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Do Elderly Workers Crowd Out Younger Workers in the United States?

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**DO ELDERLY WORKERS CROWD OUT YOUNGER WORKERS
IN THE UNITED STATES?**

by

Jing Jin

* * * * *

Submitted in partial fulfillment
of the requirements for
Honors in the Department of Economics

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ABSTRACT

JIN, JING. Do Elderly Workers Crowd Out Younger Workers in the United States?

Department of Economics, June 2017.

Advisor: Younghwan Song

This paper investigates the often repeated “lump of labor” theory that the increasing labor force participation of older workers negatively impacts the labor market activity of younger workers. Using the panel data spanning from 1998 to 2015 from the Merged Outgoing Rotation Groups of the Current Population Survey, this paper employs time-series state-level regressions to determine the extent to which such “crowding out” exists in the United States.

Existing studies show little evidence of substitution between young and old workers. In contrast to previous studies, this paper controls for differences in individual educational levels by disaggregating the labor force sample into four educational attainment categories: less high school graduates, high school graduates, some college graduates, and college-higher graduates. This is an indicator of skills associated with workers since the more similar the groups are with respect to skills, the greater the degree of possible substitution.

The estimates show no evidence that increasing the employment of older persons reduces either the job opportunities or wage rates of younger counterparts. The patterns are consistent when including considerations of education level. The lack of the trade-off of job opportunities between younger and older workers will not only have an important policy implication, but also lead to a reexamination of the overall understanding of labor markets.

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CHAPTER ONE

INTRODUCTION

A. Background

As life expectancy increases and fertility rate decreases, in recent decades, population aging is becoming widespread across the whole world. Governments and households are facing a greater challenge in ensuring a secure retirement. Many OECD countries are considering reforming their social security programs and pension systems by regulating the effective age of retirement.

In the United States, about half of all Americans were covered by mandatory retirement provisions, requiring they leave their jobs no later than a certain age, in the early 1970s. However, in 1986 Congress abolished mandatory retirement by revising the Age Discrimination in Employment Act. Moreover, Social Security's full-benefit retirement age is increasing gradually. Traditionally, the full benefit retirement age was 65, and early retirement benefits were first available at 62 with some percentage benefit reduction. Currently, the full benefit age is 66, and it will gradually rise to 67 as proposed by the Social Security Advisory Board. Early retirement benefits will be reduced much more. There is even an additional financial incentive for those who decide to retire later.

These changes are considered necessary not only to ensure the sustainability of state pensions and individual retirement benefits, but also to offset the expected slowdown of the labor force due to population aging. Nonetheless, as Boheim (2014) writes, changing the retirement age is

often interpreted as a form of active labor market intervention. Such reforms generate a controversial question resting on the impact of delayed retirement on the employment of young people. Those who oppose increasing the retirement age often state that elderly workers remaining on the jobs are occupying jobs and decreasing the chances for the young Americans to get the job. The American Association of Retired Persons (AARP) research also shows that in general, younger workers have bias and concerns with managing older workers (“Age Discrimination”, 2006). Others argue that there is no significant trade-off between the employment of old and young people (Gruber and Wise, 2010).

Under the pressure of both population aging and youth unemployment, it is important for economists and policy makers to understand the relationship between older and younger populations’ labor force behavior and appropriately implement strategies that better the welfare of the young and the economy.

B. Relationship between elderly and youth employment

Younger and older workers can in theory be either substitutes or complements. To be more specific, if there are a fixed number of jobs in an economy and more of those jobs are occupied by the non-retiring elderly, then fewer jobs are supplied for the young, causing higher unemployment among this class. This is the so-called “lump of labor” theory. This theory is often reviewed in many European countries and has suggested an economic intention for early retirement programs. Opponents of free trade and immigration often use the lump of labor argument to make people fearful about losing their jobs. On the other hand, if there is sharing of

knowledge and experience between old and young people to produce more output, and the number of jobs in the market could change to adapt the labor supply, then they can be complements in some extent. This view is commonly accepted in the United States. Many researchers argue that the labor market is dynamic and there is no upper limit on the number of jobs in an economy. Due to rapid technological progress and market growth, new products and services are produced, raising national income. Thus, more and more job opportunities can be created to adapt to labor force changes in an economy. Empirical results also show little evidence of the trade-off between the employment of older and younger workers.

Moreover, economic theory suggests that substitution in a labor market is mainly governed by the similarity of the skills and abilities associated with workers. As suggested by Freeman (1998), people with different skills are likely to be quite imperfect substitutes. Thus, a different degree of substitution between workers from different educational levels might counteract the negative consequences of delaying the retirement age. For example, young workers with a high school education level might be easily substituted by the old workers in the same education level because old workers are more experienced. On the other hand, technological revolution continuously varies the demand for skills. In this case, a college educated young worker with the most advanced skill cannot be substituted by the old workers due to their limited attachment to learning a new skill. In conclusion, a credible effort to measure the employment interaction must carefully match the skills of workers of different age.

C. Contribution of this Paper

This paper builds on the study of Munnell and Wu (2012) using panel data from the Merged Outgoing Rotation Groups (MORG) of the Current Population Survey (CPS) over the period 1998-2015 to investigate the potential employment crowding of younger and older workers. We examine not only the “quantity” effects in terms of employment rates and working hours, but also the “price” effects in terms of wages and earnings. While various measures on this subject include controls on region difference, economic growth, and gender difference, this paper also addresses the effect of a worker’s educational level. We disaggregate the labor force by educational attainment: high school graduates, some college graduates, and college-higher graduates. It is unlikely that workers of different age with very different education and skill levels are perfect substitutes.

D. Organization of Paper

The organization of this paper is as follows. Chapter Two reviews the existing literature regarding the relationship of the employment of old and young people and summarizes previous findings. Chapter Three presents the econometric model used in this analysis. Chapter Four describes the data sets and samples in this analysis. Chapter Five presents the empirical results of the econometric model, and Chapter Six provides conclusions.

CHAPTER TWO

REVIEW OF EXSITING LITERATURE

This chapter provides a review of the existing literature concerning the “lump of labor” theory and substitution between the employment of old and young people.

