

## Personal Income Changes in Oklahoma Before and After the Great Recession

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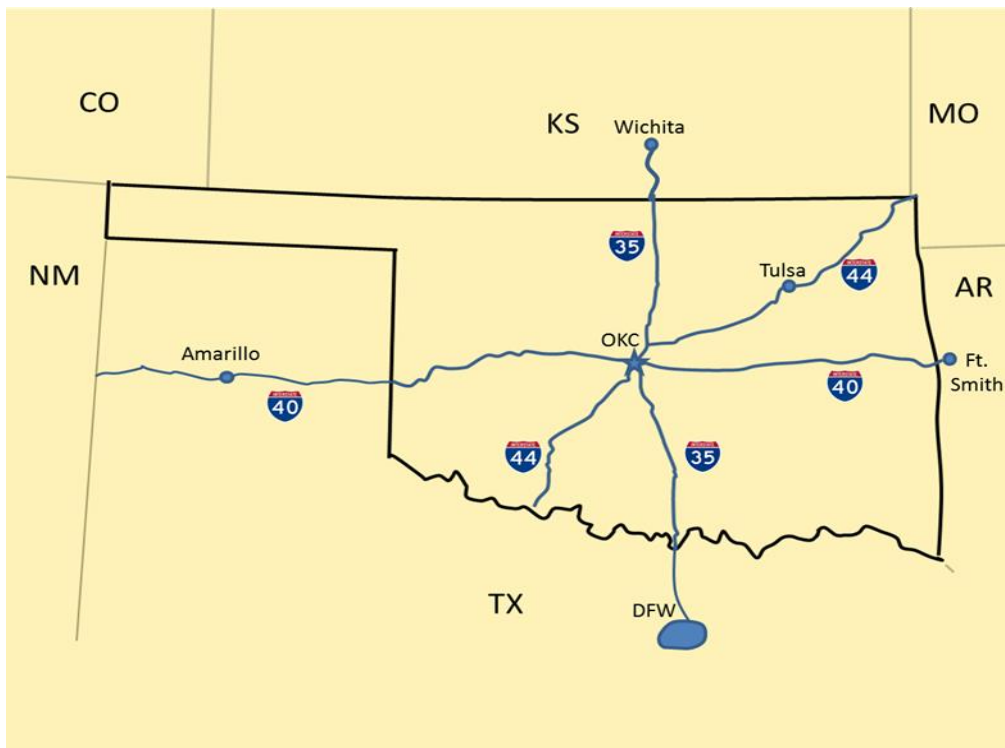
### Abstract

*An analysis of personal income changes in Oklahoma during two periods, 2002-2007 and 2013-2018, is presented. These changes, both aggregate and by sector, are compared to personal income changes in the United States and a region composed of Oklahoma and its contiguous states: Arkansas, Colorado, Kansas, Missouri, New Mexico, and Texas. The comparisons will include results from a shift-share analysis. Recent events in Oklahoma and the surrounding are used to apply the results of the analysis.*

### 1. Introduction

Oklahoma is a centrally located state, with major Interstate Highways 35 and 40 crossing in Oklahoma City. Shipments from ports near Los Angeles and Houston travel via important truck and rail routes through the Sooner State. Interstate 35 is a free-trade zone highway, acting as a major commercial corridor between Canada and Mexico (see Figure 1).

**Figure 1: Oklahoma Interstate Highways and Surrounding States**



Oklahoma's six cities with a population above 90,000 are all located along Interstate highways. As shown in Table 1, of those six metropolitan areas, four (Oklahoma City, Norman, Broken Arrow, and Edmond) experienced growth rates in excess of 25 percent during the period from 2000-2017 [Census (2017)].

**Table 1: Most Populated Oklahoma Cities, 2017**

<b>US Rank</b>	<b>City</b>	<b>Population</b>	<b>Increase (2000-2017)</b>
27	Oklahoma City	643,648	26.8%
47	Tulsa	401,800	2.2%
223	Norman	122,843	26.8%
277	Broken Arrow	108,303	34.2%
341	Lawton	93,714	1.2%
352	Edmond	91,950	34.1%

Source: US Census (2017)

The state has long been a leader in oil and natural gas production, with further potential for production using intensive processes such as fracking [Boyd (2002)]. The state is also known for casino gambling, as administered by native tribal nations [Eger (2019)]. This paper will identify industries in which Oklahoma has experienced growth in the periods before and after the Great Recession and compare them with the performance of the surrounding region and the nation using the shift-share methodology.

