Regional Wage Differences of American Advanced Educational Teachers

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Abstract

Regional differences in income are common research issues around the world and in various occupations. This article will be different from the previous analysis of income differences in the entire labor market in certain regions, and will focus on a relatively small number of American higher education recipients. Through linear regression analysis of income data in the four major regions of the United States, judge the influence of regional distribution and academic differences on advanced education teachers' income, to explore whether the income of this group has the general characteristic of income regional differences.

Key Words   region; wage differences; salary; schooling; teachers

1. Introduction

Wages are an important means of encouraging laborers to work and improve the efficiency of production activities, and are an important research object of labor economics. In real life, the factors that affect income include not only the conditions of the workers themselves, but also many factors such as the level of social and economic development and regional development differences. This article will focus on whether the income of residents with advanced education in the United States has the attribute of regional differences.

1.1 American citizenship with advanced education

The rapid development of economic globalization in the past few decades has greatly increased the demand for talent in various countries, and the prosperity of education has emerged. Under the guarantee of the rule of law and the balance of power, the United States has developed advanced education in an all-around way. From 2008 to 2018, among Native Americans over the age of 25, the number of bachelor's degree holders increased by 25.6%, the total number reached 40,393, and the growth rates of master's and doctoral students reached 37.0% and 80.9% respectively[2]. While enjoying the personal honor brought by the development of education, advanced education personnel also create more value for society through their own efforts Among them, it is one of the important manifestations that advanced education personnel engage in education and create more advanced education talents for the society. This article will study whether regional differences have an important impact on the income of advanced education by studying the income status of Native Americans with advanced education levels and working in advanced education.

1.2. Significance of research on regional differences in salary

Many studies on regional differences in economics are mainly composed of the following aspects: First, there are many factors that will cause regional differences. For example, differences in economic development levels and education development levels in different regions have an effect on income levels, reflecting regional differences in income. Second, regional differences in income will have a series of effects.

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[2] Data resource: Current Population Survey of the Bureau of Census for the Bureau of Labor Statistics.

At the social level, differences in income can affect productivity and, in turn, regional economic development. As an important incentive mechanism in labor relations, income differences under the same job requirements will produce differences in productivity, which will further cause imbalances in regional development. From the perspective of the labor market, income differences will cause imbalances in labor market supply and demand. Regions with relatively high incomes will produce a phenomenon of oversupply of labor. On the contrary, regions with relatively low incomes are in short supply. From the perspective of laborers, income level is related to the quality of life, and regions with advanced living expenses have advanced requirements for income levels, and vice versa. Once the difference in labor income is significantly greater than the difference in regional living expenses, it will cause a social disparity between the rich and the poor, and it will also increase the living pressure of some workers.

1.3 Regional income disparities of American advanced education

The income level of advanced education in the United States is generally advanced. According to the data of the Current Population Survey in the United States, the average annual income of postgraduates of 18-year-old masters and above from 2007 to 2017 increased from $ 80,977 to $ 98,369, an increase of 21.5 %. Among them, the income level of those engaged in advanced education occupies an important position. According to the survey data of the American Association of University Professors (AAUP) for almost 380,000 full-time and more than 96,000 part-time faculty members, as well as senior administrators at nearly 600 institutions in 2019-2020, the average annual income of doctoral professors is $ 160,080, the associate professors' average annual income level is $ 104,408, the average annual income of Master's professors is $ 104,555, the associate professors' average annual income level is $ 83,537. The above data is sufficient to prove the income of advanced education practitioners engaged in advanced education This is obviously more advanced than the average level of this group, which reflects the importance of advanced education and the national emphasis on education.

Hence, this article aims to study whether the income of advanced education is so high, and whether it is also affected by regional differences. According to the data of the American Association of University Professors (AAUP), whether it is for master professors or doctoral professors, the income in the southern region of the United States is generally low, and the income in the northeast and west is generally high, which is somewhat in line with the level of regional economic development. Positive correlation. However, due to the limitations and complexity of the AAUP sample, the results may be biased. In this paper, the research object is precisely US citizens with an advanced educational background, and the occupation of the research object is also positioned at the advanced education level, according to the Public Use Microdata Sample (PUMS) of the American Community Survey (ACS) among 2014-2018 to further determine the impact of regional differences on salary.

