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Wage Flexibility in Chinese Labor Market 1989-2009

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Abstract

This paper analyses wage flexibility in Chinese labor market using micro panel data of the China Health and Nutrition Survey (CHNS) for the period 1989-2009. We find the reaction of wages to local unemployment significantly varies across different worker groups. China's highly coordinated wage-setting institutions might contribute to the flexible wages of workers with strong bargaining power. However, workers with weak bargaining power have rigid wages and could be easily laid off. The highly coordinated big firms and public sector show more significant wage flexibility than the lagging small/medium firms and private sector with coordination failures. Migration workers also have less flexible wages than local workers. Moreover, the major wage flexibility is associated with the 1990s reform when the labor market moves from a centrally-planned system to a market-oriented system. After the public sector retrenchment, the labor market seems recover the rigidity in the 2000s. Heckman adjusted results really show significant selectivity effects, but would not change our basic conclusions.

Keywords: Wage flexibility; Local unemployment; Panel data

JEL classification: J31; J64; E32; C33

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Wage Flexibility in Chinese Labor Market 1989-2009

1. Introduction

The past three decades have seen an unprecedented economic growth in China. Since the 1990s, China has dramatically switched from a centrally-planned to a market-oriented economic system and embarked on public sector and rural-urban migration reforms. To assess directly the extent to which China has moved towards a competitive and flexible labor market, we need information on how workers' wages respond to labor market conditions (Appleton et al., 2005; Moore and Pentecost, 2006). The flexibility of the real wage rate is considered to be an important element of labor market flexibility to adapt structural changes of this magnitude in China. Hence, exploring the wage flexibility in Chinese labor market has become an important issue for understanding the Chinese transition experiences.

This paper endeavors to estimate and analyze the wage flexibility in the Chinese labor market over the period of 1989-2009. Although how the price of labor is affected by the market condition may be the oldest empirical question in economics, wage flexibility is still a big challenge and an ambiguous area for academia and policy makers in China (Freeman, 2007). We apply the real wage adjustment over the business cycle as proxy of wage flexibility and investigate the functioning of local labor markets in China. Real wages being flexible to business cycle means adverse shocks result in wage adjustments rather than more unemployment. Thus, the efficient functioning of a labor market with flexible wages can help the economy recover from adverse shocks faster than a labor market with rigid wages (Moore and Pentecost, 2006).

China has a highly regulated and coordinated labor market which are in a volatile marketization process and forms an instructive contrast with the more developed economies such as the US (Devereux, 2001; Shin and Solon, 2007), the UK (Devereux and Hart, 2006) and Germany (Peng and Siebert, 2012). In practice, China's wage-setting institutions are regarded as a dual system of the public and private sectors, as well as urban-rural division (Peng, 1992; Song, 1990). On the one hand, employment and wage issues in China can only be correctly understood in the context of the reform accompanied by the transition from a planned economy to a market economy (Cai and Wang, 2010; Nee, 1996). Under the planned economic regime before the reform, wages of all urban workers were centrally determined by the Bureau of Labor and Personnel through a national wage grid system. Up until the end of 1980s, the state and collective sector still hired more than 95% of the urban workers (Meng, 2000; Meng et al., 2013).

Neither job mobility nor wage determination had changed much from the planned economic regime during the 1980s. As a result of the government control, nearly all workers were covered by the rigid wages in the state or collective sector (Kang and Peng, 2012b). To vitalize the "socialist market economy" authorized in the early 1990s, the government initiated the ice-breaking of wage rigidity and finally made it legal for the SOEs to adjust their wage policies and to fire unwanted workers. The other side of the same coin is that the SOEs also had the right to retain a proportion of their profits to pay bonuses to workers (Cai and Wang, 2010). Hence, the rigid wage system in China has been gradually replaced by a flexible wage system, as the labor market began to determine wages and employment (Freeman, 2007; Meng and Kidd, 1997). This paper aims to shed new light on the wage flexibility problem in Chinese labor market under the background of these transitional changes.

On the other hand, wage setting institutions are highly command and market coordinated in China (Lin, 1995), which may result in wages being more responsive to

macroeconomic shocks. The dramatic marketization transformation provided greater autonomy to SOEs and resulted in a radical program of retrenchment within SOEs. In 1997, the premier Zhu Rongji's government implemented the “*zhuadafangxiao*” (retain the large, release the small) policy. In 1997–1998 around 12 million urban state sector workers were laid off, as more and more workers shifted to private sector employment. By 2009, employment in the state or collective sector had dropped to 54% (Meng, et al., 2013). The survived large SOEs are much less in number and more easily to be coordinated by the command of (central) government, so are more responsive to macroeconomic shocks. It is a good strategy for those lagging private small and medium enterprises to follow the wage adjustment of their “big brothers”-large SOEs in the labour market, that is, market coordination. In other words, the parties' gains to changing wages are higher if all change, so that there is a “strategic complementarity” of wage flexibility, indicating that wage rigidity may be a result of coordination failure in wage adjustments (Ball and Romer, 1991; Peng and Siebert, 2008).

However, in the early years of the 2000s, the new-elected Premier Wen Jiabao's government changed the tone of marketization policy and strengthened the monopoly status of large SOEs in the pillar industries of the national economy such as steel, petroleum, aviation, coal and finance (“*guojingmintui*”, The State Advances as the Private Sector Retreats). Large SOEs have controlled so much resource that they are trapped in the inertia of easy money and insensitive to market changes. The private small and medium enterprises used to move in the tandem with large SOEs would fail in the market coordination. The two different policy periods may cause a structure break of wage flexibility. Meng et al. (2013) also argue that the major changes of wage structure occurred in the 1990s when the labor market moved from a centrally-planned system to a market-oriented system. Therefore, we provide a factual basis for inquiry on how command and market coordination makes real wages responsive to macroeconomic shocks over last two decades in China.

In addition, this paper stresses the heterogeneity of the wage flexibility for different employee groups by examining the impact of labor restructuring on the wage responses to the business cycle. Besides above labor restructuring by public-private ownership and firm sizes, the rural–urban migration has soared in the urban China with the loosening of administrative controls over population movements. For decades since the late 1950s, the overall distribution of the Chinese population had been shaped by the strict policy of the household registration (*hukou*) system, so rural-urban migration was almost non-existent up until the end of 1980s. By 2009, around 140 million rural labor force (accounting for one-third of the urban labor force) had moved to cities to work (Meng, et al., 2013). Liberalization of restrictions on rural–urban migration raises the possibility of local workers with urban *hukou* having to compete for work with migration workers from rural region. It will naturally arouse the questions about and how migrants' wages respond to the labor market condition, and whether they are discriminated for less job chances through a rigid wage setting mechanism. The impact of rural–urban migration on wage flexibility is also the contribution of this paper.

