Understanding Workforce Transitions in West Virginia: Exploring Shifts with Shift-Share and Location Quotient Analysis

Saman Herath Bandara
West Virginia State University
saman.bandara@wvstateu.edu

Understanding Workforce Transitions in West Virginia: Exploring Shifts with Shift-Share and Location Quotient Analysis

Abstract:

West Virginia, with a population of approximately 1.77 million, is experiencing negative annualized growth and currently ranks 50th among U.S. states in terms of its growth rate. Despite active efforts in economic development, the state's Gross State Product (GSP) has only seen a slight 0.1% increase over the past five years, reaching $71.7 billion. The persistently high unemployment rate of 4.0% indicates ongoing economic challenges. Although the annualized employment growth is 0.7%, which is below the national average, certain sectors such as healthcare and social assistance, retail trade, and accommodation and food services appear to be contributing positively to employment. However, some sectors are losing their competitive edge over time.

This study aims to investigate the employment growth patterns in West Virginia from 2001 to 2020. The analysis concentrates on different industries within five regional sectors: Metro Valley, Ohio Valley, New River/Greenbrier Valley, Mountain Lakes, and Potomac Highlands. Using shift-share analysis, the study quantifies total employment growth, considering three primary effects: State growth effects, industrial mix effects, and competitive effects. Additionally, location quotient analysis is utilized, estimating Industry Location Quotient (LQ) as a measure to quantify industry concentration in each region compared to the entire state. The results shed light on specific regional sectors leading employment growth in certain industries, while others are experiencing a decline in competitiveness. The location quotient analysis supports the shift-share findings, emphasizing regions with higher competitiveness in specific industries.

The findings indicate significant shifts in West Virginia's employment sectors from 2001 to 2020. It underscores that certain prominent sectors are not yielding the expected benefits, emphasizing the need for additional support in specific regions to foster effective economic growth. Notably, New River/Greenbrier Valley and Potomac Highlands emerge as substantial contributors to the agricultural sector, while the Metro Valley region experiences growth primarily in transportation, utilities,

administration, and sales industries. Contrary to traditional beliefs that agriculture, manufacturing, and mining are the main drivers of West Virginia's economic growth, this study reveals the pivotal roles played by healthcare services, educational services, accommodation, scientific services, insurance and real estate, wholesale and retail, and at times, construction sectors in the economic development of specific regions within the state. Identifying investment priorities within these promising regional sectors and implementing a comprehensive development policy could significantly contribute to the overall development of West Virginia.

Key words: *Shift share analysis, location quotient analysis, reginal sectors, employment growth.*

1. INTRODUCTION

West Virginia, nestled in the Appalachian region of the United States, stands as one of the least populous states in the country. With a population of 1,775,513, the state experiences negative annualized growth and ranks 50th among US states in terms of growth rate. The gross state product (GSP) has reached $71.7 billion, reflecting a slight 0.1% increase over the past five years. Despite active pursuit of economic development, the state records an unemployment rate of 4.0%, indicating ongoing economic struggles (IBISWorld, n.d.). West Virginia has encountered challenges related to economic diversification and population decline, with a significant proportion of residents aged 65 and older.

While the annualized employment growth remains at 0.7%, below the national average, major sectors such as healthcare and social assistance, retail trade, and accommodation and food services contribute significantly to employment. In 2022, healthcare and social assistance employ 154,044 individuals, retail trade employs 92,119, and accommodation and food services employ 64,417. The unemployment rate, although showing improvement over the years, still stands at 4.0%, positioning West Virginia 36th among the states. The slight increase in the Gross State Product (GSP) to $71.7 billion over the past five years underscores the state's gradual economic progress (IBISWorld, n.d.).

A regional economy encompasses a spectrum of firms and industries, each with its unique economic potential. Changes, whether in growth or decline, within these sectors directly or indirectly influence overall economic growth (McNamara, 1991; Bartik, 2004; Herath et al, 2013). Consequently, understanding the competitive edge of a particular state or region in economic development initiatives becomes imperative, as it informs policy avenues and investment strategies (Melachroinos, 2002). This emphasis on identifying the comparative advantages of sectors and services holds even greater significance in less developed regions compared to their more affluent counterparts.

Objectives of the study

Over time, West Virginia has experienced noticeable changes in several industrial sectors, exerting a significant impact on the state's economic progress. Therefore, it is crucial to assess these changes for

informed decision-making. Examining different industrial sectors and their growth patterns, along with their impact on employment and social welfare, is vital for shaping future policy initiatives. This involves analyzing relevant economic data to gauge the extent of these impacts and determine the path forward. The primary focus is to analyze the expansion of two key sectors in West Virginia: agriculture and non-agricultural employment, which includes mining, construction, manufacturing, trade, transportation, finance, services, government, and related fields like forestry and fishing. The primary objective of this research is to assess the patterns of employment expansion across diverse sectors crucial to West Virginia's economic advancement. Specifically, it aims to identify potential policy measures for fostering economic growth.

