Unemployment and Labor Force Participation in China: Long Run Trends and Short Run Dynamics*

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Abstract

Using nationally representative Chinese household survey data, this paper reports for the first time China's unemployment rates and labor force participation rates from 1988 to 2009. The unemployment rate averaged 3.4% in 1988-1995, but has since risen sharply during the period of mass layoff from State-owned-enterprises in 1995-2002, and reached an average of 8.4% in the subperiod from 2002 to 2009. Labor force participation rate has declined throughout the whole period, particularly in 1995-2002 when unemployment rates increased most significantly. We also report results for different demographic groups, different regions, and different cohorts. Lastly, we use matched monthly data to study labor market dynamics for the period of 2004-2006, and show that the Chinese labor market is characterized by very low mobility among different labor force statuses and the prevalence of long-term unemployment.

Keywords: Unemployment rate; labor force participation rate; China; labor force dynamics; long-term unemployment.

1 Introduction

Imagine what would happen if one day the US bureau of labor statistics stopped releasing unemployment rates to the public. Indeed, the chaos and confusion such scenarios would bring would be almost unthinkable for any major economy today, as governments, businesses and households in modern societies all rely on accurate economic statistics for decision making. Yet China, the second largest economy in the world, has been doing this for decades. Although China's official statistics have always been viewed with considerable suspicion (see e.g. Ravallion and Chen (1999), Rawski (2001), Young (2003)), the official Chinese unemployment rate is probably the least informative among all key economic indicators.[1] Despite economic ups and downs including the 2008-2009 global financial crisis, the official unemployment rate has been only fluctuating within a very narrow range between 4% and 4.3% since 2002, and has stayed fixed at 4.1% since the third quarter of 2010. One recent article that reviews the quality of Chinese labor statistics claims that the official unemployment rate is "almost useless" (Cai et al. (2013)). Another important and related labor market indicator - the labor force participation rate - is not even reported in official statistics.[2]

The official Chinese unemployment rate is calculated as the share of total "registered" unemployed people over the total labor force.[3] In China, the low level of "registered"

[1]Many studies have examined the validity of China's GDP figures, and in general, researcher found the statistics to be at least usable and informative in understanding the Chinese economy, see e.g. Chow (2006), Fernald et al. (2013), Holz (2014).

[2]In principal, one can infer the labor force participation rates using official statistics on total employment, registered unemployment and population, as Cai et al. (2008) did for 1996-2004.

[3]The closest U.S. counterpart is the "insured unemployment rate" based on unemployment insurance claims. In recent years, its level is only 1/3 and 1/2 of the official U.S. unemployment rate. For more discussions regarding the evolution of U.S. insured unemployment rate and its relationship with official unemployment rate, see Burtless (1983) and Blank and Card (1991).

unemployment rate and its insensitivity to economic fluctuations are due to several factors.[4] First, for reasons such as lacking local household registration (*Hukou*) status, many unemployed people are not qualified to register with local employment service agencies. Second, even qualified unemployed people may lack the incentive to register due to very low levels of unemployment benefits. Third, total number of registered unemployed people are aggregated bottom-up within the bureaucratic system, thus subject to aggregation errors and potential data manipulations. Lastly, the total labor force which is the denominator in the calculation of unemployment rate, is also subject to error due to many reasons.[5]

Lack of knowledge on China's labor market outcomes is a major hindrance to a fuller understanding of the Chinese economy, now the world's second largest and is still on a relatively high-growth trajectory despite recent slowdowns. Over the past several decades, the Chinese economy has been gradually transformed from central planning to one that is mainly market-driven. It is therefore interesting to examine how the labor market has performed during the transition process. In particular, it is important to understand the labor market responses to major policy initiatives and significant events, such as the restructuring of the State-owned-enterprises (SOEs), rural-to-urban migration, World Trade Organization (WTO) entry, and the expansion of college enrollments. Even for people who are not interested in China per se, understanding Chinese labor market is also crucial, as many Chinese policies are motivated by concerns over employment situations, which increasingly affect other major economies.[6] All of the above require accurate measurements of unemployment rates and labor force participation rates over a relatively long period of time, and

[4]See also discussions in Giles et al. (2005) and Liu (2012).

[5]For more discussions about the quality of China's labor force statistics, see Cai et al. (2013).

[6]see e.g. Autor et al. (2013) for the study of how Chinese exports impact U.S. local labor market.

ideally, for different demographic groups, different regions and different cohorts.

Despite the popular disbelief of official figures, it is not easy to find an alternative. Many researchers have attempted to estimate China's true unemployment rates, and usually end up with numbers significantly higher than the official ones. In most of the cases, people relied on published government aggregate data and simply added laid-off (or "*Xiagang*" in Chinese) workers to the registered unemployed in order to derive total unemployment figure. But as pointed out by Giles et al. (2005), many officially laid-off or registered unemployed workers may actually be working part- or full-time or may be out of the labor force. In addition, administrative labor statistics are also unreliable as discussed in Cai et al. (2013). A few studies employed micro-level data, but typically such data were only available for selected regions and for a few number of years. For example, Giles et al. (2005) used self-collected data in five big cities in 2002 and retrospective information for the 1996-2001 period to estimate the national level of unemployment. Liu (2012) used China Household Income Project (CHIP) data in 1988, 1995 and 2002 which covered around 10 provinces in China. Owing to different data and methodologies, the existing alternative estimates also vary greatly (see e.g. Table 2 of Giles et al. (2005)), making it difficulty for any potential user to choose among them.

In this paper, we provide long series of estimates of nationally representative levels of unemployment rates and labor market participation rates in 1988-2009, using microdata from a household survey that covers all urban China. The Urban Household Survey (UHS) has been administered by China's National Bureau of Statistics (NBS) since the 1980s, and is based on stratified sampling. Although the data has been widely used to study various aspects of China's labor market and the urban

economy, no previous studies have focused on the issue of unemployment and labor force participation.[7] In addition, previous studies typically only have had access to a subsample of the UHS consisting of only several provinces, while we have the most complete access to UHS annual data from 1988 to 2009 covering all provinces.[8] Further, we also have access to the monthly UHS data from January 2004 to December 2006 that were never available to outside researchers before, which allow us to study labor market dynamics.

We estimate unemployment rates and labor force participation rates for the nation as a whole, as well as for different demographic groups, different regions, and different cohorts. Based on the development of the Chinese labor market, we divide the whole time period into three equal subperiods. In the first subperiod from 1988 to 1995, the urban labor market was still characterized by the so called "iron rice bowl", with state-assigned jobs and life-time employment, mainly in the state sector. The unemployment rate was very low, averaged 3.4%, and the labor force participation rates were quite high, averaged 85.3%. During the second subperiod in 1995-2002, owing to mass layoff from SOEs and rural-to-urban migration, urban unemployment rate has risen sharply, with annual increase of 0.8 percentage points. Concurrently, labor force participation rates have been declining at an annual rate of 0.7 percentage points during the same time period. The rising trend stopped in the last subperiod of 2002-2009, partly due to WTO entry which increased demand for labor, and the college enrollment expansion which improved overall quality of labor. Patterns revealed

[7]Topics that have been examined based on UHS include wage structures (Ge and Yang), gender wage gap (Zhang et al. (2008)), return to education (Zhang et al. (2005)), income and consumption inequalities (Meng et al. (2013) and Cai et al. (2010)), savings (Chamon and Prasad (2010)), among others.

[8]For example, Zhang et al. (2008) use samples from 6 provinces, Meng et al. (2013) only use samples from 16 provinces, Cai et al. (2010) use data from 1992 to 2003, while Ge and Yang goes from 1992 to 2007.

by different demographic groups, different regions, and different cohorts are largely consistent with the features of labor market developments and transformations in these subperiods.

To shed further light on the Chinese labor market, especially for the last subperiod of 2002-2009 characterized by marketization, we also use unique matched monthly UHS data to study labor market dynamics. Using data from 2004-2006, we find that the Chinese labor market is very immobile compared to the U.S. labor market. In terms of transition probabilities among different labor force statuses, only 18% of unemployed people would return to employment after one year, whereas the corresponding percentage in U.S. was 54% at roughly the same time. We also examine distributions of unemployment spells for different demographic groups, and provide upper and lower bounds for each category to deal with the censoring issue. Among all unemployment spells that happened during the 2004-06 period, between 27% (lower bound) and 59% (upper bound) were more than one year. For those people who were unemployed in July 2005, at least 73% were in a spell that lasts more than one year. Therefore, long term unemployment is prevalent in the Chinese labor market, which suggests a high degree of social exclusion. We show that state sector employment is partly responsible for the immobility of the Chinese labor market.

The reminder of the paper proceeds as follows. The next section briefly discusses key events and policy changes related to the development of China's urban labor market since 1988. Section three introduces the data set - Urban Household Survey (UHS). This is followed by section four which reports long run (1988-2009) time series of estimates for Chinese urban unemployment rates and labor force participation rates, as well as results for different demographic groups, different regions and different co-

horts. We also discuss the reliability of our estimates and conduct various robustness checks including correcting for possible misclassifications in labor force status using the method proposed by Feng and Hu (2013). In section five, we examine short run labor market dynamics using matched monthly UHS data for the 2004-2006 period. The last section summarizes our main findings and discusses additional work to be completed for this paper.

2 Historical Background

In this section, we provide a narrative of major events and institutional changes that have happened during the last several decades. Our main focus is on the development of China's urban labor market.

2.1 Prior to 1995

The Chinese economy has experienced tremendous changes since the open-door and reform policy initiated in the late 1970s. However, changes in urban labor markets came much later. In the first half of the 1980s, reform was primarily in rural areas characterized by decollectivization (see e.g. Lin (1992)). Throughout the 1980s and early 1990s, state-owned firms were gradually given some autonomies in making production decisions, and private and foreign firms started to emerge. Nevertheless, until the mid-1990s, the urban labor market was essentially still under the central planning regime. The majority of workers in cities were still employed in State-owned-enterprises. It was very difficult, if possible at all, for firms to dismiss redundant workers.

