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The Relationship between Elderly Employment and Youth Employment: Evidence from China

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Abstract: Retirement system reforms such as postponing retirement age in law are needed in China because of its rapid population aging. The overquick aging will result in both shortage of labor force supply and incubus of the social security system. The Chinese government acknowledged the negative influences of population aging, but finally decided to maintain the retirement age in law unchanged. The reason, as claimed by the policy makers and many socio-economic scholars, is postponing retirement age in law in China will crowd out youth employment. Unfortunately, no empirical evidences are provided, although the claim is critical to the potential retirement system reform. In this paper, we firstly address the validity of this claim. Using micro data from China's 1990 and 2000 census and the 2005 1% population sample survey, we provide the first piece of evidence on the relationship between elderly employment and youth employment in China. Our OLS estimation results suggest that employment rates of younger persons are positively rather than negatively associated with employment rate of older persons. We further tried to identify a causal relationship by using two-way fixed effects and TSLS estimation strategies and found results consistent with our OLS estimation. Finally, we examine whether employment of older persons hurts the youth at the intensive margin by estimating the impact of elderly employment on younger workers' monthly wage and still found a positive rather than negative effect. In short, the claim that postponing the retirement age will hurt the youth cannot be supported by empirical evidence. Although our empirical results are tentative, we view this paper as an important try to provide the first piece of evidence on the potential impact of retirement reform on youth employment and as suggesting further empirical studies on the claim that postponing retirement age will hurt the youth.

Key words: Retirement Reform; Elderly Employment; Youth Employment

JEL: H5, J1, J2

1. Introduction

During recent years, both scholars and policy makers are being disturbed by China's rapid population aging. It is suggested that the proportion of working age people will stop increasing in 2013 and bring China into its second demographic stage (Cai, 2010). Two concerns arise from the population aging. First, China is running out of cheap and productive workers and suffering from increasing labor cost, which will in turn hurt the manufacturing industries. Clearly, China cannot maintain its long-lasting high speed economic growth in absent of abundant and cheap labor force. Second, rising old age dependency ratio increases burden on China's social security system. As a series of studies have documented, China's urban pension fund is suffering from severe deficit and idle account problems (Jackson et al., 2009; Sin, 2005; Sun and Maxwell, 2002). A similar problem exists in rural area since the peasants now have fewer adult children to rely on for old age support due to family planning policy since 1980s, while formal old age support system in rural area is still far from mature. A possible policy, which has been proposed by many economists and demographers, to buffer the negative impacts of population aging is to reform the retirement system, specifically, to postpone the retirement age in law. Although the Chinese government acknowledged the influences of population aging on labor force supply and social security system, it finally decided to maintain the retirement age in law unchanged[1]. The proposal of postponing the retirement age also incurs widely criticisms and oppositions, both from scholars and the public. The concern is that postponing retirement age may hurt the employment of younger persons. Partly due to the higher education expansion from 1998 to 2005, a large number of college and university graduates are difficult to find jobs when they step out of campus. It is claimed by the government and several scholars that there would be less job opportunities left to the young graduates if the elderly stay in labor force for a longer time. The minister of Ministry of Human Resources and Social Security has publicly announced that any reforms on the retirement system should take into account of the employment situation, especially that of young graduates[2]. Worrying about crowding out the employment of the youth, however, are with no empirical evidence.

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[1] http://news.163.com/10/0916/03/6GM1PC5B0001124J.html.
[2] Please also see, http://news.163.com/10/0916/03/6GM1PC5B0001124J.html.

Population aging is a problem not only faced by China but also many developed countries. The United States and most of the European countries are also considering reform their retirement and social security system to avoid the negative influences of early retirement on pension programs and labor market. The same concern that postponing retirement age will hurt the employment of younger persons also exists in these countries. The belief that employment of older persons and younger persons are substitutes has been taken for granted for policy makers and the public for a long time but few empirical evidences are provided. In order to answer whether the retirement reform of postponing retirement age would hurt the employment of younger persons, a series of cross country analysis on the relationship between elderly employment and youth employment was done recently (Gruber et al., 2009). They investigate the relationship between the labor force participation of older persons and the labor force participation of younger persons in twelve OECD countries. Their results suggest that labor participation of younger persons is positively rather than negatively associated with employment of older persons. These results shed light on the undergoing discussion on retirement system reforms in China. Although most people claimed that there would be less job opportunities left to the young graduates if the elderly stay in labor force longer, the only empirical evidence till now shows this is not the truth. Of course, many empirical studies need be done before we can make a conclusion on a theoretical hypothesis. For China, it is highly required to empirically examine whether the employment of younger persons would be crowded out by the employment of older persons. Whether such a crowding out effect exists is the critical concern with the potential retirement reform which is needed in China considering the rapid population aging. Moreover, different from the OECD countries, China is a developing country and the labor market is still in transition, which may make a difference in the substitute among workers across different age groups. If the nature of jobs is rapidly changing and skills of workers across ages are highly different from each other, older persons and younger persons will be less likely to be substitutes. In this paper, we provide the first piece of empirical evidence to address the validity of the claim that there would be less job opportunities left to the youth if the elderly stay in labor force longer in China.

