

RELATIONSHIP BETWEEN HIGHER EDUCATION AND ECONOMIC DEVELOPMENT: EVIDENCE FROM WEST VIRGINIA

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ABSTRACT

Investment in education is the key for economic growth of a country or a state where poverty is very prominent. Many studies have proven that human capital makes a substantial contribution to economic and income growth. Education that generates skilled labor force leads to increased development and improved quality of life i.e., economic development. This study investigates the effects of higher education on the economic labor force and income growth of the state for the last 2-3 decades, 1990-2023. The data collected mainly from the U.S. census Bureau, Bureau of labor statistics, West Virginia Higher Education Policy Commission (WVHEPC), USDA-ERS, City Data Book (C&CDB), and some from Appalachian Regional Commission (ARC) were used for the analysis. The key industrial sectors of the state are considered for the analysis separately to understand the labor force effects on those sectors. The study followed a series of simultaneous equations with three endogenous variables, using an annual state-level dataset. The results show that higher education has positive and significant effects on economic development in West Virginia, while investing in professional and business services, education and health care are delivering more results.

JEL: O1, O2, O4

KEYWORDS: Education, Economic Development, West Virginia

INTRODUCTION

West Virginia, one of the rural states, has 55 counties, where 44 percent of the population lives in rural areas. Only 8 of the 55 counties meet the standard definition of urban, 34 are rural, and 13 have areas that qualify as both urban and rural. In 2022, the state of West Virginia has a population of 1,775,513, having declined an annualized -0.5 percent over the five years to 2022, which ranks it 50th out of all 50 US states by growth rate. The largest ethnic group in West Virginia is White, accounting for 91.5 percent of the state's population. West Virginia's gross state product (GSP) in 2022 reached \$71.7b, with growth of 0.1 percent over the 5 years to 2022. Businesses in West Virginia employed a total of 644,784 people in 2022, with average annual employment growth over the past five years of -0.4 percent. The top three sectors by total employment are Mining, Healthcare and Social Assistance, Manufacturing, while the unemployment rate across the state in 2022 was 4.0 percent (*State Economic West Virginia*, n.d.). The state of West Virginia employs 644,784 people in 2022, which ranks it 42nd out of all 50 US states. Employment in West Virginia has grown at an annualized rate of 0.7 percent over the five years to 2022, underperforming the national average of 3.7 percent. Major sectors by employment in West Virginia include Healthcare and Social Assistance, Retail Trade and Accommodation and Food Services, which employed 154,044, 92,119 and 64,417 people in 2022, respectively. West Virginia's unemployment rate is 4.0 percent in 2022, which ranks it 36th out of 50 states. West Virginia's unemployment rate has trended downwards at a rate of -5.0 percent over the five years to 2022, underperforming the US economy as a whole. Employment trends indicate the degree of tightness or slack in labor markets, in addition to the

overall strength of an economy. The Healthcare and Social Assistance, Retail Trade and Accommodation and Food Services sectors contributed the most to employment in West Virginia in 2022, representing a combined 52.4 percent of state employment (West Virginia Employment Trends, 2023).

In West Virginia, 25.2 percent of the population has a bachelor's or higher (ARC, 2020). The West Virginia public school system (prekindergarten through grade 12) operates within districts governed by locally elected school boards and superintendents. In 2022, West Virginia had 263,486 students enrolled in a total of 683 schools in 55 school districts (BALLOTPEDIA, 2022). There were 283,044 teachers in the public schools, or roughly one teacher for every 14 students, compared to the national average of 1:16. In 2020, West Virginia spent on average \$12,697 per pupil (2020 Annual Survey of School System Finances, 2022). The state's graduation rate was 91 percent in the 2018-2019 school years (NCES, 2021).

West Virginia's colleges and universities are not only critical for improving the state's educational attainment and training the state's workforce, but they are also economic drivers in their communities and the state as a whole. Just 11 percent of the state's base budget, or about \$497 million, is appropriated for higher education, according to a study by the West Virginia Center on Budget & Policy. The West Virginia Legislature cut higher education appropriations in Fiscal Year 2015 more than any other state except Wyoming, and it has decreased the per-student funding by more than 20 percent since the 2008 recession. As West Virginia's population continues to decline and higher education appropriations face additional cuts, there is a growing need to assess the value of public higher education and its contribution in both the state and local economies. Despite these ongoing cuts to higher education appropriations, the state's public higher education institutions continue to generate revenue that contributes one of the largest economic impacts of any agency or organization (Swisher, 2017). West Virginia intends to foster a state culture that values higher education as a means to individual, community, and economic development.