The rest of the paper is organized into four sections. Section two provides data and methods. Section three describes the empirical results and analysis. Section four presents the conclusions and policy suggestions.

2. DATA AND METHODS

Data:

Data was primarily collected from the Bureau of Labor Statistics. Employment changes in West Virginia over a 20-year period, from 2000 to 2020, were used for the analysis. Besides the Bureau of Labor Statistics, census data and other information related to West Virginia were also utilized. To conduct the analysis, a panel dataset spanning the last two decades was compiled. A combination of general descriptive analysis, shifts-share analysis, and location quotient analysis was utilized in the study to effectively address the main objectives.

Shift Share analysis:

The shift-share analysis technique, developed in the 1940s by Daniel Creamer and summarized by Dunn in 1960 (Shi and Yang, 2008), focuses on calculating geographical shifts in economic activity, as outlined by Dunn (1960). analyzing economic growth factors involves various methods, with shift-share

analysis being a popular and straightforward technique for examining employment growth in a region over a specific period (Barff and Knight III, 1988; Knudsen, 2000; Wilson and Chern, 2005; Herath et al., 2010). This method breaks down total regional growth into three effects to enhance employment growth analysis (Richardson, 1978). It specifically compares regional employment growth with national employment growth, focusing on the national growth effect (NGE), industrial mix effect (IME), and competitive effect (CE). The sum of these effects provides the actual change in total employment within the region over the studied time period.

Following the notation of Richardson (1978), the three growth effects for a specific region and industrial sector are expressed as follows:

National growth effect for sector i in region r = $E_{ir} * G_n$

Industrial mix effect for sector i in region r = $E_{ir} * (G_{in} - G_n)$

Competitive effect for sector i in region r = $E_{ir} * (G_{ir} - G_{in})$

where,

E_{ir} = employment in sector i in region r at the beginning of the time period

G_n = growth rate for total employment for the nation over the time period

G_{in} = growth rate in sector i for the nation for the time period

G_{ir} = growth rate in sector i in region r for the time period.

In this specific investigation, the utilization of shift-share analysis is employed to evaluate the employment growth in five significant regions of West Virginia: Mid-Ohio Valley, Metro Valley, New River/Greenbrier Valley, Potomac Highlands, and Mountain Lakes (Figure 1; Table 1). This assessment is made in relation to the overall employment growth within the state, with state employment growth acting as a benchmark akin to national growth. The primary focus lies in comparing the average regional employment growth to that of the state, highlighting the influence of state growth effect (SGE), industrial

mix effect (IME), and competitive effect (CE). The cumulative impact of these factors reveals the actual change in total employment within each region during the specified study period.

Figure 1. Regional map of West Virginia

Table 1. Sectors and counties

Reginal sectors	Counties
Metro Valley	Boone, Cabell, Kanawha, Lincoln, Logan, Mason, Mingo, Putnam, Wayne
Ohio Valley	Brooke, Calhoun, Hancock, Jackson, Marshall, Ohio, Pleasants Ritchie, Roane, Tyler, Wetzel, Wirt, Wood
New River & Greenbrier Valley	Fayette, Greenbrier, Mercer, Monroe, McDowell, Raleigh, Summers, Wyoming
Mountain & Lakes Country	Barbour, Braxton, Clay, Doddridge, Gilmer, Harrison, Lewis, Marion, Monongalia, Nicholas, Preston, Taylor, Upshur, Webster
Potomac Highlands-	Berkeley, Grant, Hampshire Hardy, Jefferson, Mineral, Morgan, Pendleton, Pocahontas, Randolph, Tucker

Location Quotient Analysis

An Industry Location Quotient serves as a measure to quantify the level of concentration of an industry within a specific region in comparison to a broader geographical area, such as the state or nation

(Richardson, 1973). It helps identify key industries shaping the regional economy, pinpoint export-oriented sectors, recognize emerging industries, and highlight problematic sectors that may weaken the region's economic base.

The formula for calculating an Industry Location Quotient is provided below:

$$LQ_i = \frac{(\frac{E_{iS}}{E_S})}{(\frac{E_{iR}}{E_R})}$$

where:

- LQi represents the location quotient for sector i within the subregion.

- EiS denotes the number of employees in sector i within the subregion.

- ES indicates the total number of employees within the subregion.

- EiR stands for the number of employees in sector i within the region.

