Aerospace Product and Parts Manufacturing Productivity

March 2013

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This article reports data on the aerospace product and parts manufacturing (APPM) sector[1] in Kansas and other selected states for the period 2007-2011. The data are principally based on information collected in the Annual Survey of Manufactures[2] conducted by the U.S. Census Bureau and the Quarterly Census of Employment and Wages from the Bureau of Labor Statistics.[3]

Kansas manufacturing is highly concentrated in the APPM sector. The private APPM sector[4] contributed to 28.1 percent of the manufacturing industry's total wages in Kansas and 20 percent of its employment.[5]

Given that Kansas APPM is important to the region's well-being, it is essential to examine the state's relative economic performance and competitiveness by analyzing that sector's level of productivity. Also, in order to have a better picture of Kansas APPM, this article compares Kansas to the APPM sectors in Alabama, Arizona, Connecticut, Missouri, Georgia, Texas, Washington, and Utah.

Aerospace Product and Parts Manufacturing Productivity, Definitions and Methodology

This article uses a measure of labor productivity based on value added per hour worked by production workers.[6]

Value added data are easily accessible and have been proven by previous research to be one of the best measures for comparing the relative economic importance of an industry and its productivity improvement, by determining the worth of the additional amount of labor input generated by that industry. The Census Bureau[7] clarifies that the value added data avoid duplication that might happen when using the value of goods sold data, such as cost of materials or value of shipments — same inputs can be counted twice if the products of one establishment are the materials of another.

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[1] The U.S. Census Bureau states that the APPM sector includes establishments predominantly involved in one or more of the following: aircraft, missile, or space vehicles manufacturing; aircraft engine and engine parts manufacturing; developing and making prototypes of aerospace products; aircraft conversion; and complete aircraft or propulsion systems overhaul and rebuilding. Source: U.S. Census Bureau, *2012 NAICS Definitions*, February 2013.

[2] Source: U.S. Census Bureau, *2007, 2008, 2009, 2010, and 2011 Annual Survey of Manufactures*, February 2013.

[3] Source: Bureau of Labor Statistics (BLS), *Quarterly Census of Employment and Wages (QCEW)*, March 2013.

[4] In this study, all the APPM data from BLS' QCEW are for the private sector only.

[5] Source: Bureau of Labor Statistics, *Quarterly Census of Employment and Wages*, March 2013.

[6] The U.S. Census Bureau cites that "The 'production workers' number includes workers (up through the line-supervisor level) engaged in fabricating, processing, assembling, inspecting, receiving, storing, handling, packing, warehousing, shipping (but not delivering), maintenance, repair, janitorial and guard services, product development, auxiliary production for plant's own use (e.g., power plant), recordkeeping, and other services closely associated with these production operations at the establishment covered by the report." U.S. Census Bureau, *2011 Annual Survey of Manufactures*, February 2013.

[7] The U.S. Census Bureau calculates this measure "by subtracting the cost of materials, supplies, containers, fuel, purchased electricity, and contract work from the value of shipments (products manufactured plus receipts for services rendered). The result of this calculation is adjusted by the addition of value added by merchandising operations (i.e., the difference between the sales value and the cost of merchandise sold without further manufacture, processing, or assembly) plus the net change in finished goods and work-in-process between the beginning- and end-of-year inventories. For those industries where value of production is collected instead of value of shipments, value added is adjusted only for the change in work-in-process inventories between the beginning and end of year. For those industries where value of work done is collected, the value added does not include an adjustment for the change in finished goods or work-in-process inventories."

Because there are part-time and overtime workers, as well as full-time, it is appropriate to calculate productivity as output per hour of labor.

Examining Kansas APPM productivity requires a comparison of Kansas to other states that have a similar manufacturing industry infrastructure. States for comparison were selected based on a high concentration in their APPM sector, using the location quotient technique. Location quotient is defined as a ratio between a percentage of regional industry employment and a percentage of national industry employment. It determines whether a geographic area has a greater share of an industry or a sector than the nation as a whole. A region is said to be specialized when its location quotient is higher than 1.20.

Table 1: Location Quotients for the APPM Sector by State in 2007 and 2011[8]

	2007	2011
Alabama	1.84	1.94
Arizona	2.88	2.96
Connecticut	5.21	5.05
Florida	0.69	0.71
Georgia	1.30	1.52
Kansas	8.41	6.58
Massachussets	1.02	0.98
Missouri	1.49	1.49
North Carolina	0.24	0.30
Ohio	0.85	0.85
Pennsylvania	0.44	0.56
South Carolina	0.13	0.68
Texas	1.30	1.24
Washington	7.60	8.12
Utah	1.90	1.36
Source: Bureau of Labor Statistics, February 2013.		