A. “Lump of Labor” Theory

The term “lump of labor” has been frequently cited in immigration and early retirement literature. In the case of the relationship between employment of older and younger workers, the theory suggests that more older people in the labor market will occupy and reduce the job opportunities for younger persons. This claim is largely founded on two assumptions: (1) There is a fixed amount of work to be done in an economy. While more jobs have been occupied by elderlies, few of them are left for young workers; (2) The labor force of different age groups is substitutable.

Concerning the first hypothesis, economists in the United States have repeatedly characterized this argument as a fallacy. No theoretical justification nor empirical evidence is offered in support of this claim (Hunt and Katz, 1998; Kalwij, Kapteyn and De Vos, 2010). Lump of labor advocates ignore the fact that, over the long run, as economies grow and become more complex due to technological improvements, more products and services are created, thus raising the job opportunities and overall demand for labor. Furthermore, as discussed in Hunt and Katz (1998), if the decline in working hours is associated with an increase in marginal production costs, the optimal output will fall, leading to a decrease in total labor demand. In such a case, a strategy

that aims to cause a reduction in labor force participation of the elderly population, such as early retirement policy, would not help young people in employment.

For the second hypothesis, it is suggested by economic theory that the substitution of one type of worker with another type is mainly determined by the similarity of the skills and abilities they possess. Older and younger workers seem to have very different education backgrounds and working experiences. According to previous literature, Card and Lemieux (2000) and Fizenberger and Kohn (2006) find that employees of different ages are imperfect substitutes. Hebbink (1994) reports a negative elasticity of substitution, which suggests that old and young labor are complementary factors of production. However, in line with Hamermesh (2001), there is no sufficient empirical evidence concerning the degree of substitution between groups of workers.

B. Relationship Between Employment of Old and Young Workers

Regarding the relationship between employment of old and young workers, a series of papers examine whether labor force participation of older individuals crowds out employment of younger individuals in 12 industrialized countries, including Belgium, Canada, Denmark, France, Germany, Italy, Japan, Spain, Sweden, Netherlands, United Kingdom, and the United States (Gruber and Wise, 2010). Based on individual country analyses, empirical results from all of these countries show no evidence of trade-off between job opportunities for younger and for older workers. Indeed, the overall analysis suggests that greater labor force participation of older persons is associated with greater youth employment and reduced youth unemployment.

Nevertheless, in the study of Gruber and Milligan (2010) investigating the extent of this “crowding out” effect in the United States, they do find some evidence showing movements in elderly employment are negatively correlated to prime-aged employment. However, there is no consistent pattern when excluding female workers from the sample, who experienced a large secular increase in employment over that time period.

The evidence for an individual country may not be conclusive; cross-country comparisons using panel data regressions provide additional observations. Kalwij, Kapteyn and De Vos (2010) revisit the nexus between employment of older and younger workers in 22 OECD countries. Their findings based on a dynamic model of employment do not support the supposition that old and young labor are substitutes but also discover some minor complementarities of employment in the different age groups.

One possible explanation for this positive relationship is suggested by Van and Hendrik (2002), who focus on the relationship between financing early retirement and labor demand. The authors indicate that when early retirement schemes are financed through payroll taxes, wage costs for all workers may increase, thereby reducing the total labor demand. As a result, the employment of the young and the elderly would be positively related. On the other hand, these international studies may not completely investigate the issue because the authors may be constrained to methods and data that could be applied to all countries for ease of comparison.

This paper builds on the study of Munnell and Wu (2012) for the U.S. analysis. The authors employ a state-level regression to examine the labor force activity of the old to that of the young

in the U.S. from 1977 to 2011. They test not only the “quantity” impacts in terms of employment rates and working hours but also the “price” impact in terms of real wages and earnings. The baseline results without any controls show that a 1 percentage point increase in the older worker employment rate is associated with a decline in youth unemployment of 0.11 percentage points, an increase in youth employment of 0.21 percentage points, and an increase in hours worked per week of 0.13 percentage points. In order to isolate the effects of changing economic conditions on labor market, the authors further comprise controls for state specific characteristics and an indicator of great recession period. Again, no evidence of crowding out is found in their analysis. Furthermore, taking into account the possibility of endogeneity, they use the state-year mortality rate, which is an indicator of health status, as the instrumental variable correlated with the labor force participation of older workers, to estimate a Two Stage Least Squares model. The results are consistent: none of the coefficients are statistically significant. In conclusion, changes in labor force activity of older workers do not adversely affect the employment of the young. In fact, substantial complementarity between the young age group and older workers is found.

Munnell and Wu consider all the effects of elderly employment on young workers’ employment, working hours and wages. However, as suggested by Borjas (2016), any credible effort to estimate the impact of immigration must carefully match the skills of the immigrants with the skills of the native workforce. Similarly, the impact of increased elderly employment depends crucially on the levels of skill embodied in workers of different age. This paper builds on the study of Munnell and Wu (2012) and brings a new perspective to the analysis of the crowding effect in the U.S. We revisit the question by taking into consideration of groups with different educational levels and examining whether the effects are different by education groups. We use

the education attainment of individuals as an indicator of their associated skills. Economic theory suggests that the more similar the groups are with respect to skills, the greater the degree of possible substitution. For instance, if mostly college educated old workers delay retirement, they may be displacing college educated youth. Similar for high school educated workers. Moreover, there could also be cross-group complementarity between older and younger workers of different education level. For example, older workers with more working experiences can complement younger workers with the most advanced technological knowledge but little practices to produce more outputs.

Since youth unemployment is a pressing problem in the world, many countries are also suffering from population aging, the lack of a trade-off of employment opportunities between the young and the elderly workers has an important policy implication.

CHAPTER THREE

ECONOMETRIC MODEL

This chapter describes the econometric model used in this analysis.