Objectives and Research Questions

In West Virginia, improved economic development is essential as the current performance is not adequate to make a difference. Though various regional and state level investments in different sectors are happening the expected outcomes are still delayed or inadequate. Therefore, it is important to analyze total economic changes of the state for the applications of effective and efficient investments and policies. Even though economic analyses are abundant for economic growth, income, education, and employment growth in the United States as a whole, studies are limited to West Virginia (Krueger and Lingahl, 2001; Yogish, 2006; Chaudhary et al., 2009; Matsushita et al., 2006; Alam, 2009; Johnson, 2011; Bashir et al. 2013). This requires more studies to analyze the economic growth of West Virginia for productive decision-making. Due to the lack of research studies mentioned above, the current study attempts to find answers to the research question of the impact of education on employment growth and its significant contribution on state economic development. With significance of the above research question, the main objective of this study is to understand the relationship between education, employment, and income growth in West Virginia. Second, to estimate the relationship between higher education attainment, employment growth and income generation in West Virginia. Finally, to propose effective and practical policy suggestions to enhance economic growth in West Virginia.

Findings of this paper will have the following contributions. First, it will add a research study to the state that discusses some long-term implications of education and economic growth to the state and would help to compare the implications with different other studies of USA. As West Virginia's population continues to decline and higher education appropriations face additional cuts, there is a growing need to assess the value of public higher education and its contribution in both the state and local economies. Findings will hopefully be useful to families and others to prepare for colleges and universities, administrators, and policymakers in educational investment planning of the state. The paper is organized into five sections.

Section 2 provides the literature review, Section 3 presents methodology and data sources and section 4 presents empirical results and discussion, followed by the last section of conclusions.

LITERATURE REVIEW

The role of education has been broadly recognized by economists and decision-makers (Ranis et al. 2000; Hanushek and Wobmann, 2007; Gilead, 2012). The use of infrastructure and technology requires that the higher education system plays an important role in regional economic development (NICA and POPESCU, 2014). Economists estimate that investing in education or human capital increases labor production and productivity. Investing in human capital is critical in the future as the economy transforms into a knowledge-based economy from the post-industrial economy (Abel and Deitz, 2012; Pera, 2014). Maurova and Khan (2016) revealed that public investments, especially in education, transportation, health, police and fire, and welfare, significantly contribute to the economic development of a state.

Moretti (2004) backs up the claim that more educated individuals raise the wages of less-educated individuals, suggesting that educational externalities exist. According to Moretti, a 1 percent increase in the supply of college graduates' results in a 0.4 percent increase in the salaries of college graduates, a 1.6 percent increase in the wages of high school graduates, and a 1.9 percent increase in the wages of high school dropouts. French and Fisher (2009) found that having more education increases one's chances of participating and succeeding in the job market. Berger and Fisher (2013) reported that investing in education can result in better outcomes based on state-level data analysis. The strength of a state's economies can be increased by increasing the number of well-educated workers.

Educational investment has a variety of non-monetary benefits for society. Dee (2004), Glaeser and Saks (2006), and Milligan et al (2004) observed that better education leads to civic activity and good governance. Deming (2011), Lochner (2011), and Lochner (2011) demonstrate that crime rates are lower with increased education. Lochner (2011), Wheeler (2007), and Wolfe and Haveman (2002) found that higher education can help people lead lives that are more beneficial for public health, intrafamily productivity, marital choice efficiency, and child health. Cutler and Lleras-Muney (2008) demonstrated that the connection between higher education and better life expectancy significantly boosts private returns on education. According to Haaga (2004), workers who have persevered and succeeded in their academic career are more likely than others to have specific skills, general knowledge, the ability to acquire new skills, and other personal characteristics that employers value.