2.2 1995-2002

Since the mid-1990s, China's urban labor market has experienced significant transformations and structural changes (see e.g. Li et al. (2012) and Meng (2012)). Along with the product market reforms and the emergence of the non-state-owned sector, the state-owned firms began to experience substantial financial difficulties in the 1990s. In the mid 1990s, more than 40% of the state-owned enterprises were making losses. Starting from 1995, government began a policy of "seizing the large and letting go of the small (in Chinese, *Zhua da fang xiao*)", to privatize small and medium-sized SOEs while retain control of large enterprises. This has triggered large-scale lay offs from SOEs. During the period from 1997 to 2002, there were an estimated around 40 million state sector workers laid off.

In line with the transformation of China's labor market, the first labor law of the People's republic of China became effective since January 1st, 1995. The law formally enacted the regulations of the labor contract system, and made labor contracts mandatory in all industrial enterprises. The labor contract system allowed firms to select and hire suitable individuals. The law also permitted no-fault dismissal of workers by employers. On the other hand, employees were given the right to negotiate the duration, terms, and conditions of their employment, as well as the right to resign.

During roughly the same period of time, rural-to-urban migration picked up. Historically, migration of peasants to cities was highly regulated with the *Hukou* system . But since the mid-1990s, along with the changes in product market and labor market in the urban sectors, demand for cheap labor increased, and government gradually relaxed restrictions on population movements. According to Meng et al. (2013), in

1997 there were around 39 million migrant workers in cities, and by 2009, this has increased to 145 million. The most significant inflow occurred during the early 2000s. Meng et al. (2013) also argued that the main effect of migrant inflows on the urban market is a "quantity" effect rather than "price" effect. Because urban workers with *Hukou* were protected and received a wage premium, when rural migrants came, urban workers primarily dropped out of labor force or became unemployed instead of receiving lower wages.

2.3 Post-2002

On December 11, 2001, China officially became WTO's 143rd member. China's WTO entry has triggered profound changes. Total export increased from $266 billion USD in 2001 to $2.2 trillion in 2013. Domestic manufacturing sector thrived, demand for labor has increased which generated employment opportunities for both rural migrants and urban residents.

In 1999, China implemented one of the most important educational policies in recent years - college enrollment expansion. Since then, overall college enrollment has dramatically increased, from 1,080,000 in 1998 to about 5.5 million in 2006, and 6.3 million in 2009. College expansion has drastically increased number of workers with college degrees since 2002, the first year that three-year college students enrolled in 1999 graduated. The increase in the supply of college-educated workforce may have had profound impact on China's labor market.

3 Data

3.1 The Urban Household Survey data

The primary data source for this study is the 22 consecutive years of Urban Household Surveys (UHS) conducted by the National Bureau of Statistics (NBS) of China for the 1988-2009 period. The survey design of the UHS is similar to that of the Current Population Surveys (CPS) in the U.S., which is the source of official US labor market statistics including unemployment rates and labor force participation rates. The UHS is also the only nationally representative household dataset in China that encompasses all provinces and contains yearly information dating back to the 1980s.

Every three years, the NBS draws a first-stage sample of households from selected cities and towns in each province probabilistically in a multistage fashion, starting from cities and towns, then districts, residential communities, and finally housing units. A final sample is then randomly selected from the first-stage sample for detailed interviews and diary-keeping every month. Each year, one third of the households in the final sample is replaced by other households from the first-stage sample. Nevertheless, the design has not been always strictly enforced in all years. For example, in a couple of cases, some provinces may have delayed withdrawing and replacing the first-stage sample at the end of the three-year period for funding reasons. In addition, household identifiers that are necessary to match the same households in different years are only available since 2002. The survey questionnaires have also been updated several times along the way, with two major changes in 1992 and 2002, and minor changes in 1997 and 2007.

Throughout the analysis, we restrict the sample to those aged between 16 to 60 for

males and for those aged between 16 and 55 for females. This is because that the official retirement age is 60 for males and either 50 (for blue collar jobs) or 55 (for white collar jobs or so called "cadres") for females. We also focus on people with local household registration (those with local urban *Hukou*) for the following reasons. First, due to policy restrictions, there were very few non-local-*hukou* people in cities in the 1980s and early 1990s. Thus, in order to examine the long run trend of a homogenous group, it is better to stick with people with local *Hukou* throughout the whole period. Second, while UHS also covers non-local-*Hukou* people since 2002, the coverage is less than satisfactory due to the difficulties in interviewing non-local-*Hukou* people, as discussed in Ge and Yang and many other studies that use UHS data.[9] Last but not least, the *Hukou* population is also the more politically salient group, as unemployed migrant workers without *Hukou* can return to their rural hometown or migrate to a different city.

Sample summary statistics are given in Table A1. We divide the sample into 8 different demographic groups by sex (male or female), age (less than 40 or 40+) and education (college education or high school and below). Total sample size was more or less stable before 2002, but jumped from 36,529 in 2001 to 92,337 in 2002 due to a change in UHS sample design, and have increased further after that.

The UHS does not provide weights. Therefore, the main results in this paper are not weighted, as almost all other studies based on UHS. However, in robustness checks, we also provide weighted results using weights derived from population census data. We use data from the 1990 and 2010 census, starting from urban *Hukou* population

[9]When we calculate unemployment rates and labor force participation rates also including non-local-*Hukou* people, we find very similar results. The results are not included in the paper but are available upon request.

in each age(5-yr categories)/province/sex cell, we interpolate linearly for all years in our sample, then calculate weights as the ratio of population size and sample size for each cell. Thus two persons in the same cell, i.e., two sample individual in the same province, with the same sex, and the same age (5-yr category) would have the same weight in a given year.

The annual UHS data that the research community typically had access to was aggregated from internal UHS monthly data.[10] For the first time, we were given access to the internal monthly UHS data from January 2004 to December 2006. The structures of the monthly data sets are the same as the corresponding annual data. Sample sizes of different demographic groups are presented in Table A2. For working age people (16-60 for males and 16-55 for females) with local *Hukou*, total sample size is between 100K to 120K each month. As sample household are required to stay in UHS for at least one full calendar year and many stay for up to three years, the longitudinal dimension of UHS allows us to study labor force dynamics based on matched monthly files.

3.2 Labor force status classifications in UHS

The annual UHS data has information regarding labor force status in December of that year, which allow us to calculate unemployment rates and labor force participation rates. During the 1992-2009 period, fifteen categories for "employment status" are consistently reported for all sampled individuals,[11] including (1) Staff and workers

[10]For variables such as total wages and income, the annual data just add up numbers from all 12 monthly data files. For variables such as labor force status, the annual data file just contains information from the December monthly file.

[11]Note that the exact orders of the 15 categories are slightly different for the 1992-2001 and 2002-2009 periods.

in state-owned economic units. (2) Staff and workers in urban collectively-owned economic units. (3) Staff and workers in other types of economic units, such as foreign owned enterprises. (4) Self-employed workers or owners of enterprises. (5) Persons employed by private firms. (6) Retired staff and veteran cadre who are reemployed. (7) Other employees. (8) Students at school. (9) Housewives. (10) Retired people. (11) People who are unable to work due to disabilities and illnesses. (12) People waiting for assignment. (13) People waiting to be employed. (14) People waiting to enter higher levels of schools. (15) Other non-working-age nonemployed peoples. For the 1988-1991 period, we are also able to reconstruct these same 15 categories based on two variables: "employment status" and "occupation".

The exact meanings of the 15 labor force status categories are translated from the original Chinese interviewer manual and included in the Appendix. We assign category (1) to (7) as employed, category (12) (13) and (15) as unemployed, and category (8), (9), (10), (11) and (14) as not-in-labor-force(NILF).[12] A careful perusal of the explanations of the 15 labor force categories suggest that our classification of employment, unemployment and NILF are largely consistent with the ILO definitions. For example, to be qualified as "unemployed" (category 13), one has to be "capable of working, has performed paid work before, but do not have a job at the time of the survey, and are actively looking for job, and are currently available for work". UHS is also careful in assigning people as "mainly responsible for housekeeping" (category 9) only if they "have no intention to seek paid employment outside home".

Nevertheless, readers should still be cautious when comparing our results with labor

[12]Admittedly, there is some ambiguity on whether category (15) "other non-working-age nonemployed people" should fall into the unemployed or NILF group. But most people in this category have passed the official retirement age, thus not included in our sample, this should not significantly affect our results. We also provide robustness check later on.

statistics from other countries, such as the United States. As far as we know, there are at least three differences between the UHS-based and CPS-based definitions of labor force statuses. First, unlike CPS, there was no clear reference week for the labor force status in UHS in a given month. Second, the exact definitions of employment are slightly different. If a full-time student in summer break works for even one hour for pay during the reference week, then he is defined as "employed" according to CPS, while he would be classified as "NILF" in UHS. Third, in terms of job searches which are important criteria for unemployment, CPS has a four week reference period and lists specific activities to be qualified as active searching, while no such details are given in UHS.

4 Trends in unemployment and labor force participation

4.1 Unemployment

Panel A of Figure 1 shows unemployment rates based on UHS from 1988 to 2009, and contrasts them to the official rates. Consistent with the developments of the labor market in China over the past several decades as described in section 2, we divide the whole time period into three equal subperiods: 1988-1995, 1995-2002, and 2002-2009. Results by subperiods are also shown in Table 1. In the first subperiod, unemployment rate were relatively stable at a low level, with an average of 3.4%, which was only slightly higher than the official average of 2.5%. Nevertheless, in 1995-2002, the UHS-based unemployment rate climbed up rapidly, gaining 0.8 percentage points each year.

The official rate only increased very mildly. In the last subperiod of 2002-2009, UHS-based unemployment rate reached a peak and declined somewhat, with an average of 8.4%. The official rate lagged far behind at an average of only 4.2%, or only half of the UHS-based rate.

Panel A of Table 1 also presents results for different demographic groups for the three subperiods, with more detailed information shown in Figure A1. The patterns displayed by all groups are similar: unemployment rates increased most during the 1995-2002 period, while experienced considerably smaller changes in the first and last subperiod. Three groups have witnessed the highest growth rates in unemployment rate during 1995-2002, with the non-college young females saw an annual increase of 1.7 percentage points, the non-college young males and non-college old females both experienced an annual increase rates of 1.2 percentage points. As a result, during the last subperiod of 2002-2009, these three groups also posted the highest unemployment rates. The average unemployment rates for the non-collage young females, non-college young males, and non-college old females were 17.1%, 13.7% and 10.2%, respectively. On the other hand, college old males and females have posted the lowest unemployment rates in all subperiods. Even in 2002-2009, both groups had very low unemployment rates of less than than 2%. Overall, we see that people without college degrees, young people, and females systematically face more slack labor markets than their more educated, older and male counterparts.