Using micro data of China census 1990, 2000 and mini-census 2005, we examine the relationship between employment of older persons and younger persons at the

prefecture level in China. We also conduct a panel data with three waves at the prefecture level, which allow us to do two-way fixed effects estimation. Finally we use the TSLS estimation strategy by exploiting the characteristics of the retirement system to identify a causal relationship between employment of older persons and employment of younger persons. Estimates from various model specifications consistently suggest that employment rate of the youth are positively rather than negatively associated with employment rate of older persons. Theoretically, employment of older persons may negatively affect the wage earnings of younger persons while has no effects on their employment. For one instance, reservation wage of younger persons is low and their labor supply is inelastic. To test whether this is the case, we estimate the impact of elderly employment on younger workers' wage, and again find positive rather than negative impacts. Impact of elderly employment on prime age workers' wage is negative but insignificant. In short, the claim that postponing the retirement age will hurt the younger persons cannot be supported by empirical evidence. Although the empirical analysis in this paper is tentative and are somehow suffering from endogenous problems, we view this paper as an important try to provide the first piece of evidence on the potential impact of retirement reform on employment of youth and as suggesting further empirical studies on the claim that postponing retirement age would hurt the youth in China.

The rest of the paper is laid out as follows. Section 2 briefly discusses the theoretical background of the relationship between employments of different age groups in economy. Section 3 introduces the data we are using. Section 4 provides empirical results from various model specifications. In section 5, we conclude.

2. Theoretical Background

The claim that postponing the retirement age will crowd out youth employment is based on two theoretical assumptions: first, labor force between different age groups are substitutes; second, the amount of jobs in the economy is fixed, which is not affected by old workers retired (Hunt and Katz, 1998; Kalwij et al., 2009).

For the first assumption, some empirical studies found substitute relationship between different types of labor (Card and Lemieux, 2000), while others find older workers and younger workers are complements (Hebbink, 1994). In short, the empirical evidence is rather inconclusive concerning the degree of substitution and, furthermore,

few studies estimate the degree of substitution between the old age workers and youth. Whether older workers and younger workers are highly substitute depends on to what extent they are homogenous. As suggested by Freeman (1998), people with different skills are likely to be quite imperfect substitutes. In practice, workers with different level of skills could be complements. Old age workers probably have more specific skills while young age workers generally have less specific skills because specific skills are usually accrued during period of employment and closely attached to the firm in which they worked. In China it is even more so, young people always have higher levels of education due to rapid education development during the past three decades, while nature of jobs has also largely changed due to rapid technological progress making skills accrued in firms very specific (Figure 1). Because of the large differences in specific skills and education level between younger persons and older persons in China, younger persons and older persons are less likely to be homogeneous and thus less likely to be substitutes comparing with those in developed countries.

For the latter assumption, economic theory suggests it is a very special and seldom supported by empirical evidence (Hunts and Katz, 1998; Kalwij et al., 2009; Kapteyn, et al., 2004). This assumption is also sometimes called the "Lump-of-Labor-Fallacy" (Walker, 2007). Theoretically, Hunt and Katz (1998) said that "if a reduction in hours implies an increase in the marginal cost of production at the original level of output, optimal output will fall, tending to reduce demand for inputs. Higher marginal labor costs will also cause substitution away from labor and toward other inputs." In this case, decline of employment of older persons will decrease the employment of younger persons.

3. Data

Data used here are the largest micro data sets of population survey in China. It includes 1% sample of Census 1990, 0.095% sample of Census 2000 and 0.2% sample of the 2005 1% population sample survey. We exclude those worked in agricultural sector who are also self-employed since they cannot be affected by the retirement system which we are concerning. We also exclude students at school. During the past three decades, years of schooling for young people have largely increased. Whether including students affects the employment rate of youth and thus

our results. College enrollment decision is probably affected by employment situation of younger persons. For instance, students are more likely to stay at school if there are few job opportunities. We are not sure to what extent the decision to stay at school are related to employment situation of younger people. To test whether our results are robust to our sample restriction, we also do all estimations using data including students. We obtain the same conclusion in either case. [3]