Location quotients (LQs) are ratios that assist in comparing the distribution of employment across various industries in a specific area to a reference area, usually the overall industry total (Richardson, 1973). As per the Bureau of Labor Statistics, an LQ of 1 signifies that the industry has a proportional representation of local area employment as it does in the reference area. An LQ exceeding 1 indicates that the industry commands a greater portion of local area employment compared to the reference area.

3. RESULTS AND DISCUSSION

I. Descriptive analysis

This analysis presents the employment changes in West Virginia as a whole. In West Virginia, agricultural commodities contribute significantly, amounting to $800 million annually to the economy. Although average farm sizes remained relatively constant between 2017 and 2021, the total statewide acreage decreased to 3.5 million acres. Notably, Greenbrier, Pendleton, Hardy, Monroe, and Preston

counties had the most farmland in terms of overall acreage (Sperow and Charles, 2023; West Virginia Agriculture, 2023). The analysis shows that agricultural employment numbers declined in West Virginia

West Virginia's manufacturing sector has seen a mix of positive and challenging developments. Chemical manufacturing, a major player in this sector, contributes significantly to employment and economic output, representing 20% of manufacturing jobs and nearly 40% of economic output. This sector encompasses the production of adhesives, plastics, pharmaceuticals, and industrial chemicals. Other manufacturing sectors in the state include motor vehicles, primary metals, petroleum and coal products, fabricated metal products, wood products, aerospace, transportation equipment, non-metallic mineral products, and food, beverage, and tobacco products (Fauber, 2022; Miller, 2022). Overall, manufacturing constitutes 10.25% of the state's total output and employs 6.48% of the workforce. In 2018, West Virginia's manufacturing sector generated $7.94 billion in total output, with $3.64 billion from manufactured goods exports. Notably, small businesses play a significant role, representing 76% of total manufacturing exporters in the state (Atitwa, 2020).

The workforce in the construction sector has exhibited variations over time, with a noticeable decline observed in the latter part of 2018. These shifts can be attributed to various factors that have influenced the construction industry over the last two decades. Understanding construction trends is important for job creation, income, and tax revenue in the state. It affects various sectors like manufacturing, warehousing, transportation, and real estate. Construction trends serve as key indicators of economic health in West Virginia, involving both residential and non-residential sectors (West Virginia Construction & Building Trends, 2023).

The mining sector's workforce in West Virginia since 2012, indicating a shrinking industry. The once-dominant coal industry experienced a significant workforce reduction, from 131,700 miners in 1948 to merely 20,100 in 2006, reflecting a five-fold decrease even after considering population decline (Bell and York, 2010). Coal mine employment has notably dropped from almost 14,500 workers in early 2018 to just over 11,000 in late 2020 (Witt and Fletcher, 2005; Witt and Leguizamon, 2007).

Despite challenges, the industry has shown improvements due to increased global coal demand and temporary enhancements in the domestic steam coal market. Production averaged nearly 80 million short tons in the first half of 2021. Although mining sector employment only makes up three percent of statewide employment, its impact on GDP is significant, accounting for 15 percent of total statewide GDP in 2021 (Bureau of Business and Economic Research, n.d.).

The healthcare sector plays a crucial role in West Virginia's economy, with hospitals making a substantial annual contribution of nearly $10.5 billion and supporting approximately 46,000 jobs. Each year, West Virginia's hospitals serve around 227,000 inpatients and over 7 million outpatients. Notably, the state has experienced remarkable growth, exemplified by the expansion of WVU Medicine, which has added more than 550 doctors to its team nationwide in the last four and a half years (Young, 2019). The healthcare sector's workforce has shown a positive trajectory over the past two decades, influenced by significant changes in health-related activities (HRSA, 2022).

The education workforce in West Virginia saw a slight decline from 2001 to 2020, with a notable increase from 2010 to 2012 before returning to normal levels. The state's public school system employed 283,044 teachers, resulting in a student-to-teacher ratio of approximately 1:14, favorable compared to the national average of 1:16. In 2020, West Virginia allocated an average of $12,697 per pupil (U. S. Census Bureau, 2022). The state achieved a graduation rate of 91 percent in the 2018-2019 school year, up from 81.4 percent in 2012-2013, the lowest among its neighboring states (National Center for Education Statistics, 2022).

The workforce in the government sector has notably decreased, particularly in recent years since 2019. Despite these challenges, the federal government has played a crucial role in job creation within West Virginia. Agencies such as the FBI, US Treasury, and National Park Service have significantly expanded their staffing levels across the state. However, the long-term impact of the state's declining population on future federal government decisions remains uncertain (Bureau of Business and Economic Research, n.d.).

Data shows a slight decline of the workforce in West Virginia's transportation sector over the past two decades. A marginal decline in numbers is evident, particularly in the recent years marked by challenges

posed by the pandemic. The West Virginia transportation network encompasses a comprehensive infrastructure, comprising highways, local roads, streets, bridges, airports, transit and rail, freight railroad, and ports and waterways. This interconnected system plays a vital role in facilitating the movement of travelers, supporting businesses, transporting freight, and driving economic growth (Manufacturing et al., 2015).