The remainder of this paper is organized as follows. In section 2, we present our estimation methods, and in Section 3, we describe the data. Section 4 presents empirical results by workers' and firms' characteristics. We also test the robustness of results by considering selection biases. The final section concludes.

2. Estimation methods

In the empirical literature the wage flexibility has often been specified (and estimated) as a reduced form assuming the labor market shocks (for simplicity, the changes of local

unemployment) as exogenous variables. However, if the wage flexibility is interpreted as a structural relation, it is necessary to introduce some assumptions concerning how the long-run market equilibrium is determined. Hence, a structural relation in terms of a wage equation and a labor demand equation is necessary. Following Ammermuller et al. (2010), the model can be written as follows:

$$W_l = \phi[f(U_l), R_l|X_l] \quad (1a)$$

$$U_l = \varphi[W_l, R_l, Z_l|Y_l] \quad (1b)$$

where l indexes the province (R), R_l is the provincial fixed effect; W is the wage level; U is the provincial unemployment; Z is a demand shock; and X and Y are two vectors of control variables, that is, respectively, for the wage equation (1a) and the labor demand equation (1b). The identification of equation (1a) can be obtained either by assuming that only variations in Z occur (that is, idiosyncratic shocks affect only the demand), or by using instrumental variables (IV) techniques to instrument regional unemployment. Nijkamp and Poot (2005) summarize that less than 10% of the studies use instrumental variables (IV) to control for endogeneity of the unemployment rate and employ Ordinary Least Square (OLS) directly as the estimation technique instead. In this paper, we follow the tradition of Bils (1985) and Solon et al. (1994) to use the unemployment change of current year as the proxy of business cycle.

Therefore, the standard decomposition of total wage growth (Devereux and Hart, 2006; Solon et al., 1997) for three provinces ($l=1, 2$ and 3) is:

$$E(\Delta \ln W) = (1 - P_2 - P_3)E(\Delta \ln W_1) + P_2E(\Delta \ln W_2) + P_3E(\Delta \ln W_3) \quad (2)$$

where P_2 and P_3 denotes the proportion of workers are in province 2 and 3, and $E(\Delta \ln W_1)$, $E(\Delta \ln W_2)$, and $E(\Delta \ln W_3)$ is the expected wage growth of workers in province 1, 2 and 3. Differentiating equation (2) with respect to the change in the unemployment rate, Δu , provides a decomposition of total wage responses:

$$\begin{aligned} \frac{\partial E(\Delta \ln W)}{\partial(\Delta u)} &= (1 - P_2 - P_3) \frac{\partial E(\Delta \ln W_1)}{\partial(\Delta u)} + P_2 \frac{\partial E(\Delta \ln W_2)}{\partial(\Delta u)} + P_3 \frac{\partial E(\Delta \ln W_3)}{\partial(\Delta u)} \\ &+ \frac{\partial P_2}{\partial(\Delta u)} E(\Delta \ln W_2 - \Delta \ln W_1) + \frac{\partial P_3}{\partial(\Delta u)} E(\Delta \ln W_3 - \Delta \ln W_1) \end{aligned} \quad (3)$$

The first three terms are the weighted average wage response of workers in three provinces. The last two terms represent the cyclicity of the working probability in the provinces weighted by the wage growth of workers in province 2 and 3 relative to workers in province 1 (i.e. regional wage differentials). Since the last two working probability terms are very small, we focus on the weighted average wage responses. This decomposition process can be extended to more than three provinces.

The traditional approach to examine labor market flexibility is to estimate a Phillips curve as in Pentecost and Sessions (2002), or a wage curve (Blanchflower and Oswald, 1990; Card, 1995). Studies using aggregated data have concluded that real wages are at best weakly flexible in China (Sabin, 1999; Wu, 2004). However, estimations of wage flexibility using aggregated wage are counter-cyclically biased because changing composition partially offsets measured wage flexibility (Bils, 1985; Solon, et al., 1994). Low-wage persons drop out of the workforce in recessions, and they return to it in booms,

which may bring downwards biases of the estimation of wage flexibility (Heckman, 2001; Heckman and Sedlacek, 1985). For example, more unskilled workers become employed in expansion and pull the aggregate average wage downwards. The converse occurs in recession. Hence, traditional aggregated statistics may exhibit “too little variability” over the business cycle. In order to remove the compositional biases from the wage measure, Solon et al. (1994) uses wage differencing approach for micro panel data. Following the same vein, we specify differencing wage equations and empirically estimate the links between individual wages and provincial unemployment rates. Thus, our estimations use a micro panel data and remove the composition biases of aggregated measures of wage adjustment over the business cycle.

Moreover, we match the micro panel data of real wage movements in the China Health and Nutrition Survey (CHNS) to local unemployment rates. Blanchflower and Oswald (2005) argue that with segmented local labor markets, economic shocks to one province mainly have an impact on the level of local wages, leading to a negative relationship between wages and unemployment “within” provinces. Empirical estimates are usually based on highly disaggregated data in order to control for heterogeneity in provincial labor markets both in terms of workers’ (that is, gender, age, education, marital status etc.) and firms’ characteristics (that is, firm size, ownership, location etc.). However, the unemployment rate usually refers to the region where individuals work (or firms are located). The use of variables at different levels of disaggregation may lead to biased estimates if all the individuals who work in the same province share some common factors. Moulton (1986) shows that individuals in the same year/province will share some common component of variance that is not entirely attributable either to their measured characteristics (e.g., age) or to the local unemployment rate in that year. Therefore, the standard error of the coefficient of the unemployment variable would be underestimated in an OLS regression (Shin, 1994). From a statistical point of view, this can overestimate the importance of provincial unemployment in influencing individual wages (Moulton, 1986; Moulton, 1990).

To tackle this Moulton problem, a two-step procedure has been used by Solon et al. (1994) and Blanchard and Katz (1997). In the first step, individual wages are regressed on personal characteristics and on province*year fixed effects, which are used as proxies for the wages at province level. Once these are estimated, they are regressed against provincial unemployment over time, as well as province and year fixed effects. The latter variables are needed in order to seize all permanent components of the relationship between wages and unemployment and leave only the transitory components to the unemployment coefficients (García-Mainar and Montuenga-Gómez, 2003). In step 1, we estimate a wage difference equation using individual data. This equation is given by:

$$\ln \frac{w_{ilt}}{w_{il,t-s}} = \alpha_0 + \alpha_1 Age_{ilt} + \sum_{l=1}^9 \sum_{t=1991}^{2009} \alpha_{lt} R_l Y_t + u_{1it} \quad (4)$$

where w_{ilt} is real hourly wages of individual i in province l ($l = \text{Guangxi}, \dots, \text{Shandong}$, 9 provinces in the CHNS) and year t ($t = 1991, \dots, 2009$, 7 wage differencing waves in the CHNS), and s equals 2, 3 or 4 according to whether the most recent interview before the year t interview was two, three or four years earlier. Age_{ilt} is a cubic in age, R_l denotes province dummy variables, Y_t denotes year dummy variables and ε_{ilt} is a random error term. This step gives us a panel data of wage changes for the workers in province l and between t and $t-s$, that is, α_{lt} .