A. Statement of Model

To examine the effect of increased employment of elderly people on employment of young people, this study uses the following econometric model:

$$Y_{st,edu} = \beta_0 + \beta_1 \text{olderlabor}_{st} + \beta_2 X_{st} + \varepsilon_{st}$$

where $Y_{st,edu}$ is the outcome of interest for state s in year t of the sample group with edu educational category. We disaggregate the labor force sample by educational attainment: high school graduates, some college graduates, and college-higher graduates, to capture the differences in different education levels. The key dependent variables include employment and unemployment rates, hours worked per week, and the average wage rate and earnings of young and prime-aged individuals. The key independent variable in the regression is the state-year labor force participation rate of older people (olderlabor_{st}). The vector X_{st} includes a set of state-specific, time-varying explanatory variables. These variables indicate and control for differences in labor market conditions among states, such as the per capita level of Gross State Product (GSP), GSP growth rate, and the state average unemployment rate.

B. List of Variables

Dependent Variables

YOUEMP state average employment rate of population aged 20 to 24

<i>YOUUNEMP</i>	state average unemployment rate of population aged 20 to 24
<i>YOUWORK</i>	state average working hours of population aged 20 to 24
<i>YOUWAGE</i>	state average wage rate of population aged 20 to 24
<i>PRIMEEMP</i>	state average employment rate of population aged 25 to 54
<i>PRIMEUNEMP</i>	state average unemployment rate of population aged 25 to 54
<i>PRIMEWORK</i>	state average working hours of population aged 25 to 54
<i>PRIMEWAGE</i>	state average wage rate of population aged 25 to 54

Independent Variables

<i>OLDEMP</i>	state average employment rate of population aged 55 to 64
<i>BLACK</i>	state average fraction of black
<i>SELFEMP</i>	state average percent of jobs in self-employment
<i>GSP</i>	gross state product per capita
<i>GROWTH</i>	gross state product growth rate
<i>POVERTY</i>	state average poverty rate
<i>WAGE</i>	state average wage rate
<i>UNEMP</i>	state average unemployment rate
<i>MANUFAC</i>	state average percent of jobs in manufacturing
<i>SERVI</i>	state average percent of jobs in service industry
<i>LESSHI</i>	state average fraction of population of less than high school education

CHAPTER FOUR

DATA

This chapter provides a description of the Current Population Survey. It also presents the descriptive statistics for the data set in this analysis.

A. Selection of the Sample and Descriptive Statistics

Our analysis of the labor market impacts of the increased older workers' labor-force participation uses panel data from the Merged Outgoing Rotation Groups (MORG) of the Current Population Survey (CPS), conducted by the Bureau of the Census for the Bureau of Labor Statistics. The CPS is the nation's largest primary source of labor force statistics for the population of the United States. The MORG are extracts of the Basic Monthly Data during the household's fourth and eighth month in the survey. This survey provides detailed questions about labor force participation, wages and salaries, plus supplemental information on topics such as schooling and working experience. Moreover, demographic characteristics such as age, sex, race and marital status are shown for each person. The analysis spans from 1998 through 2015, including the most recent data.

The analytic sample, which consists of individuals aged 20 to 65 in the survey year, is divided into three age groups: 20-24 (the "young"), 25-54 (the "prime-aged"), and 55-64 (the "old"). This is consistent with study of Munnell and Wu (2012). The dependent variables of interest include employment and unemployment rates, hours worked per week, and wage rates of the young and the prime-aged individuals. The key independent variable is the employment rate of

the old workers. We take averages of these measures for each age group over time using the provided survey weights. The analysis is presented in each case first for all sample together, then for different education attainments separately.

B. Descriptive Statistics

Table 1 presents the descriptive statistics of the data. The full sample used in this paper contains 918 state-level observations for 50 states plus Washington D.C. from 1998 to 2015. On average, the employment rate of the young of each state is 68 percent, but ranges from 47 percent to 85 percent. The average employment rate of the prime-aged is higher, at 80 percent, with a smaller variance. The mean employment rate of old individuals is the lowest, at 61 percent. The differences among the unemployment rates of people with different ages are much smaller. Moreover, the average weekly earnings of the prime-aged is higher than those of the young. Similarly, the typical prime-aged worker works more hours per week (40 hours) than the young (35 hours).

When we disaggregate the sample by educational attainment, we can see differences in the labor force activity among people with different education levels. For instance, the low-educated young workers have the lowest employment rate, at 52 percent, while the high-educated prime workers have the highest employment rate, at 87 percent on average. This directly reflects the return of education. Moreover, the working hours and earning wages show the similar patterns.

Demographic characteristics also vary considerably among states. For example, the share of the population ages 20-24 is 9 percent on average, but varies between 6 and 14 percent. The variance

of the fraction of less high school education level is even larger, from 11 to 65 percent, indicating an uneven level of education among states. Similarly, the average poverty rate is 13 percent, varying from 5 to 23 percent.

CHAPTER FIVE

ESTIMATION RESULTS: QUANTIFYING THE EFFECT OF THE EMPLOYMENT OF OLD WORKERS ON THE EMPLOYMENT OF YOUNGER WORKERS

This chapter presents the results of the regression analysis. It is divided into two sub-sections. The first sub-section presents the direct evidence of the crowding out effect. The second sub-section divides the sample by educational attainment to see the cross educational group effect under the employment of old workers.

A. Direct Effect of the Employment of the Old

Table 2 displays the Ordinary Least Square (OLS) regression results for young workers aged between 20 and 24 by the impact of employment of old workers. Controlling for other factors of labor market conditions and demographic characteristics, the coefficient in the first column is positive and significant, indicating that a 1-percentage-point increase in the employment rate for older people is associated with a 0.14 percentage points increase in youth employment on average. However, the coefficients in columns 2 is positive and statistically insignificant, that is, the increase in employment of older people has no impact on youth unemployment. This finding is consistent with the finding of Munnell and Wu (2012), and it strongly contradicts the crowd-out hypothesis.

In addition to employment/unemployment, equations are also estimated to measure the impact of the employment of old workers on the “quantity” and “price” of younger workers, that is, their

working hours and weekly earnings. If the crowd out effect is not directly reflected through the employment/unemployment rates, younger workers may confront reduced working hours and earnings due to an increased labor supply of older people. Results are summarized in the third and fourth column of Table 2, and the explanatory variables are the same in the earlier regressions. Again, the coefficients are positive and statistically insignificant, showing no evidence of the “lump of labor” theory.