The workforce in the finance sector depicts a declining trend from 2001 to 2020. The financial services sector encompasses employees in Securities, Commodity Contracts, Other Financial Investments, Real Estate, and Real Estate Rental and Leasing services. Notably, employment reductions are anticipated in Credit Intermediation and Related Activities, while minimal employment change is expected in Insurance Carriers and Related Activities (Page, 2018).

The utilities sector exhibited a decline over time, with a slight increase observed after 2016. Notably, there appears to be a decrease in numbers coinciding with the impacts of the pandemic. Utilities services in West Virginia encompass critical functions related to the provision and distribution of electricity, natural gas, water, and wastewater treatment, playing a vital role in supporting residential, commercial, and industrial activities statewide. While West Virginia's coal plants may suggest an increase in utility spending and ratepayer costs, a shift toward clean energy in the long term has the potential to create an affordable and reliable energy supply for West Virginia's ratepayers, accompanied by additional long-term community benefits (Ashtin Massie, Maria Castillo, 2023).

West Virginia's service industry, known for its diversity, spans health and education, biometrics and government, hospitality, media and telecommunications, printing, retail, tourism, and banking. The community, personal, and business service sector holds the largest share of the gross product within this industry, with tourism and healthcare sectors playing pivotal roles, consistently fostering growth, and creating numerous job opportunities. According to the data, employment changes in the entertainment and accommodation services showed a substantial decline during the onset of the pandemic, but have significantly relaxed since spring 2021 (Bureau of Business and Economic Research, n.d.)

II. Shift Shara analysis.

This analysis employs a methodology to assess the growth of five key regions in West Virginia: Mid-Ohio Valley, Metro Valley, New River/Greenbrier Valley, Potomac Highlands, and Mountain Lakes, in comparison to the overall employment growth in the state. State employment growth serves as a benchmark like national growth. The primary focus is on contrasting regional employment growth averages with state employment growth, emphasizing the impact of state growth effect (SGE), industrial mix effect (IME), and competitive effect (CE). The cumulative influence of these factors reveals the actual change in total employment within each region over the specified study period.

Table 2. Employment growth in Mid-Ohio Valley in West Virginia: 2001-2020

	SGE	IME	CE	Actual growth
Total Industries	-13096.29	0.00	-5401.71	-18498.00
Information	-223.46	-822.88	-149.66	-1196.00
Agriculture	-4.82	-13.34	-22.84	-41.00
Mining	-214.64	-375.73	2521.37	**1931.00**
Construction	-636.16	-395.21	439.37	-592.00
Manufacturing	-2214.14	-5538.63	-1088.24	-8841.00
Wholesale Trade	-491.38	-675.95	-69.67	-1237.00
Retail Trade	-2071.47	-653.70	-636.83	-3362.00
Transportation	-230.87	-0.43	267.30	**36.00**
Finance	-508.78	-600.87	674.65	-435.00
Scientific	-310.26	448.98	-37.72	**101.00**
Utilities	-90.91	-139.04	-146.05	-376.00
Entertainment	-150.42	101.33	166.10	**117.00**
Rental	-111.14	18.00	-74.86	-168.00
Administrative	-641.80	-1.73	-1369.47	-2013.00
Healthcare	-2407.61	7288.51	-4486.90	**394.00**
Accommodation	-1114.71	1136.09	883.62	**905.00**
Educational Services	-1152.11	-410.13	-696.75	-2259.00

Other Services (Except public admin.)	-521.60	-789.95	-150.45	-1462.00

Table 2 displays the actual employment changes in the Mid-Ohio Valley, West Virginia, utilizing shift-share analysis. Positive figures signify growth, while negative values indicate a decline in employment. Notably, growth is observed in the transportation, scientific, entertainment, accommodation, and healthcare sectors.

Table 3. Employment growth in Metro Valley in West Virginia: 2001-2020

	SGE	IME	CE	Actual growth
Total Industries	-23953.63	0.00	-13381.37	-37335.00
Information	-615.22	-2265.51	-294.27	-3175.00
Agriculture	-37.87	-104.73	-60.40	-203.00
Mining	-1130.12	-1978.32	-2881.56	-5990.00
Construction	-1333.23	-828.28	-1041.49	-3203.00
Manufacturing	-2064.54	-5164.40	920.94	-6308.00
Wholesale Trade	-1091.43	-1501.40	-744.17	-3337.00
Retail Trade	-3377.78	-1065.93	-1930.30	-6374.00
Transportation	-769.06	-1.42	-1292.52	-2063.00
Finance	-1080.72	-1276.33	-841.95	-3199.00
Scientific	-1086.49	1572.26	-1755.78	-1270.00
Utilities	-311.55	-476.47	-214.98	-1003.00
Entertainment	-215.82	145.38	199.44	**129.00**
Rental	-334.37	54.14	-276.78	-557.00
Administrative	-1453.78	-3.92	-790.30	-2248.00
Healthcare	-4075.44	12337.52	1028.92	**9291.00**
Accommodation	-1994.56	2032.81	-1700.25	-1662.00
Educational Services	-2068.53	-736.36	-292.10	-3097.00
Other Services (Except public admin.)	-913.13	-1382.90	-769.98	-3066.00