We also present results for different regions in China, including North, Northeast, East, South Central, Southwest, and Northwest.[13] Panel A of Table 1 gives results

[13]The provinces included in different regions are as follows. North (5 provinces): Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia. Northeast (3): Liaoning, Jilin, Heilongjiang. East (7): Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong. South Central (6): Henan, Hubei, Hunan, Guangdong, Guangxi, Hainan. Southwest (5): Chongqing, Sichuan, Guizhou, Yunnan, Tibet.

by subperiods, while the graphs are shown in Figure A2. Overall, different regions follow quite similar patterns - unemployment rates remained at low levels in the first subperiod, rose rapidly during the second subperiod, and then declined slightly during the last subperiod. Nevertheless, for regions with more SOE layoffs, the rise in unemployment rate in 1995-2002 was more significant, such as the Northeast, South Central and Southwest regions.

Finally, we examine patterns for different cohorts. Panel A of Figure 2 show unemployment rates for males for four different cohorts: those who were born before 1960, those born in the 1960s, 1970s and 1980s, while panel B depicts results for females.[14] The most striking pattern is that young people had very high unemployment rates, especially for more recent cohorts. This should be due to the timing when the different cohorts entered the labor market. Even at the age of around 30, the post-1970 female cohorts had roughly 10% unemployment rate, as compared to only 2-4% for females born before 1970. For males, the pre-1970 cohorts also had unemployment rates around 6 percentage points lower than those born after 1970 when they were 30. However, as people get older, the gap in unemployment rates gradually close. At around 40, the 1960s cohort and 1970s cohort had roughly the same unemployment rates.

4.2 Labor force participation

Panel B of Figure 1 shows that the overall rate of labor force participation has dropped significantly from 1988 to 2009, with most of the declines happened in 1995-2002. Ta-

Northwest (5): Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang.

[14]To make sure of comparability across different years, results shown in Figure 2 are weighted. The unweighted results are very similar and are available from the authors upon request.

ble 1 reports average participation level and annual rate of change by subperiod. In 1988-1995, there were not much changes with labor force participation rates averaged at 85.3%. During the second subperiod when mass-layoff in SOEs and rural-to-urban migration happened, participation rates declined substantially, by 0.7 percentage points each year. In the last subperiod, labor force participation stabilized again at around 79%.

In terms of differences among demographic groups, the three groups that have experienced most substantial rise in unemployment rates also show most significant declines in labor force participation, including non-college young males, non-college young females, and non-college old females (Figure A1 and Table 1). For male non-college youths, labor force participation rates was 82.3% in the first subperiod, declined steadily to around 69.2% in the last subperiod, which represents 13 percentage points decline. Similarly, female non-college youths has experienced an almost 16 percentage point decline, with the decreasing trend continues in the last subperiod. For old non-college females, the main decline in labor force participation happened during the 1995-2002 subperiod and is most likely related to mass-layoffs from SOEs. Given the coinciding movements in both unemployment rate and labor force participation rate, rather than just selecting out of labor market voluntarily, non-college youths and old non-college females are likely to have faced increasingly toucher labor market conditions compared to other groups.

Panel B of Table 1 show results for different regions (see also Figure A2). In the first subperiod from 1988 to 1995, the Northwest region had a participation rate of 81.3%, which was around 5 percentage points lower than other regions. This was likely due to cultural differences as the Northwest provinces are populated by Muslim ethnic

groups. Although all regions have experienced substantial declines in labor force participation in 1995-2002, the rates of decline are higher for regions with initially high levels of participation. Therefore, participation rates in different regions have converged somewhat in the last subperiod. The North and Northwest regions had the lowest participation rates of around 76.5%. The East region had the highest participation rates of 80.4%.

For different cohorts, as shown in Figure 2 (Panel C and Panel D), younger generations have significantly lower participation rates when they were young, which should be partly due to increased schooling years, particularly the college enrollment expansion that impacted the 1980s cohort. Nevertheless, for males (Panel C), at around age 30, different cohorts converged. For females, more recent cohorts had somewhat lower participation rates continuously, possibly due to changes in and out of labor market that makes women's participation more difficult (or less rewarding).

Although the Chinese government does not release official labor force participation rates, two alternative estimates are available from existing studies for the years roughly correspond to our second subperiod of 1995-2002. Both series show a significant decline in labor force participation similar to what we observed based on UHS data. Cai et al. (2008) use official aggregate labor statistics and report that labor force participation rates for working age population has declined from 73% in 1996 to 64% in 2004. Using the Chinese Urban Labor Survey (CULS) that was conducted in five large Chinese cities (Fuzhou, Shanghai, Shengyang, Wuhan and Xi'an) by the authors, Giles et al. (2006) find that the labor force participation rate in these cities has declined from 83.3% in 1996 to 74.4% in 2001.

4.3 Robustness checks

To make sure that our results on unemployment rates and labor force participation rates, especially their long run trends, are robust to choices made regarding estimation techniques and sample restrictions, as well as potentially measurement errors, we do a couple of robustness checks in this subsection. The results are graphically illustrated in Figure A3. Table A3 also presents corresponding results by subperiod.

Firstly, we use weights calculated based on population census data to estimate weighted unemployment rates and labor force participation rates. In general, compared to our baseline results which are not weighted, the weighted unemployment rates are slightly higher and the weighted labor force participation rates are slightly lower. This is mainly because young people which have relatively high unemployment rates and low labor force participation rates are under represented in UHS. Nevertheless, the differences are not large. Even in 2002-2009 when the differences are the most pronounced, compared to our baseline unweighted figures, average weighted unemployment rate is only 0.9 percentage point higher, while weighted labor force participation rates are 0.8 percentage points lower. The annual changes in the three subperiods are all very close to the baseline rates of change, suggesting that the trends are largely the same.

Secondly, we restrict the sample differently to include both males and females aged between 16 to 60. This makes the sample more comparable to international practices despite that the official working age upper limit is 55 for females in China. As shown in Table A3, doing so increased unemployment rates and reduced labor force participation rates. This is hardly surprising as women aged between 55 and 60 are much less likely to be in the labor force and more likely to be unemployed than other people.

Next, one might worry about the possible measurement errors in the labor force statuses and the derived unemployment rates and labor force participation rates. Here we follow Feng and Hu (2013) and model the underlying true labor force status as a latent process potentially subject to measurement error. Using matched annual UHS data we estimate the misclassification probabilities for different demographic groups, as shown in Table A4. Overall, there were much less measurement errors compared to the US (see Table 1 in Feng and Hu (2013)). Once we correct for the unemployment rates and labor force participation rates (Table A3) using the estimated misclassification probabilities, we find that the corrected rates are very close to the baseline results.

The latent variable approach might not be able to identify measurement errors that are systematic over time. For example, if discouraged workers as always classified as unemployed rather than not-in-labor-force, then the approach used by Feng and Hu (2013) would not be able to identify such measurement errors.[15] This is a serious concern for UHS as the National Bureau of Statistics (NBS) does not specifically ask for labor search activities, which is necessary in order to use definitions given by International Labour Organization (ILO). Rather, the labor force statuses fall into 15 different categories based on the information provided by the respondent and the interviewer's judgement.

Despite that, the study of Giles et al. (2005) have shown that the NBS-based classification may be quite close to ILO-based measures. They surveyed labor force status in five Chinese cities in 2002 using questionnaires consistent with ILO standards, and then compare the generated unemployment rates with the predicted ones based on

[15] In this example, Assumption 5 in Feng and Hu (2013) that requires each individual to be more likely to report the true labor force status than to report any other possible values are violated.

historical NBS-based unemployment rates. They found the difference to be quite small. The actual ILO-based unemployment rates are only 1.064 times the predicted rates based on historical NBS-based rates. To show the magnitude of the difference, if the ILO-based unemployment rate is 9%, the predicted rate would be 8.5%. The actual difference between ILO-based and NBS-based unemployment rates could be even smaller if prediction errors are taken into account.

After a careful examination of all the 15 labor force statuses categories, we find that the most ambiguous category is "other non-working-age nonemployed people". Because no further information is provided, it is difficult to be sure whether this belongs to unemployment or not-in-labor-force. Fortunately, this group mostly applies to those who have passed the official working age upper limit. Thus, it should not affect our results much irrespectively. As a robustness check, we tried to classify those "other non-working-age nonemployed people" as not-in-labor-force. The results (Table A3) show that doing this only decreased unemployment rates slightly and hardly affected labor force participation rates. For example, in 2002-2009, the average unemployment rate was 8% as compared to our baseline result of 8.4%, average labor force participation rate was 78.3%, only slightly lower than the baseline rate of 78.6%.

4.4 Discussions

The overall trends of unemployment and labor force participation shown by UHS data correspond very well with China's economic transformations and institutional changes in different development stages. As reviewed in the section on historical background, no major reforms happened regarding labor market in 1988-1995. The state sector remained predominant in the economy despite the emergence of non-state firms. For

state employers, it was still very difficult, if not completely impossible, to dismiss redundant workers. Most jobs were still "iron rice bowls". Therefore, unemployment rates were very low and stable during this period of time, and labor force participation rates were high.

With the kickoff of massive SOE layoffs, things have changed dramatically during the second subperiod. Together with the development of the non-state sector, state employment share declined by half, from 60% to 30% in 1995-2002, as shown in Panel D of Figure 1. Rural-to-urban migration have also gained momentum, which severely worsened labor market conditions of low-skilled urban residents. These events underlay the massive rise in unemployment rates that we observe during this period. The enactment of the labor law also signals the structural change in China's labor market from centrally-controlled to market-oriented. Some groups, such as old uneducated females, suffered especially hard from the mass-layoffs. Regions that had more SOEs and layoffs also had witnessed a more severe worsening of labor market conditions, characterized by both rising unemployment and declining labor force participation.