## 2. Methodology

This paper focuses on annual personal income data in the aggregate and by individual sectors. The analysis examines the five-year pre-recession period (2002-2007) data and the most recent five-years (2013-2018) of the post-recession data. The shift-share analysis methodology is used as is an examination of percentage change and rates of change of personal income.

The shift-share technique had early use in regional studies of employment changes [Creamer (1943), Fuchs (1959), and Dunn (1960)]. The technique was later employed in Buck (1970), Houston (1967) and Barff & Knight (1988). A brief discussion of the shift-share procedure follows. A more detailed discussion is available in Rice & Horton (2012).

The shift-share analysis is a decomposition of sector growth into three component parts. The comparisons include three entities: the United States (US), Oklahoma (OK), and a region composed of Oklahoma and its contiguous states, which are Arkansas, Colorado, Kansas, Missouri, New Mexico, and Texas [the Oklahoma contiguous region (CR)]. The OGS component (Overall-Growth Share) calculates the total percentage change of the larger entity (either US or CR) and applies that percentage change to each sector of the smaller entity (either CR or OK). Thus, the component represents the change in each sector of the smaller entity that

would be attributed to the percentage increase or decrease of the overall percentage change of the larger entity.

The DCS component (Differential-Compositional Share) calculates the percentage change for each sector of the larger entity (US or CR, depending upon the comparisons) and compares each larger entity sector percentage change with the percentage change of total personal income for the larger entity. If the sector percentage is greater, the sector is considered fast growth. If the sector percentage change is smaller than the total percentage change, the sector is considered slow growth.

The SCS component (Sector-Competitive Share) compares percentage change in each sector of the larger entity (either US or CR) with the percentage change of each corresponding sector of the smaller entity (either CR or OK). If the percentage change of a sector in the smaller entity, for example, OK, exceeds the percentage change of the corresponding sector in the larger entity, for example, US, then the sector in the smaller entity (OK) is considered to be a highly-competitive/high performing sector. Conversely, if the percentage change of the sector in the smaller entity is less than the percentage change of the corresponding sector in the larger entity, then the sector in the smaller entity is considered to be under-performing.

After calculating each component for each sector of the smaller entity, the three components are added together such that:

$$\text{Total change (sector of the smaller entity)} = \text{OGS} + \text{DCS} + \text{SCS}$$

$$\text{Total change (all sectors of the smaller entity)} = \Sigma (\text{OGS}) + \Sigma (\text{DCS}) + \Sigma (\text{SCS})$$

### 3. Aggregate Analysis

Personal income data for the US, CR (which contains the states of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas) and OK for years 2002, 2007, 2013, and 2018 are obtained from the Regional Economic Accounts of the U.S. Bureau of Economic Analysis website: <http://www.bea.gov/regional>

Table 2 presents the total personal income for US, CR, and OK for years 2002, 2007, 2013, and 2018. It should be noted that total personal income for all three entities for 2018 (US = \$17,572,929 million, CR = \$2,239,254 million, and OK = \$181,886 million) exceed the 2007 levels. Thus, all three entities have increased to well-above the pre-recession levels.

**Table 2: Aggregate Results - Changes in Personal Income**

	Personal Income (millions of dollars)						Overall Percentage Change		Average Annual Percentage Change	
	2002	2007	Increase	2013	2018	Increase	2002- 07	2013- 18	2002- 07	2013- 18
<b>US</b>	9,155,663	12,002,204	2,846,541	14,175,503	17,572,929	3,397,426	31.09	23.97	5.56	4.39
<b>CR</b>	1,080,680	1,464,686	384,006	1,881,192	2,239,254	358,062	35.53	19.03	6.27	3.55
<b>OK</b>	90,233	127,819	37,586	165,860	181,886	16,026	41.65	9.66	7.21	1.86

Source: Personal Income data for tables obtained from “Regional Economic Accounts,” Bureau of Economic Analysis: <http://www.bea.gov/regional>. All computations in tables and construction of CR by the authors.