Partially based on works of Gruber et al. (2009), we define three age groups for male and female separately. All analysis is separately done for male and female because they work in different sectors and the nature of their jobs is highly different from each other. The young age group is defined as individuals aged 20 to 24, for either male or female. The prime age group is defined as individuals aged 25 to 54 for male, and 25 to 49 for female. The old people are defined as individuals aged 55 to 64 for male and 50 to 59 for female. Our definitions of prime age group and old age group are different from Gruber, et al. (2009) in which prime age is defined as 25 to 54 and old age is defined as 55 to 64 for both male and female. We define a younger old age group for female because in China retirement age in law for female is 50, while for male it is 60.[4] If the government reforms the current retirement system, it is probably that retirement ages in law for female and male will be postponed to 60 and 65 respectively. In this case, female aged from 50 to 59 and male aged from 60 to 64 will stay longer in labor force, and thus are the older persons with whom we are concerning. Employment rates for each group are calculated as ratio of employment in persons to the total population in each age group.[5]

We display the employment rates of each age group from 1990 to 2005 separately for male and female in Table 1. For male, the employment rate of older persons decreases from 0.33 at 1990 to 0.30 at 2000, and further decrease to 0.29 at 2005. The decline of elderly employment rate from 1990 to 2000 may result from the lay-off of old age workers in later 1990s. Both employment rates of youth and prime age persons firstly decrease from 1990 to 2000 and then increase from 2000 to 2005. Employment rates for these two groups are almost the same between 1990 and 2005. For female, the

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[3] Results are available upon request.

[4] Female working in governments is allowed to retire at age 55.

[5] This is different from the classical definition of employment rate which excludes those having left the labor force. And it is also different from the normal definition of labor force participation rate which includes the unemployed persons. However, there are minor differences among these definitions, and we believe it wouldn't affect our basic results.

employment rate of older persons increases from 0.14 at 1990 to 0.18 at 2000 and then slightly drops to 0.17 at 2005. Employment rates of youth female and prime age female both decrease from 1990 to 2005 and the drop from 2000 to 2005 is larger. For young age female, employment rate decline by ten percentage points from 66% in 2000 to 56% in 2005. For prime age female, there are five percentage points drop from 65% in 2000 to 60% in 2005.

Since our census data do not have information on economic growth and fixed asset investment which are macro shocks to employment of people in all age groups, we also extract those variables from China's city statistic yearbook to serve as controls. We match census 2000 and 2005 data with data from city statistic yearbook of the corresponding years at the prefecture level. For year 1990, city data are not available.

4. Empirical Strategy and Results

4.1. Empirical Strategy

In our empirical analysis, the primary unit of analysis is the prefecture. In order to examine the relationship between elderly employment and youth employment and employment of prime age persons, we estimate the following reduced form equation using 2005, 2000 and 1990 data separately for either male or female.

$$Employment_{Yj} = \alpha + \beta Employment_{Oj} + \gamma X_j + \epsilon_j \ (1)$$

where $Employment_{Yj}$ is employment rate of younger persons or prime age persons. $Employment_{Oj}$ is employment rate of older persons. Both employment rate of prime age persons and employment rate of older persons are differently defined for male and female, as we have discussed in section 3. X_j is a set of control variables that may affect labor supply and labor demand.

It is acknowledged that we cannot control all confounding factors simultaneously affecting employment of persons belonging to different age groups. If any confounding factors are omitted, our estimates will be biased. For example, if the government in one prefecture is more effective on promoting employment than the government in another prefecture, employment rate of old people and employment rate of young people would be both higher in the former prefecture. In this case, we have a spurious regression. To eliminate potential bias of our estimates, we first

exploit the fact that we have data for three waves. We construct a data in panel form at the prefecture level using our 1990, 2000 and 2005 data and then employ the two-way fixed effects estimation strategy. We estimate the following equation:

$$Employment_{Yjt} = \alpha + \beta Employment_{Ojt} + \gamma X_{jt} + p_j + \gamma_t + \epsilon_j \ (2)$$

where p_j captures the prefecture fixed effects, γ_t captures the year fixed effects. This two way fixed effect estimation allows us to control all time-invariant and prefecture-invariant factors.

Furthermore, we exploit the characteristics of the retirement system and using share of workers whose age is approaching the retirement age in law in formal sector to instrument the employment rate of older persons. Formal sector includes government, institutions and state-owned enterprises. The intuition is that if the share of workers whose age is approaching the retirement age in law in formal sector is larger, there should be a larger share of older workers retires once they turn to the retirement age in law. In order to avoid potential effect of composition of employment (employment in formal and non-formal sector) on both employment of young persons and old persons, we further add share of young workers in formal sector as controls. Note that, the TSLS estimations are done using only the 2005 data, which have information on the organization in which one works. The TSLS regressions allow us to estimate the local average treatment effect (LATE) (Imbens and Angrist, 1994). The LATE we estimated are caused by retirement of older workers in formal sector. Since we are concerning reforms on retirement system, this LATE is just what we want to estimate.