In the last subperiod from 2002 to 2009, WTO entry helped to improve labor demand. The college enrollment expansion, which increased quality of labor force, also served to discontinue the rising trend in unemployment. Meanwhile, unemployment rates became substantially more volatile, suggesting that the labor market was more sensitive to changes in macro economic conditions as a result of the structural changes. After the unemployment rate peaked in 2002-2005, it started to decline slightly, and sharply dipped in 2007, with an recovery in 2008. The decline in unemployment rate during the 2005-2007 period can be considered as a recovery from the end of SOE mass layoffs. The 2007 dip in unemployment rate coincided with an exceptionally

high real GDP growth rate of 14.2%, as compared to only 9.6% in 2008 (see Panel C of Figure 1). The rebound after 2007 can be linked to the global financial crisis. Overall, it seems that the most recent natural rate of unemployment rate are very different from 1980s and early 1990s due to fundamental changes in labor market and overall economic structure.

5 Labor market dynamics

To gain a more complete understanding of the Chinese labor market, we proceed to study the short run dynamics in labor forces. There were essentially no such studies due to lack of data. We focus on the last subperiod (2002-2009) as by then, major reforms have been completed and the Chinese labor market was mainly driven by market forces. This also facilitates comparisons with labor market in developed economies.

We use monthly UHS files for the 2004-2006 period. This is the first time that researchers outside NBS were able to access such files. By design, sample individuals stay in UHS for at least one full calender year and usually for three years before exiting the sample. This allows us to match monthly files in order to study month-to-month transition probabilities and unemployment spells.

To match two monthly data, we use the following identifying variables: (1) geographic code, which identifies a 6-digit city (usually a county level city or a district within a prefecture level city), (2) household id, which uniquely identifies a household within a 6-digit city, (3) sex, (4) age, and (5) relationship to household head. We first sort each monthly data by the five identifying variables and drop the individuals with the

same set of ID variables for a given month. We then conduct the matching of two monthly files using the ID variables. Age differences can be -1, 0 or 1, while all other ID variables are required to be the same in the two months. [16]

5.1 Month-to-month labor force status transition probabilities

We first study the month-to-month labor force status transition patterns, which can be summarized by a 3-by-3 transition matrix between month i and month i+k. We consider both short run and longer run transitions by varying k from 1 to 12. We pool all possible combinations of two-month matches where the difference between the two months is k based on all the monthly samples included in the 2004-2006 period, and report the matching results in Table A5. For example, in the first row of Table A5, where we match two adjacent months (month i and month i+1), the results reported include all such matches (January 2004 matched with February 2004, February 2004 matched with March 2004, and so on.). Before conducting the matching, note that dropping samples with duplicate IDs only results in negligible reductions in sample size of 0.18%. The matching rate, measured as the percentage of month i sample individuals (after those with duplicate IDs are dropped) that can be matched with month i+1, is 97%. The matching rate drops as k increases, for matching of month i with month i+2, the matching rate is 94%, while matching month i with month i+3 results in a 91% probability of matching. For two monthly files that are half year

[16] We do so in three rounds. In the first round, we match individuals using the IDs requiring that all variables including age to be exactly identical. In the second round, for those unmatched from the first round, we allow age difference to be 1, while requiring all other ID variables to be identical. In the third round, we allow age difference to be -1.

apart, around 80% of individuals can be matched. The matching rate drops further to 52% when matched to 1 year later. This is of course due to some sample households dropping out of the UHS sample after one year.

Table 2 shows the transition probabilities of the three different labor force statuses based on the matched samples for different demographic groups. Overall, we see that mobilities across different labor force statuses are quite low. After one month, only between 2% and 4% of those unemployed get out of employment to either employed or NILF. Even after one year, only less than 30% of those who are unemployed will be able to move out of the unemployment status. There exist substantial heterogeneities across different demographic groups. Compared to their less-educated counterparts, people with college education are significantly more likely to move to employment when they are either unemployed or NILF. The differences among old and younger individuals, and among males and females are quite small.

To put the degree of labor market mobility of China in perspective, Table 3 compares transition probabilities between employment and unemployment for China and US. To ensure comparability, we use monthly CPS data for US for the same period of 2004-2006.[17] Note that the Chinese labor market is indeed much less dynamic compared to US. The probability of transition to unemployment from employment after one year is 1.1% in China, but 1.9% in US. With respect to transition from unemployment to employment, the difference is even larger. In China, only 17.8% of those unemployed

[17]We choose 2004-2006 as the comparison period because they are the same calendar years as in our UHS data. In addition, the 2004-2006 is also a period with "normal" labor market conditions for U.S., as argued by Krueger et al. (2014). In any case, the U.S. rates of transitions between unemployment and employment status are rather stable over time, at least before the recent great recession. Based on Figure 1 of Davis et al. (2006), for the 1996-2003 period, the average monthly flow rate from employment to unemployment is 1.1% and from unemployment to employment is 29%. The corresponding percentages are 1.2% and 27.4% in 2004-2006 based on our calculations, as shown in Table 3.

return to employment after one year, while in US this percentage is 54.3%.

One possible reason for overall low mobility in China may be state sector employment. Although state-owned-enterprises nowadays are quite different from at the beginning of the reform, state sector employment is still characterized by high job security and low mobility. Table A6 treat state employment and non-state employment as two distinct labor force statuses, and confirms that state sector employment is indeed less dynamic as compared to the non-state sector. To gauge the quantitative importance of the state sector employment, we do one hypothetical exercise in Table 3, allowing the state sector to have the same transition probabilities as the non-state sector. After this adjustment, we see that the probability of transition from employment to unemployment after one year becomes 2.1%, which is very close to US level. In terms of transition probability from unemployment to employment, the adjusted percentage almost doubled to 35%, although still significantly lower than the US level. Overall, we can conclude that state employment is partly responsible for China's low labor market mobility as compared to US.

5.2 Unemployment spells

The month-to-month transition matrices ignore changes in labor force statuses between the two months under study. In order to examine the complete history of individuals within the 36 months that we have data, we match individuals from all the 36 monthly files to form a long history of labor force statuses. Table A7 shows the matching results. Among all individuals that appear at least once, about 12.9% of them drop in less than one year. And 44.4% stay in the UHS sample for exactly 12 months. While another 5% drop between 13 and 23 months, 29% stay for exactly

two years. Some people stay longer, with around 7.6% stay for exactly three years while about 1% stay for more than 2 years but less than 3 year. Overall, the matched results are consistent with the UHS designs where households normally stay in the sample for one year.

Table 4 lists the distribution of unemployment spells. In panel A, all unemployment spells that can be found during the 36 months period are included and there were in total 20,996 unemployment spells. Since many of these spells are either left- or right-censored, we calculate lower and upper bounds on the percentages of spells that falls into a given category. For example, we know that between 81.5% and 85% of the spells last more than 3 months. Between 70.4% and 72.7% of the unemployment spells last more than 6 months. Censoring becomes a more serious issue for longer spells. The proportion of unemployment spells that last more than one year, the lower bound is 27% and the upper bound is 59%. And between 3.4% and 19.8% of the spells last for more than 2 years.

When we compare results for different demographic groups, again we find that college educated people in general are more likely to have shorter unemployment spells. The three demographic groups that post the highest increase in unemployment rates during the 1988 to 2009 period also seem to have the longest unemployment spells: young noncollege males, young noncollege females, and old noncollege females.

Panel B takes a snapshot of all those unemployed in July 2005, around the mid-point of the 36 months period. At least 96% of those unemployed in July 2005 are in a unemployment spell that last more than 6 months, and at least 73% are in a spell longer than one year. Non-college youths and old non-college females posted the longest unemployment spells but variations among different demographic

groups are not huge. Overall, long-term unemployment is quite prevalent in China. More research are needed in order to design proper policies to put those long-term unemployed back to work.

Finally, Table 5 presents results on duration of unemployment for all unemployed in a given month up to that month, which is typically what people do when measuring long-term unemployment.[18]. In this case there's no need to worry about right-censoring but left-censoring is still problematic so we report both lower bounds and upper bounds.[19] We show results for all months in the year 2006. For unemployment spells more than 6 months, which is typically used as a measure of long term unemployment, the upper bounds are consistently around 90% in all months. The lower bounds are low from January 2006 to June 2006 due to severe left censoring caused by sample rotations which typically happen at the start of a calendar year in UHS. However, for July to December 2006, the lower bounds are quite close to upper bounds. For example, for July 2006, between 87 to 91 percent of all unemployed are long term unemployment. The ratio of those unemployed for more than one year is also high, although less precisely measured due to more severe left-censoring. For those unemployed in July 2006, between 56 and 85 percent have been unemployed for more than one year.

[18]Consider all unemployed people in month i, in panel B of table 4, spell length includes both before and after month i, while in table 5 we only count unemployment spell up to month i.

[19]In other countries, typically unemployed people are directly asked how long they have been unemployed, such as in CPS. But there were no such questions in UHS, thus we have to rely on matched data.

6 Conclusions

For years, China's true unemployment rates have remained unknown and left guessing, as the official unemployment figure based on registered unemployment severely underestimate the true levels of unemployment and bias the trends. In addition, no information was provided on labor force participation rate, an equally important labor market barometer.

This paper fills such a void by using existing nationally representative household survey in China. The survey is administered by the National Bureau of Statistics and is the only source of information regarding Chinese labor market during the last two decades. We make several contributions. First, we report for the first time nationally representative time series on unemployment rate and labor force participation rate dating back to the late 1980s. Second, we identify several demographic groups that post high unemployment and low participation, including young uneducated people and old uneducated females. We also show that regions with more SOE layoffs experienced more increase in unemployment. These particular demographic groups and regions deserve policy priority in order to achieve maximum employment. Third, we compare different cohorts and show that recent cohorts experience significant higher unemployment rates and lower participation rates compared to their predecessors, particularly when they were young. Last, we examine dynamics in labor market and found that the Chinese labor market is quite immobile even in the post-2002 era when major labor market reforms have been completed. State sector employment is partly responsible for this immobility.