Winters (2016) revealed that increasing college graduates are important for regional economic growth though those graduates are quite geographically mobile. Drucker (2016) asserts that regional economic development drives higher education institutions to offer more advanced degrees that are positively associated with entrepreneurial activity. This encourages the traditional missions of research and teaching, as well as general policies that promote entrepreneurship, to support economic performance. According to Vogel and Keen (2010) and Selingo (2016), colleges and universities are becoming more widely acknowledged by US policymakers as sources of economic growth and development. Higher expenditures on education are supposed to lead to increased levels of human capital in an economic system. This leads to an increase in productivity, earnings, new business attractions, and other positive externalities, with a boost in economic performance (Abhijeet and Islamia 2010; Erdem and Tugcu 2012).

The system of higher education in the USA is more dispersed than that of most other industrialized nations (Koedel, 2014). State governments control the majority of public institutions. The regulation and oversight of private institutions vary depending on the state but are greatly affected by federal financial aid allocations. In the United States, most high-school graduates go on to pursue more education due to the educational demands of well-paying jobs and as a significant factor in social and income mobility (Perfetto, 2012; Baum, et al., 2013). Regarding West Virginia, it has reported low educational attainment levels and

high unemployment rates compared to many states in the United States. Even though the government has spent more on education investment for human capital formation, the number of higher education graduates working in the state has decreased over time (Hough, 1996). Nevertheless, the State’s public higher education institutions are essential for enhancing the educational achievement of its residents and workforce. According to Swisher (2017), the state's public higher education institutions continue to generate revenue and have one of the largest economic impacts of any agency or organization.

In West Virginia, access to postsecondary education depends on three central factors: adequate preparation, accessible information, and feasible cost (Wagner, 2010). West Virginia already has one of the least educated workforces in the country, and with a struggling economy, a growing share of future jobs will require a college education. West Virginia is part of a region that has not historically valued higher education (Higginbotham & Witt, 2010). However, according to Herndon (2008), expenditures on investment in education for human capital formation have increased in West Virginia, but the number of higher education graduates working within the state have decreased over time (Hammond, 2012). Investing in higher education to keep tuition affordable and provide quality education at public colleges and universities would help West Virginia develop the skilled and diverse workforce it will need to grow its economy (Scholar & Arcadipane, 2014).

METHODOLOGY

Data

The data for the analysis for the period of 1990 to 2023 were collected mainly from US census of Bureau, Bureau of labor statistics, West Virginia Higher Education Policy Commission (WVHEPC), USDA-ERS, City Data Book (C&CDB), and some from Appalachian Regional Commission (ARC). The analysis was based on annual data at the state level, and the statistical package STATA was used for the analysis. Table 1 contains definitions for all endogenous and exogenous variables utilized in this study.

Table 1: Definition For Variables and Summary Statistics

Variable	Variable definition	Mean	Std. Dev.	Min	Max
TEMP	Total employment	732, 793	28,480	671,085	805,561
PCI	Per Capital Income	29,791.44	10,500.97	14,608	49,200
HEDU	Number over 25 of age who having Bachelor or higher degree	311,521	61,138	219,382	430,312
PHEDU	Percentage of population over 25 years old having Bachelor or higher degree	17.141	3.41	12.2	24.1
EEDHS	Employees in education and healthcare services in 1000'	109.18	18.14	66.29	130.31
ECONS	Employees in construction sector in 1000'	35.32	4.18	29.75	46.85
EPBSS	Employees in professional and Business service sector in 1000'	57.01	11.21	33.37	71.82
EMANU	Employees in manufacturing sector in 1000'	52.69	6.98	43.68	64.70
CRIME	Crime rate foe 100,000 population	285.47	57.94	169.30	366
PRATE	Poverty rate %	17.96	0.82	16	19.25
TPOPL	Total population	1,817,747	23,639	1,766,945	1,857,446
PCHGE	Annual population change	-0.059	0.39	-0.78	0.59

Table 1 shows the definitions, average, standard deviation, minimum and maximum values of the variables considered for the analysis. The table was created using annual data for the period of 1990-2023. Column 1 gives the variable codes used and column 2 gives the definition of the variables. The rest of the columns give summary statistics.

