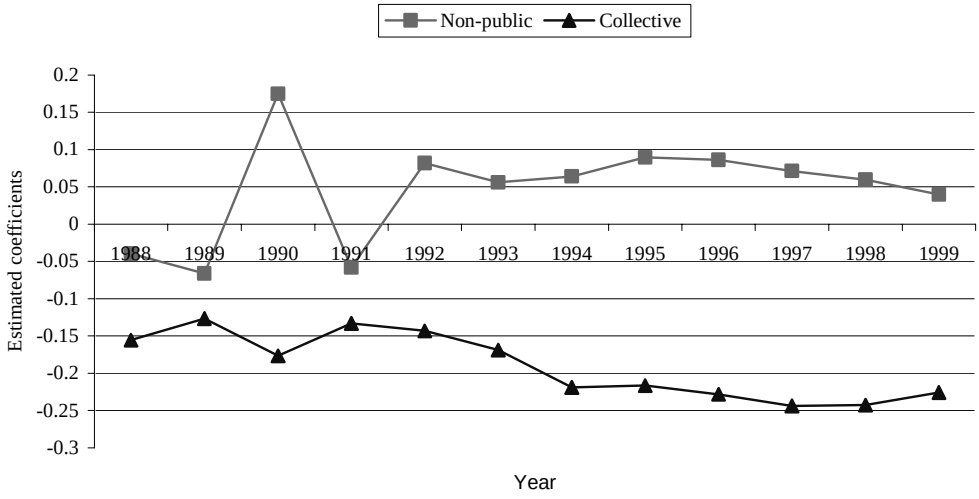

Figure 27. Occupation Coefficients, Reference Manual Worker, 1988-1999

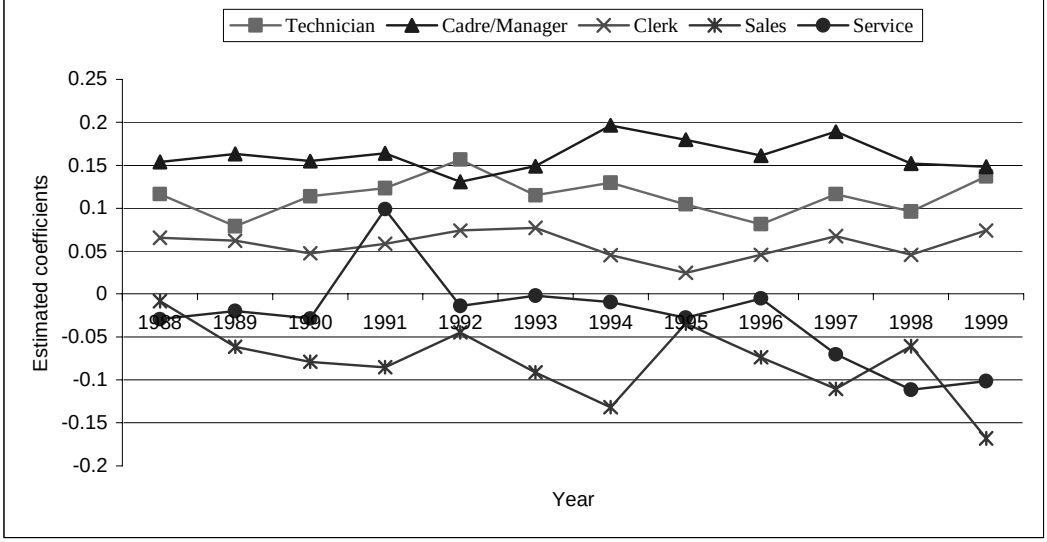

Figure 28. Coefficients of Sectors, Reference Manufacture, 1988-99