Table 2 also presents the overall percentage changes and average annual percentage changes for the pre-recession (2002-2007) period and the post-recession (2013-2018) period. During the pre-recession period, OK experienced the largest overall percentage change (41.65%) and average annual percentage change (7.21%) followed by the CR (35.53%; 6.27%) and US (31.09%; 5.56%). In the post-recession period, the opposite growth pattern occurred, with US experiencing the largest overall percentage change (23.97%) and average annual percentage change (4.39%) followed by the CR (19.03%; 3.55%) and OK (9.66%; 1.86%). Additionally, all the percentages in the post-recessionary period are smaller than the corresponding pre-recession percentages. Particularly, it is noteworthy that average annual percentage changes (annual growth rates) in the post-recession period lag behind the growth rates in the pre-recessionary period with OK experiencing the most dramatic decline from 7.21% during 2002-2007 to 1.86% from 2013-2018.

**Table 3: Summary of Shift-Share Computations - Personal Income Changes**

Row	Comparisons	Overall-Growth (OGS)	Differential-Compositional (DCS)	Sector-Competitive (SCS)	Total
<b>US versus OK</b>					
<b>1</b>	2002-2007	28,054	769	8,763	37,586
	2013-2018	39,752	-7,455	-16,271	16,026
<b>CR versus OK</b>					
<b>2</b>	2002-2007	32,063	604	4,918	37,586
	2013-2018	31,569	-2,227	-13,317	16,026
<b>US versus CR</b>					
<b>3</b>	2002-2007	335,989	5,136	42,881	384,006
	2013-2018	450,863	-48,036	-44,763	358,061

Source: Tables 8, 9, and 10 using Column Totals

Table 3 presents an aggregate summary of the shift-share computations for the pre-recession period (2002-2007) and the post-recession period (2013-2018). Included in the table are the results for three different comparisons: 1. US versus OK, 2. CR versus OK, and 3. US

versus CR.

Row 1 examines the growth in OK personal income when compared to the US. In the pre-recession period, Oklahoma's increase in personal income was stronger than that of the United States as evidenced by all three shift-share components (OGS = \$28,054 million, DCS = \$769 million, and SCS = \$8,763 million) are positive with a very strong SCS component, indicating that, in the aggregate, Oklahoma's individual sectors outperformed their corresponding United States sectors.

However, in the post-recession period, two of the three OK shift-share components (DCS = -\$7,455 and SCS = -\$16,271) were negative, causing the overall increase in Oklahoma personal income (\$16,026 million) to be less than OGS (\$39,752 million). Thus, in the post-recession period, Oklahoma personal income growth contained both slow-growth sectors (negative DCS) and many non-competitive sectors (negative SCS). This combination resulted in Oklahoma personal income growth that did not match the personal income growth (\$39,757 million) that would have occurred had Oklahoma personal income grown at the same percentage as the United States.

Row 2 compares OK to CR and the results mirror those shown in Row 1. That is, in the pre-recession period, Oklahoma personal income growth was stronger than that of the region in that all three shift-share components (OGS = \$32,063 million, DCS = \$604 million, and SCS = \$4,918 million) were positive with the SCS component indicating strong sector performances. But, in the post-recession period, Oklahoma's personal income increase lagged behind regional growth as evidenced by the two negative shift-share components (DCS = -\$2,227 million and SCS = -\$13,317 million). In particular, the large negative SCS component suggests many individual sectors were non-competitive.

Row 3 compares CR to US. Again, a similar situation exists in Row 3 as was found in Rows 1 and 2. In the pre-recession period, the region experienced personal income growth greater than that of the United States. As in Rows 1 and 2, all three shift-share components (OCS = \$335,989 million, DCS = \$5,136 million, and SCS = \$42,881 million) were positive. Once again, the SCS aggregate was very strong indicating many strong, competitive, sectors. However, in the post-recession period, the region's gains in personal income fell considerably when compared to that of the nation. The shift-share component (OGS = \$450,863 million) is the post-recession personal income increase that would have occurred had the Oklahoma contiguous region grown at the same rate as the United States. However, the other two shift-share components (DCS = -\$48,038 million and SCS = -\$44,763 million) were both strongly negative. The implication is that the region contained an aggregate of slow-growth sectors (DCS negative) and an aggregate of non-competitive sectors (SCS negative).

#### **4. Sector Analysis**

The sector analysis will focus on Oklahoma personal income change in the post-recession period. Table 4 provides the percentage of total personal income reported in each sector for all four years.