Moving on to Table 3, focusing on the Metro Valley in West Virginia, it observes employment growth exclusively in the healthcare and entertainment sectors. The agriculture sector, however, shows minimal losses in employment during the specified period.

Table 4 presents the findings for the New River/Greenbrier Valley region, highlighting employment growth exclusively in the healthcare, rental, transportation, and administrative services sectors over the past two decades. The agricultural and utilities sectors indicate minimal losses in employment during this period.

Table 4. Employment growth in New River/Greenbrier valley in West Virginia: 2001-2020

	SGE	IME	CE	Actual growth
Total Industries	-9784.49	0.00	-2726.51	-12511.00
Information	-234.52	-863.59	-194.90	-1293.00
Agriculture	-73.98	-204.59	77.56	-201.00
Mining	-471.38	-825.17	898.56	-398.00
Construction	-505.02	-313.75	-888.24	-1707.00
Manufacturing	-555.12	-1388.63	-39.25	-1983.00
Wholesale Trade	-348.36	-479.22	-10.42	-838.00
Retail Trade	-1688.42	-532.82	-907.77	-3129.00
Transportation	-151.25	-0.28	290.53	139.00
Finance	-318.61	-376.27	-569.12	-1264.00
Scientific	-265.09	383.62	-378.53	-260.00
Utilities	-69.51	-106.30	62.81	-113.00
Entertainment	-174.30	117.41	-283.11	-340.00
Rental	-91.27	14.78	197.49	**121.00**
Administrative	-342.01	-0.92	897.93	**555.00**
Healthcare	-1995.38	6040.58	-1756.20	**2289.00**
Accommodation	-1089.07	1109.96	-1083.89	-1063.00
Educational Services	-1002.63	-356.92	-306.45	-1666.00
Other Services (Except public admin.)	-408.58	-618.78	-332.64	-1360.00

Table 5, which outlines the results for the Potomac Highlands region of West Virginia, multiple sectors, including healthcare, accommodation, educational services, other services, retail trade, finance, scientific, and utilities, exhibit positive employment growth. This suggests a widespread positive trend across various industries in the region. The healthcare sector seems to be the leading employment sector in the region.

Table 5. Employment growth in Potomac Highlands in West Virginia: 2001-2020

	SGE	IME	CE	Actual growth
Total Industries	-8447.03	0.00	7345.03	-1102.00
Information	-280.97	-1034.66	285.63	-1030.00
Agriculture	-83.62	-231.26	51.88	-263.00
Mining	-25.29	-44.26	230.55	161.00
Construction	-496.90	-308.70	-403.39	-1209.00
Manufacturing	-1351.46	-3380.66	692.13	-4040.00
Wholesale Trade	-294.73	-405.44	-73.82	-774.00
Retail Trade	-1207.15	-380.94	2007.10	**419.00**
Transportation	-187.24	-0.35	0.58	-187.00
Finance	-234.63	-277.10	537.73	**26.00**
Scientific	-216.40	313.16	662.24	**759.00**
Utilities	-21.88	-33.46	79.33	**24.00**
Entertainment	-169.95	114.48	-587.53	-643.00
Rental	-91.27	14.78	-20.51	-97.00
Administrative	-340.25	-0.92	-383.84	-725.00
Healthcare	-1327.47	4018.63	2641.84	**5333.00**
Accommodation	-913.36	930.88	911.48	**929.00**
Educational Services	-966.05	-343.90	1498.95	**189.00**
Other Services (Except public admin.)	-238.40	-361.04	625.44	**26.00**

Table 6, focusing on the Mountain Lakes region in West Virginia, numerous industries showcase positive growth. Notably, construction, accommodation, healthcare, transportation, wholesale, scientific, entertainment, and educational services contribute significantly to the economic growth of the region.

Remarkably, none of the regions exhibits positive growth in the agricultural employment sector. However, it is noteworthy that the losses in employment in the agriculture sector are minimal across all regions. This observation suggests that, despite not showing substantial growth, agriculture continues to make a modest contribution to the state's economy.