2. Data

In this article, in order to objectively reflect whether there are regional differences in income through sample data, I will use the data of all US citizens who have received advanced education and engaged in advanced education in 2014-2018 in PUMS. PUMS defines citizens born in the United States as "Native Americans", which does not include naturalized citizens, non-citizens with permanent visas, or non-citizens with temporary visas. At the same time, PUMS will provide the year of advanced education Income level, but I will only use the annual income of advanced education workers who have obtained a master's degree or doctorate. It is worth noting that because PUMS data has sample weights and income adjustment factors, in order to maintain the consistency of the sample subject and income data for the five years from 2014 to 2018, we will apply these prerequisites during the regression analysis.

Finally, it should be noted that since the data studied in this article are from advanced education workers who participated in the PUMS survey, the conclusion of the regression analysis has certain limitations, and the conclusion cannot be fully applied to a large number of American advanced education immigration workers and Citizens born abroad and engaged in advanced education in the United States, etc. The calculated regional difference influence will provide a certain reference significance in the research of advanced education income.

The formula to be estimated, including the characteristics of advanced educators and regional distribution factors is:

Log W i (t) = α + β1 * SCHL i + β2 * EXPE i + β3 * EXPSQ i + β4 * REG i + ε i (t)

where:

W[3] is the faculty's annual earnings, which is a dependent Variable. W is the annual income of advanced education workers, whose categories are masters and doctoral professors.

SCHL shows the educational years the workers received, in which there are two major categories of workers, doctoral and master teachers, whose schooling years are 24 and 22 respectively.

EXPE describes the worker's working hours per week in the past 12 months.

EXPSQ is the square of experience, i.e., the square of working hours per week in the past 12 months.

REG is a vector of 3 dummy variables for the four surveyed regions.

The error term corresponds to the individual error in measuring observed variables.

Regschl is the interaction term of region and schooling.

Regexper is the interaction term of region and experience.

Regexpers is the interaction term of the region of experience square.

Schlexper is the interaction term of schooling and experience.

The vector of coefficients **β1** and **β2** represents the returns of schooling and experience. **β3** is the return of experience square. The earning function will be used to test whether the vector **β4** is different from zero, and thus provide evidence of regional segmentation of the labor market.

The American Community Survey (ACS) Public Use Microdata Sample (PUMS) files show the full range of population and housing unit responses collected on individual ACS questionnaires, for a subsample of ACS housing units and group quarters persons. Each record in the file represents a single person, or--in the household-level dataset--a single housing unit. In the person-level file, individuals are organized into households, making possible the study of people within the contexts of their families and other household members. PUMS files for an individual year, such as 2015, contain data on approximately one percent of the United States population. PUMS files covering a five-year period, such as 2014-2018, contain data on approximately five percent of the United States population.

Here, we will refer to the data from 2014 to 2018 for 5 consecutive years, and select 42,898 sample data from about 5% of the population of the United States that meets the level of advanced education and Native American wage data for advanced education as analysis resources. Use the theory of linear programming to explore whether there is a regional difference in the wage of this group of people, and whether the regional distribution has an interaction effect on wages with education or work experience.

3. Estimation and results

3.1 Sample Characteristics

This article selects all American natives who participated in the survey from 2014 to 2018 by PUMS, and restricted the education conditions to masters and doctors. The survey content involves their annual income, weekly working hours, and location, so as to compose all survey data. The sample characteristics are summarized in Table 1.

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[3] The adjusted annual income calculation formula according to the adjustment factor in PUMS here is:
   W=WAGP * ADJINC/1000000.

Table 1   Sample Characteristics

Total in Sample	42,898	
% Master	50.5%	
Variables	Mean	Standard Deviation
Log Wage	10.72	1.06
Schooling(Years)	22.99	1.00
Experience(Hours Weekly)	38.79	14.96
Regions	Population Percentage	
Northeast	21.9%	
Midwest	21.2%	
South	35.4%	
West	21.6%	

Table 2   Characteristics of The Labor Force by Selected Regions in 2014-2018

	Northeast	Midwest	South	West
Wage(Ave./Hour)	39.45	34.21	35.46	37.36
Monthly Salary(Ave.)	6112.97	5383.66	5484.33	5754.70
Schooling(Ave.Years)	23.04	22.94	23.01	22.94
Experience(Ave.Hours Weekly)	38.74	39.35	38.67	38.50
% Master	47.8%	52.8%	49.3%	53.1%

Combine the sample data with the selected area to analyze regional differences more intuitively. The overall regional distribution of wage levels is the highest in the northeast and the lowest in the central and western regions, which is positively related to the level of education, that is, the doctoral teachers in the northeast account for a larger proportion, and the master teachers in the central and western regions are the main labor force. The relationship is weak, and it is not possible to clearly determine the relationship. It is necessary to draw further conclusions through the significance of regression analysis.