Method

A model with a system of simultaneous equations is used for analysis. Number of people having a bachelor’s degree or higher as the level of education (HEDU), total number of employees (TEMP), and Per Capital income (PCI) at state level were used as endogenous variables, while population change (PCHGE),

poverty rate (PRATE), Crime rate (CRIME) and some other socioeconomic variables were used as exogenous variables. All the variables were applied at the state level for the period of 1990 to 2023, for 34 years. A system of equations estimates all the identified structural equations together as a set. The most important advantage of this method is to have a small asymptotic variance. According to Zellener and Thiel (1962), 3SLS is more efficient than a two-stage least squares (2SLS) estimator and the method can take account of restrictions on parameters in different structural equations. The focus of this study is to analyze the relationship between higher education and economic growth represented by the changes of per capita income, total employments, and number in higher education. The general form of the three simultaneous equations model is as follows:

$$TEMP = f(HEDU, PCI/X^{TEMP}) \quad (1)$$

$$HEDU = f(TEMP, PCI/X^{HEDU}) \quad (2)$$

$$PCI = f(HEDU, TEMP/X^{PCI}) \quad (3)$$

where TEMP, HEDU and PCI are endogenous variables, while X^{TEMP} , X^{HEDU} , X^{PCI} are set of exogenous variables having either direct or indirect effects on the endogenous variables.

Empirical Model

Starting from the theoretical model, the estimated econometric models for each dependent variable can be written as:

$$LHEDU = \beta_0 + \beta_1 LTEMP + \beta_2 LPCI + \beta_3 PRATE + \beta_4 PCHGE + eit \quad (4)$$

$$LTEMP = \beta_0 + \beta_1 LPCI + \beta_2 LHEDU + \beta_3 PRATE + \beta_4 PCHGE + \beta_5 CRIME + eit \quad (5)$$

$$LPCI = \beta_0 + \beta_1 LHEDU + \beta_2 PRATE + \beta_3 PCHGE + \beta_4 LEPBSS + \beta_5 LEEDHS + \beta_6 CRIME + eit \quad (6)$$

RESULTS AND DISCUSSION

Descriptive Analysis

Figure 1 shows the changes of total population total employment, per capita income, poverty rate as well as some employment changes in leading sectors of West Virginia for the period of 1990-2023, for 34 years. According to the graphs in figure 1, and based on other research outcomes, it is clear that West Virginia faces problem of population declining with the time being. It was serious in recent years with the pandemic impact as well. However, total employment numbers and the per capital income show increasing rates while some industrial sectors maintain a good number of employees. It seems the poverty rate has declined slightly with the time being.

Figure 1: Population Changes in West Virginia, 1990-2023

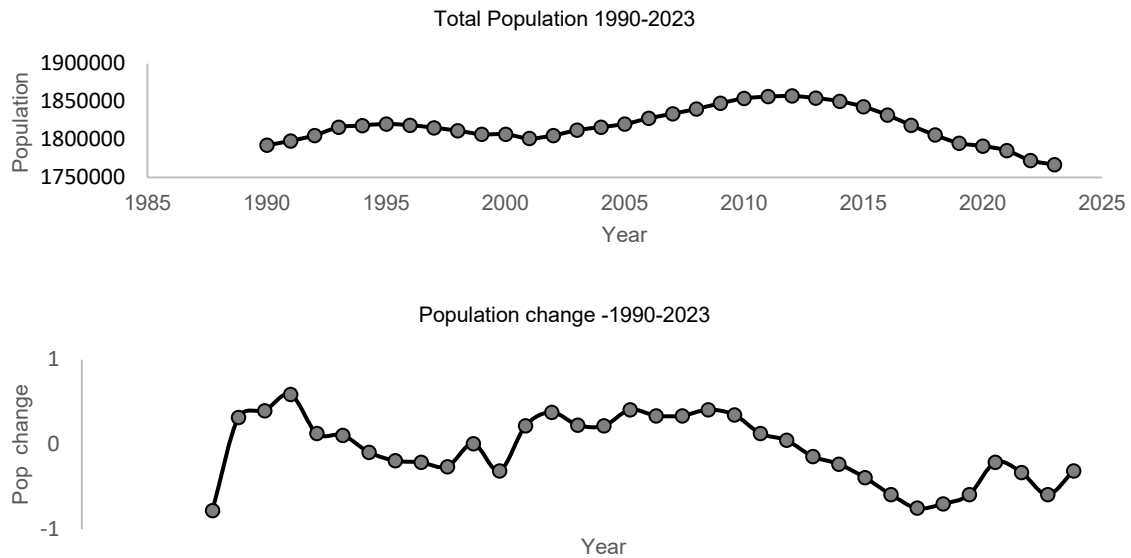


Figure 1 shows two graphs. The first graph depicts the total population for the period 1990-2023. The second graph depicts population changes for the same period. The population in West Virginia is decreasing overall, as shown by both graphs. Graph 2 demonstrates a positive change in population over the past 4-5 years, indicating a slower decline in total population.