**Table 4: Sector Analysis for Oklahoma - Percentage of Personal Income by Sector**

Sector	Oklahoma			
	2002	2007	2013	2018
<b>Farm employment</b>	1.09%	0.53%	1.08%	0.46%
<b>Forestry/Fishing</b>	0.12%	0.11%	0.11%	0.15%
<b>Mining</b>	2.32%	7.80%	9.09%	6.70%
<b>Utilities</b>	1.02%	0.91%	0.94%	0.79%
<b>Construction</b>	4.23%	3.88%	4.49%	4.21%
<b>Durable Goods</b>	5.31%	4.66%	4.10%	4.27%
<b>Nondurable Goods</b>	2.90%	3.46%	1.90%	1.84%
<b>Wholesale Trade</b>	3.34%	2.90%	2.75%	2.56%
<b>Retail Trade</b>	5.39%	4.32%	4.16%	3.91%
<b>Transportation</b>	2.82%	2.85%	6.74%	6.69%
<b>Information</b>	1.94%	1.50%	1.09%	1.18%
<b>Finance and Insurance</b>	3.11%	2.75%	2.55%	2.71%
<b>Real Estate</b>	1.23%	1.08%	1.37%	1.05%
<b>Professional Services</b>	3.88%	3.77%	3.69%	3.82%
<b>Management</b>	0.98%	0.85%	0.76%	1.07%
<b>Administrative</b>	2.91%	2.97%	2.76%	2.86%
<b>Education</b>	0.58%	0.54%	0.54%	0.54%
<b>Healthcare</b>	7.09%	6.75%	6.75%	7.17%
<b>Arts and Entertainment</b>	0.36%	0.30%	0.34%	0.47%
<b>Accommodations</b>	2.63%	2.17%	1.98%	2.16%
<b>Other Services</b>	3.23%	2.58%	2.34%	2.41%
<b>Governments</b>	15.10%	14.09%	12.71%	12.84%
<b>plus: Adjustment for residence</b>	1.09%	0.66%	0.29%	0.23%
<b>plus: Dividends, interest, and rent</b>	18.65%	19.30%	17.00%	18.42%
<b>plus: Personal current transfer receipts</b>	16.73%	16.78%	17.64%	18.84%
<b>less: Contributions for OASDHI</b>	8.04%	7.51%	7.17%	7.36%
<b>Total</b>	100%	100%	100%	100%

For discussion, the top ten personal income sectors in Oklahoma in 2018 are identified and compared with their 2007 percentages and presented in Table 5, which is organized as follows.

1. The sectors listed are the top ten Oklahoma personal income sectors based on the 2018 percentages. These sectors contributed 86.87 percent of Oklahoma's personal income.
2. The arrows indicate whether the 2018 percentage is more than (up-arrow) or less than (down-arrow) the 2007 percentage.
3. The table is divided into two groups. The up-arrow group is the first five sectors, and the down-arrow group is the second five sectors.

**Table 5: Oklahoma Personal Income Percentages**

Sector		2007	2018
<b>Transfer Receipts</b>	↑	16.78%	18.84%
<b>Healthcare</b>	↑	6.75%	7.17%
<b>Transportation and Warehousing</b>	↑	2.85%	6.69%
<b>Construction</b>	↑	3.88%	4.21%
<b>Profession and Technical Services</b>	↑	3.77%	3.82%
<b>Dividends, Interest, and Rent</b>	↓	19.30%	18.42%
<b>Government</b>	↓	14.09%	12.84%
<b>Mining</b>	↓	7.80%	6.70%
<b>Durable Goods</b>	↓	4.66%	4.27%
<b>Retail Trade</b>	↓	4.32%	3.91%
<b>Totals</b>		84.20%	86.87%

Table 4 is the basis of the organization of Table 5. Tables 6 and 7 present selected shift-share results, and the detailed shift-share results are provided in Tables 8, 9, and 10.