The regularities that this paper reveals are largely consistent with the economic

transformations and macroeconomic developments in China during the past several decades. However, we view this paper only a first step toward a full understanding of the Chinese labor market in the last several decades. Due to data limitations we have not studied labor market outcomes for people living in cities but without official registration status, a group that has becoming increasingly important since late 1990s. The exact labor market consequences of many important events, such as rural-to-urban migration, WTO entry, mass layoff from SOEs, as well as secular social and cultural changes that may have affected participation patterns, are left for further investigation in the future.

Finally, we conclude this paper with a brief comparison of China's level of overall and long-term unemployment with other major transitional and developed economies. Table 6 presents average levels of unemployment for the three sub-periods of our study, as well as ratios of long term unemployed among all unemployed for the year 2006.[20] China's level of unemployment was among the lowest in the first sub-period of 1988-1995, similar to Czech and Austria and only slightly higher than Japan. Even in the second sub-period from 1995 to 2002, when China witnessed substantial increase in unemployment, average level unemployment rate was still a modest 5.2%, which was lower than all other transitional economies listed in the table. During the last sub-period of 2002-2009, unemployment levels in China stood high by international standards, and were comparable to some major continental European countries. On the other hand, China's long-term unemployment in 2006 was close to 90%, the highest among all countries. This is probably not very surprising given that all transitional countries have ratios of long-term unemployment higher than 60%.

[20]For China we simply used the lower bound for July 2006, which is rather close to the upper bound. There were also not much variations in different months.

Nevertheless, the extremely high level of long-term unemployment in China still calls for more thorough investigations of the underlying structural features of its labor market and overall economy. We again leave those to future work.

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Appendix: Detailed explanations on "employment status" from the UHS interviewer manual

Employment status refers to the current employment situation of the respondent, including those who are not employed. All respondents are required to fill in the employment status according to the following list of categories.

1: employees of state-owned economic units: refers to people working in and paid by the following units: public institutions owned by the party or the government, state-owned enterprises and their affiliated units. Workers in stock companies where the state has the majority share are also included in this category. However, people reemployed after official retirement are not included.

2: workers in urban collective economic units: refers to people working in and paid by urban collectively-owned enterprises, collectively-owned public institutions and their affiliated economics units. Those who are reemployed after retirement are not included.

3: workers in economic units of other types: refers to people working in and paid by economic units of mixed ownerships, joint-stock firms, foreign and Hong Kong, Macau, Taiwan invested firms, and types of economic units. People reemployed after official retirement are not included.

4: urban self-employed and private entrepreneurs: also known as self-employed persons (individual employers and self-employed persons), refers to an individual or a couple or several partners work together, and own the production assets and the final product (and income generated). They should have obtained the approval and

receive the license for "individual or private business operations". Those who have not obtained a license yet but has normal operations at a fixed place should also be included in this category, including: Employer: refers to people who have the appropriate license and hire at least one employee (not a household member) in their businesses. Self-employed persons: refers to people who have a proper license but have not hired any other individuals (except for the family members).

5: employees in private enterprises: refers to people who are hired and paid by self-employed people and private entrepreneurs.

6: Re-employed retirees: refers to people who are hired by their original employers or other employers after official retirement, and receive payment other than their pension. Those self-employed with a proper business license after retirement are also included. Retirees who have performed some social activities during the survey month that with remunerations enough to cover basic living cost should also be included.

7: other employed people: refers to people who are employed but not included in the above six categories, including: those without a stable job but has performed social activities for more than half of the month during the survey month and earned remunerations enough to cover basic living cost. Some examples are: people who take raw materials from a firm and process in their own home, washing and mending from home, childcare, nanny, freelance writers and painters, and people who provide service in information as intermediaries, stocks and other investments in securities, and other self-employed without proper license or fixed work place. Middle school, high school, college students who participate in work during the holidays are not counted as employed people, although they may receive remunerations. The payments they receive should be counted as "other labor income". The following is the categories

for non-employed people:

8: students: refers to people who study in all types of schools.

9: people responsible for housekeeping: refer to working-age people who stay at home to perform household duties and receive no remunerations, and have no intention to seek paid employment outside home.

10: retirees: refer to people who are officially retired and rely only on pension for living. Those who are reemployed after retirement should be considered as employed and not included here.

11: incapacitated: refer to working-age people (16-60 years old for men and 16-55 years old for women) who are unable to work due to psychological, physical disabilities, illnesses or other reasons.

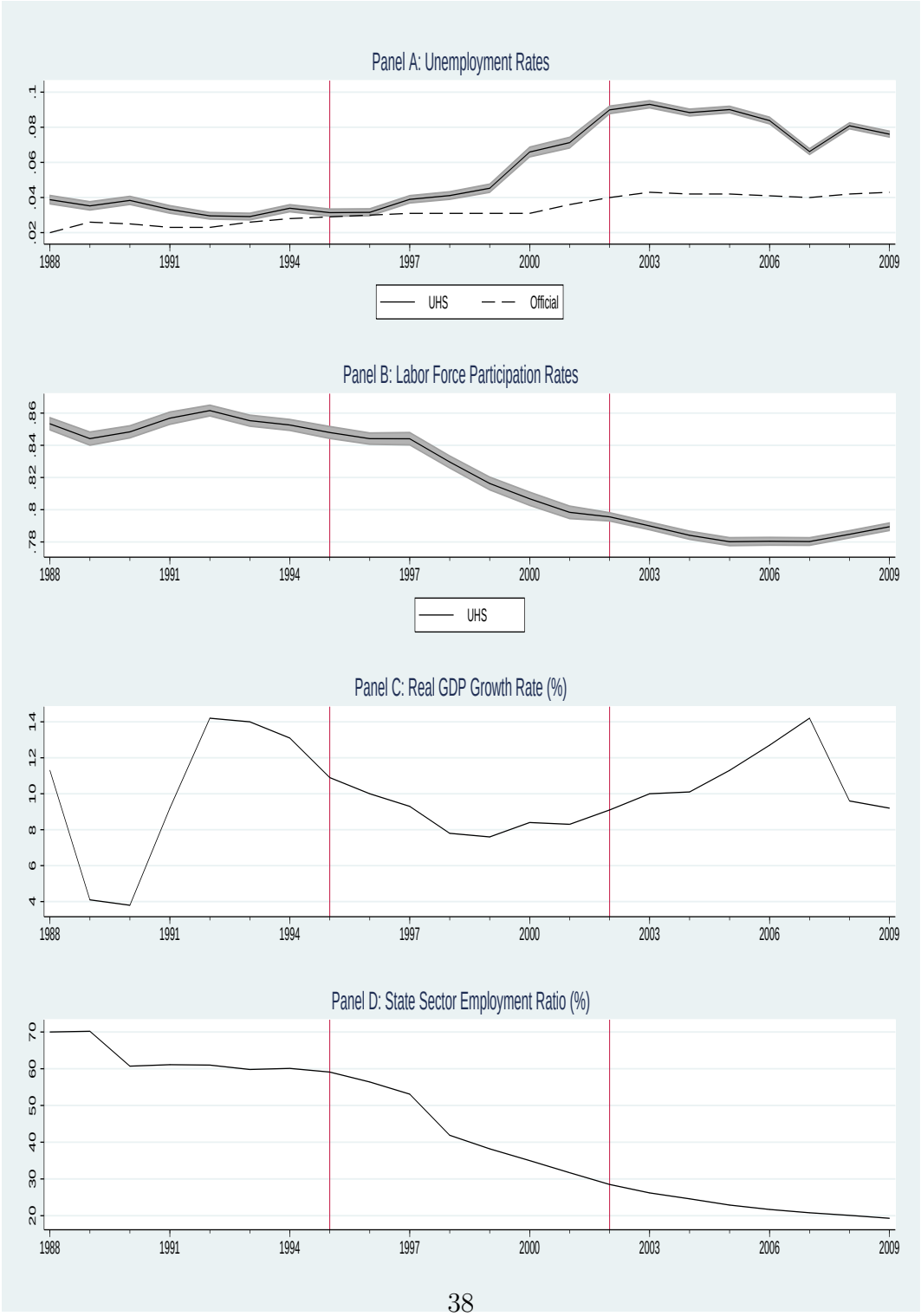
12: people waiting to be assigned to jobs: refer to people who are waiting to be assigned to jobs by the government after they graduate from colleges, technical high schools and other technical schools. Demobilized soldiers who have waited for less than a year to be assigned to jobs by the government should also be included here.

13: unemployed: refer to working-age people who are capable of working, has performed paid work before, but do not have a job at the time of the survey, and are actively looking for job, and are currently available for work. Note those who are performing some kind of paid work and seeking new jobs at the same time should be considered employed and not included in this category.

14: people waiting to enter the next level of schools: refers to middle school and high school graduates who are waiting to enter the next level of schools, and high school graduates studying at home to prepare for college entrance exams.