Figure 2: Employment and Per Capita Income Change in West Virginia, 1990-2023

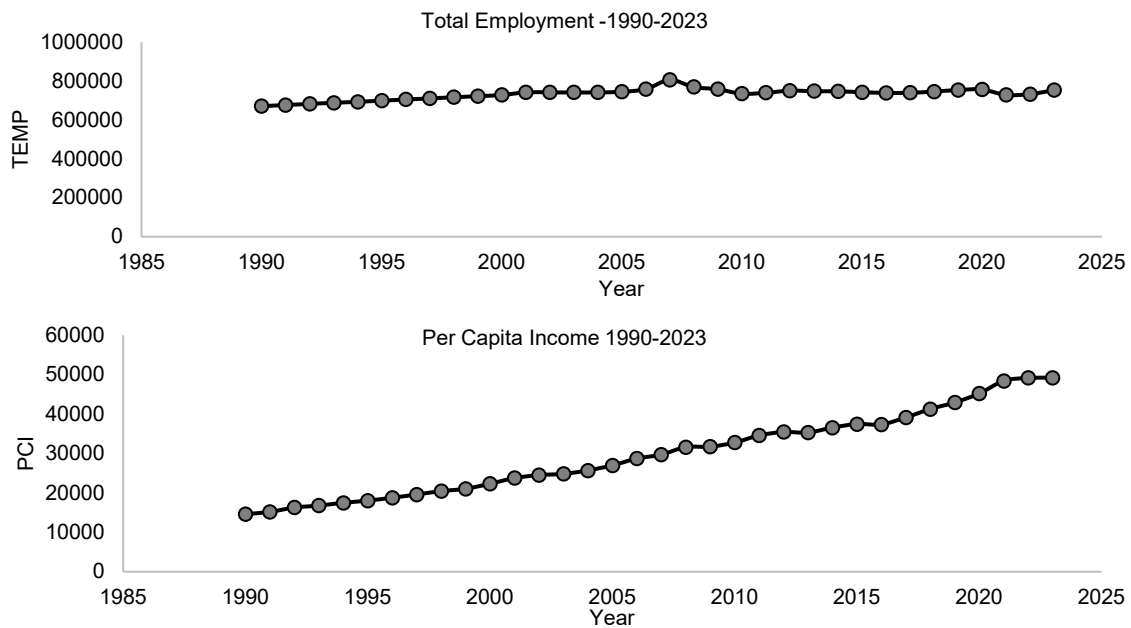


Figure 3: Employment Sectors and Per Capita Income Change in West Virginia, 1990-2023