**Table 6: Selected Summary of Results**

SECTOR	2018 Oklahoma Percentage Contribution to Personal Income	Shift-Shares: 2013-2018 (millions of dollars)			
		US versus OK			
		OGS	DCS	SCS	Total
<b>Transfer Receipts</b>	18.84 ↑	7,012	-295	-1,715	5,002
<b>Healthcare</b>	7.17 ↑	2,684	-77	-768	1,839
<b>Transportation and Warehousing</b>	6.69 ↑	2,680	1,042	-2,739	983
<b>Construction</b>	4.21 ↑	1,785	1,166	-2,743	209
<b>Profession and Technical Services</b>	3.82 ↑	1,466	386	-1,017	834
<b>Dividends, Interest, and Rent</b>	18.42 ↓	6,759	2,960	-4,413	5,306
<b>Government</b>	12.84 ↓	5,054	-2,176	-608	2,270
<b>Mining</b>	6.70 ↓	3,612	-8,278	1,787	-2,879
<b>Durable Goods</b>	4.27 ↓	1,629	-410	-246	973
<b>Retail Trade</b>	3.91 ↓	1,654	-390	-1,052	212
<b>Total</b>	86.87%	34,335	-6,072	-13,514	14,749

Source: Tables 5 and 8

Table 6 presents thirty shift-share results for the United States versus Oklahoma comparison and Table 7 presents another thirty for the Oklahoma contiguous region versus Oklahoma comparison. First, it should be noticed that the Total columns are the same in both comparisons because it is the Oklahoma personal income change that is being reported. Second, discussion of these two tables will focus on the DCS and SCS columns.

Focusing on Table 6, which presents data from the United States versus Oklahoma comparison, four sectors (Transportation and Warehousing = \$1,042 million, Construction = \$1,166 million, Professional and Technical Services = \$386 million, and Dividends, Interest, and Rent = \$2,960 million) displayed positive differential-composition shares (DCS) and are considered fast-growth sectors. However, each of these sectors had negative sector-competitive shares (SCS) indicating that, although the four sectors are fast-growth nationally, the Oklahoma sectors are growing more slowly than are their corresponding national sectors.



**Table 7: Selected Summary of Results**

SECTOR	2018 Oklahoma Percentage Contribution to Personal Income	Shift-Shares: 2013-2018 (millions of dollars)			
		Region vs. Oklahoma			
		OGS	DCS	SCS	Total
<b>Transfer Receipts</b>	18.84 ↑	5,569	1,215	-1,782	5,002
<b>Healthcare</b>	7.17 ↑	2,132	380	-672	1,839
<b>Transportation and Warehousing</b>	6.69 ↑	2,129	2,834	-3,979	983
<b>Construction</b>	4.21 ↑	1,418	819	-2,628	209
<b>Profession and Technical Services</b>	3.82 ↑	1,164	596	-926	834
<b>Dividends, Interest, and Rent</b>	18.42 ↓	5,368	3,215	-3,277	5,306
<b>Government</b>	12.84 ↓	4,014	-1,121	-622	2,270
<b>Mining</b>	6.70 ↓	2,868	-8,428	2,681	-2,879
<b>Durable Goods</b>	4.27 ↓	1,294	-667	347	973
<b>Retail Trade</b>	3.91 ↓	1,314	-177	-925	212
<b>Total</b>	86.87%	27,269	-1,335	-11,183	14,749

Source: Tables 5 and 9

In Table 7, which focuses on the region versus Oklahoma, six sectors (Transfer Receipts = \$1,215 million, Healthcare = \$380 million, Transportation and Warehousing = \$2,834 million, Construction = \$819 million, Professional and Technical Services = \$596 million, and Dividends, Interest, and Rent = \$3,215 million) had positive differential-composition shares (DCS) and are considered fast-growth in the region. However, just as in Table 6, each of the sectors had negative sector-competitive shares (SCS), indicating that these six sectors are growing slower in Oklahoma than in the surrounding region.

Additionally, four sectors (Transportation and Warehousing, Construction, Professional and Technical Services, and Dividends, Interest, and Rent) had positive differential-compositional shares (DCS) in both Table 6 and Table 7. However, as noted earlier, the positives were offset by negative sector-competitive shares (SCS) in both tables. Examining the total values in both tables shows DCS totals of -\$6,072 million in Table 6 and -\$1,335 million in Table 7 as well as SCS totals of -\$13,514 million (Table 6) and -\$11,183 million (Table 7).

These negatives combine to significantly affect the overall-growth shares (OGS) of \$34,335 million (Table 6) and \$27,269 million (Table 7), resulting in weak growth in Oklahoma personal income in the post-recession period. Finally, it should be noted that the most significantly negative DCS sector is Mining (-\$8,278 million in Table 6 and =-\$8,428 million in Table 7).