In step 2, we derive estimates of the wage flexibility of workers by regressing α_{lt} on the unemployment change variable at provincial level (ΔU_{lt}), with provincial fixed effects (R_l) and time dummies (Y_t). This equation is given by:

$$\widehat{\alpha}_{lt} = \delta_0 + \delta_1 \Delta U_{lt} + \delta_2 R_l + \delta_3 Y_t + \gamma_{lt} \quad (5)$$

In this step, we only have time series variation for each province, reducing the number of observations – in our case 7 wage differencing waves of 9 provinces (actually only 58 observations in the step 2 as the wage data of *Liaoning* are missing in 1997, *Heilongjiang* missing in 1989, 1991 and 1993). We use weighted least squares where the weights are the numbers of individuals observed in each province and year as we described in equation (3). Our data cover more than one full business cycle in China and can reflect the wage flexibility situations over the last two decades of labor market reform.

3. Data Description

The main data used in this paper are the eight waves (1989, 1991, 1993, 1997, 2000, 2004, 2006 and 2009) of the China Health and Nutrition Survey (CHNS), which employ a multistage random-cluster sampling process to draw households from 9 provinces (*Guangxi, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Liaoning, and Shandong*). We have two samples of micro data at individual level:

1) Work force sample, including all people aged 16-65 residing in the urban region¹. Descriptive statistics of an unbalanced panel of 7,748 individuals (3,692 males and 4,056 females) are presented in the top panel of Table 1. Total observation number is 23,795 including 11,603 males and 12,192 females. The average length of time series of panel unit is about 3 waves. Females in the urban workforce are a little older (40.1 years) than males (39.8 years), while males have higher educational attainment than females. 20.8% males and 15.6% females have never been married in the workforce sample. About 66-67% residents in the urban region have the urban *hukou*, so one third urban residents are migrants from the rural region which is consistent with the findings in Meng et al. (2013). The average family size is 4 persons in urban region which may be a typical Chinese household including two parents and two children;

2) Wagers sample, including all wage earning employees in the urban region. We exclude self-employed workers and owners of private or individual enterprises because it is difficult to separate their wages from profit income. Descriptive statistics of an unbalanced panel of 6,126 individuals (3,020 males and 3,106 females) are presented in the bottom panel of Table 1. Total observation number is 16,549 including 8,618 males and 7,931 females. The average length of time series of panel unit is about 2.7 waves. Male employees have more chances to work in public sector and big firms (100 employees+) than females². Both male and female wage earners have lower proportions of urban *hukou* than the work force, suggesting higher labor market participation of rural-urban migrants than local people.

¹ In this paper, we focus on the non-agricultural residents in the urban region because the official unemployment rates in the rural region are not available. Residential region is different from the household registration (*hukou*). Since the early 1950s, China implemented a household registration (*hukou*) system connected with the social welfare system, whereby individuals born in a city are given an urban *hukou*, and those who were born in countryside are given a rural *hukou*. Individuals with rural *hukou* cannot benefit from the urban welfare system, even though they might work and reside in cities (Meng, et al., 2013).

² The public sector includes all civil servants and employees in the SOEs, as the private sector includes all employees in the private and collective enterprises. Since 1990, China appears to be evolving towards a standard mixed economy with a sizeable public sector and a vibrant private sector (Appleton, et al., 2005).

(Table 1 around here)

The wage variable used here is the real hourly wage in 1995 prices, which is real annual earnings divided by annual total working hours. Nominal annual earnings, including regular wages, subsidies and bonuses from the employer³, are converted into real annual earnings using corresponding deflators of provincial urban Consumer Price Index (CPI), provided by the National Bureau of Statistics of China (NBSC). Male employees earn about 19% ($=0.944-0.753$) more than females over the entire period. Actually, the wages grow so fast that the wage levels of both males and females in the 2000s are about 120% higher than 10 years ago, which brings larger gender gap in the 2000s than in the 1990s. The gender gap, however, is narrower in the small/medium firms than in the big firms, as well as narrower in the public sector than in the private sector. We find that the wage premium of working in big firms is larger for males ($43.5\%=1.218-0.783$) than for females ($36.9\%=0.989-0.62$). Situation flips in the firms with different ownership, as the wage premium of working in the public sector is larger for females ($11.8\%=0.803-0.685$) than for males (only $4.7\%=0.962-0.915$). Urban *hukou* also brings about 15% wage premiums for both males and females. Therefore, a job in a large firm is more important for males in urban China, while a job in the public sector is more important for females. Urban *hukou* is equally important for both males and females. The dramatic changing wage structure suggests a segmented labor market and strong selection of jobs.

When it comes to the annual growth rates of wages (defined as wage changes between two consecutive waves divided by corresponding number of years), most groups shows very similar growth rate of wages (about 10% per year) over the last two decades, during which the 2000s years saw a little slower speed of wage growth than that in the 1990s. Wages of males in the public sector (11% per year) grow much faster than males working in private sector (only 8% per year) and males without urban *hukou* (the least growth rate 7.4% per year). However, we do not find the similar disadvantages of working in the private sector or migration status for females. The privatization and urbanization reform seems to favor females rather than males. Thus, in both sense of level and growth rate there is great wage disparity among employee groups by gender, firm ownership, firm size and urban/rural regions. The wage structure and its evolution over the period 1989-2009 need further exploration on the wage responses to labor market conditions.

For the macro data of business cycle, we splice the Chinese National Labor Statistics Yearbook 1994-2009 and Chinese National Statistics Yearbook 1993-2009 to develop an unemployment dataset corresponding to the CHNS at provincial level. This urban registered unemployment rates may be the only official information sources of unemployment data at the provincial level over the period 1989-2009. Hence, they are used as our cyclical indicator of local labor market. The geographic location of the provinces covered by the CHNS can be broadly categorized into four regions for simplicity: Northeast (*Heilongjiang* and *Liaoning*), Coastal (*Jiangsu* and *Shandong*), Interior (*Henan*, *Hubei* and *Hunan*) and West (*Guangxi* and *Guizhou*). Figure 1 presents the regional unemployment rates since 1985. We can find the unemployment rates were as low as around 2% at the middle of the 1980s for all four regions. After that, the unemployment rates have been increasing over the entire period and doubled to around 4% in 2009, reflecting the transition process of a labor market after the 1970s.

³ Kang and Peng (2012a) find the wage cyclicality in urban China is mainly from the bonus and subsidy components of gross wages. We focus on the average hourly rate including all basic salary, bonus and subsidy components in this paper.