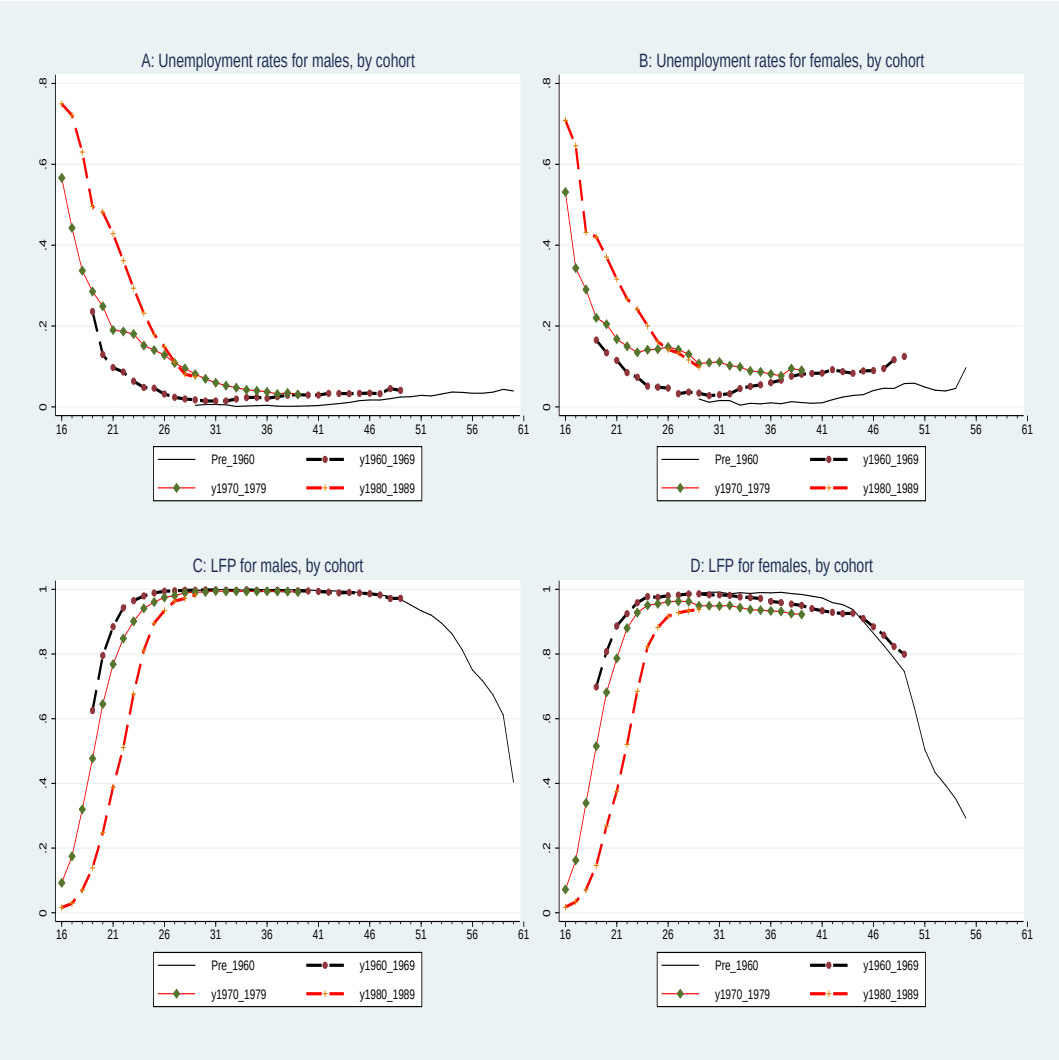
15: other non-employed people: refer to other non-employed people not included in the above categories.

Figure 1: National Unemployment Rates and Labor Force Participation Rates: 1988-2009.



NOTE: Sample restricted to people with local urban HuKou and aged 16-60 for males and 16-55 for females. In panels A and B, the shaded areas represent 95% confidence bands based on 500 bootstrapped samples.

Figure 2: Unemployment and Labor Force Participation by Cohort.



NOTE: Sample restricted to people with local urban HuKou and aged 16-60 for males and 16-55 for females. Results are weighted.

Table 1: Unemployment rates and Labor Force Participation rates by subperiod (%)

	subperiod 1 (1988-1995)		subperiod 2 (1995-2002)		subperiod 3 (2002-2009)	
	Average	Annual Chg.	Average	Annual Chg.	Average	Annual Chg.
			Unemployment Rate			
Nation	3.4	-0.1	5.2	0.8	8.4	-0.2
-by subgroup						
Male/Young/Non-col	6.4	0.1	10.3	1.2	13.7	-0.6
Male/Young/Col	0.5	-0.0	2.2	0.5	4.8	0.2
Male/Old/Non-col	0.3	-0.0	1.5	0.6	5.6	0.2
Male/Old/Col	0.1	-0.0	0.4	0.2	1.2	-0.0
Female/Young/Non-col	5.5	0.0	10.7	1.7	17.1	-0.4
Female/Young/Col	1.3	-0.1	3.0	0.6	5.8	0.2
Female/Old/Non-col	1.8	-0.3	3.3	1.2	10.2	0.2
Female/Old/Col	0.2	-0.1	0.4	0.3	1.6	-0.1
-by region						
North	2.8	-0.2	4.2	0.8	6.6	-0.2
Northeast	3.0	0.2	6.8	1.1	10.3	-0.3
East	2.4	-0.1	3.7	0.7	7.2	-0.1
South Central	3.4	-0.1	5.6	1.0	9.3	-0.2
Southwest	4.4	-0.1	5.9	0.9	10.7	-0.1
Northwest	5.6	-0.4	6.4	0.7	8.4	-0.2
			Labor Force Participation Rate			
Nation	85.3	-0.1	82.3	-0.7	78.6	-0.1
-by subgroup						
Male/Young/Non-col	82.3	-0.5	77.0	-1.1	69.2	-0.6
Male/Young/Col	92.3	-0.1	89.3	-0.6	85.2	-0.2
Male/Old/Non-col	90.5	-0.0	88.8	-0.3	87.8	0.0
Male/Old/Col	97.1	-0.2	94.5	-0.1	95.3	0.1
Female/Young/Non-col	84.8	-0.3	79.5	-1.3	69.2	-1.0
Female/Young/Col	88.1	0.4	86.9	-0.3	83.9	-0.1
Female/Old/Non-col	77.3	0.2	74.8	-1.3	67.6	-0.4
Female/Old/Col	96.6	-0.4	93.1	-0.6	92.4	0.1
-by region						
North	84.7	-0.2	80.7	-0.9	76.5	-0.1
Northeast	84.9	-0.2	80.7	-0.7	77.9	-0.1
East	86.8	-0.1	83.8	-0.7	80.4	-0.0
South Central	86.0	-0.3	83.2	-0.6	79.9	-0.1
Southwest	86.3	0.1	83.7	-0.9	77.8	-0.2
Northwest	81.3	0.5	79.9	-0.9	76.5	-0.2

Table 2: Month-to-Month Labor Force Transition Probabilities(%)

K	E-U	E-O	U-E	U-O	O-E	O-U	E-U	E-O	U-E	U-O	O-E	O-U
	Male/Young/Non-col						Male/Young/Col					
1	0.20	0.00	1.90	0.10	0.10	0.10	0.10	0.00	3.20	0.20	0.70	0.30
2	0.40	0.00	3.60	0.20	0.30	0.20	0.20	0.00	5.80	0.30	1.50	0.60
3	0.60	0.00	5.10	0.30	0.40	0.30	0.30	0.00	8.10	0.50	2.30	0.90
6	0.90	0.10	8.90	0.60	0.90	0.70	0.40	0.10	14.30	0.90	4.80	1.80
12	1.30	0.20	17.40	1.40	2.10	1.70	0.60	0.20	27.20	2.10	10.60	3.90
	Male/Old/Non-col						Male/Old/Col					
1	0.20	0.20	2.60	0.30	0.50	0.00	0.00	0.10	3.60	0.30	0.70	0.00
2	0.30	0.40	4.60	0.60	0.90	0.10	0.10	0.20	6.20	0.40	1.30	0.00
3	0.40	0.50	6.40	0.90	1.30	0.10	0.10	0.30	8.50	0.60	1.80	0.10
6	0.60	1.00	10.90	1.70	2.40	0.20	0.20	0.50	15.30	1.10	3.40	0.10
12	1.00	2.00	18.30	3.50	5.20	0.50	0.30	1.00	28.70	2.60	7.40	0.20
	Female/Young/Non-col						Female/Young/Col					
1	0.30	0.10	1.90	0.10	0.30	0.10	0.10	0.00	2.90	0.10	0.80	0.30
2	0.60	0.10	3.50	0.20	0.50	0.20	0.20	0.10	5.40	0.30	1.50	0.50
3	0.80	0.20	5.00	0.30	0.80	0.30	0.30	0.10	7.70	0.40	2.30	0.80
6	1.40	0.30	8.90	0.60	1.60	0.50	0.60	0.10	13.30	0.80	4.90	1.50
12	2.30	0.60	17.30	1.60	3.60	1.20	0.90	0.40	24.70	1.70	11.00	3.40
	Female/Old/Non-col						Female/Old/Col					
1	0.20	0.50	1.80	0.60	0.50	0.00	0.00	0.20	2.20	0.60	0.80	0.00
2	0.40	0.90	3.30	1.20	0.90	0.10	0.10	0.30	4.20	1.10	1.50	0.10
3	0.50	1.30	4.50	1.70	1.20	0.10	0.10	0.40	6.10	1.60	2.00	0.10
6	0.90	2.50	7.70	3.50	2.20	0.20	0.20	0.70	11.60	3.10	3.40	0.20
12	1.50	5.40	13.90	8.10	4.80	0.40	0.30	1.50	22.00	2.80	6.90	0.50

Note: E, U, O stands for employment, unemployment and NILF, respectively. E-U is the probability of unemployed in month i+k for those employed in month i.

Table 3: Transition probabilities between employment and unemployment (%)

k	China	China-adjusted	USA
Panel A: Probabilities of unemployment in month i+k conditional on being employed in month i			
1	0.2	0.3	1.2
2	0.3	0.6	1.5
3	0.4	0.8	1.7
6	0.7	1.3	NA
12	1.1	2.1	1.9
Panel B: Probabilities of employment in month i+k conditional on being unemployed in month i			
1	2.1	4.5	27.4
2	3.9	8.1	36.6
3	5.5	11.6	42.3
6	9.6	19.5	NA
12	17.8	35.1	54.3

NOTE: [China] is based on matched UHS monthly data during the 2004-2006 period. [China-adjusted] assumes that the state sector has the same transition probabilities to and from unemployment as the non-state sector. [USA] is based on matched CPS monthly data during the 2004-2006 period.