Theoretically, if employment of older persons affects employment of younger persons at the intensive rather than extensive margins, we will not see impact on employment of younger persons but on wages of younger persons. Whether this will happen depends on the elasticity of younger persons' labor supply. Even only the wages are negatively affected by later retirement of older workers, we can still say younger persons are hurt. To see whether the younger persons are affected at the intensive margins, we further estimate the impact of employment of older persons on younger workers' monthly wage. We use the 2005 data to investigate whether employment of older persons affect younger workers' monthly wage, since only the 2005 data has

wage information. We first run OLS regressions. TSLS estimations are also done using instruments as that in estimating the impact on employment.

4.2. Empirical Results

4.2.1 Relationship between employment of older persons and younger persons

We first provide visually persuasive evidence on the relationship between elderly employment rate and youth employment rate and employment rate of prime age persons in Figure 2. Each hollow dot denotes employment rate in one prefecture. For either male or female, employment rates of youth and prime age people are both positively associated with employment rates of older persons. The positive relationships between employment rates of different groups are also shown across industries. If the older workers and younger workers are substitutes, it cannon only be reflected across prefectures but also across industries. In figure 3, we can see that the employment of younger persons parallel closely the employment of older persons across industries.

In table 2, we estimate equation (1) to examine the relationship between elderly employment rate and youth employment rate and employment rate of prime age persons. Equation (1) is a reduced form equation allowing us to take into account other factors affecting labor supply and demand, e.g. gross domestic products, growth rate of gross domestic products and fixed assets investment. We choose these variables as covariates as suggested in Gruber et al., (2009). Results using 2005, 2000 and 1990 data consistently show that both the employment rates of youth and prime age persons are positively associated with the employment rate of older persons. For male, one percentage higher employment rate of older persons is associated with 0.569 percentage higher employment rate of youth in the 2005 sample. After adding other covariates, the coefficient decreases to 0.391 and still statistically significant at the 1% level. For prime age persons, their employment rates are also positively associated with the employment of older persons. Without controls, one percentage higher employment rate of older persons is associated with 0.312 percentage higher employment rate of prime age people. Adding controls only decreases the coefficient slightly and leave the significance unchanged. Results using 2000 and 1990 data are very similar, except for lower magnitude of effects of elderly employment on both employment rates of younger persons and prime age persons. Similar relationship

between employment rates of younger persons and older persons are found for female. Different from male, relationship between employment rate of younger persons and older persons are stronger: one percentage higher employment rate of older persons is associated with almost one percentage higher employment rate of younger persons. However, the coefficient largely decreases to 0.535 after adding controls, suggesting the relationship between rates of employment of people in these two age groups are highly simultaneously affected by common economic shocks. Again, analysis using 1990 data and 2000 data for female suggest the similar results: employment of younger persons and prime age persons are positively associated with employment of older persons, although the magnitude of effects varies with sample. These OLS estimates basically show that the relationship between younger persons and older persons in China are positive. Indeed employment rates of people in these age groups are simultaneously affected by common economic shocks. However, controlling the macro economic variables only decreases the magnitude of the effect.

As an alternative strategy, we estimate the two way fixed effects model as equation (2). Table 3 provides the estimation results. Our between-group estimates again suggest a positive relationship between employment rates of older persons and younger persons, both for male and female. Whether controlling for industrial composition doesn't change the estimates much. For male, one percentage higher of employment rate of older persons is associated with 0.226 percentages higher employment rate of younger persons and 0.202 percentages higher employment rate of prime age people. For female, one percentage higher of employment rate of older persons is associated with 0.434 percentages higher employment rate of younger persons and 0.522 percentages higher employment rate of prime age people. Clearly, relationship between employment rate of younger persons and older persons are stronger for female, which is consistent with our cross-sectional estimates.

Two-way fixed effects estimation allows us to control all time-invariant and prefecture-invariant factors, but it cannot control some confounding factors varying across both prefecture and time, which may still cause omitted variable bias. We finally use the TSLS strategy we discussed in section 4.1 to identify a causal relationship between employment between younger persons and older persons. First stage estimation results are displayed in Table A1 in the appendix. Higher share of workers whose age is approaching the retirement age in law in formal sector is related

to lower employment rate of older persons. The coefficient is statistically significant at the 1% level. Results of the second stage estimation are displayed in Table 4. For male, the effect of elderly employment on employment rate of younger persons is 0.822 and statistically significant at the 1% level. This effect is even larger than the OLS estimates and is still positive. The effect on employment rate of prime age people is very similar as large as 0.815. For female, the effect of elderly employment on employment rate of younger persons is 0.588, which is slightly larger than the OLS estimates. The effect on employment rate of prime age people turns to negative but statistically insignificant. Our TSLS estimates suggest that the effects of elderly employment on employment of younger persons are still positive even we further avoid endogenous bias.