3.2 Regional distribution of the number and income of higher education

First, in order to understand the regional differences in the income of higher education, we should understand the regional differences in American education. According to the individual education and regional characteristics of our study, we can get the specific proportion of the number of American masters and Ph.D. recipients in the Northeast, Midwest, South, and West from 2014 to 2018. Furthermore, by analyzing the consistency and continuity of the numbers in different years, the data can reflect the stability and influence of the development of education in these four regions.

Figure 1
Degree Regional Distribution
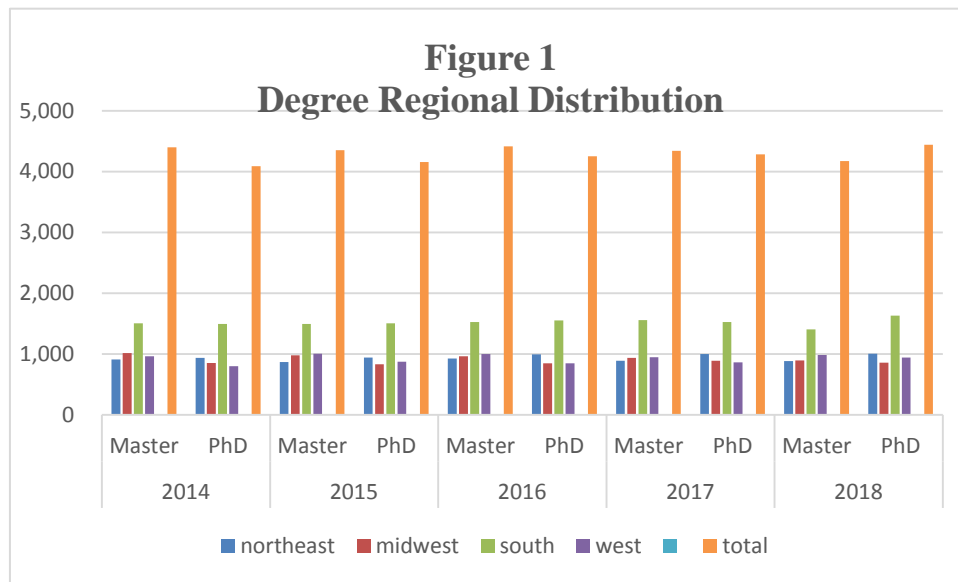
The data in Figure 1 shows that overall, in the PUMS sample, the number of master's and doctoral candidates has been stable for five consecutive years. In addition to 269 people, there are always more masters in other years. After comparing the data differences in different regions, we can clearly see that the southern region occupies a higher proportion of the two academic qualifications. It has maintained 35% in four regions for five consecutive years, while the other three regions have the same level, about 22% of the total. It can be seen that the higher education holders in the southern region have obvious advantages, and the difference in the other three regions is not obvious.

Figure 2
Regional Wage Differences
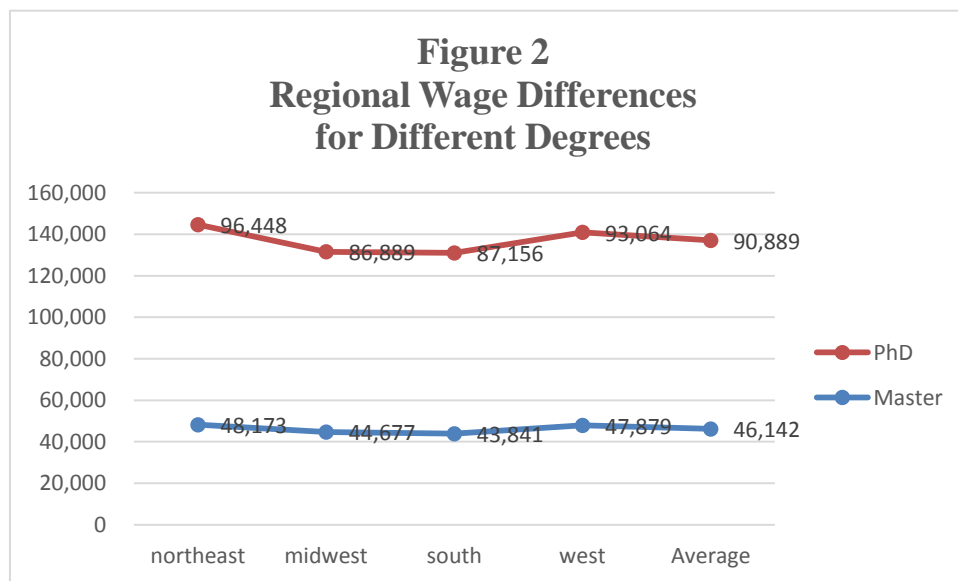**for Different Degrees**