Table 4: Distribution of unemployment spells

	Male Young Non-col	Male Young Col	Male Old Non-col	Male Old Col	Female Young Non-col	Female Young Col	Female Old Non-col	Female Old Col	Total
Panel A: All Unemployment Spells									
Spell> 3									
LB (%)	82.9	76.8	78.5	75.1	83.9	78.1	81.5	86.2	81.5
UB (%)	86.4	80.6	82.5	76.7	87.0	82.5	85.1	87.9	85.0
Spell> 6									
LB (%)	72.3	61.4	66.3	62.8	73.8	63.5	71.9	75.3	70.4
UB (%)	74.7	64.3	68.8	64.4	75.8	66.2	74.1	77.0	72.7
Spell> 12									
LB (%)	28.2	22.2	26.7	22.0	28.8	24.2	27.8	24.7	27.3
UB (%)	62.2	47.2	54.2	46.9	63.3	50.7	60.3	55.7	59.0
Spell> 24									
LB (%)	3.8	2.9	3.6	2.9	3.6	2.4	3.1	3.4	3.4
UB (%)	20.7	14.2	18.5	12.9	21.9	16.1	20.1	19.5	19.8
Number of spells	4188	1164	3292	309	6239	1349	4281	174	20996
Panel B: Unemployment Spells For the Unemployed in July 2005									
Spell> 3									
LB (%)	98.9	98.2	98.9	96.8	99.2	97.3	98.5	100.0	98.8
UB (%)	99.0	98.5	98.9	96.8	99.3	98.0	98.6	100.0	98.9
Spell> 6									
LB (%)	96.6	94.7	96.3	94.7	97.3	94.5	97.0	98.4	96.6
UB (%)	97.7	95.6	96.8	94.7	97.7	95.0	97.3	98.4	97.2
Spell> 12									
LB (%)	73.1	68.1	72.4	63.2	74.8	71.2	73.0	65.6	73.0
UB (%)	87.5	81.6	85.3	74.7	88.2	83.9	86.0	79.7	86.3
Spell> 24									
LB (%)	10.6	9.9	10.4	9.5	10.1	8.2	8.9	9.4	9.9
UB (%)	58.4	48.2	54.2	42.1	61.4	53.8	57.1	53.1	57.4
Number of spells	1486	342	1125	95	2223	403	1504	64	7242

Note: Table based on matched monthly files from January 2004 to December 2006 using UHS.

Table 5: Distribution of unemployment spells up to month i

	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06
$Spell > 3$						
LB(%)	64	64	64	93	94	94
UB(%)	94	93	92	95	95	95
$Spell > 6$						
LB(%)	61	60	61	61	61	61
UB(%)	92	91	90	90	90	89
$Spell > 12$						
LB(%)	55	55	55	56	56	56
UB(%)	87	86	86	86	86	85
Number of spells	7342	7334	7297	7247	7204	7169
	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06
$Spell > 3$						
LB(%)	93	93	93	94	94	95
UB(%)	95	95	95	95	95	96
$Spell > 6$						
LB(%)	87	88	88	88	88	89
UB(%)	91	91	91	92	92	92
$Spell > 12$						
LB(%)	56	55	55	56	56	56
UB(%)	85	85	84	85	84	84
Number of spells	7172	7201	7214	7164	7180	7158

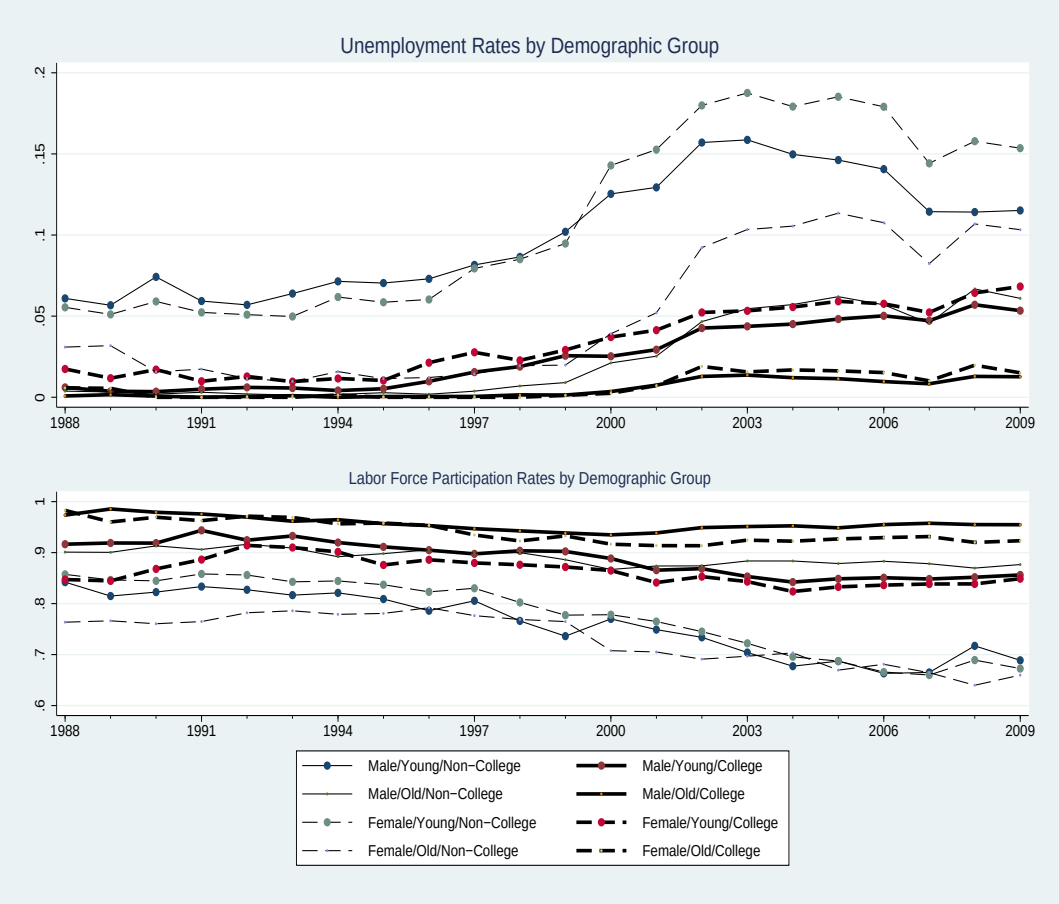
Note: Table based on matched monthly files from January 2004 to December 2006 using UHS.

Table 6: International comparison

	Unemployment Rate (%)			Long-term
	subperiod 1 (1988-1995)	subperiod 2 (1995-2002)	subperiod 3 (2002-2009)	Unemployment (% of all unemployed)
China	3.4	5.2	8.4	87
Transitional Countries				
Estonia	4.3	11.0	8.5	62
Slovak Republic	13.4	15.2	14.5	84
Slovenia	n.a.	6.7	5.7	68
Russian Federation	7.2	10.6	7.3	61
Poland	12.3	14.5	14.4	69
Czech Republic	3.5	6.6	6.9	75
Developed Countries				
Australia	8.7	7.4	5.2	31
Austria	3.6	3.9	4.5	44
Belgium	10.9	10.0	7.9	65
Canada	9.5	8.2	7.0	16
France	8.8	9.0	7.9	60
Germany	6.7	8.6	9.2	71
Greece	8.5	10.6	9.0	72
Italy	11.3	11.0	7.7	64
Japan	2.5	4.2	4.6	48
United Kingdom	8.7	6.4	5.4	40
United States	6.2	4.9	5.8	18

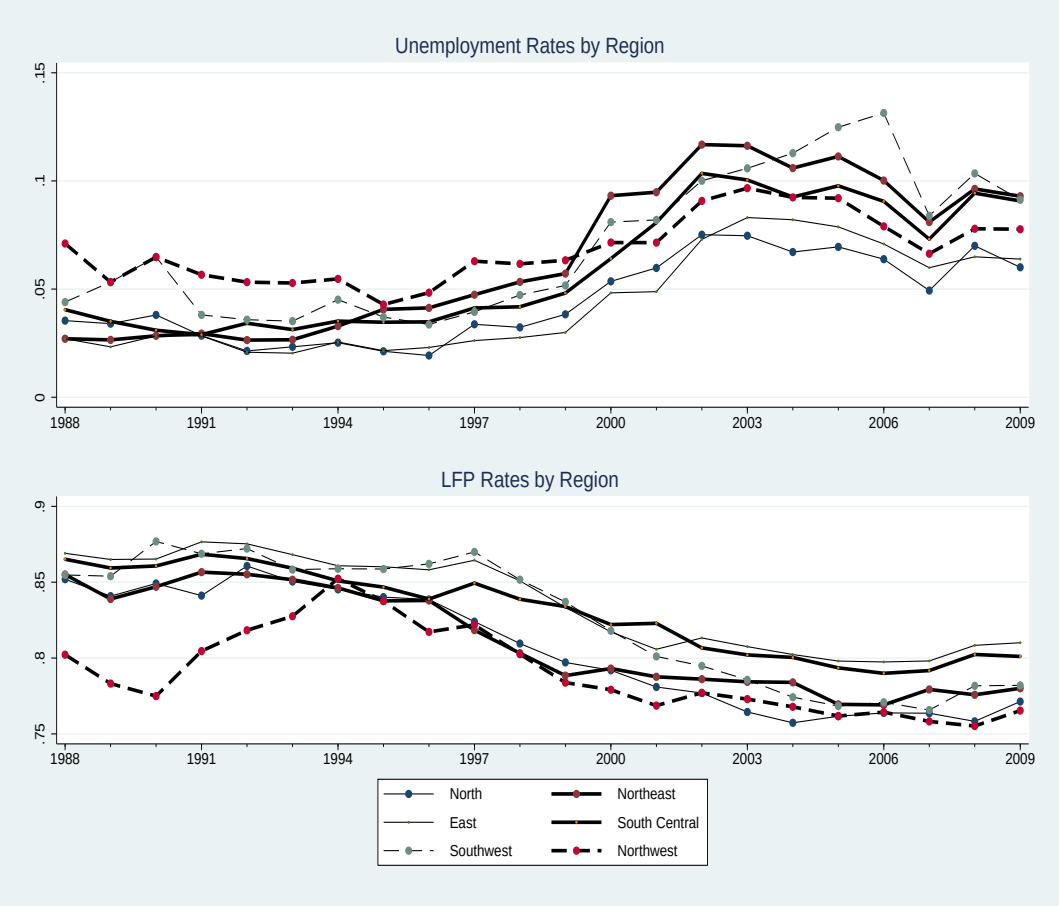
Note: The last column on long-term unemployment is for year 2006 only. For China we just use the lower bound for July 2006 as in Table 5. Sources: UHS for China and OECD for all other countries.

Figure A1: Unemployment and Labor Force Participation by Demographic Groups.



NOTE: Sample restricted to people with local urban HuKou and aged 16-60 for males and 16-55 for females.

Figure A2: Unemployment and Labor Force Participation by Region.