Table 1 indicates that Kansas', Connecticut's, and Washington's APPM sectors were the most concentrated in 2007 and 2011. Alabama, Arizona, Georgia, Missouri, Texas, and Utah also had a high concentration in the APPM sector.

[8] Location quotient = (Employment in APPM sector in state X/ Total employment in state X)/ (Employment in APPM sector in the United States/ Total employment in the United States)

Trends in States Aerospace Product and Parts Manufacturing Productivity

Alabama

- A significant share of APPM is located in the Huntsville, AL MSA.

	All APPM Employment (persons)		Total APPM Wages ($1,000)	
	2010	2011	2010	2011
Alabama	13,672	13,180	988,634	983,556
Huntsville MSA	4,392	4,123	413,441	398,288
MSA Percentage of State	32.12%	31.28%	41.82%	40.49%
Source: BLS, QCEW, February 2013.				

- APPM productivity in Alabama never represented more than 65.67 percent of the national average between 2007 and 2011 (Table 2).
- The state's productivity maintained an upward trend from 2007 through 2010, increasing by $52.61 per hour.
- In 2011, Alabama's APPM productivity was almost 44 percent lower than the average in the country.

Arizona

- More than half of all private employment and total wages in the APPM sector, in Arizona, was centralized in the Phoenix-Mesa-Scottsdale, AZ MSA in 2007 and 2008. The Tucson, AZ MSA also had a high concentration of employment in the APPM sector.[9]

	All APPM Employment (persons)		Total APPM Wages ($,1000)	
	2007	2008	2007	2008
Arizona	27,426	27,900	2,261,465	2,342,030
Phoenix-Mesa-Scottsdale MSA	15,175	15,244	1,168,695	1,196,471
MSA Percentage of State	55.33%	54.64%	51.68%	51.09%
Source: BLS, QCEW, February 2013.				

- Through the five-year period, Arizona had APPM productivity above the national average.
- Although Arizona had one of the highest levels of APPM productivity between 2007 and 2011 within the selected states, its productivity decreased by $1.32 per hour during that time period. Among the selected states, Arizona had the highest productivity the year the recession[10] started. But, the state's productivity growth declined by 6.5 percent in 2008 and 19.5 percent in 2009.
- In 2011, APPM output per hour of labor in Arizona was 27.9 percent higher than the United States' average.

[9] BLS does not disclose in its website the APPM employment and wages data for the Tucson MSA for the period 2007-2011.
[10] The recession started in December 2007 and ended in June 2009.

Table 2: APPM Productivity by State from 2007 to 2011

2007			
State	Productivity	Percent Change	Productivity Percentage of U.S. Average
Arizona	$ 330.79	-	147.95%
Utah	$ 240.78	-	107.69%
U.S. Average	$ 223.58	-	100.00%
Kansas	$ 171.21	-	76.58%
Texas	$ 161.55	-	72.25%
Alabama	$ 100.84	-	45.10%
2008			
State	Productivity	Percent Change	Productivity Percentage of U.S. Average
Washington	$ 348.75	N.A.	172.72%
Arizona	$ 309.37	-6.47%	153.21%
Utah	$ 224.06	-6.94%	110.96%
Texas	$ 204.15	26.37%	101.10%
U.S. Average	$ 201.92	-9.69%	100.00%
Connecticut	$ 185.66	N.A.	91.95%
Kansas	$ 155.44	-9.21%	76.98%
Georgia	$ 140.72	N.A.	69.69%
Alabama	$ 124.84	23.80%	61.83%
2009			
State	Productivity	Percent Change	Productivity Percentage of U.S. Average
Texas	$ 264.98	29.79%	119.99%
Arizona	$ 248.98	-19.52%	112.74%
Utah	$ 230.88	3.04%	104.55%
U.S. Average	$ 220.84	9.37%	100.00%
Connecticut	$ 211.98	14.18%	95.99%
Alabama	$ 145.03	16.17%	65.67%
Georgia	$ 128.48	-8.70%	58.18%
Kansas	$ 124.24	-20.07%	56.26%
Missouri	$ 118.12	N.A.	53.49%
2010			
State	Productivity	Percent Change	Productivity Percentage of U.S. Average
Utah	$ 338.71	46.70%	128.78%
Arizona	$ 328.02	31.75%	124.72%
Connecticut	$ 268.87	26.84%	102.23%
U.S. Average	$ 263.01	19.09%	100.00%
Texas	$ 207.32	-21.76%	78.83%
Kansas	$ 169.42	36.36%	64.42%
Georgia	$ 169.30	31.78%	64.37%
Missouri	$ 154.00	30.37%	58.55%
Alabama	$ 153.45	5.80%	58.34%
2011			
State	Productivity	Percent Change	Productivity Percentage of U.S. Average
Arizona	$ 329.47	0.44%	127.90%
Utah	$ 283.55	-16.29%	110.07%
U.S. Average	$ 257.60	-2.05%	100.00%
Texas	$ 240.53	16.02%	93.37%
Connecticut	$ 238.24	-11.39%	92.48%
Kansas	$ 193.24	14.06%	75.01%
Georgia	$ 167.81	-0.88%	65.14%
Alabama	$ 144.57	-5.79%	56.12%
Missouri	$ 125.73	-18.35%	48.81%