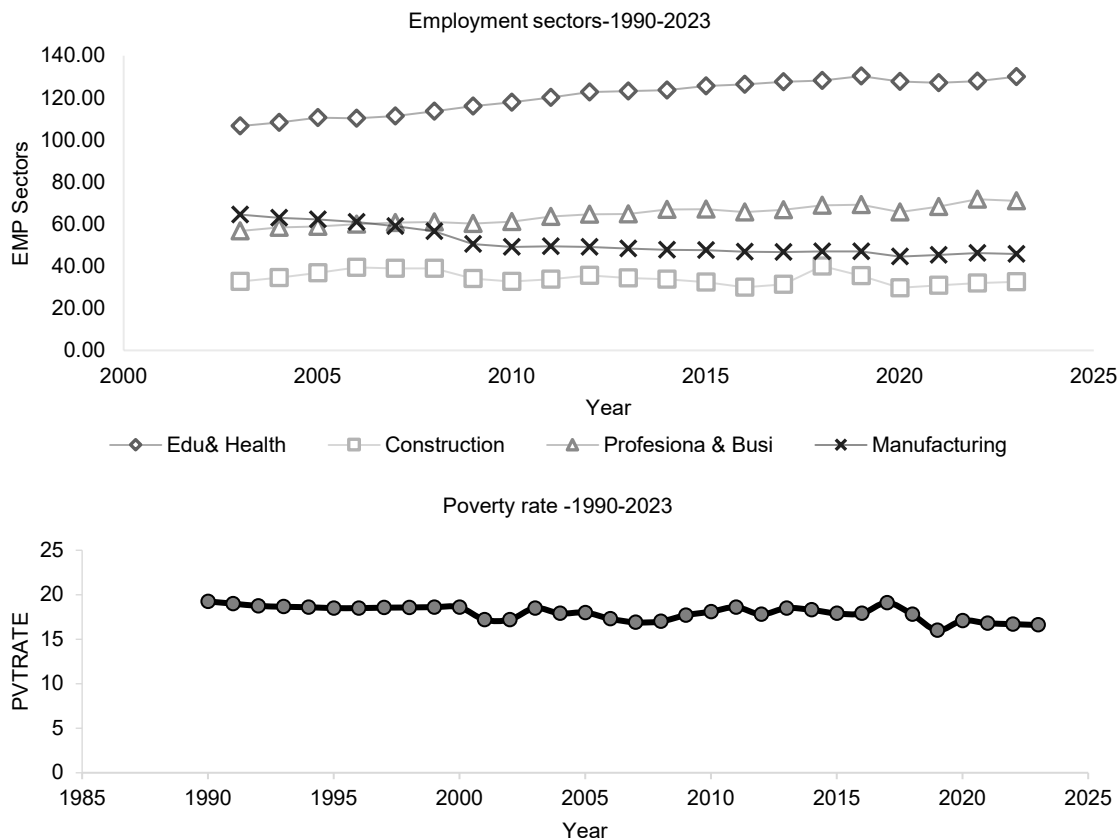


Figure 3 displays two graphs. The first graph shows the total employment number in the selected sectors of education & health, constructions, professional & business, and manufacturing in West Virginia for the period 1990-2023. The graph shows that education & health, and professional & business sectors are becoming the primary sources of employment in West Virginia. The second graph shows the poverty rate in West Virginia for the same period, which shows a slight decrease over time.

Regression Analysis

The results of the system of three simultaneous equations are shown in Table 2. Log forms of the endogenous variables (LHEDU, LTEMP, LPCI) were the best fit for the results presented in Table 2 after checking the statistical tests including multicollinearity and heteroscedasticity. Exogenous variables used in each equation are displayed in the first column of the Table. Columns 2 and 3 indicate results for higher education (LHEDU) equation while columns 4 and 5 present results for total employments (LTEMP). Result for the income (LPCI) equation is shown in columns 6 and 7. The empirical results for higher education (LHEDU) equation indicate that increasing total employment number (LTEMP) increases the number of higher education (LHEDU) significantly and positively, i.e., an increase in total employment by one percent leads to an increase in higher education by 0.91 percent. The result is supported by numerous studies as well (Johnson, 2011; Bashir et al., 2013; Maurova & Khan, 2016). Thus, there is a high potential for increasing income growth through investing more in higher education in West Virginia. Also, results show that increasing Per capita income (LPCI) brings a positive and significant impact on increasing higher education (LHEDU). A one percent increase in per capita income would increase higher education by 0.47 percent. In general, people would like to achieve higher knowledge and skills if they have better income opportunities. The decrease in population growth (PHGE) has a negative impact on increasing the LHEDU. This means that if there are fewer people, there will be fewer higher-educated individuals in the long run. This could negatively affect the local economic growth of West Virginia. By making better investments in

education and other income-generating activities, population decline could be minimized. Results show that increasing the rate of poverty (PRATE) has a positive impact on higher education (HEDU) in West Virginia.

Table 2: Results of 3SLS Regression Analysis

Variable	LHEDU		LTEMP		LPCI	
	Coefficient	P>Z	Coefficient	P>Z	Coefficient	P>Z
LTEMP	0.9126*** (0.336)	0.007	-	-	-	-
LPCI	0.4731 *** (0.0453)	0.000	-6.65e-06*** (0.001)	0.000	-	-
LHEDU	-	-	0.4582*** (0.098)	0.000	2.445*** (0.441)	0.000
PRATE	0.0324** (0.0149)	0.031	-0.2496*** (0.008)	0.002	-0.0532 (0.034)	0.128
PCHGE	-0.0782 *** (0.0277)	0.005	0.0392*** (0.014)	0.007	0.1448** (0.074)	0.052
LEPBSS	-	-	-	-	0.6438* (0.363)	0.077
LEEDHS	-	-	-	-	0.1012 (0.411)	0.805
CRIME	-	-	0.0001 (0.001)	0.830	0.0004 (0.003)	0.915
CONS	-5.1262 (4.337)	0.238	8.358 (1.171)	0.000	-17.584 (-4.562)	0.000
N	34		34		34	
R ²	0.93		0.56		0.88	
Chi ²	516.45		81.60		308.68	