Table 6. Employment growth in Mountain Lakes in West Virginia: 2001-2020

	SGE	IME	CE	Actual growth
Total Industries	-14463.28	0.00	14217.28	-246.00
Information	-259.10	-954.10	353.20	-860.00
Agriculture	-58.22	-161.00	-35.78	-255.00
Mining	-672.26	-1176.82	-768.92	-2618.00
Construction	-802.93	-498.82	1893.75	**592.00**
Manufacturing	-1067.67	-2670.76	-485.58	-4224.00
Wholesale Trade	-352.36	-484.72	898.08	**61.00**
Retail Trade	-2185.20	-689.59	1467.79	-1407.00
Transportation	-346.48	-0.64	734.12	**387.00**
Finance	-351.07	-414.61	198.68	-567.00
Scientific	-503.73	728.95	1509.78	**1735.00**
Utilities	-220.17	-336.72	218.88	-338.00
Entertainment	-76.92	51.81	505.11	**480.00**
Rental	-151.13	24.47	174.66	**48.00**
Administrative	-550.18	-1.48	1645.67	**1094.00**
Healthcare	-2875.11	8703.77	2572.34	**8401.00**
Accommodation	-1301.60	1326.56	989.04	**1014.00**
Educational Services	-2200.14	-783.21	-203.65	-3187.00
Other Services (Except public admin.)	-489.02	-740.61	627.63	-602.00

III. Location Quotient Analysis

Location quotients (LQs) are ratios used to compare the distribution of employment across different industries in a specific area to a reference area, typically the overall industry total (Richardson, 1973). According to the Bureau of Labor Statistics, an LQ of 1 indicates that the industry has a proportional representation of local area employment as it does in the reference area. An LQ exceeding 1 suggests that the industry commands a greater portion of local area employment compared to the reference area. Table 7 presents the LQs for all regions of West Virginia for the years 2001 and 2020, illustrating how employment numbers changed over the 20-year period across all regions. It highlights the critical importance of certain industries to specific regions of West Virginia in terms of employment. This underscores the need to understand and prioritize certain industries in particular regions. Furthermore, LQ analysis reveals emerging industries and emphasizes the importance of giving them more attention in terms of development. This insight enables policymakers and stakeholders to make informed decisions about resource allocation and economic development strategies.

Location Quotient (LQ) n Table 7 for the Mid-Ohio Valley region in 2020 signifies a higher concentration of employment compared to the entire state of West Virginia. Notably, sectors such as mining, manufacturing, finance, and entertainment exhibit superior performance in the Mid-Ohio Valley region. The agriculture sector shows the lowest presentation of employment in the valley. LQs for the Metro Valley region for 2020 reveal that administrative, rental, utilities, scientific, wholesale trade, and finance sectors outperform other industries in the region when compared to the overall employment distribution in West Virginia. Again, the agriculture sector shows one of the lowest presentations of employment in Metro Valley. LQs for the New River/Greenbrier Valley region for 2020 highlight the agriculture sector as the top-performing industry, followed by mining, entertainment, accommodation, and educational services. LQs for the Potomac Highlands region for 2020 indicate agriculture as the leading sector. Manufacturing, information, accommodation, and educational services also play significant roles, outperforming in comparison to the state as a whole. LQs for the Mountain Lakes region of West Virginia for 2020 underscore

the prominence of construction, transportation, scientific, utilities, healthcare, and educational services as leading and performing sectors in the region.