Moreover, there are very different variation patterns across regions. The less developed Western provinces (*Guangxi* and *Guizhou*) have much higher and more volatile unemployment rates than other regions before the 2000s, which arrive at the summit of 5.4% in 1997. However, the unemployment of the Northeast (*Heilongjiang* and *Liaoning*) dramatically increased after 1992 and peaked 5.7% in 2002. It is consistent with the reform of the SOEs and the shift in industrial structure out of heavy industry over the period of 1992-2002 (Appleton, et al., 2005), which affected the old industrialized provinces in the Northeast more than others. As expected, the most developed Coastal provinces (*Jiangsu* and *Shandong*) have the lowest unemployment rates after 2002.

(Figure 1 around here)

Cai and Wang (2010) argue that the Chinese reform, without a clear blueprint from the beginning, was initiated and carried out to solve urgent problems in the economic system and to seek instant welfare gain. Hence, the reform progress is characterized by the gradual approach of “crossing the river by feeling the stones” (Appleton, et al., 2005). Meanwhile, while the reform, by and large, advances in a gradual and incremental manner, it also takes relatively radical measures in certain regions and at certain stages from time to time. The choices of forms and measures in the reform process depend on adaptability of different components of the economic system and on how much the society is capable of adapting itself to the reform.

In order to test the gradual and spontaneous characteristics of labor market reform, Table 2 displays the pairwise correlation coefficients of annual unemployment changes at provincial level. Except a few cases, for example, within the Coastal (*Jiangsu* and *Shandong*, 0.4451**) and the West (*Guangxi* and *Guizhou*, 0.5075**), there is no significant correlation between provincial unemployment changes. The local labor markets seem quite segmented and isolated each other. The provincial governments could have taken different experiments for economic development according to their comparative advantages and disadvantages over last two decades. Hence, local labor markets may experience different reform paths as the changes of provincial unemployment are not coordinated or controlled by central government. These disparate patterns of unemployment alleviate our concern on that the unemployment volatility in China could have been “damped” by active labor market policies of central or provincial governments (Nickell, 1997). Therefore, the changes of unemployment are likely to reflect true volatility of Chinese local labor markets.

(Table 2 around here)

4. Empirical results

4.1 Basic results

The OLS two step results for the unemployment change coefficients from equation (5) are reported in Table 3. The estimated wage response to unemployment is significantly negative for urban males. One point increase of the local unemployment rate could decrease the real wages of males by 6.197%. Wage response to unemployment is also negative for females, but not significant. A flexible wage setting mechanism can drop wages as the labor market become worse, *vice versa*, which show a negative association between wage and unemployment and is regarded as a good institutional arrangement for

economic growth and stability. Our results are consistent with a flexible labor market in the transition process.

Moreover, we differentiate estimation by employees' marital status (married and single) and education levels (upper middle school and above, and below higher school), and find markedly difference among sub-labor markets. Married and higher educated male workers still show significant wage flexibility. One point increase of the local unemployment rate could decrease the real wages of married (high educated) males by 7.295% (6.007%). Marriage and higher education mean better bargaining strategy and market information, so that easier to be coordinated to flexible wages by government and keep their jobs over the bad time.

A little surprising result is that urban female workers with lower education level (under Upper middle school) rather than higher education have flexible wages. One point increase of the local unemployment rate could decrease the real wages of unskilled females by 6.416%, but insignificant for high skilled females. O'Mahony and Peng (2008) find similar results in European countries that unskilled females in services are complementary to information and communication technology (ICT) hence have advantages in wage bargaining as a whole. If we consider those female-dominant industries such as hospitality, nurses, primary education, community caring and other services, unskilled females may have better bargaining strategy on jobs and wages as an industry or professional organization in China. Thus, it is highly possible for unskilled females to have flexible wages and keep their jobs over the business cycle. On the contrary, skilled females may be vulnerable as the time is bad because they could not change their wages.

(Table 3 around here)

For other groups of workers, we cannot find wage flexibility maybe because of their weak bargaining power and coordination failures. Time period division shows the wage flexibility is mainly from the dramatic reforms of labor market in the 1990s for both males and females. However, the labor market recovers the rigidity in the 2000s, which is consistent with the renationalization process of the Premier Wen Jiabao's government.

4.2 Labor Restructuring

4.2.1 Firm size

We estimate the wage flexibility by firm size and time period in Table 4a. Males in big firms have flexible wage. One point increase of the local unemployment rate could decrease the real wages of males in big firms by 5.95%. Males in small/medium firms also have right sign and are close to be significant. Females have no flexible wages in either big or small/medium firms. When we come to the two-period division, wage responses of both males and females to local unemployment are negative and significant during the 1990s, except the females in small/medium firms (-7.344%) being very close to be significant. For the 2000s, no one is significant. It is consistent with a coordinated labor market in the transition process.

First of all, most big firms are public-owned before the 1990s and only have rigid wages. While various reform measures had been introduced to increase labor flexibility, the dismissal of state employees remained an exception up until the early 1990s. The retrenchment of during the 1990s enforces the big firms wage to be flexible to keep their jobs. The highly coordinated big firms may show sensitive wages to the labor market conditions as we find in Table 4a. Second, in the mid-1990s, a radical ownership reform

program was launched, under which state ownership was to be maintained only among large SOEs; small- and medium-sized SOEs were to be restructured through privatization, mergers, and bankruptcies (Xu et al., 2005). In late 1997, the “*zhuadafangxiao*” policy strengthens the command coordination of the big firms according to the macroeconomic conditions, but let the small/medium firms operate in a market coordination process. The large-scale labor retrenchment program attempts to reverse the money-losing trends of the SOE sector. Our results show this policy has been once very successful to get the wage flexibility for all workers. The wages in the 1990s are very sensitive to labor market conditions. However, during the 2000s, the “*guojingmintui*” policy allows more space for big firms to maintain and strengthen their monopoly position and keep their rigid wages. Thereafter, the command coordination of big firms and market coordination of small/medium firms just dysfunction.

4.2.2 Ownership restructuring

Given China’s unique experience in labor restructuring, an analysis of China’s wage flexibility in the public sector downsizing process should generate valuable insights for the ongoing policy debates over how to best restructure public enterprises. We differentiate estimation by firm ownership and time periods in Table 4b. The wage flexibility in Chinese labor market is mainly from the public sector. For males in the public sector, one point increase of the local unemployment rate could decrease the real wages by 7.466% (and very significant), but only 5.537% (and less significant) in the private sector. Females in the public sector also show significantly flexible wages (-7.031%) but not in the private sector, which is very strong evidence of coordination. Similarly, we find wage flexibility for both males and females in the 1990s, except the females in the private sector which have the right sign but insignificant.