Table 3 presents the results for prime-aged individuals. The pattern that emerges is quiet similar to the young. Instead of crowding out, employment of old workers has no influence on unemployment or weekly working hours by the prime-age, but significantly increases their employment rates and earnings, with the coefficient on the employment rate statistically significant at 1 percent level and the coefficient on the log weekly wage statistically significant at only 10 percent level. To be more specific, a 1-percentage-point increase in the employment of elderly would increase the employment of the prime-aged by 0.08 percent, as well as the wage earnings by 0.09 percent.

Most of the other controls have coefficients in the expected direction, although often insignificant. For example, the state level poverty rate significantly decreases the employment rate and increases the unemployment rate, working hours, and weekly wages for both young and prime workers. Similarly, the state level average unemployment rate significantly decreases the working hours for both young and prime-aged people.

B. Differential Impacts by Education Groups

The potential for older workers to crowd out younger counterparts should depend on the extent to which they are substitutes. Economic theory suggests that the more similar the groups are with respect to skills, the greater the degree of substitution. Therefore, this section explores whether the effects are different by education groups.

Table 4 summarizes the results examining the impact on the employment rates of young workers with different education levels. Coefficients on employment rates of older ones with different education levels are mostly positive but insignificant. Table 5 shows the results on the unemployment rates. Again, coefficients are all statistically insignificant. Table 6 displays how the employment of the old affect the working hours of the young, and table 7 is examining the earnings effect. As shown in these tables, the employment of old people has almost no effect on the employment, unemployment, working hours and weekly earnings of the young since most of these coefficients are statistically insignificant. The only significant estimate suggests that more low-educated elderly employment leads to an increase in engagement of low-educated young people in Table 4. To be more specific, as indicated in the first column of table 4, a 1-percentage-point increase in the employment of old people with less than high school education level is associated with a 0.10 percentage points increase in the employment of young people with the same education level at 10 percent level. At the same time, as shown in the first column of table 5, a 1-percentage-point increase in the employment of old people with less than high school education level leads to a 0.06 percentage points decrease in the unemployment of the young. These findings imply that the increase in employment of older people seems to have

bigger influence on low-educated young people. However, all these results contradict the “lump of labor” theory.

We did the same regression analyses for the prime-aged group, as summarized in table 8, 9, 10, and 11 for employment rates, unemployment rates, working hours, and weekly earnings respectively. The impact of the employment of the old seems more substantial for the prime as for the young. For example, as indicated in the first column of Table 8, a 1-percentage-point increase in the employment of old people with less than high school education level and some college education level statistically increases the employment of the prime who are educated less than high school and who are educated college higher at 1 percent level. Furthermore, the coefficients of employment of old workers with college higher education level are all positive and statistically significant at 5 percent level. At the same time, the coefficients are negative and statistically significant on the unemployment rate of the prime with some-college and college-and-above. That is, instead of crowding out the prime workers, the employment of the old workers with college-and-above indeed increases the employment and decreases the unemployment of prime persons in different educational attainment. With considerations of the “quantity” and “price” effects, no negative and significant coefficients are found.

Concerning the control variables, a few things are worth a comment. First, results show that the state level average poverty rate is negatively associated with the overall employment of both young and prime people. Similarly, the state average unemployment rate is always negatively related with the working hours and earning rates. These are consistent with previous literature.

Second, an increasing proportion of less-than-high-school educated people is sometimes related to declines in working hours and earning rates, indicating returns to education.

These results are largely consistent with the aggregate analysis. The magnitudes of the coefficients on the employment of older persons are sometimes higher and sometimes lower, and significance fails in some cases. However, no evidence of a crowd-out is provided. If anything, the effect of the employment of the old is indeed positive. In conclusion, the relationship between older and younger persons' labor-force behavior does not vary by educational attainment.

CHAPTER SIX

CONCLUSIONS

A. Summary of the Findings

Global rapid population aging brings big challenges to both the social security system and labor force supply. The concern about postponing retirement age may hurt the employment of youth has been always claimed by the public and media. Using the panel data from the Merged Outgoing Rotation Groups (MORG) of the Current Population Survey (CPS), this study investigates whether the increased employment of elderly workers is having negative effects on the labor force activity of younger workers. In contrast to previous studies in the literature, this study examines the existence of “crowding out” while separating the estimating sample by educational attainment.

I used various regression approaches to investigate the relationship. The results vary across specifications, and many remain statistically insignificant. As we shown in the paper, higher employment rate of older persons does not cause lower employment rates of younger persons, as well as their working hours and wage rates. Instead, the impact of increased elderly employment on the employment of young and prime-aged workers are both positive. In conclusion, I find no evidence of crowding out of younger workers from the labor market by older workers. If anything, the employment of the young and prime aged tends to move in the same direction as the elderly, indicating that the younger and older individuals are complementary. These findings are consistent with previous literatures.

B. Policy Implications

The lack of “crowding out” effect can have an important influence on the employment and retirement policy. Considering the rapid population aging in the United States, it is time for the government and public to reform the current retirement system. Policies to foster early retirement to release jobs for the young can be limited or rejected since they may lead to higher labor costs and may dampen the demand for old workers. Moreover, to reduce social panic and labor force discrimination, it is important to spread and convince the public and employers that the lump of labor theory does not hold. However, this paper still has some limitations. The evidence from one country may not be conclusive. And the positive correlation between employment of younger and older workers cannot be clearly explained. Therefore, more researches are needed for future investigation.