Notes: Productivity ($) is equal to Value Added ($1,000) / Production Worker Hours (1,000).
Percent change from the previous year.

Connecticut

- Approximately 64 percent of APPM employment and wages was focused in the Hartford, CT MSA in 2009. There is also a presence of the APPM sector in the Bridgeport-Stamford-Norwalk, CT MSA.[11]

	All APPM Employment (persons)	Total APPM Wages ($1,000)
	2009	
Connecticut	31,278	2,744,580
Hartford-West Hartford-East Hartford MSA	19,928	1,749,407
MSA Percentage of State	63.71%	63.74%
Source: BLS, QCEW, February 2013.		

- Connecticut APPM productivity was between 8.05 and 4.01 percent below the nation's average during the period 2008-2011,[12] excluding 2010.
- Connecticut productivity was not negatively affected during the recession; in fact, it grew by 14.18 percent from 2008 to 2009. The only year when the state's APPM productivity was above the national average was 2010 when it reached $268.87 per hour.
- APPM productivity in Connecticut lost ground in 2011 when it declined to $238.24.

Georgia

- The APPM sector in the Atlanta-Sandy Springs-Marietta, GA and Savannah, GA MSAs represented a substantial source of wages and employment for Georgia. In 2011, almost three-fourths of all employees and total wages in the state's APPM sector were located in these two areas.

	All APPM Employment (persons)		Total APPM Wages ($1,000)	
	2010	2011	2010	2011
Georgia	20,181	21,673	1,548,486	1,720,578
Atlanta-Sandy Springs-Marietta MSA	N.A.	8,698	N.A	761,923
MSA Percentage of State	N.A.	40.13%	N.A	44.28%
Savannah MSA	6,760	7,345	544,918	630,981
MSA Percentage of State	33.50%	33.89%	35.19%	36.67%
Source: BLS, QCEW, February 2013.				

- Georgia APPM productivity never surpassed the national average between 2008 and 2011.[13]
- Its productivity varied through the years compared to the other selected states. Georgia productivity growth declined by 8.7 percent between 2008 and 2009, and 0.9 percent between 2010 and 2011. Nonetheless, it increased by 31.8 percent between 2009 and 2010.
- Georgia reached its highest level of productivity in 2010 with $169.30 per hour.

[11] BLS does not disclose in its website the APPM employment and wages data for the Bridgeport-Stamford-Norwalk MSA the period 2007-2011.
[12] The 2007 Annual Survey of Manufactures does not disclose the value added data for the state of Connecticut.
[13] The 2007 Annual Survey of Manufactures does not disclose the value added data for the state of Georgia.

Kansas

- Most APPM is centralized in the Wichita area. Wichita's APPM sector is a significant source of wages in the state, 94.16 percent of total APPM wages in 2011. The APPM sector in the MSA also contributed 93.72 percent of all private APPM employees in Kansas the same year.

	All APPM Employment (persons)		Total APPM Wages ($1,000)	
	2009	2011	2009	2011
Kansas	37,464	32,196	2,509,632	2,357,514
Wichita MSA	35,198	30,174	2,373,771	2,219,953
MSA Percentage of State	93.95%	93.72%	94.59%	94.16%
Source: BLS, QCEW, February 2013.				

- APPM productivity in Kansas was at least 23.02 percent below the national average in all years.
- Productivity declined at a growing rate during the recession; in fact, it decreased by 9.2 percent between 2007 and 2008, and 20.1 percent between 2008 and 2009. Besides, Kansas had one of the lowest APPM productivity levels among the comparison states in 2009 ($124.24). Productivity increased to $169.42 in 2010, and rose again in 2011 to $193.24, its highest level of productivity in the years reviewed. Subsequently, most of the increase in APPM productivity in Kansas through the study period happened during the recovery.

Missouri

- The St. Louis, IL-MO MSA had the highest concentration of APPM employment in Missouri. At least 94.75 percent of Missouri's APPM employment and wages were generated in St. Louis in 2007 and 2011.