Figure2 uses a line chart to reflect the regional income differences of different educational backgrounds. There is no doubt that in different regions, the income level of doctoral teachers is significantly higher than that of income. The difference in the northeast region is the most obvious. The average annual income of doctoral teachers is double that of master teachers, and the income of doctoral teachers and master teachers Both are significantly higher

than the average income of the four regions, and the western region is also showing the same trend. However, the income levels of the Midwest and Southern regions are lower, and the income gap between teachers with different academic qualifications is relatively small.

At different levels of education, the comparison of the increase of the two broken lines can draw a conclusion that the change in the income of doctoral teachers is higher than the change in the income of master teachers, which is 11.0% and 9.9%. Explore the reasons. On the one hand, the absolute level of income Creates income fluctuation space. Because the income level of doctoral teachers is relatively high, and the requirements for academic qualifications and teachers' personal characteristics are high, both provide the possibility of changes in income regions. Relatively, there is little room for change in the income of master teachers. On the other hand, regional development and education levels are expected to have an influence. Economic development affects the development of education, and different requirements for the highest level of education will also cause differences in the range of income changes for different higher education workers.

3.3 Regression analysis

In this section, we will analyze the impact of various variables on wages based on the linear regression of the above model. Since the logarithm of wages is more in line with the normal distribution, we will focus on analyzing the relationship between the logarithm of wages and various variables. First, determine the degree of stability and maximum value of the influence of variables in five consecutive years by reflecting the influence interval of each variable in different years. And according to the size of the absolute value, compare the difference of influence of different variables. Then, the plane analysis constantly adds new variables and observes the changes in the coefficients of each variable, so as to understand the interaction between each variable.

Table 3 Analysis of Covariance for Selected Years (All bounds are statistically significant at the 0.1% level)				
	Schooling	Experience	Experience Square	Region
（2014 R-squared = 0.54 N=8.485）				
Lower Bound	0.19	0.10	0.00	-0.04
Upper Bound	0.23	0.11	0.00	-0.01
No. of Variables	2	99	9801	4
（2015 R-squared = 0.52 N=8.510）				
Lower Bound	0.19	0.10	0.00	-0.03
Upper Bound	0.23	0.10	0.00	-0.01
No. of Variables	2	99	9801	4
（2016 R-squared = 0.53 N=8.666）				
Lower Bound	0.17	0.11	0.00	-0.03
Upper Bound	0.21	0.11	0.00	0.00
No. of Variables	2	99	9801	4
（2017 R-squared = 0.53 N=8.624）				
Lower Bound	0.19	0.11	0.00	-0.02
Upper Bound	0.22	0.11	0.00	0.01
No. of Variables	2	99	9801	4
（2018 R-squared = 0.52 N=8.613）				
Lower Bound	0.20	0.11	0.00	-0.03
Upper Bound	0.23	0.11	0.00	0.00
No. of Variables	2	99	9801	4

According to Table 3 above, we can see the meaningful contribution interval of each variable to the logistic wage. Among them, the contribution of schooling changes the most from year to year, from 0.17 to 0.23. At the same time, it is also the most contributing factor, up to 0.23. The contribution of work experience (i.e. working hours) is stable, basically maintained at 0.11, and the contribution of the square of experience is small, but according to the t-test result, we can know that this variable is significant. The contribution of regional variables is also very small, and in most cases presents the opposite contribution. Therefore, we need to analyze the specific differences between different regions in more detail to judge whether regional differences exist.