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Table 1. Descriptive Statistics, U.S. Data

	Mean	Standard deviation	Minimum	Maximum
Dependent variables				
All young				
Employment rate	0.68	0.07	0.47	0.85
Unemployment rate	0.07	0.02	0.02	0.15
Weekly wage	399.02	54.83	244.51	648.16
Hour worked last week	35.14	1.69	29.97	39.40
All prime age				
Employment rate	0.80	0.04	0.67	0.89
Unemployment rate	0.04	0.02	0.01	0.11
Weekly wage	787.33	133.20	486.02	1333.21
Hour worked last week	40.48	0.72	38.15	42.44
Young (less than high school)				
Employment	0.52	0.12	0.14	0.85
Unemployment	0.13	0.07	0.00	0.42
Weekly wage	343.91	61.99	144.07	673.01
Hour worked last week	36.88	3.10	21.38	47.58
Young (high school)				
Employment	0.69	0.09	0.43	0.91
Unemployment	0.09	0.04	0.00	0.24
Weekly wage	402.15	53.53	270.05	634.91
Hour worked last week	37.42	1.91	31.55	45.22
Young (some college)				
Employment	0.68	0.08	0.44	0.88
Unemployment	0.05	0.02	0.00	0.13
Weekly wage	346.12	47.71	229.04	557.68
Hour worked last week	32.12	2.12	24.91	38.79
Young (college higher)				
Employment	0.80	0.08	0.48	1.00
Unemployment	0.04	0.03	0.00	0.24
Weekly wage	567.25	99.70	275.71	1014.7
Hour worked last week	37.80	2.32	27.74	45.29
Prime (less than high school)				
Employment	0.61	0.08	0.29	0.78
Unemployment	0.07	0.03	0.00	0.17
Weekly wage	467.05	66.71	308.23	748.32
Hour worked last week	39.31	1.46	33.42	44.77
Prime (high school)				
Employment	0.76	0.05	0.57	0.88
Unemployment	0.05	0.02	0.01	0.15
Weekly wage	625.54	87.16	393.03	923.16
Hour worked last week	40.15	0.97	36.87	43.60
Prime (some college)				
Employment	0.81	0.04	0.66	0.91

Unemployment	0.04	0.02	0.01	0.12
Weekly wage	700.73	93.47	442.71	960.76
Hour worked last week	39.87	0.92	36.49	42.38
Prime (college higher)				
Employment	0.87	0.03	0.79	0.95
Unemployment	0.02	0.01	0.00	0.07
Weekly wage	1060.24	164.60	601.37	1595.77
Hour worked last week	41.49	0.83	38.33	43.71
Independent variables				
Employment of old (all)	0.61	0.06	0.40	0.79
Employment of old (less high)	0.41	0.09	0.17	0.71
Employment of old (high)	0.57	0.07	0.34	0.80
Employment of old (some college)	0.64	0.06	0.46	0.82
Employment of old (college higher)	0.72	0.05	0.51	0.89
Demographics				
Population 20-24	0.09	0.01	0.06	0.14
Population 25-54	0.52	0.03	0.44	0.65
Population 55-64	0.15	0.01	0.10	0.16
Black	0.11	0.11	0.00	0.14
Less high school	0.18	0.04	0.11	0.65
State total unemployment rate	0.04	0.01	0.02	0.09
Poor	0.13	0.03	0.05	0.23
Employment profile				
Manufacturing	0.06	0.03	0.00	0.14
Service occupation	0.19	0.04	0.07	0.30
Self-employment	0.05	0.01	0.03	0.11
Other economic indicators				
GSP per capita (\$)*	47602	17776	28714	170687
GSP growth (%)	0.01	0.03	-0.09	0.19

*chained in 2009 dollars

Table 2. Relationship between Older Workers' Employment and Youth Labor Market Activity

VARIABLES	(1) Employment	(2) Unemployment	(3) Working hours	(4) Wage (log)
Older persons' Employment rate	0.137** (0.059)	-0.033 (0.023)	-1.402 (1.550)	-0.014 (0.091)
Percent of population 20-24	0.004 (0.188)	-0.005 (0.102)	-7.842 (7.295)	-0.344 (0.400)
Fraction of black In state	-0.167 (0.148)	0.122** (0.052)	-9.050* (4.620)	-0.347 (0.255)
Percent of jobs in Self-employment	0.155 (0.278)	0.130 (0.126)	-4.650 (9.448)	-0.207 (0.538)
GSP per capita (log)	0.100** (0.039)	-0.054*** (0.020)	0.343 (1.577)	0.117 (0.096)
GSP growth (percent)	0.001 (0.000)	-0.000 (0.000)	0.024* (0.012)	-0.000 (0.001)
Poverty rate	-0.003** (0.001)	0.001*** (0.000)	-0.065** (0.027)	-0.003* (0.002)
State average wage (log)	0.023 (0.065)	-0.034 (0.040)	10.591*** (2.681)	1.060*** (0.157)
State average unemployment rate			-24.954*** (9.302)	-1.541*** (0.552)
Percent of jobs in Manufacturing	0.281* (0.155)	0.025 (0.084)	3.472 (4.929)	0.012 (0.289)
Percent of jobs in Service industry	0.105 (0.081)	0.085* (0.046)	-11.913*** (4.128)	-0.403* (0.208)
Fraction of less than High school in state	-0.037 (0.132)	-0.115 (0.073)	2.668 (4.779)	-0.230 (0.300)
Year dummies	yes	yes	yes	yes
State dummies	yes	yes	yes	yes
Observations	918	918	918	918
R-squared	0.847	0.649	0.758	0.871

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3. Relationship between Older Workers' Employment and Prime-Aged Labor Market Activity

VARIABLES	(1) Employment	(2) Unemployment t	(3) Working hours	(4) Wage (log)
Older persons' Employment rate	0.083*** (0.025)	-0.020 (0.015)	0.009 (0.567)	0.086* (0.050)
Fraction of black In state	-0.159** (0.076)	0.077** (0.034)	-2.937 (2.230)	-0.379*** (0.126)
Percent of jobs in Self-employment	0.110 (0.125)	0.167* (0.088)	1.730 (3.673)	-0.526** (0.238)
GSP per capita (log)	0.070*** (0.021)	-0.034*** (0.012)	0.128 (0.503)	0.039 (0.032)
GSP growth (percent)	0.000 (0.000)	-0.001*** (0.000)	0.009* (0.005)	-0.002*** (0.000)
Poverty rate	-0.002*** (0.000)	0.001*** (0.000)	-0.022** (0.009)	-0.002* (0.001)
State average wage (log)	-0.016 (0.039)	-0.026 (0.023)	2.232** (0.990)	0.541*** (0.070)
State average unemployment rate			-9.874*** (3.206)	-0.207 (0.221)
Percent of population 20-24	-0.052 (0.051)	-0.023 (0.030)	-1.247 (1.294)	0.173 (0.119)
Percent of jobs in Manufacturing	0.091 (0.095)	0.002 (0.055)	1.249 (1.830)	-0.038 (0.139)
Percent of jobs in Service industry	0.065 (0.051)	0.052* (0.030)	0.802 (1.558)	0.171 (0.109)
Fraction of less than High school in state	0.043 (0.061)	-0.072* (0.038)	0.175 (1.602)	-0.345** (0.171)
Year dummies	yes	yes	yes	yes
State dummies	yes	yes	yes	yes
Observations	918	918	918	918
R-squared	0.939	0.848	0.878	0.985