**Table 8: Shift-share Analysis Results - Personal Income Changes for each Period  
United States versus Oklahoma (millions of dollars)**

Sector	2002-2007				2013-2018			
	OGS	DCS	SCS	Total	OGS	DCS	SCS	Total
<b>Farm income</b>	305	261	-869	-304	428	-1,169	-199	-940
<b>Forestry/Fishing</b>	34	-25	20	29	45	5	32	81
<b>Mining</b>	652	863	6,356	7,871	3,612	-8,278	1,787	-2,879
<b>Utilities</b>	285	-123	87	249	373	-89	-395	-111
<b>Construction</b>	1,187	-112	68	1,143	1,785	1,166	-2,743	209
<b>Durable Goods</b>	1,490	-878	557	1,168	1,629	-410	-246	973
<b>Nondurable Goods</b>	813	-555	1,548	1,806	755	-331	-219	204
<b>Wholesale Trade</b>	936	-69	-170	697	1,093	-404	-598	91
<b>Retail Trade</b>	1,512	-771	-78	663	1,654	-390	-1,052	212
<b>Transportation</b>	792	-36	336	1,092	2,680	1,042	-2,739	983
<b>Information</b>	543	-287	-91	165	435	75	-180	330
<b>Finance/Insurance</b>	871	54	-219	706	1,013	-19	-301	694
<b>Real Estate</b>	346	-431	349	264	546	353	-1,268	-369
<b>Professional Svcs</b>	1,090	258	-32	1,315	1,466	386	-1,017	834
<b>Management</b>	274	113	-177	210	302	41	338	681
<b>Administrative</b>	815	148	214	1,177	1,099	159	-647	611
<b>Education</b>	162	45	-46	162	214	-46	-72	96
<b>Healthcare</b>	1,989	172	68	2,229	2,684	-77	-768	1,839
<b>Arts/Entertainment</b>	101	10	-49	61	135	22	129	286
<b>Accommodations</b>	737	-84	-243	409	786	293	-423	655
<b>Other Services</b>	906	-330	-188	388	930	-138	-281	511
<b>Governments</b>	4,237	-410	554	4,380	5,054	-2,176	-608	2,270
<b>plus: Adjustment for residence</b>	307	-329	-116	-138	114	-218	50	-54
<b>plus: Dividends, interest, and rent</b>	5,233	2,550	47	7,830	6,759	2,960	-4,413	5,306
<b>plus: Personal current transfer receipts</b>	4,694	509	1,146	6,349	7,012	-295	-1,715	5,002
<b>less: Contributions for OASDHI</b>	2,256	-228	309	2,337	2,851	-83	-1,278	1,491
<b>Total</b>	<b>28,054</b>	<b>769</b>	<b>8,763</b>	<b>37,586</b>	<b>39,752</b>	<b>-7,455</b>	<b>-16,271</b>	<b>16,026</b>

**Table 9: Shift-share Analysis Results - Personal Income Changes for each Period  
Region versus Oklahoma (millions of dollars)**