Table 4 Panel Data Models			
	(1)	(2)	(3)
	Log Wage	Log Wage	Log Wage
Schooling	0.396***	0.210***	0.205***
	(83.24)	(52.30)	(55.42)
Experience		0.041***	0.107***
		(153.74)	(133.16)
Experience Square			0.000***
			(-86.01)
_cons	1.610***	4.300***	3.402***
	(14.69)	(47.93)	(40.74)
N	42,898	42,898	42,898
t statistics in parentheses			
* p<0.05, ** p<0.01, *** p<0.001			

Table 4 regression analysis shows that the effect of schooling on income is always relatively large from 0.20 to 0.39, and the working time and the square of working time also show a positive effect, and it is statistically significant. The impact of educational level is accompanied by other factors. With the gradual decrease, the influence of working hours has increased significantly, with 0.04 increasing to 0.11.

Although the effect of the square of working time is small, it cannot be considered insignificant, and it increases the importance of the working time factor to a certain extent. Especially for the income of master students, the increase in working hours makes them an important way to increase their income.

Then, after analyzing the independent effects of variables on wages, we also need to know whether there are interaction effects from both regional and other factors in order to determine the interaction variables we can focus on.

Table 5 Significance Tests of Regional Variables and Interactions

	Degree of Freedom	F	Prob>F
Model	8	5995.94	0.00
Error	42,889		
C Total	42,897	Adj. R-Square	0.53

Tests	t	P>| t |	Remark
Schooling	9.91	0.000	Reject H0
Experience	8.60	0.000	Reject H0
Experiences	-33.95	0.000	Reject H0
Region	2.72	0.007	Reject H0
Regschl	-3.26	0.001	Reject H0
Regexper	1.34	0.180	Cannot Reject H0
Regexpers	-0.40	0.691	Cannot Reject H0
Schlexper	9.14	0.000	Reject H0

Since this article focuses on regional differences in income, we mainly refer to the interaction effect of regional variables and other variables. The results in Table 5 reflect that the variables independently have significance. The cross-influence includes the cross-variables of regional variables and education variables and the cross-variables of education and working hours are significant. Therefore, next, we will analyze the interaction of different regions and different education levels on wages.

Table 6
Significance Tests of Regional Variables and Interactions

	Degree of Freedom	F	Prob>F
Model	9	5995.94	0.00
Error	42,888		
C Total	42,897	Adj. R-Square	0.53

Tests	Coef.	Std.Err	t	P>|t|
Schooling	0.42	0.02	27.27	0.000
Experience	0.11	0.00	133.87	0.000
Experiences	0.00	0.00	-86.55	0.000
Region_Midwest	-0.13	0.02	-8.36	0.000
Region_South	-0.14	0.14	-9.95	0.000
Region_West	-0.02	0.02	-1.45	0.148
Midwest*Schooling	-0.01	0.02	-0.37	0.709
South*Schooling	0.02	0.02	0.85	0.394
West*Schooling	-0.05	0.02	-2.54	0.011

The areas in this article are divided into the Northeast, Midwest, South, and West of the United States. In order to avoid complete multicollinearity, the Northeast data is omitted. Compared with the western region, the central and southern regions have a more obvious regional influence on wages, respectively 0.13 and 0.14, which is about 0.11 higher than the western region, although this effect has a significant negative effect. This can also be seen from the characteristics of the regional wage distribution, that is, the incomes of the Midwest and South are lower than the average income level of the four regions, which is closely related to the level of regional economic development. In contrast, the incomes of the central and western regions and the southern region are less affected by the combined effects of regional variables and educational variables, while the western region is significantly affected by both variables, but it also has a negative effect.

4. Conclusion

According to the differences in regional economic development levels, we can see that the wage levels of the Midwest and the South, which are relatively low in the United States, are relatively low, while the impact of the Western region is reduced by 0.11. Conversely, when education and regional development work together, the western region is significantly affected, while the central and western regions are not significantly affected. The southern region is even positively affected to a certain extent. First, the level of regional economic development has a direct impact on wage income, especially in areas with relatively low levels of development. Although education has a significant influence on wages, the degree of influence varies according to regional development differences. In areas with relatively low levels of development, the role of education is significantly weakened, while in areas with higher levels of development, advanced and lagging education will have a significant impact on the income of advanced education workers.

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