The reform program termed “activating the system of permanent employment” initiated in 1987 touched upon the core system of the “iron rice bowl” and began revising the legacy of traditional labor policies under the planning system (Cai and Wang, 2010). The retrenchment of public sector employment is one of the most important reform programs, especially when the rigid wage setting under central planning had created severe labor redundancy and skill mismatch. The removal of wage rigidity in the developing labor market is imperative for Chinese economic restructuring. Hence, the reform aiming at “breaking up the iron-rice-bowl” has been quite successful in the public sector during the 1990s and made good progress in developing a flexible wage setting mechanism. However, the renationalization in the 2000s recovers the rigidity of wage setting mechanism in the labor markets. Both males and females in the public or private sector lose their wage flexibility in recent years, which may bring more systematic risk for employment and decrease the efficiency of the labor market.

(Table 4 around here)

4.2.3 Rural-Urban migration

Rural-urban migrants are regarded as second-class workers in urban China (Démurger et al., 2009). The main institutional barrier to mobility was the household registration (*hukou*) system excluding the workers without urban *hukou* from the urban welfare system, which provided residents with urban *hukou* with food ration, housing, medical care, education, childcare, and pension, and also has access to desirable positions in the labor market (Wang and Moffatt, 2008). This system made it practically very difficult, if

not impossible for rural *hukou* holders to survive in cities. The reform of SOEs makes competition between urban unemployed and rural migrants harder, which was further reinforced by administrative regulations against rural migrants. Several city governments had implemented local regulations to restrict rural migrants' employment and even forced enterprises to lay off migrant workers in favor of urban local workers. Hence, *hukou* policy which causes employment and wage distortions is regarded as an inefficient institutional factor in Chinese labor market (Chan and Zhang, 1999).

In Table 4c, we find evidence of disadvantages of rural *hukou* in flexible wage setting. One point increase of the local unemployment rate could decrease the real hourly wage of local males (with urban *hukou*) by 6.804%. For those male migrants (working in the urban region but without urban *hukou*), however, their wages are totally rigid. Workers with urban *hukou* obviously have more power to bargain their wages and jobs, and more easily to be coordinated for flexible wages. Hence, these incumbent male workers are more likely to retain their jobs in face of adverse shock of business cycle. For local females, the wage responses to local labor market have right signs, but insignificant. As the dramatic reform of the 1990s is concerned, both local males (-9.522) and females (-9.577) with urban *hukou* can have very flexible wage during this period, while only female migrants have flexible wages. During the 2000s, everyone's wage becomes rigid and easily to be fired.

Therefore, *hukou* status does matter in workers' wage flexibility, and then whether they can retain their jobs in the time of bad. That is, urban *hukou* leads to better bargaining position for their contract on job and wages. They may have pro-cyclical and flexible wages to help their employers, so they can survive the recession of business cycle and benefit in the prosperity. Male migrants have rigid wages over the two periods, obviously the most vulnerable group to be fired in time of bad.

4.3 Selectivity

We consider the possible selection biases in above wage differencing approach of real wage flexibility using micro panel data. Hence, we examine the relation between workers' characteristics (age, education and marital status etc.), province*year dummies and the probability of employment in two consecutive waves by testing vector of coefficients γ in the probit estimates of the selection equation:

$$\text{Pr}(\text{employed in two consecutive waves} | X_{it}) = \Phi(X_{it}\gamma) + u_{2it} \quad (6)$$

Probability of employed in two consecutive waves is given by cubic age, 5 education dummies, marital status, urban/rural *hukou*, family size and all province*year dummies (X_{it}). Residual errors of two equations (4) and (6) follow normal distribution with mean 0 and standard deviations of σ and 1, and are correlated each other: $u_1 \sim N(0; \sigma)$; $u_2 \sim N(0; 1)$; $\text{corr}(u_1; u_2) = \rho$. When $\rho \neq 0$, standard regression techniques applied to equation (4) yield biased results.

From these estimates, the non-selection hazard—what Heckman (1979) referred to as the inverse of the Mills' ratio, m_{it} —for each observation is computed as $m_{it} = \frac{\varphi(X_{it}\gamma)}{\Phi(X_{it}\gamma)}$, where φ is the normal density. The parameter estimates of equation (2) are obtained by augmenting the regression equation with the non-selection hazard m_{it} , and we obtain the additional parameter estimate on the variable containing the non-selection hazard. And

then, we test regression estimates using the non-selection hazard (Heckman, 1979). Selectivity effect $\lambda (= \rho\sigma)$ is tested to justify the Heckman selection model.

Table 5 shows a sensitivity test on wage and unemployment changes after the Heckman adjustment. The top panel presents the results of selection equation (6). We can see that elder workers are more likely to be employed in two consecutive waves, especially for females. Workers with higher education have more possibility to be employed for longer time. As for age, education levels have more prominent effects on female workers' working chances. Married males and single females are more likely to be employed. Urban *hukou* can increase the employment chance dramatically. Hence, as many authors such as Wang and Moffatt (2008) points out, urban *hukou* reflects the advantages on social welfare and better job chances. Finally, the larger is family, the lower possibility to be hired. It may just reflect the family background is bad for education and jobs, as poor family is more likely to have more children and large family size.

The middle panel is the test for selectivity effect. From the inverse mills ratio tests, the selection biases exist for both males and females. Likelihood-ratio (LR) chi2 test for independence of selection and wage equation show similar results that these two equations are significantly correlated. Hence, the Heckman adjustment is necessary for males and females. The bottom panel of Table 5 presents the Heckman adjusted results, in which wage flexibility does not change its pattern. Only male workers in the urban region have flexible wages. One point increase of the local unemployment rate could decrease the real hourly wage by 6.048% which is a little less than the OLS results in Table 3. Wage flexibility for females is still insignificant. These insignificant results are also a little smaller than OLS results. After we divide the sample into two periods, both males and females have flexible wages during the 1990s while they recover the rigid system during the 2000s. Hence, we find selection biases of OLS results, but would not change our basic results. We can conclude our results are robust after Heckman adjustment.

5. Conclusions

In this paper we examine the wage flexibility in Chinese labor market during a period of unprecedented economic growth and significant institutional changes. The rising share of workers employed in the private sector and competition from the rural-urban migration increase the extent to which pay is determined by market-based economic returns in China. Rigid wages can neither help workers keep their jobs as the local labor market is bad, nor get more benefit of economic growth as the local labor market is good. With the emergence of a mixed economy and dramatic urbanization process, China's urban labor market is supposed to be evolving towards a competitive and flexible market similar to those found in OECD countries. However, we find wage flexibility in Chinese labor market distinguish itself from the Anglo-American model based on the individual bargaining, and the continental European model based on the collective bargaining. Thus, we find a unique case of wage flexibility: a coordinated labour market in the transition process which has never been studied in literature.