Table 7. Location quotient analysis for all regions in West Virginia

	Mid-Ohio Valley		Metro Valley		New River/ Greenbrier		Potomac Highlands		Mountain Lakes	
	2001	2020	**2001**	2020	**2001**	2020	**2001**	2020	**2001**	2020
Total Industries	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Information	0.7378	0.6438	1.1102	1.0497	1.0364	0.8422	1.4383	1.6319	0.7746	0.9292
Agriculture	0.0938	0	0.4028	0.2886	1.9263	**2.4434**	2.5222	**2.5563**	1.0255	0.7891
Mining	0.4548	1.4640	1.3093	0.7875	1.3369	1.8487	0.0830	0.1924	1.2899	0.9137
Construction	0.8978	1.0454	1.0287	0.9853	0.9539	0.7375	1.0872	0.8594	1.0260	1.2182
Manufacturing	1.6261	1.5515	0.8289	0.9755	0.5456	0.5587	1.5388	1.5202	0.7100	0.5706
Wholesale Tde	1.0151	1.0493	1.2328	1.1837	0.9633	0.9956	0.9440	0.8114	0.6591	0.8252
Retail Trade	1.0478	1.0614	0.9341	0.9290	1.1431	1.0984	0.9467	1.0446	1.0009	0.9676
Transportation	0.7298	0.8915	1.3292	1.1144	0.6400	0.8349	0.9177	0.8227	0.9918	1.1246
Finance	1.0867	1.3911	1.2620	1.1955	0.9108	0.6787	0.7770	0.9487	0.6789	0.6540
Scientific	0.6938	0.7242	1.3283	1.1760	0.7934	0.6926	0.7502	0.90227	1.0199	1.2038
Utilities	0.6782	0.5246	1.2707	1.2143	0.6940	0.8298	0.2530	0.3644	1.4872	1.5338
Entertainment	1.0176	1.2222	0.7982	0.9599	1.5782	1.3134	1.7824	0.9219	0.4711	0.7511
Rental	0.7598	0.7333	1.2497	1.2044	0.8351	1.1121	0.9673	0.8414	0.9355	0.9518
Administrative	1.0272	0.7777	1.2721	1.2748	0.7326	1.0273	0.8443	0.6428	0.7973	0.9861
Healthcare	1.0113	0.8807	0.9359	1.0355	1.1218	1.0677	0.8645	0.9211	1.0935	1.0490
Accommodation	0.9258	1.0708	0.9057	0.8807	1.2107	1.1105	1.1761	1.1774	0.9788	0.9426
Edu. Services	0.8305	0.8044	0.8152	0.8634	0.9673	0.9617	1.0796	1.1775	1.4360	1.2532
Other Services	1.0807	1.0885	1.0344	0.9602	1.1331	1.0168	0.7658	0.9869	0.9175	0.9850

4. CONCLUSIONS AND POLICY SUGGESTIONS

This study's primary goal is to analyze the employment growth patterns in various sectors of West Virginia over the last two decades, with a focus on their contributions to long-term economic development. Conducting descriptive analyses for each sector and county reveals key sectors that demand more attention for economic upliftment at the county level.

The shift-share analysis covering the period from 2001 to 2020 offers intriguing insights into employment changes across West Virginia's five regions, facilitating more informed investment planning for regional economic development. This analysis highlights the need for tailored regional policy options to foster better economic growth across the state.

Additionally, location quotients for each of the five regions pinpoint the most economically significant sectors, guiding policymakers to channel more investments into these areas. For instance, the regions of New River/Greenbrier Valley and Potomac Highlands exhibit positive contributions and gains from agricultural industries, suggesting a need for increased state investments in agriculture for these regions.

Shift-share analysis provides insight into the employment growth of each sector within the region, while location quotient indicates the industry's proportional representation within that region. Therefore, although shift-share analysis may reveal employment declines in certain regional industries, LQs greater than one highlight industries that contribute significantly to regional employment. By employing both analyses, policymakers can identify job-creating industries and facilitate their growth to promote economic development. Understanding the state's economically thriving industries becomes imperative for policymakers, as it provides valuable insights when formulating development-related policy suggestions.

The main implication of the findings challenges the conventional belief that agriculture, manufacturing, and mining are the primary contributors to West Virginia's economic growth. Instead, healthcare services, educational services, accommodation, scientific services, insurance and real estate, wholesale and retail, and sometimes construction sectors play pivotal roles in the economic development of specific regions

within the state. Identifying investment priorities within these growing sectors in these specific regions and implementing a comprehensive regional development policy, along with fostering public-private partnerships, will undoubtedly enhance the future development of West Virginia.

References

Ashtin Massie, Maria Castillo, J. D. (2023). *Affordable energy in West Virginia starts with economic dispatch*. Utilitydive. https://www.utilitydive.com/news/affordable-energy-west-virginia-coal-plants-economic-dispatch-pjm/690309/

Atitwa, S. C. (2020). *What Are The Biggest Industries In West Virginia?* Worldatlas. https://www.worldatlas.com/articles/what-are-the-biggest-industries-in-west-virginia.html#:~:text=West Virginia is also a,%2C forestry%2C biometrics and tourism.

Barff, Richard A. and Prentice L. Knight III (1988)."Dynamic Shift Share Analysis". Growth and Change19 (2):1-10.

Bartik, T. J. (2004). Economic Development in J. Richard Aronson and Eli Schwartz, eds. Management Policies in Local Government Finance (5th ed.), 355-395.

Bell, S. E., & York, R. (2010). Community economic identity: The coal industry and ideology construction in West Virginia. *Rural Sociology*, *75*(1), 111-143.

Bureau of Business and Economic Research. (n.d.). West Virginia Economic Outlook 2023-2027. Retrieved from https://business.wvu.edu/research-outreach/bureau-of-business-and-economic-research/economic-outlook-conferences-and-reports/economic-outlook-reports/west-virginia-economic-outlook-2023-2027.

Charles Sperow. (2023). *Agriculture*. E-Wv, The West Virginia Encyclopedia. https://www.wvencyclopedia.org/articles/166#:~:text=While average farm sizes remained,Hardy%2C Monroe%2C and Preston.