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4. Relationship between Older Workers' Employment and Youth Employment by Education Level

VARIABLES	(1) Less than high school	(2) High school	(3) Some college	(4) College and above
Less-high older Persons' employment	0.097* (0.053)	0.008 (0.028)	0.026 (0.020)	-0.030 (0.034)
High-school older Persons' employment	0.118 (0.106)	-0.038 (0.057)	0.004 (0.049)	-0.097 (0.083)
Some-college older Persons' employment	0.061 (0.071)	0.034 (0.061)	0.061 (0.047)	0.068 (0.072)
College-above older Persons' employment	0.046 (0.100)	0.047 (0.062)	0.049 (0.045)	0.056 (0.103)
Fraction of black In state	-0.258 (0.258)	-0.064 (0.193)	0.219 (0.156)	0.010 (0.369)
Percent of jobs in Self-employment	0.638 (0.721)	-0.237 (0.410)	-0.002 (0.342)	0.700 (0.827)
GSP per capita (log)	-0.080 (0.132)	0.150** (0.073)	0.069 (0.042)	0.175** (0.071)
GSP growth (percent)	0.003* (0.002)	-0.000 (0.001)	0.001 (0.001)	0.001 (0.001)
Poverty rate	-0.008** (0.003)	-0.003** (0.002)	-0.001 (0.001)	0.000 (0.002)
State average wage (log)	0.123 (0.242)	0.007 (0.131)	0.090 (0.075)	-0.120 (0.150)
Percent of population 20-24	-0.122 (0.632)	0.396 (0.350)	-0.225 (0.302)	-0.374 (0.464)
Percent of jobs in Manufacturing	0.888 (0.568)	0.182 (0.238)	0.253 (0.235)	-0.107 (0.438)
Percent of jobs in Service industry	0.286 (0.336)	-0.308* (0.183)	0.249** (0.122)	-0.035 (0.203)
Fraction of less than High school in state	-0.433 (0.415)	0.157 (0.235)	0.044 (0.188)	-0.264 (0.331)
Year dummies	yes	yes	yes	yes
State dummies	yes	yes	yes	yes
Observations	918	918	918	918
R-squared	0.543	0.719	0.767	0.319

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5. Relationship between Older Workers' Employment and Youth Unemployment by Education Level

VARIABLES	(1) Less than high school	(2) High school	(3) Some college	(4) College and above
Less-high older Persons' employment	-0.059* (0.032)	-0.002 (0.017)	-0.010 (0.010)	0.006 (0.018)
High-school older Persons' employment	-0.025 (0.063)	0.029 (0.033)	-0.021 (0.019)	0.004 (0.039)
Some-college older Persons' employment	-0.017 (0.051)	-0.035 (0.024)	-0.016 (0.015)	-0.011 (0.030)
College-above older Persons' employment	-0.018 (0.059)	-0.010 (0.038)	-0.003 (0.018)	-0.054 (0.042)
Fraction of black In state	0.362 (0.290)	0.127 (0.096)	-0.046 (0.085)	0.127 (0.123)
Percent of jobs in Self-employment	0.014 (0.460)	0.318 (0.251)	0.255* (0.143)	-0.546 (0.336)
GSP per capita (log)	-0.152** (0.058)	-0.061* (0.035)	-0.026 (0.019)	-0.050 (0.047)
GSP growth (percent)	-0.000 (0.001)	-0.001* (0.001)	-0.000 (0.000)	-0.000 (0.000)
Poverty rate	0.001 (0.001)	0.002* (0.001)	0.001* (0.001)	0.000 (0.001)
State average wage (log)	-0.049 (0.119)	-0.106 (0.073)	-0.027 (0.036)	0.021 (0.074)
Percent of population 20-24	-0.093 (0.390)	-0.204 (0.211)	0.188* (0.108)	0.252 (0.217)
Percent of jobs in Manufacturing	0.184 (0.367)	-0.046 (0.163)	0.023 (0.088)	-0.026 (0.155)
Percent of jobs in Service industry	0.017 (0.170)	0.330*** (0.106)	-0.003 (0.064)	0.170** (0.081)
Fraction of less than High school in state	-0.058 (0.291)	-0.276 (0.117)	-0.065 (0.081)	-0.013 (0.162)
Year dummies	yes	yes	yes	yes
State dummies	yes	yes	yes	yes
Observations	918	918	918	918
R-squared	0.315	0.519	0.463	0.167

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6. Relationship between Older Workers' Employment and Youth Working Hours by Education Level

VARIABLES	(1) Less than high school	(2) High school	(3) Some college	(4) College and above
Less-high older Persons' employment	-0.235 (1.482)	-0.054 (0.641)	-0.292 (0.834)	0.763 (1.012)
High-school older Persons' employment	1.572 (2.915)	-2.829 (1.664)	0.565 (1.744)	0.720 (2.457)
Some-college older Persons' employment	-0.263 (2.709)	-1.750 (1.234)	-0.483 (1.585)	-1.916 (2.012)
College-above older Persons' employment	-4.221 (2.579)	-0.219 (1.492)	-3.084 (1.523)	3.654* (2.118)
Fraction of black In state	-26.592** (12.915)	3.971 (9.260)	-3.412 (6.827)	2.692 (7.894)
State average unemployment rate	-38.256* (21.567)	-20.646 (13.695)	-27.792** (12.587)	7.688 (23.131)
Percent of jobs in Self-employment	-28.212 (28.021)	-7.242 (14.947)	2.128 (13.992)	-12.864 (21.347)
GSP per capita (log)	0.453 (3.021)	0.198 (1.217)	0.027 (2.341)	2.943 (2.321)
GSP growth (percent)	0.005 (0.042)	0.023 (0.021)	0.057** (0.024)	-0.046 (0.030)
Poverty rate	-0.118 (0.094)	-0.071** (0.035)	-0.078* (0.041)	0.019 (0.069)
State average wage (log)	-0.697 (5.753)	9.389*** (2.747)	11.767*** (3.956)	6.086 (4.452)
Percent of population 20-24	2.042 (18.228)	-11.142 (9.668)	-11.816 (11.331)	-4.802 (13.020)
Percent of jobs in Manufacturing	-3.920 (15.050)	-0.217 (6.998)	6.624 (8.191)	-22.236 (14.789)
Percent of jobs in Service industry	-16.225 (9.690)	-13.788** (5.846)	-13.828** (5.399)	-3.687 (5.331)
Fraction of less than High school in state	-13.290 (14.803)	5.389 (7.014)	-1.847** (7.133)	15.060 (9.916)
Year dummies	yes	yes	yes	yes
State dummies	yes	yes	yes	yes
Observations	918	918	918	918
R-squared	0.277	0.609	0.622	0.251