Table 2 shows the results of 3 SLS regression analysis. Column one shows the independent variables used for the analysis. Column two shows results for the log form of endogenous variable, number of people having a bachelor's degree or higher as the level of education (LHEDU) while column three shows the relevant P>Z. Column 4 shows results for the log form of endogenous variable, total number of employees (LTEMP) while column five shows its relevant P>Z values. Column six shows results for the log form of endogenous variable, Per Capital income (LPCI) while column seven shows the relevant P>Z values of each independent variable. *** means reaching the 1% significant level, ** means reaching the 5% significant level: * means reaching the 10% significant level.

According to the empirical results for total employment (LTEMP), an increase in per capita income (LPCI) could decrease LTEMP, but the impact is highly insignificant. Interestingly, higher education (LHEDU) shows positive and significant results, indicating the importance of higher education on total employment growth of the state. A 0.46 percent increase in total employment can be achieved by increasing higher education by one percent. It appears that the growth of higher education and employment coincides with the growth of economic growth. Thus, the development of comprehensive investment schemes is crucial to enhance economic growth in the state. Further, results show that high poverty rate (PRATE), decreases the employment growth in the state, while population change (PCHGE) brings positive impacts.

The regression results for per capita income (LPCI) shows that increasing higher education number (LHEDU) significantly increases the per capita income of the state. A one percent increase in higher education increases per capita income by 2.44 percent. The result is supported by some studies that highlight the importance of more investments in education (Herndon, 2008; Scholar & Arcadipane, 2014). Increasing the employment growth in professional and business services (LEPBSS) brings more impact on per capita income. A one percent change in EPBSS would bring about a 0.64 percent change in per capita income for West Virginians. As the EPBSS is one of the most growing sectors, improving the sector would bring multiplicative impacts to the state. Also, decreasing population change (PCHGE) impacts positively and significantly on PCI. It is obvious when the number decreases per person income allocation could be high.

A Path Forward

The study reinforces the connection between higher education and economic development, resulting in many positive spillover effects for a poor economy like West Virginia. According to various research findings, this is true for many states and countries worldwide. However, in the sense of higher education it needs to prioritize the major employment sectors of a state that demands various levels of knowledge and skills for efficient allocation of investments. The potential exists for this to differ from state to state, region to region, and country to country. This needs a better connection between two parties of higher educational institutions and different employment sectors to bring quick and immense economic changes. It appears

that this connection is still not well established in West Virginia, despite the occasional identification of economic-boosting sectors. According to literature, attempting to connect regionally would result in better outcomes. There is a need for more research and studies on this.

CONCLUSION AND FUTURE WORKS

The study examines the importance of skilled labor in economic development. The main focus of the study was to understand the significant relationship between education, employment, and income growth in West Virginia in order to evaluate the importance of higher education on the economy of West Virginia. The study used secondary data collected mainly from the US Census Bureau, Bureau of Labor Statistics, West Virginia Higher Education Policy Commission, USDA-ERS, City Data Book, and some from the Appalachian Regional Commission. The study followed 3 SLS analysis using simultaneous equations with 3 endogenous variables of number of people having a bachelor's degree or higher as the level of education (HEDU), total number of employees (TEMP), and Per Capita Income (PCI). To analyze equations, the STATA statistical package was utilized.

The study found significant relationships between higher education and economic growth in West Virginia. The results show a significant and positive connection between higher education, total employment, and Per Capita income. It clearly indicates the importance of higher education for increased employment growth in the state, and vice versa. The study found that professional and business services, as well as education and healthcare services, are the most demanding employment sectors in West Virginia. Thus, compared to sectors like construction, mining, and manufacturing in West Virginia, these sectors appear to be better investments to boost the economy of West Virginia. The results are crucial for scholars, policy makers, and all other economic agents, particularly when it comes to investing and improving research and education opportunities in West Virginia, which will lead to fulfilling the skilled labor requirement of the state. The study findings prompt further research into the most demanding employment sectors to pinpoint the exact educational skills needed for them. This would lead to spillovers in the state's economic growth.

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