	All APPM Employment (persons)		Total APPM Wages ($1,000)	
	2007	2011	2007	2011
Missouri	14,560	14,490	1,254,541	1,407,020
St. Louis MSA	14,005	13,729	1,230,052	1,370,098
MSA Percentage of State	96.19%	94.75%	98.05%	97.38%
Source: BLS, QCEW, February 2013.				

- From 2009 to 2011, Missouri had APPM productivity below the national average.[14]
- Output per hour of labor in the state was seriously impacted during the recovery when it fell by 18.35 percent between 2010 and 2011. This was the highest decline in productivity during that time period compared to the other states.

[14] The 2007 and 2008 Annual Surveys of Manufactures do not disclose the value added data for the state of Missouri.

Texas

- More than 70 percent of Texas APPM employment and wages was created in the Dallas-Fort Worth-Arlington, TX MSA in the years reviewed.

	All APPM Employment (persons)		Total APPM Wages ($1,000)	
	2007	2011	2007	2011
Texas	47,871	48,391	3,744,806	4,266,528
Dallas-Fort Worth-Arlington MSA	34,559	35,810	2,898,679	3,350,394
MSA Percentage of State	72.19%	74.00%	77.41%	78.53%
Source: BLS, QCEW, February 2013.				

- The only years when APPM productivity in Texas was above the nation's average were 2008 ($204.15) and 2009 ($264.98).
- Texas experienced the fastest growth (48.89 percent) through the study period. Unlike the other selected states, most of the increase in APPM productivity happened during the recession when it rose by 64.02 percent between 2007 and 2009.
- Output per hour of labor grew by 16.02 percent during the period 2010-2011.

Washington

- The Seattle-Tacoma-Everett, WA MSA centralized 97.68 percent of Washington's APPM employment in 2011, but also generated 98.53 percent of the state's total wages the same year.

	All APPM Employment (persons)		Total APPM Wages ($1,000)	
	2007	2011	2007	2011
Washington	80,036	86,577	6,941,926	8,416,589
Seattle-Tacoma-Everett MSA	78,210	84,566	6,837,002	8,292,605
MSA Percentage of State	97.72%	97.68%	98.49%	98.53%
Source: BLS, QCEW, February 2013.				

- With the exception of 2008, the productivity data for Washington was withheld for all years.[15] In 2008, Washington had a very high output per hour of labor ($348.75) within the selected states. At that time, productivity in the state was $146.83 above the average for the nation.

Utah

- The APPM sector in Utah has an important presence in the Brigham City, UT micropolitan area.[16]
- Utah APPM productivity was at least 4.6 percent higher than the national average in all years.
- Productivity fell by $16.72 per hour in Utah between 2007 and 2008. Then, APPM productivity increased by approximately 47 percent between 2009 and 2010.

[15] The 2007, 2009, 2010, and 2011 Annual Surveys of Manufactures do not disclose the value added data for the state of Washington.
[16] BLS does not disclose in its website the APPM employment and wages data for the Brigham City area for the period 2007-2011.

- Productivity in Utah APPM did not keep the pace the following year, when it dropped to $283.55 per hour.

Key Findings

Through the study period, APPM productivity was the highest in Arizona, Utah, and Washington and was the lowest in Alabama, Georgia, and Missouri. Although productivity in Arizona was always at a minimum of 12.74 percent above the nation's average, its productivity decreased by $1.32 per hour from 2007 to 2011. Productivity increased for the other compared states during the same period. Texas had the highest productivity growth (48.89 percent).

Arizona, Kansas, and Utah were most affected during the recessionary period. Their APPM productivity dropped by more than 6.00 percent between 2007 and 2008.

Productivity growth was much faster during the recovery than during the recession. In 2010, output per hour of labor growth accelerated at a minimum of 5.80 percent in all states analyzed in this study, except in Texas where productivity growth decreased by 21.76 percent. This positive change was the most substantial in Kansas and Utah where productivity rose by $45.18 and $107.83 per hour, respectively. Nonetheless, productivity started to slow after the first year in recovery across the nine states, especially in Missouri where productivity fell by 18.35 percent between 2010 and 2011. Only Kansas and Texas had productivity growth higher than 14 percent during this period.

Kansas APPM productivity was under the United States average from 2007 to 2011. APPM productivity decreased greatly the last year of the recession by $31.20 per hour. This was the largest loss in productivity for the state of Kansas, in the years reviewed. However, productivity went up by $69 per hour during the recovery. Except in 2009, output per hour of labor in Kansas was above Alabama in all years, and above Georgia between 2008 and 2011. As well, Kansas output per hour of labor was always above Missouri from 2009 through 2011.