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7. Relationship between Older Workers' Employment and Youth Earnings by Education Level

VARIABLES	(1) Less than high school	(2) High school	(3) Some college	(4) College and above
Less-high older Persons' employment	-0.001 (0.083)	0.060 (0.040)	-0.029 (0.047)	0.126** (0.057)
High-school older Persons' employment	0.120 (0.124)	-0.081 (0.086)	0.034 (0.079)	-0.013 (0.129)
Some-college older Persons' employment	-0.163 (0.149)	-0.045 (0.078)	-0.028 (0.093)	0.070 (0.093)
College-above older Persons' employment	-0.237 (0.157)	-0.061 (0.075)	-0.061 (0.094)	-0.015 (0.142)
Fraction of black In state	-0.498 (0.591)	0.350 (0.454)	0.475 (0.479)	-0.199 (0.444)
State average unemployment rate	-1.730 (1.076)	-2.270*** (0.632)	-1.321 (0.800)	-0.550 (1.044)
Percent of jobs in Self-employment	-0.376 (1.492)	-0.434 (0.736)	-0.313 (0.675)	-2.043* (1.158)
GSP per capita (log)	0.142 (0.159)	0.129 (0.105)	0.068 (0.108)	0.181 (0.143)
GSP growth (percent)	0.000 (0.003)	-0.000 (0.002)	0.001 (0.001)	-0.003 (0.002)
Poverty rate	-0.002 (0.004)	-0.003 (0.002)	-0.004** (0.002)	-0.000 (0.003)
State average wage (log)	0.971*** (0.294)	1.198*** (0.170)	1.178*** (0.178)	0.632** (0.272)
Percent of population 20-24	-0.443 (1.375)	-0.776 (0.548)	-0.565 (0.658)	0.716 (0.793)
Percent of jobs in Manufacturing	0.365 (0.715)	-0.039 (0.537)	0.014 (0.446)	-1.314* (0.669)
Percent of jobs in Service industry	-1.008* (0.511)	-0.590** (0.273)	-0.909*** (0.305)	-0.117 (0.310)
Fraction of less than High school in state	-1.749** (0.788)	-0.215 (0.453)	-0.348** (0.390)	1.296 (0.616)
Year dummies State dummies	yes yes	yes yes	yes yes	yes yes
Observations	918	918	918	918
R-squared	0.376	0.688	0.716	0.635

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8. Relationship between Older Workers' Employment and Prime-Aged Employment by Education Level

VARIABLES	(1) Less than high school	(2) High school	(3) Some college	(4) College and above
Less-high older Persons' employment	0.097*** (0.019)	0.019* (0.010)	-0.009 (0.012)	-0.005 (0.008)
High-school older Persons' employment	-0.020 (0.042)	0.054** (0.024)	0.026 (0.021)	0.011 (0.015)
Some-college older Persons' employment	0.028 (0.035)	-0.004 (0.019)	0.018 (0.020)	0.041*** (0.015)
College-above older Persons' employment	0.109** (0.048)	0.014** (0.019)	0.044** (0.022)	0.040** (0.015)
Fraction of black In state	-0.378** (0.161)	0.164 (0.112)	0.165* (0.093)	-0.054 (0.091)
Percent of jobs in Self-employment	0.141 (0.506)	-0.133 (0.190)	0.149 (0.165)	0.192 (0.150)
GSP per capita (log)	0.054 (0.049)	0.072** (0.029)	0.073** (0.035)	0.054*** (0.016)
GSP growth (percent)	0.001** (0.001)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Poverty rate	-0.005*** (0.001)	-0.002*** (0.001)	-0.001** (0.001)	-0.000 (0.000)
State average wage (log)	0.003 (0.121)	0.022 (0.062)	0.007 (0.054)	-0.039 (0.042)
Percent of population 25-54	0.292** (0.110)	-0.147** (0.070)	-0.067 (0.082)	-0.063 (0.065)
Percent of jobs in Manufacturing	0.249 (0.255)	0.066 (0.158)	0.193* (0.112)	0.055 (0.129)
Percent of jobs in Service industry	-0.040 (0.132)	-0.076 (0.090)	-0.036 (0.071)	0.060 (0.046)
Fraction of less than High school in state	0.574*** (0.175)	0.164* (0.090)	0.113 (0.085)	0.112 (0.087)
Year dummies	yes	yes	yes	yes
State dummies	yes	yes	yes	yes
Observations	918	918	918	918
R-squared	0.798	0.904	0.867	0.744

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9. Relationship between Older Workers' Employment and Prime-Aged Unemployment by Education Level