In short, there are no evidences supporting the claim that employment of older persons would crowd out employment of younger persons. Instead, a positive association between employment of younger persons and older persons are found using the micro census data, either for male and female. Moreover, there results are robust to various model specifications.

4.2.2 Relationship between employment of older persons and younger workers' wage

We have shown that employment of older persons does not hurt the employment of younger persons. Theoretically, however, employment of older persons could hurt younger persons at the intensive margin rather than at extensive margin, i.e. brings negative impacts on younger workers' wage earnings. Firms may still employ younger workers but only willing to pay lower wages. Young people will still be employed once their reservation wages are low enough. We estimate the impact of employment of older persons on younger workers' monthly wage. Table 5 provides the OLS estimation results. Similar to employment, we see positive rather than negative effects. Adding control variables largely decreases the effects of elderly employment, which suggests common macro economic shocks do exist.

Similar to employment, we also employ the TSLS estimation strategy to avoid possible endogenous bias. Estimation results are displayed in Table 6. One percentage higher employment rate of older persons increases the monthly wage of younger workers by about 0.45% and 3.45% for male and female, respectively. For prime age workers, the effects of elderly employment on their monthly wage are negative, for

both male and female. However, neither is significant. Overall, we have found significant negative effects of employment of older persons on younger persons and prime age people. For younger workers, the effect is significantly positive.

So far, we have shown that the effects of employment of older persons on younger persons' employment and wages are both positive. Moreover, our estimates are robust to various model specifications. Our TSLS estimates consistently suggest a positive causal relationship between employment of older persons and younger persons. All in all, there are no evidences in support of the claim that postponing the retirement of older workers would hurt the youth.

5. Conclusions

Population is rapidly aging in China. Data report from the 6th population census conducted in 2010 shows that the proportion of people aged 65 and above in 2010 is 8.87%, about 1.91 percentage points higher than that in 2000. China's rapid population aging brings big challenges to both its social security system and labor force supply. One option is in front of the government: postponing the retirement age in law to reform its current retirement system. Currently, men retire at age 60, while women retire at 50, either is a young age comparing to retirement age in US and Europe. Moreover, most workers actually retire even earlier than the retirement age in law. Postponing the retirement age in law could be an effective policy to buffer the negative impacts of population aging. Chinese government, however, finally decided to maintain its retirement age in law unchanged. The concern is that postponing retirement age may hurt the employment of youth, which has also been claimed by the public and scholars. But this is actually a deceptive argument. As we have shown in this paper, higher employment rate of older persons does not cause lower employment rate of younger persons. In contrast, we found the impact of elderly employment on employment rates of younger persons and prime age persons are both positive. Moreover, the impact of elderly employment on young workers' wage is also positive. Our results are robust to various model specifications.

Considering the rapid population ageing, it is time for the Chinese government to reconsider reforming the current retirement system. The only obstacle in the way is the concern that postponing retirement age in law would hurt employment of younger persons. Our empirical analysis in this paper suggests there are no evidences

supporting this claim. The government may either reconsider the reform or further empirical studies are required on the claim that postponing retirement age would hurt the youth in China.