Fauber, K. H. (2022). *West Virginia's Automotive Manufacturing Industry*. WVExecutive. https://wvexecutive.com/west-virginias-automotive-manufacturing-industry/

Herath, J., Schaeffer, P. V., & Gebremedhin, T. G. (2013). Employment change in LDs of West Virginia: A dynamic spatial shift-share analysis. *American Journal of Rural Development*, *1*(5), 99-105.

Herath, J., Gebremedhin, T. G., & Maumbe, B. M. (2010). A Dynamic Shift-Share Analysis of Economic Growth in West Virginia. *Journal of Rural and Community Development*, *6*(2), 155–169. https://www.researchgate.net/profile/Janaranjana_Herath/publication/236646929_A_dynamic_shift_share_analysis_of_economic_growth_in_West_Virginia/links/00463518bef1e8a5f4000000.pdf

HRSA. (2022). *Overview of the State - West Virginia - 2022*. US Department of Health and Human Services. https://mchb.tvisdata.hrsa.gov/Narratives/Overview/94a29364-c888-407c-9d0e-80a05fe5434d

IBISWorld. (n.d.). West Virginia Economic Profiles. Retrieved from https://www.ibisworld.com/united-states/economic-profiles/west-virginia/

Knudsen, Daneil C. 2000. "Shift Share Analysis: further examination of models for the description of economic change." Socio-Economic Planning Sciences, 34:17-198.

Manufacturing, M., Firms, D., & Services, O. (2015). *WEST VIRGINIA TRANSPORTATION FACTS — ECONOMIC West Virginia Direct Employment Supported by Transportation WEST VIRGINIA TRANSPORTATION FACTS — SCOPE & CONDITION*. 255–259.

McNamara K. T. (1991). Employment Growth in Indiana: A State and Regional Analysis. Purdue University Corporative Extension Service, EC 660.

Melachroinos, K.A. (2002). European Integration and the Spatial Dynamics of Manufacturing-Employment Change. Environment and Planning, 34(11), 2017-36.

Miller, O. (2022). *Ladies Leading in Chemical Manufacturing*. WVExecutive. https://wvexecutive.com/ladies-leading-in-chemical-manufacturing/

National Center for Education Statistics. (2022). Public High School Graduation Rates - National. Retrieved from https://nces.ed.gov/programs/coe/pdf/2021/coi_508c.pdfNews, B. (2018). *'Smart Manufacturing' focus of WVU study*. WVExecutive. https://wvexecutive.com/smart-manufacturing-focus-wvu-study/

Richardson, H. (1978). Regional and Urban Economics. Harmondsworth: Penguin.

Richardson, H. (1973). Regional Growth Theory. London: Macmillan.

Shi, C and Y. Yang (2008). Review of Shift Share Analysis and Its Application in Tourism, "International Journal of Management Perspectives", ISSN:1307-1629, I (1) 2130.

Sperow, Charles "Agriculture." e-WV: The West Virginia Encyclopedia. 14 July 2023. Web. 10 August 2023.

U.S. Census Bureau. (2022). U.S. School System Current Spending Per Pupil by Region: Fiscal Year 2020. Retrieved from https://www.census.gov/library/visualizations/2022/comm/spending-per-pupil.html.

West Virginia Construction & Building Trends. (2023). IBISWorld 2023. https://www.ibisworld.com/united-states/economic-profiles/west-virginia/

West Virginia Agriculture. (2023). Farm Flavor. https://farmflavor.com/west-virginia-agriculture/

Witt, T.S. and J.S. Leguizamon. 2007. Tourism and the West Virginia Economy. Bureau of Business and Economic Research, West Virginia University. Retrieved August 18, 2007 (http://www.be.wvu.edu/bber/publications.aspx#).

Witt, T.S. and M. Fletcher. 2005. Tourism and the West Virginia Economy. Bureau of Business and Economic Research, West Virginia University. Retrieved August 18, 2007 (http://www.be.wvu.edu/bber/publications.aspx#).

Wilson, Peter and Ting Su Chern. 2005. "A Dynamic Shift Share Analysis of the Electronics Export Market 1988-2001: Can the NIEs Compete with China?" Department of Economics, SCAPE Working Paper Series, Paper No. 2005/07-May2005. http/nt2.fas.nus.edu.sg/es/pub/wp-scape/0507.pdf.

Young, C. (2019). *Health care in WV: State faces unique set of challenges, opportunities*. West Virginia News. https://www.wvnews.com/news/wvnews/health-care-in-wv-state-faces-unique-set-of-challenges-opportunities/article_18a140c9-7fe0-5ac7-8fd4-56b8700ea414.html