VARIABLES	(1) Less than high school	(2) High school	(3) Some college	(4) College and above
Less-high older Persons' employment	-0.013 (0.013)	-0.008 (0.007)	0.003 (0.005)	0.005 (0.004)
High-school older Persons' employment	0.016 (0.027)	-0.014 (0.014)	-0.012 (0.011)	-0.001 (0.009)
Some-college older Persons' employment	-0.013 (0.023)	-0.001 (0.010)	-0.004 (0.009)	-0.006 (0.006)
College-above older Persons' employment	-0.032 (0.024)	-0.006 (0.010)	-0.023*** (0.007)	-0.015** (0.006)
Fraction of black In state	0.163* (0.088)	-0.078 (0.065)	-0.022 (0.037)	0.045* (0.025)
Percent of jobs in Self-employment	0.230 (0.231)	0.240* (0.135)	0.147 (0.099)	0.132** (0.053)
GSP per capita (log)	-0.057* (0.029)	-0.042** (0.017)	-0.029** (0.013)	-0.010 (0.007)
GSP growth (percent)	-0.001*** (0.000)	-0.001*** (0.000)	-0.000** (0.000)	-0.000*** (0.000)
Poverty rate	0.002*** (0.001)	0.001* (0.000)	0.001** (0.000)	0.000 (0.000)
State average wage (log)	-0.007 (0.053)	-0.062 (0.037)	-0.041* (0.024)	-0.016 (0.015)
Percent of population 25-54	-0.180** (0.078)	0.040 (0.045)	-0.050 (0.036)	0.005 (0.026)
Percent of jobs in Manufacturing	-0.031 (0.131)	0.009 (0.082)	0.046 (0.062)	-0.055 (0.039)
Percent of jobs in Service industry	0.139* (0.077)	0.110** (0.052)	0.102*** (0.028)	0.015 (0.019)
Fraction of less than High school in state	-0.232** (0.097)	-0.060 (0.057)	-0.080 (0.050)	-0.063** (0.029)
Year dummies	yes	yes	yes	yes
State dummies	yes	yes	yes	yes
Observations	918	918	918	918
R-squared	0.576	0.800	0.792	0.657

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10. Relationship between Older Workers' Employment and Prime-Aged Working Hours by Education Level

VARIABLES	(1) Less than high school	(2) High school	(3) Some college	(4) College and above
Less-high older Persons' employment	-0.538 (0.668)	0.117 (0.285)	-0.247 (0.255)	0.111 (0.243)
High-school older Persons' employment	0.777 (1.326)	0.510 (0.589)	-0.378 (0.444)	0.088 (0.654)
Some-college older Persons' employment	-0.029 (1.139)	-0.237 (0.582)	-0.097 (0.441)	0.226 (0.407)
College-above older Persons' employment	1.125 (1.302)	-0.783 (0.563)	0.855* (0.505)	-0.296 (0.479)
Fraction of black In state	-4.879 (5.150)	3.773 (2.893)	2.942 (2.665)	-1.824 (3.028)
State average unemployment rate	-24.002*** (8.714)	-16.142*** (4.717)	-15.495*** (3.866)	1.132 (5.644)
Percent of jobs in Self-employment	-4.613 (13.863)	2.762 (5.856)	1.867 (4.665)	1.912 (5.249)
GSP per capita (log)	-0.110 (1.302)	-0.347 (0.659)	0.963 (0.658)	0.023 (0.717)
GSP growth (percent)	0.015 (0.024)	0.011 (0.009)	0.003 (0.008)	0.008 (0.009)
Poverty rate	-0.045* (0.025)	-0.029* (0.016)	-0.002 (0.012)	-0.026 (0.017)
State average wage (log)	5.430** (2.513)	3.575*** (1.123)	2.619* (1.305)	1.177 (1.293)
Percent of population 25-54	-9.481* (4.970)	-3.306 (2.327)	-1.564 (1.787)	0.590 (2.004)
Percent of jobs in Manufacturing	1.337 (5.503)	0.609 (3.358)	1.609 (2.745)	5.316 (3.410)
Percent of jobs in Service industry	-1.737 (2.282)	-1.648 (1.748)	-0.138 (2.308)	1.597 (2.356)
Fraction of less than High school in state	0.564 (4.992)	-0.467** (2.558)	2.796 (1.946)	1.440 (2.751)
Year dummies	yes	yes	yes	yes
State dummies	yes	yes	yes	yes
Observations	918	918	918	918
R-squared	0.509	0.787	0.796	0.727

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 11. Relationship between Older Workers' Employment and Prime-Aged Earnings by Education Level

VARIABLES	(1) Less than high school	(2) High school	(3) Some college	(4) College and above
Less-high older Persons' employment	0.074* (0.040)	0.002 (0.020)	-0.023 (0.021)	0.006 (0.021)
High-school older Persons' employment	-0.068 (0.074)	0.072 (0.044)	0.046 (0.033)	0.021 (0.042)
Some-college older Persons' employment	-0.018 (0.064)	-0.039 (0.036)	0.019 (0.033)	0.050 (0.035)
College-above older Persons' employment	0.011 (0.068)	0.003 (0.036)	0.042 (0.036)	0.030 (0.034)
Fraction of black In state	-0.111 (0.296)	0.660** (0.284)	0.415** (0.159)	-0.307** (0.152)
State average unemployment rate	-1.528** (0.641)	-0.634* (0.336)	-0.461 (0.298)	-0.177 (0.351)
Percent of jobs in Self-employment	-0.841 (0.638)	-0.892* (0.452)	-0.777*** (0.281)	-0.379 (0.455)
GSP per capita (log)	-0.038 (0.081)	0.030 (0.060)	0.082 (0.052)	0.025 (0.054)
GSP growth (percent)	-0.002 (0.002)	-0.001* (0.001)	-0.003*** (0.001)	-0.001 (0.001)
Poverty rate	-0.005** (0.002)	-0.002* (0.001)	-0.001 (0.001)	-0.002 (0.001)
State average wage (log)	0.878*** (0.171)	0.791*** (0.113)	0.653*** (0.110)	0.444*** (0.116)
Percent of population 25-54	-0.235 (0.224)	0.133 (0.173)	-0.027 (0.143)	0.324** (0.152)
Percent of jobs in Manufacturing	-0.070 (0.463)	-0.009 (0.246)	0.464** (0.222)	0.119 (0.266)
Percent of jobs in Service industry	-0.565** (0.227)	-0.137 (0.145)	-0.052 (0.120)	-0.055 (0.131)
Fraction of less than High school in state	-0.097* (0.336)	-0.362* (0.233)	-0.134 (0.213)	0.250 (0.203)
Year dummies	yes	yes	yes	yes
State dummies	yes	yes	yes	yes
Observations	918	918	918	918
R-squared	0.784	0.951	0.954	0.962

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1