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Figure 1 Percent of College Graduates by Age
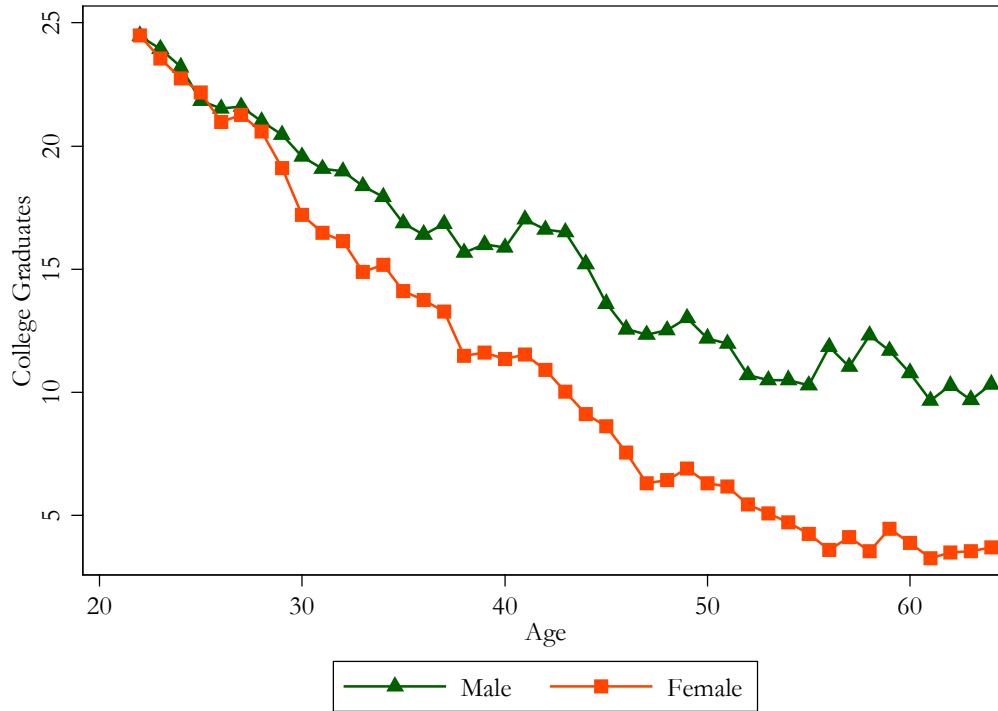
Notes: College graudates also include graduates from universities.
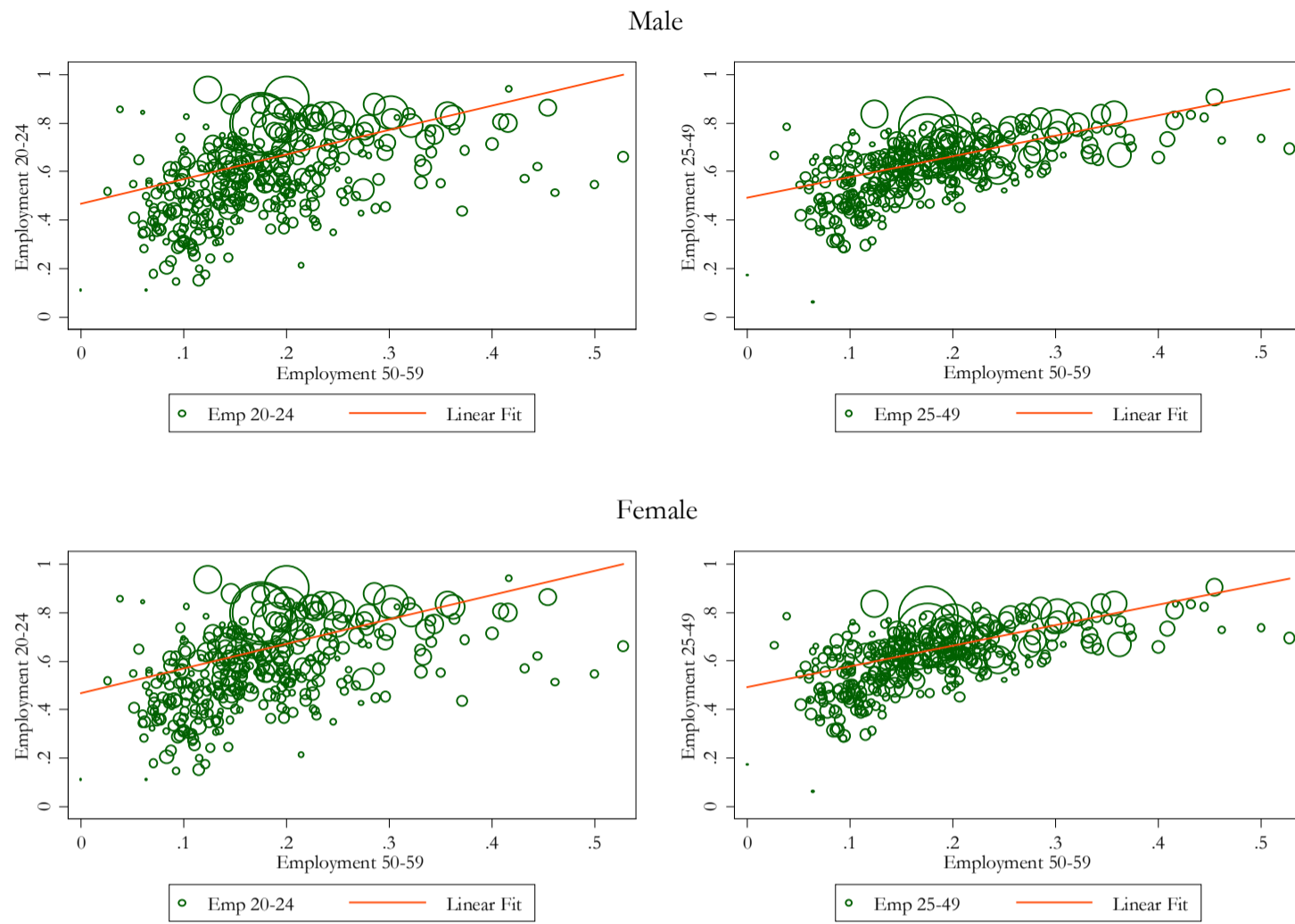
Figure 2
Relationship between Employment of Older Persons and Younger Persons