Wage flexibility could be achieved by efficient bargaining on wage and job at either individual or collective level. Based on the privatization and urbanization reform of the last two decades, we estimate the effects of labor restructuring on wage flexibility in China. We find flexible wages are associated with the firm and employee characteristics of coordination and bargaining power in wage setting mechanism. Real wages are

flexible in big firms and the public sector with a successful process of command and market coordination, while the lagging small/medium firms and private sector are unable to catch up with the changes. Employee groups with disadvantageous bargaining positions and coordination failures have rigid wages and easily to be laid off. Thus, wage flexibility in Chinese labor market is different from the individual bargaining paradigm of the USA and UK, in which private sector and small firms are closer to the market and have more flexible wages than big firms and the public sector (Devereux, 2001; Devereux and Hart, 2006; Shin and Solon, 2007).

Furthermore, without independent trade union and collective bargaining, wage flexibility in Chinese labor market is not completely same as corporatism countries such as Germany and Italy either, even though the more flexible wages are also found in the highly coordinated big firms and public sector in these countries (Peng and Siebert, 2008; Peng and Siebert, 2012). Our analysis indicates that as the wage setting transformed from an administratively determined system to a market-based system, the highly command and market coordination can achieve a flexible labor market for a short term. With the cost of those (female, unskilled and migration) workers with weak bargaining power and coordination failure, the coordination process can improve wage flexibility and economy efficiency.

However, the success of command and market coordination in China is actually from the privatization policy of central government during the 1990s, which cannot last without a formal collective bargaining and trade union system. When the policy changes the direction, the renationalization process recovers the wage rigidity sooner than we thought. Therefore, the once successful command and market coordination was based on short-term policy, which would be dominated by the political cycle in China rather than long-term institutional evolution. As the gradual and incremental characters of reform are concerned, China seems still in the middle of river leading to a flexible and efficient labor market. Studies based on more accurate industry and employment movement analysis (Devereux and Hart, 2006; Heckman and Sedlacek, 1985) is expected for the future research on the wage flexibility in Chinese labor market.

References

- Ammermüller, Andreas, Lucifora, Claudio, Origo, Federica, Zwick, Thomas, 2010. Wage flexibility in regional labour markets: Evidence from Italy and Germany. *Regional Studies* 44, 401-421.
- 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.

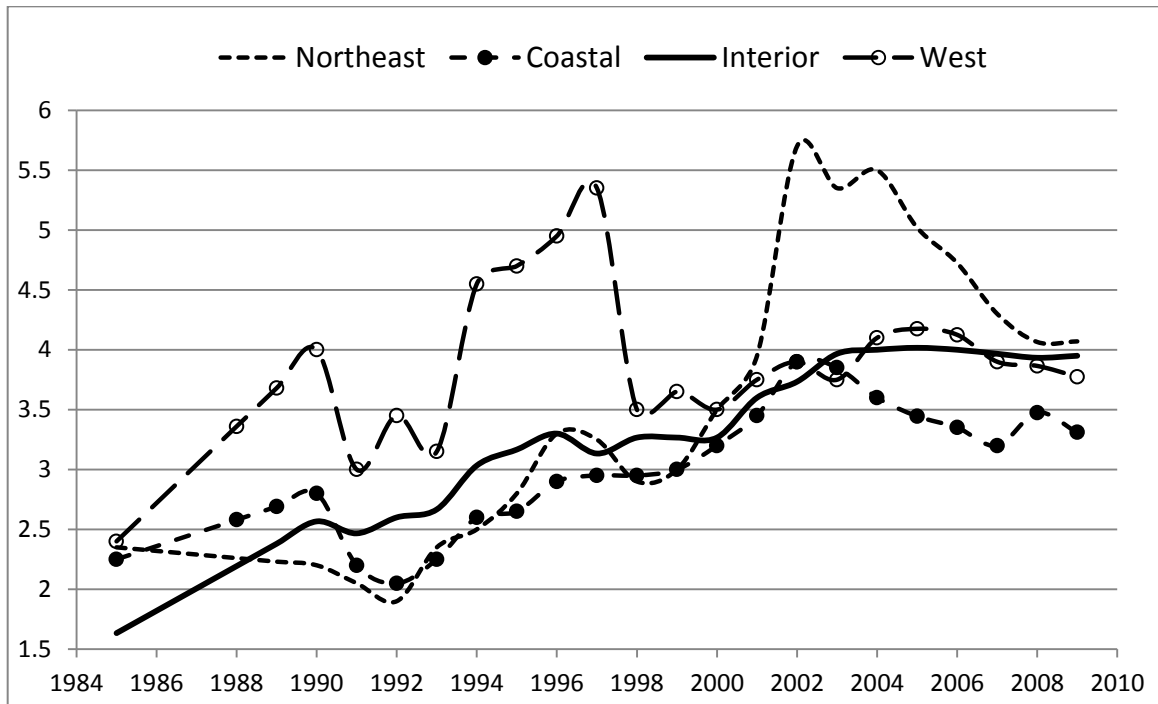
- Ball, Laurence, Romer, David, 1991. Sticky Prices as Coordination Failure. *The American Economic Review* 81, 539-552.
- Bils, Mark J., 1985. Real Wages over the Business Cycle: Evidence from Panel Data. *The Journal of Political Economy* 93, 666-689.
- Blanchard, Olivier, Katz, Lawrence F., 1997. What we know and do not know about the natural rate of unemployment. *Journal of Economic Perspectives* 11, 51-72.
- Blanchflower, David G., Oswald, Andrew J., 1990. The wage curve. *Scandinavian Journal of Economics* 92, 215–235.
- Blanchflower, David G., Oswald, Andrew J., 2005. The Wage Curve Reloaded. IZA DP No. 1665.
- Cai, Fang, Wang, Meiyang 2010. Growth and structural changes in employment in transition China. *Journal of Comparative Economics* 38, 71–81.
- Card, David, 1995. The wage curve: a review. *Journal of Economic Literature* 33, 758–799.
- Chan, Kam Wing , Zhang, Li, 1999. The Hukou system and rural-urban migration in China: Processes and changes. *The China Quarterly* 160, 818–855.
- Démurger , Sylvie, Marc, Gurgand, Li, Shi, Yue, Ximing, 2009. Migrants as second-class workers in urban China? A decomposition analysis. *Journal of Comparative Economics* 37, 610–628.
- Devereux, Paul J., 2001. The Cyclicalities of Real Wages Within Employer-Employee Matches. *Industrial and Labor Relations Review* 54, 835-850.
- Devereux, Paul J. , Hart, Robert A. , 2006. Real Wage Cyclicalities of Job Stayers, Within-Company Job Movers, and Between-Company Job Movers. *Industrial and Labor Relations Review* 60, 105-119.