NOTE: Sample restricted to people with local urban HuKou and aged 16-60 for males and 16-55 for females.

Figure A3: Robustness Check Results.

Table A1: Sample Size

Year	Male Young Non-col	Male Young Col	Male Old Non-col	Male Old Col	Female Young Non-col	Female Young Col	Female Old Non-col	Female Old Col	Total
1988	8727	1079	5569	1290	10268	609	5291	352	33185
1989	8092	1172	5422	1260	9458	605	5129	377	31515
1990	8094	1255	5684	1441	9581	743	5370	459	32627
1991	7905	1495	5365	1450	9459	917	5064	403	32058
1992	8852	2131	6423	2048	10668	1364	6207	705	38398
1993	8313	2067	6524	2111	10008	1368	6414	712	37517
1994	7824	2358	6463	2117	9524	1532	6493	758	37069
1995	7549	2302	6721	2113	9137	1546	6691	787	36846
1996	7319	2365	7012	2173	8790	1641	6932	838	37070
1997	7060	2441	7099	2076	8617	1764	7028	781	36866
1998	6940	2574	7183	2147	8349	1956	7218	830	37197
1999	6751	2552	7239	2295	7885	2124	7449	923	37218
2000	6350	2852	7026	2121	7599	2368	7184	887	36387
2001	6285	2798	7230	2136	7392	2414	7357	917	36529
2002	14536	7530	18447	6395	16912	6930	18762	2825	92337
2003	15764	8125	20633	7539	18168	7678	20985	3459	102351
2004	15333	8553	21463	8346	17534	8426	21607	4049	105311
2005	16175	9924	22177	9199	18226	9867	21875	4639	112082
2006	15977	10209	22565	9970	17740	10331	22308	5160	114260
2007	15786	11508	23775	10901	17623	12021	23236	5829	120679
2008	17077	13588	25412	10656	18558	14032	24076	5719	129118
2009	15570	13058	25179	11423	16906	13664	23713	6317	125830

Source: Authors' calculation from UHS.

Table A2: Sample sizes for the 2004-2006 monthly samples

Year	Month	Male Young Non-col	Male Young Col	Male Old Non-col	Male Old Col	Female Young Non-col	Female Young Col	Female Old Non-col	Female Old Col	Total
2004	1	15185	8804	20724	7662	17663	8398	20955	3633	103024
2004	2	15208	8768	20789	7721	17625	8375	21020	3678	103184
2004	3	15166	8685	20799	7755	17531	8320	21043	3696	102995
2004	4	15084	8613	20859	7803	17498	8259	21080	3717	102913
2004	5	14981	8510	20751	7792	17351	8133	20950	3720	102188
2004	6	15074	8486	20904	7915	17414	8157	21113	3778	102841
2004	7	15072	8420	20971	7979	17422	8133	21131	3809	102937
2004	8	15054	8360	20995	8043	17345	8123	21133	3831	102884
2004	9	14813	8343	20975	8078	17018	8113	21132	3856	102328
2004	10	14821	8328	21080	8142	17023	8121	21228	3903	102646
2004	11	14805	8260	21097	8172	16947	8058	21251	3938	102528
2004	12	14728	8215	21076	8182	16849	8036	21227	3965	102278
2005	1	15848	9982	21389	8433	18003	9660	21298	4192	108805
2005	2	15738	9883	21335	8443	17858	9567	21238	4197	108259
2005	3	15778	9850	21398	8547	17883	9585	21317	4243	108601
2005	4	15752	9798	21467	8628	17882	9553	21316	4287	108683
2005	5	15742	9708	21466	8661	17860	9472	21275	4317	108501
2005	6	15721	9662	21529	8733	17852	9460	21325	4355	108637
2005	7	15680	9606	21490	8787	17790	9418	21288	4384	108443
2005	8	15556	9536	21443	8790	17676	9356	21236	4393	107986
2005	9	15323	9562	21507	8859	17366	9426	21286	4447	107776
2005	10	15326	9521	21549	8926	17355	9396	21274	4482	107829
2005	11	15323	9506	21587	8975	17344	9378	21319	4524	107956
2005	12	15211	9452	21544	8976	17237	9330	21245	4531	107526
2006	1	15614	10294	22105	9345	17656	10156	21890	4792	111852
2006	2	15642	10244	22163	9406	17645	10154	21939	4821	112014
2006	3	15603	10159	22123	9441	17578	10104	21906	4840	111754
2006	4	15593	10072	22130	9521	17536	10063	21917	4860	111692
2006	5	15609	10028	22177	9567	17529	10037	21949	4884	111780
2006	6	15607	9965	22160	9609	17465	10002	21933	4931	111672
2006	7	15635	9911	22144	9634	17442	9971	21896	4951	111584
2006	8	15661	9904	22195	9696	17423	9986	21955	4991	111811
2006	9	15384	9959	22173	9720	17168	10023	21929	5006	111362
2006	10	15337	9922	22172	9736	17120	9972	21926	5028	111213
2006	11	15324	9874	22195	9766	17075	9923	21923	5048	111128
2006	12	15310	9834	22201	9800	17039	9911	21936	5073	111104

Source: Authors' calculation from UHS.

Table A3: Alternative Estimates of Unemployment rates and Labor Force Participation rates (%)

	subperiod 1 (1988-1995)		subperiod 2 (1995-2002)		subperiod 3 (2002-2009)	
	Average	Annual Chg.	Average	Annual Chg.	Average	Annual Chg.
			Unemployment Rate			
Baseline	3.4	-0.1	5.2	0.8	8.4	-0.2
A1	3.6	-0.0	6.0	0.9	9.3	-0.3
A2	3.8	-0.1	5.6	0.8	8.8	-0.1
A3	3.2	-0.1	5.1	0.9	8.4	-0.2
A4	3.1	-0.0	5.0	0.8	8.0	-0.1
			Labor Force Participation Rate			
Baseline	85.3	-0.1	82.3	-0.7	78.6	-0.1
A1	85.7	-0.2	81.8	-0.9	77.8	-0.0
A2	83.5	-0.2	80.2	-0.8	76.0	-0.2
A3	85.3	-0.1	82.3	-0.7	78.6	-0.1
A4	85.0	-0.0	82.1	-0.8	78.3	-0.0

Note: A1: Weighed results. A2: Results using sample including all people aged 16-60. A3: Corrected results using the approach by Feng and Hu (2013). A4: "Other nonemployed" classified as NILF.

Table A4: Misclassification Probabilities (%)

Group	P_{21}	P_{31}	P_{12}	P_{32}	P_{13}	P_{23}
Male/Young/Non-col	0.68	0.09	1.30	0.38	0.12	0.00
Male/Young/Col	0.05	0.02	7.80	3.02	0.00	0.00
Male/Old/Non-col	0.18	0.10	3.10	1.72	1.22	0.79
Male/Old/Col	0.11	0.04	7.20	0.00	1.02	1.51
Female/Young/Non-col	0.82	0.16	2.11	2.10	0.23	0.00
Female/Young/Col	0.37	0.04	5.63	6.74	0.68	6.28
Female/Old/Non-col	0.22	0.24	2.24	2.37	0.70	0.00
Female/Old/Col	0.06	0.05	4.29	0.00	2.49	0.04

Note: P_{ij} stands for $P(u = i|u^* = j)$

Table A5: Matching month i with month i+k based on all 2004-2006 monthly samples

k	duplicate ID (%)	Matching rate (%)	Matched sample size
1	.180	97	3633310
2	.180	94	3412878
3	.180	91	3195511
6	.180	80	2555468
12	.182	52	1325380

Note: Table based on pooled results for matching month i with month i+k based on all monthly samples during the 2004-2006 periods.

Table A6: Transition Probabilities between four labor force statuses (%)

		State	Nonstate	Unemployment	NILF
	State	99.7	0.1	0.1	0.1
K=1	Nonstate	0.1	99.4	0.3	0.2
	Unemployment	0.4	1.8	97.6	0.3
	NILF	0.1	0.3	0.1	99.5
		State	Nonstate	Unemployment	NILF
	State	99.4	0.2	0.1	0.2
K=2	Nonstate	0.2	98.8	0.6	0.4
	Unemployment	0.7	3.2	95.6	0.5
	NILF	0.2	0.6	0.2	99
		State	Nonstate	Unemployment	NILF
	State	99.1	0.4	0.2	0.3
K=3	Nonstate	0.3	98.3	0.8	0.6
	Unemployment	0.9	4.6	93.8	0.7
	NILF	0.3	0.8	0.3	98.6
		State	Nonstate	Unemployment	NILF
	State	98.3	0.8	0.3	0.7
K=6	Nonstate	0.7	97	1.3	1
	Unemployment	1.7	7.8	89	1.4
	NILF	0.6	1.6	0.6	97.2
		State	Nonstate	Unemployment	NILF
	State	95.9	2.1	0.5	1.4
K=12	Nonstate	1.8	94.1	2.1	2
	Unemployment	3.5	14.3	78.9	3.4
	NILF	1.4	3.5	1.3	93.8

Note:Table report transition probabilities between month i (rows) and month i+K (columns) Each row sum thus equals to 100%.

Table A7: Distribution of all matched individuals based on number of months matched (%)

	Male Young Non-col	Male Young Col	Male Old Non-col	Male Old Col	Female Young Non-col	Female Young Col	Female Old Non-col	Female Old Col	Total
1-11	15.5	11.5	10.8	10.6	14.8	13.2	12.7	11.9	12.9
12	41.9	44.6	46.2	46.2	42.7	43.8	45.6	45.2	44.4
13-23	6.5	4.6	4.1	4.1	5.9	4.9	4.8	4.7	5.0
24	28.0	30.5	30.0	29.7	28.7	29.2	28.4	28.4	29.1
25-35	1.1	0.9	0.8	0.9	1.1	1.0	1.0	0.9	1.0
36	6.9	7.9	8.1	8.5	6.8	7.9	7.6	8.8	7.6
Sample size	34164	20198	42808	16711	38956	19504	43018	8220	223579

Note: Table shows percentage of individuals in the matched file with certain number of months that can be matched . The results are based on matched sample using 36 monthly CUHS files from January 2004 to December 2006.