Male

Female

Figure 3
Industrial Distribution of Workers in Different Age Groups
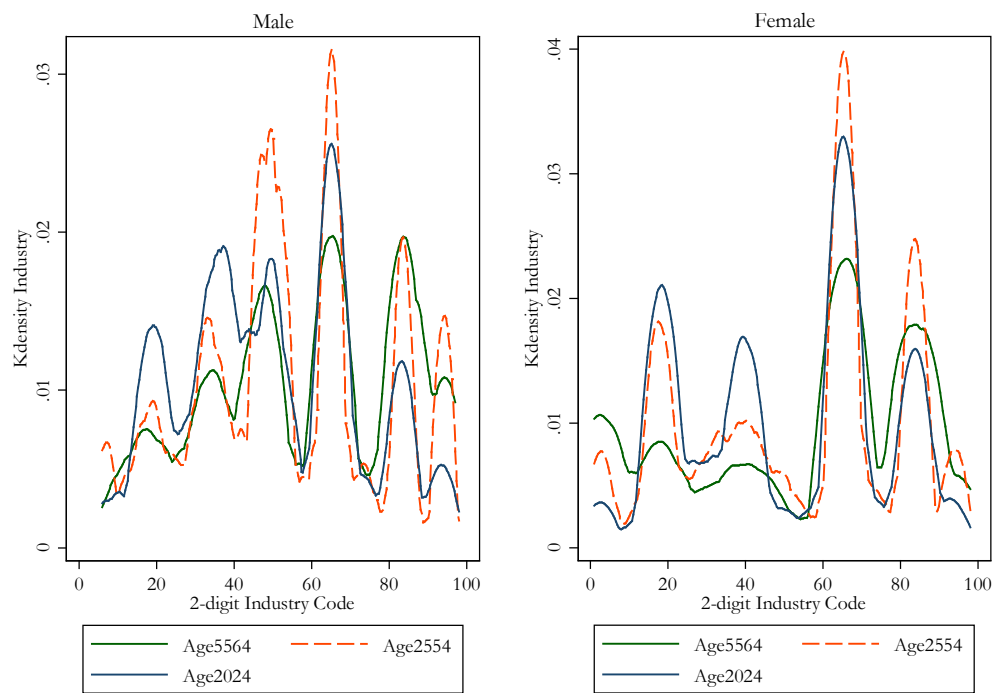
Table 1 Percent of People Employed for Various Age Groups

Year	Male			Female		
	20-24	25-54	55-64	20-24	25-49	50-59
1990	0.77	0.88	0.33	0.73	0.67	0.14
2000	0.64	0.77	0.30	0.66	0.65	0.18
2005	0.74	0.85	0.29	0.56	0.60	0.17
Total	0.72	0.83	0.31	0.64	0.64	0.17

Source: 0.2% sample of 2005 mini-census, 0.095% sample of 2000 census, 1% sample of 1990 census.

Notes: Sample excludes students and workers work in agricultural sector.

Table 2 Relationship between Employment of Older Persons and Younger Persons: *By Gender*

	2005				*2000*				*1990*			
	Panel A: Employment of Young Male											
	Age 20-24		*Age 25-54*		*Age 20-24*		*Age 25-54*		*Age 20-24*		*Age 25-54*	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Elderly Employment: 55-64	0.569***	0.391***	0.312***	0.279***	0.325***	0.351***	0.163***	0.200***	0.231***	0.233***	0.133***	0.134***
	(0.0493)	(0.0548)	(0.0195)	(0.0249)	(0.0631)	(0.0605)	(0.0278)	(0.0261)	(0.0316)	(0.0323)	(0.0153)	(0.0122)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	345	278	345	278	313	231	315	231	347	347	347	347
	Panel B: Employment of Young Female											
	Age 20-24		*Age 25-49*		*Age 20-24*		*Age 25-49*		*Age 20-24*		*Age 25-49*	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Elderly Employment: 50-59	1.009***	0.535***	0.848***	0.698***	0.331***	0.299**	0.233***	0.224***	0.867***	0.801***	1.354***	1.310***
	(0.119)	(0.0896)	(0.0881)	(0.0960)	(0.101)	(0.115)	(0.0630)	(0.0838)	(0.105)	(0.110)	(0.159)	(0.170)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	345	278	345	278	311	231	316	231	347	347	347	347

Source : 0.2% sample of 2005 mini-census, 0.095% sample of 2000 census, 1% sample of 1990 census and city statistic yearbook for 2000 and 2005.

Notes : Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Sample excludes students and workers worked in agricultural sector. All variables are collapsed to the prefecture level. Controls in regressions for 2000 and 2005 include share of manufacturing employment, gross domestic product, growth rate of gross domestic product and fixed-assets investment. Controls in regressions for 1990 only include share of manufacturing employment. All regressions are weighted by the prefecture's share of employment of the country's total employment.