- Freeman, Richard B., 2007. Labor Market Institutions around the World. NBER working paper.
- García-Mainar, Inmaculada , Montuenga-Gómez, Víctor, 2003. The Spanish wage curve: 1994-1996. *Regional Studies* 37, 929-945.
- Heckman, James J., 1979. Sample Selection Bias as a Specification Error. *Econometrica* 47, 153-161.
- Heckman, James J., 2001. Micro data, heterogeneity, and the evaluation of public policy: Nobel Lecture. *Journal of Political Economy* 109, 673– 748.
- Heckman, James J., Sedlacek, Guilherme, 1985. Heterogeneity, Aggregation, and Market Wage Functions: An Empirical Model of Self-selection in the Labor Market. *Journal of Political Economy* 93, 1077-1125.
- Kang, Lili, Peng, Fei, 2012a. Real Wage Cyclicity in Urban China. *Economics Letters* 115, 141-143.
- Kang, Lili, Peng, Fei, 2012b. A Selection Analysis on Education Returns in China. *Post-Communist Economies* 24, 535-554.
- Lin, Nan, 1995. Local Market Socialism: Rural Reform in China. *Theory and Society* 24, 301-354.
- Meng, Xin, 2000. *Labour Market Reform in China*. Cambridge University Press.
- Meng, Xin, Kidd, Michael P., 1997. Labor Market Reform and the Changing Structure of Wage Determination in China's State Sector during the 1980s. *Journal of Comparative Economics* 25, 403-421.
- Meng, Xin, Shen, Kailing, Xue, Sen, 2013. Economic Reform, Education Expansion, and Earnings Inequality for Urban Males in China, 1988-2007. *Journal of Comparative Economics* 41, 227-244.

- Moore, Tomoe, Pentecost, Eric J. , 2006. An investigation into the sources of fluctuation in real and nominal wage rates in eight EU countries: A structural VAR approach. *Journal of Comparative Economics* 34, 357–376.
- Moulton, Brent R., 1986. Random Group Effects and the Precision of Regression Estimates. *Journal of Econometrics* 32, 385-397.
- Moulton, Brent R., 1990. An illustration of a pitfall in estimating the effects of aggregate variables on micro units. *Review of Economics and Statistics* 72, 334-338.
- Nee, Victor, 1996. The Emergence of a Market Society: Changing Mechanisms of Stratification in China. *The American Journal of Sociology* 101, 908-949.
- Nickell, Stephen, 1997. Unemployment and Labor Market Rigidities: Europe versus North America. *Journal of Economic Perspectives* 11, 55-74.
- Nijkamp, Peter, Poot, Jacques 2005. The Last Word on the Wage Curve? *Journal of Economic Surveys* 19, 421-450.
- O'Mahony, Mary, Peng, Fei, 2008. Skill Bias, Age and Organisational Change. Paper presented at the EUKLEMS final conference.
- Peng, Fei, Siebert, W. Stanley, 2008. Real Wage Cyclicalities in Italy. *LABOUR* 22.
- Peng, Fei, Siebert, W. Stanley, 2012. Real Wage Cyclicalities in Germany and the UK: New Results Using Panel Data. Discussion Paper 2688, Institute for the Study of Labor (IZA), Bonn.
- Peng, Yusheng, 1992. Wage Determination in Rural and Urban China: A Comparison of Public and Private Industrial Sectors. *American Sociological Review* 57, 198-213.
- Pentecost, Eric J., Sessions, John G., 2002. Changing labor market flexibility in the European Union. *Review of World Economics* 138, 148–160.
- Sabin, Lora, 1999. The development of urban labour markets: China's urban wage curve, 1980-92. *Journal of Development Studies* 35, 134-152.

- Shin, D, Solon, Gary, 2007. New Evidence on Real Wage Cyclicity Within Employer-Employee Matches. *Scottish Journal of Political Economy* 54, 648-660.
- Shin, Donggyun, 1994. Cyclicity of real wages among young men. *Economics Letters* 46, 137-142.
- Solon, Gary, Barsky, Robert, Parker, Jonathan A., 1994. Measuring the Cyclicity of Real Wages: How Important Is Composition Bias? *Quarterly Journal of Economics* 109, 1-26.
- Solon, Gary, Whatley, Warren, Stevens, Ann Huff, 1997. Wage Changes and Intracompany Job Mobility over the Business Cycle: Two Case Studies. *Industrial and Labor Relations Review* 50, 402-415.
- Song, Lina, 1990. Convergence: A Comparison of Township Firms and Local State Enterprises. in *China's Rural Industry: Structure, Development, and Reform*, edited by W. A. Byrd and Q. Lin. London, England: Oxford University Press., 392-412.
- Wang, Wen, Moffatt, Peter G., 2008. Hukou and Graduates' Job Search in China. *Asian Economic Journal* 22, 1-23.
- Wu, Zhongmin, 2004. Wage curve for urban China: A panel data approach. *Applied Economics Letters* 11, 425-428.
- Xu, Lixin Colin, Zhu, Tian, Lin, Yi-min, 2005. Political control, agency problems, and ownership reform: Evidence from China. *Economics of Transition* 13, 1-24.

Figure 1 Registered urban unemployment rates (%) in China, 1985-2009



Data source: Chinese National Labor Statistics Yearbook 1994-2009; Chinese National Statistics Yearbook 1993-2009. Data of 1986 and 1987 are missing.

Table 1 Descriptive statistics in Urban China, the CHNS 1989-2009

Workforce sample (age:16-65)	Male	Female
Age (mean)	39.8	40.1
Education attainment = primary school (%)	14.6	15.2
Education attainment = lower middle school (%)	35.3	30.2
Education attainment = upper middle school (%)	20.8	18.0
Education attainment = vocational degree (%)	8.7	8.8
Education attainment = college or above (%)	9.4	6.1
Marital status = single (%)	20.8	15.6
Hukou = urban (%)	67.1	66.3
Family size (mean)	3.9	3.9
Total number of panel individuals	3,692	4,056
Average number of observations each year	1,450	1,524
Total number of observations	11,603	12,192
Wage earner sample (age:16-65)	Male	Female
Employees working in public sector (%)	46.7	39.2
Employees working in big firms (≥ 100 , %)	29.5	26.0
Employees with Urban hukou (%)	65.3	62.8
Mean real wage, 1995 prices (lnW):		
Overall	0.944	0.753
1989-2000	0.591	0.412
2000-2009	1.829	1.619
Working in big firms (≥ 100)	1.218	0.989
Working in small/medium firms (< 100)	0.783	0.620
Working in public sector	0.962	0.803
Working in private sector	0.915	0.685
Urban hukou	1.031	0.847
Rural hukou	0.880	0.716
Real wage annual changes ($\Delta \ln W$)*:		
Overall	0.100	0.101
1989-2000	0.103	0.105
2000-2009	0.092	0.090
Working in big firms (≥ 100)	0.107	0.098
Working in small/medium firms (< 100)	0.095	0.103
Working in public sector	0.110	0.104
Working in private sector	0.080	0.095
Urban hukou	0.103	0.100
Rural hukou	0.074	0.109
Total number of panel individuals	3,020	3,106
Average number of observations each year	1,077	991
Total number of observations	8,618	7,931

Notes: *Wage changes are for all paid employees. Annual wage changes are wage changes ($\Delta \ln W_{it}$) in the equation (2) divided by corresponding number of years, that is, divided by 2 for wage changes over the periods of 1989-1991, 1991-1993 and 2004-2006, divided by 3 for wage changes over 1997-2000 and 2006-2009, and divided by 4 for wage changes over 1993-1997 and 2000-2004.