Sector	2002-2007				2013-2018			
	OGS	DCS	SCS	Total	OGS	DCS	SCS	Total
<b>Farm income</b>	348	-27	-624	-304	340	-1,086	-194	-940
<b>Forestry/Fishing</b>	39	-32	22	29	35	11	35	81
<b>Mining</b>	745	1,707	5,419	7,871	2,868	-8,428	2,681	-2,879
<b>Utilities</b>	326	-246	170	249	296	-47	-361	-111
<b>Construction</b>	1,357	-509	295	1,143	1,418	819	-2,028	209
<b>Durable Goods</b>	1,703	-798	263	1,168	1,294	-667	347	973
<b>Nondurable Goods</b>	929	-266	1,144	1,806	599	-438	43	204
<b>Wholesale Trade</b>	1,070	187	-559	697	868	-262	-515	91
<b>Retail Trade</b>	1,728	-938	-127	663	1,314	-177	-925	212
<b>Transportation</b>	905	-244	431	1,092	2,129	2,834	-3,979	983
<b>Information</b>	621	-228	-228	165	345	-263	248	330
<b>Finance/Insurance</b>	996	-16	-274	706	805	8	-120	694
<b>Real Estate</b>	396	-294	163	264	434	521	-1,323	-369
<b>Professional Svcs</b>	1,246	139	-70	1,315	1,164	596	-926	834
<b>Management</b>	313	207	-310	210	240	410	31	681
<b>Administrative</b>	931	402	-156	1,177	873	158	-420	611
<b>Education</b>	186	-11	-13	162	170	-14	-60	96
<b>Healthcare</b>	2,273	-457	414	2,229	2,132	380	-672	1,839
<b>Arts/Entertainment</b>	115	-58	4	61	107	120	59	286
<b>Accommodations</b>	842	-199	-234	409	624	464	-433	655
<b>Other Services</b>	1,035	-375	-272	388	738	-25	-203	511
<b>Governments</b>	4,843	-810	348	4,380	4,014	-1,121	-622	2,270
<b>plus: Adjustment for residence</b>	351	-137	-352	-138	90	-70	-74	-54
<b>plus: Dividends, interest, and rent</b>	5,981	2,274	-425	7,830	5,368	3,215	-3,277	5,306
<b>plus: Personal current transfer receipts</b>	5,365	1,036	-52	6,349	5,569	1,215	-1,782	5,002
<b>less: Contributions for OASDHI</b>	2,578	-301	59	2,337	2,265	379	-1,153	1,491
<b>Total</b>	32,063	604	4,918	37,586	31,569	-2,227	-13,317	16,026

**Table 10: Shift-share Analysis Results - Personal Income Changes for each Period  
United States versus Region (millions of dollars)**

Sector	2002-2007				2013-2018			
	OGS	DCS	SCS	Total	OGS	DCS	SCS	Total
<b>Farm income</b>	2,389	2,046	-1,920	2,514	4,375	-11,958	-51	-7,634
<b>Forestry/Fishing</b>	609	-450	-39	120	672	79	-44	707
<b>Mining</b>	7,969	10,554	11,446	29,969	26,693	-61,176	-6,605	-41,088
<b>Utilities</b>	3,022	-1,305	-876	841	2,975	-710	-278	1,988
<b>Construction</b>	19,559	-1,851	-3,748	13,960	22,463	14,674	-9,000	28,137
<b>Durable Goods</b>	21,045	-12,403	4,141	12,783	19,885	-5,005	-7,227	7,653
<b>Nondurable Goods</b>	11,803	-8,061	5,879	9,620	12,213	-5,359	-4,243	2,610
<b>Wholesale Trade</b>	14,222	-1,053	5,921	19,089	18,480	-6,833	-1,405	10,241
<b>Retail Trade</b>	18,480	-9,428	598	9,651	19,299	-4,548	-1,490	13,261
<b>Transportation</b>	11,931	-545	-1,429	9,956	15,218	5,916	7,040	28,174
<b>Information</b>	8,541	-4,515	2,151	6,178	7,594	1,316	-7,467	1,444
<b>Finance/Insurance</b>	14,049	866	882	15,796	19,633	-372	-3,507	15,755
<b>Real Estate</b>	5,038	-6,267	2,705	1,476	6,359	4,111	642	11,112
<b>Professional Svcs</b>	20,677	4,890	711	26,277	27,922	7,355	-1,750	33,526
<b>Management</b>	3,735	1,543	1,818	7,096	6,320	857	6,424	13,601
<b>Administrative</b>	9,474	1,717	4,311	15,502	13,998	2,030	-2,897	13,131
<b>Education</b>	2,369	655	-479	2,545	3,457	-741	-199	2,517
<b>Healthcare</b>	24,575	2,129	-4,269	22,435	32,631	-939	-1,162	30,531
<b>Arts/Entertainment</b>	1,855	180	-976	1,058	2,336	382	1,213	3,930
<b>Accommodations</b>	7,870	-895	-103	6,872	9,595	3,573	117	13,286
<b>Other Services</b>	10,264	-3,735	947	7,476	11,789	-1,751	-993	9,045
<b>Governments</b>	43,535	-4,218	2,117	41,434	52,519	-22,615	154	30,058
<b>plus: Adjustment for residence</b>	-1,014	1,089	-780	-705	-1,327	2,543	-1,454	-238
<b>plus: Dividends, interest, and rent</b>	54,070	26,349	4,870	85,289	75,913	33,248	-12,764	96,397
<b>plus: Personal current transfer receipts</b>	47,047	5,099	12,011	64,156	73,630	-3,096	703	71,237
<b>less: Contributions for OASDHI</b>	27,124	-2,746	3,007	27,385	33,780	-980	-1,481	31,320
<b>Total</b>	335,989	5,136	42,881	384,006	450,863	-48,038	-44,763	358,061