Table 3 Relationship between Employment of Older Persons and Younger Persons: *Two Way Fixed-effects Estimation*

Panel A: Employment of Young Male

	Age 20-24		Age 25-54	
	(1)	(2)	(3)	(4)
Elderly Employment: 55-64	0.179***	0.226***	0.181***	0.202***
	(0.0545)	(0.0549)	(0.0237)	(0.0238)
Controls	No	Yes	No	Yes
Observations	937	937	937	937
Number of prefecture	346	346	346	346

Panel B: Employment of Young Female

	Age 20-24		Age 25-49	
	(1)	(2)	(3)	(4)
Elderly Employment: 50-59	0.451***	0.434***	0.543***	0.522***
	(0.0710)	(0.0702)	(0.0540)	(0.0516)
Controls	No	Yes	No	Yes
Observations	938	938	941	941
Number of prefecture	346	346	346	346

Source : 0.2% sample of 2005 mini-census, 0.095% sample of 2000 census, 1% sample of 1990 census.

Notes : Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Sample excludes students and workers worked in agricultural sector. All variables are collapsed to the prefecture level. All regressions control year fixed-effects. Controls include share of manufacturing employment. All regressions are weighted by the prefecture's share of employment of the country's total employment.

Table 4 Instrumental Estimation of Impact of Elderly Employment on Employment of Younger Persons

	Panel A: Employment of Young Male	
	Age 20-24	Age 25-54
Elderly Employment: 55-64	0.822***	0.815***
	(0.154)	(0.314)
Controls	Yes	Yes
Observations	278	278

	Panel B: Employment of Young Female	
	Age 20-24	Age 25-49
Elderly Employment: 50-59	0.588*	-0.967
	(0.314)	(0.974)
Controls	Yes	Yes
Observations	278	278

Source : 0.2% sample of 2005 mini-census and city statistic yearbook for 2005.

Notes : Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Sample excludes students and workers worked in agricultural sector. All variables are collapsed to the prefecture level. Controls include share of manufacturing employment, gross domestic product, growth rate of gross domestic product, fixed-assets investment and share of young workers working in formal sector. All regressions are weighted by the prefecture's share of employment of the country's total employment.

Table 5 Relationship between Elderly Employment and Younger Workers' Wage

Panel A: Log Monthly Income of Male

	Age 20-24		Age 25-54	
	(1)	(2)	(3)	(4)
Elderly Employment: 55-64	0.934***	0.583***	0.981***	0.668***
	(0.152)	(0.0958)	(0.186)	(0.0975)
Controls	No	Yes	No	Yes
Observations	345	278	345	278
R-squared	0.171	0.553	0.138	0.731

Panel B: Log Monthly Income of Female

	Age 20-24		Age 25-49	
	(1)	(2)	(3)	(4)
Elderly Employment: 50-59	2.636***	1.440***	1.270***	1.237***
	(0.478)	(0.284)	(0.399)	(0.222)
Controls	No	Yes	No	Yes
Observations	345	278	345	278
R-squared	0.122	0.681	0.047	0.710

Source : 0.2% sample of 2005 mini-census and city statistic yearbook for 2005.

Notes : Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Sample excludes workers worked in agricultural sector. All variables are collapsed to the prefecture level. Controls include share of manufacturing employment. All regressions are weighted by the prefecture's share of employment of the country's total employment.

Table 6 Instrumental Estimation of Elderly Employment's Impact on Younger Workers' Wage

Panel A: Log Monthly Income of Male		
	Age 20-24	Age 25-54
Elderly Employment: 55-64	0.449*	-1.112
	(0.259)	(1.070)
Controls	Yes	Yes
Observations	277	277

Panel B: Log Monthly Income of Female		
	Age 20-24	Age 25-49
Elderly Employment: 50-59	3.453***	-4.919
	(1.062)	(3.705)
Controls	Yes	Yes
Observations	278	278

Source : 0.2% sample of 2005 mini-census and city statistic yearbook for 2005.

Notes : Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Sample excludes workers worked in agricultural sector. All variables are collapsed to the prefecture level. Controls include share of manufacturing employment. All regressions are weighted by the prefecture's share of employment of the country's total employment.

Table A1 First Stage Estimation: *Impact of Share of SOEs and Government Employment on Elderly Employment*

Panel A: Elderly Employment of Male

	(1)	(2)
Share of SOEs and Governments	-0.0028***	-0.0011**
Employment: Age 55-59	(0.0004)	(0.0004)
Controls	Yes	Yes
Observations	278	278

Panel B: Elderly Employment of Female

	(1)	(2)
Share of SOEs and Governments	-0.0023***	-0.0011**
Employment: Age 45-49	(0.0004)	(0.0005)
Controls	Yes	Yes
Observations	278	278

Source **:** Same to Table 4.

Notes : Same to table 4