Table 2 Pairwise correlation coefficients of annual Δu_t , 9 provinces 1989-2009

	Liaoning	Heilongjiang	Jiangsu	Shandong	Henan	Hubei	Hunan	Guangxi
Heilongjiang	0.0521 <i>0.8224</i>							
Jiangsu	0.5920*** <i>0.0047</i>	0.3418 <i>0.1294</i>						
Shandong	0.3286 <i>0.1458</i>	0.2151 <i>0.349</i>	0.4451** <i>0.0432</i>					
Henan	-0.007 <i>0.976</i>	0.1705 <i>0.4599</i>	0.208 <i>0.3655</i>	0.1642 <i>0.477</i>				
Hubei	0.2383 <i>0.2983</i>	0.4346** <i>0.049</i>	0.3615 <i>0.1073</i>	0.3565 <i>0.1127</i>	-0.2731 <i>0.231</i>			
Hunan	-0.006 <i>0.9794</i>	-0.0996 <i>0.6676</i>	0.1243 <i>0.5913</i>	0.2589 <i>0.2572</i>	0.109 <i>0.638</i>	0.284 <i>0.2122</i>		
Guangxi	0.1934 <i>0.401</i>	0.0351 <i>0.8798</i>	0.3166 <i>0.162</i>	0.3286 <i>0.1459</i>	0.1116 <i>0.63</i>	0.345 <i>0.1256</i>	0.0963 <i>0.6779</i>	
Guizhou	0.1568 <i>0.4974</i>	0.1842 <i>0.4242</i>	0.133 <i>0.5656</i>	0.3959 <i>0.0757</i>	-0.2006 <i>0.3833</i>	0.6487*** <i>0.0015</i>	0.0369 <i>0.8738</i>	0.5075** <i>0.0189</i>

Notes: Significance levels are reported in italics. ***, ** and * denote significance at 1%, 5% and 10% levels for two-tail tests.

Data source: Chinese National Labor Statistics Yearbook 1994-2009; Chinese National Statistics Yearbook 1993-2009

Table 3 Wage and unemployment changes (coefficients on Δu_t from equation 5)

	Male	Female
All	-6.197** (2.644)	-5.462 (5.016)
Married	-7.295** (2.991)	-4.133 (5.786)
Single	-6.02 (5.678)	-6.614 (6.79)
Upper middle school +	-6.007* (3.581)	-4.778 (5.464)
Upper middle school -	-4.527 (3.822)	-6.416* (4.039)
1989-2000	-9.443*** (3.053)	-9.419*** (3.207)
2000-2009	1.918 (6.108)	0.851 (16.549)

Notes: Standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10% levels for two-tail tests. There are 9,556 individual observations (2,802/2,091 males/females) in the first step equation (4), and 58 province*year weighted observations for the second step equation (5) for the entire period 1989-2009 (31 observations in the period of 1989-2000).

Table 4 Wage and unemployment changes (coefficients on Δu_t from equation 5)

4a. by firm size and period	Male	Female
Big firms(≥ 100)	-5.950*	-3.937
	(3.231)	(4.65)
1989-2000	-9.409**	-12.709***
	(3.789)	(3.705)
2000-2009	0.362	13.202
	(6.057)	(9.872)
Small/medium (<100)	-5.8	-4.48
	(3.659)	(6.437)
1989-2000	-9.469**	-7.344
	(4.481)	(4.519)
2000-2009	5.337	-9.048
	(9.626)	(22.698)
4b. by sector and period	Male	Female
Public	-7.466**	-7.031*
	(3.115)	(3.856)
1989-2000	-10.798***	-12.749***
	(3.194)	(3.697)
2000-2009	0.004	6.414
	(7.48)	(8.592)
Private	-5.537*	0.021
	(3.549)	(6.853)
1989-2000	-7.803*	-3.138
	(4.499)	(3.507)
2000-2009	1.938	5.665
	(9.389)	(25.724)
4c. by hukou and period	Male	Female
Urban hukou	-6.804**	-4.694
	(2.932)	(4.049)
1989-2000	-9.522**	-9.577**
	(3.706)	(3.576)
2000-2009	-0.087	5.489
	(6.524)	(9.305)
Rural hukou	3.694	-12.426
	(6.814)	(8.749)
1989-2000	-0.36	-14.376*
	(9.824)	(8.724)
2000-2009	19.152	-10.397
	(21.427)	(45.784)

Notes: Standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10% levels for two-tail tests. There are 9,556 individual observations (2,802/2,091 males/females) in the first step equation (4), and 58 province*year weighted observations for the second step equation (5) for the entire period 1989-2009 (31 observations in the period of 1989-2000).

Table 5 Wage and unemployment changes, Heckman adjustment model (coefficients from equations 4-6)

	Male	Female
5a. Selection equation (6), dependent variable = employment in two consecutive waves		
Age	0.171*** (0.047)	0.455*** (0.061)
Age2	-0.001 (0.001)	-0.007*** (0.002)
Age3	-0.012 (0.009)	0.025* (0.013)
Primary	0.334*** (0.075)	0.474*** (0.078)
Lower middle school	0.562*** (0.069)	0.829*** (0.070)
Upper middle school	0.736*** (0.073)	0.995*** (0.074)
Vocational degree	1.084*** (0.082)	1.487*** (0.083)
College or above	1.160*** (0.080)	1.615*** (0.091)
Single	-0.159** (0.067)	0.236*** (0.077)
Urban Hukou	0.846*** (0.044)	0.894*** (0.052)
Family size	-0.050*** (0.014)	-0.060*** (0.016)
Province*Year dummies	Yes	Yes
N	10,065	10,535
5b. Inverse mills ratio tests		
Lambda	-0.136*** (0.031)	-0.067*** (0.030)
LR test of indep. eqns. (rho = 0, chi2 test):	13.84 ***	4.79**
5c. Heckman adjusted wage equation (5)		
All	-6.048** (2.733)	-5.673 (5.054)
1989-2000	-9.649*** (3.287)	-9.922*** (3.132)
2000-2009	2.481 (5.951)	0.87 (16.552)
Province dummies	Yes	Yes
Year dummies	Yes	Yes
N	2,620	1,951

Notes: Standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10% levels for two-tail tests. There are 10,065/10,535 males/females in the selection equation, 2,620/1,951 males/females in the first step of wage equation and 58 province*year weighted observations for the second step (31 observations in the period of 1989-2000).