## 5. Conclusions

Mindful of the potential of some of the industries identified above, Oklahoma has taken steps in several of its potentially high-growth sectors to enhance its ability to compete in these areas [see Rickman & Wang (2019) and Wilkerson & Shupert (2019)]. In the case of healthcare, with the University of Oklahoma hosting a nationally ranked trauma center [Zizzo (2010)] and the Oklahoma State University Medical Center as the nation's largest osteopathic teaching hospital in Tulsa, Healthcare is potentially a high-growth sector for the state. The state's attempts to meet Oklahoma's healthcare needs through mergers with struggling, private, providers, has the benefit of not only addressing past deficiencies, but also training more physicians [Muchmore (2013)].

Transportation and Warehousing benefits from Oklahoma's access to major interstate freeways, as noted above, as well as the American Airlines maintenance facility in Tulsa [Sloan (2016)]. As a complement to other facilities in nearby Missouri and Texas, the airlines industry will continue to be a significant source of income for Oklahomans.

Fracking enabled the state to extract more oil than was previously thought possible but has come with its share of bad press [Boyd (2002)]. Neighboring states, such as Arkansas, Louisiana, Texas, and even New Mexico, will continue to compete heavily in minerals [Bryan (2019)]. As the price of oil and natural gas continue to trend downward, alternative industries will have to supplement the Minerals sector.

Throughout 2019, the governor has negotiated with tribal councils to adjust the share of profits from casino gambling that the state collects [Eger (2019), Forman (2019), and Payne (2019)]. However, even if the governor is successful, this revenue stream may be diminished by the recent election in neighboring Arkansas which authorizes the operation of four casinos in the state, at least one of which would be located along I-40 with close proximity to Oklahoma [Murphy (2019)]. If such funds are forthcoming, then the state would be wise to continue to invest in such high potential sectors as Transportation and Warehousing and Healthcare. As more medical and transportation facilities are built, the construction industry should also benefit. These three sectors can help to offset the volatility of minerals extraction.

## 6. Summary

1. Personal Income changes for the pre-recession period (2002-2007) and most recent post-recession period (2013-2018) are examined and compared for three entities: (1) the United States, (2) a region composed of Oklahoma plus contiguous states (Arkansas, Colorado, Kansas, Missouri, New Mexico and Texas) and referred to as the Oklahoma contiguous region, and (3) the state of Oklahoma.

2. The percentage change and annual rate of increase for the pre-recession period and post-recession period were calculated for each entity:

Entity	Pre-recession 2002-2007		Post-recession 2013-2018	
	Percentage Change	Annual Rate of Change	Percentage Change	Annual Rate of Change
United States	31.09%	5.56%	23.97%	4.39%
Region	35.53%	6.27%	19.03%	3.55%
Oklahoma	41.65%	7.21%	9.66%	1.86%

3. The preceding table indicates that all three entities experienced a smaller percentage change and slower annual rates of change in the post-recession period. In particular, Oklahoma moved from the largest in both categories in the pre-recession period to the smallest in both categories in the post-recession period. The surrounding region remained in the middle during both periods.
4. The summary of the shift-share results (Table 3) indicates that, in the aggregate in the post-recession period, the combined personal income sectors are composed of slow-growth sectors (negative differential-compositional shares compared to both the nation and the region) and underperforming sectors (negative sector-competitive shares compared to both the nation and the region).
5. In the sector analysis of Oklahoma performance relative to the nation (Table 6) and region (Table 7), the state had negative sector-competitive shares in almost all its top ten sectors (all ten when compared to the United States and eight when compared to the region).
6. Four sectors: Transportation and Warehousing, Construction, Professional and Technical Services, and Dividends, Interest, and Rent, had positive differential-compositional shares compared to both the nation and region. However, in both comparisons, the positives were offset by a significant negative DCS component in the Mining sector.
7. A final observation is that future growth in Oklahoma personal income may be driven by fast-growth sectors identified directly above. In particular, two sectors: Transportation and Warehousing, an important sector regionally, and Construction, always important in economic recovery, seem to stand out as potentially strong sectors.

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