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Ohio Manufacturing Update

Manufacturing is a crucial part of Ohio's economy, providing 13 percent of the state's jobs and 17 percent of gross domestic product – each well in excess of the corresponding national average. The output and sales of Ohio's factories brings wealth into the state from the nation and the world. The recovery that began in 2009 has featured the first sustained manufacturing employment growth in 20 years.

On the Money last surveyed Ohio's manufacturing sector in the February 14, 2014 issue (Vol. 130, No. 27). The primary findings of that analysis were that Ohio manufacturing employment was growing faster than average, but that the state's manufacturing productivity was far below average. With the national and state economic expansion continuing over the last year and a half, it is time to revisit this vital sector. The earlier article focused on state-level trends; this article delves into trends and characteristics of manufacturing at the regional level.

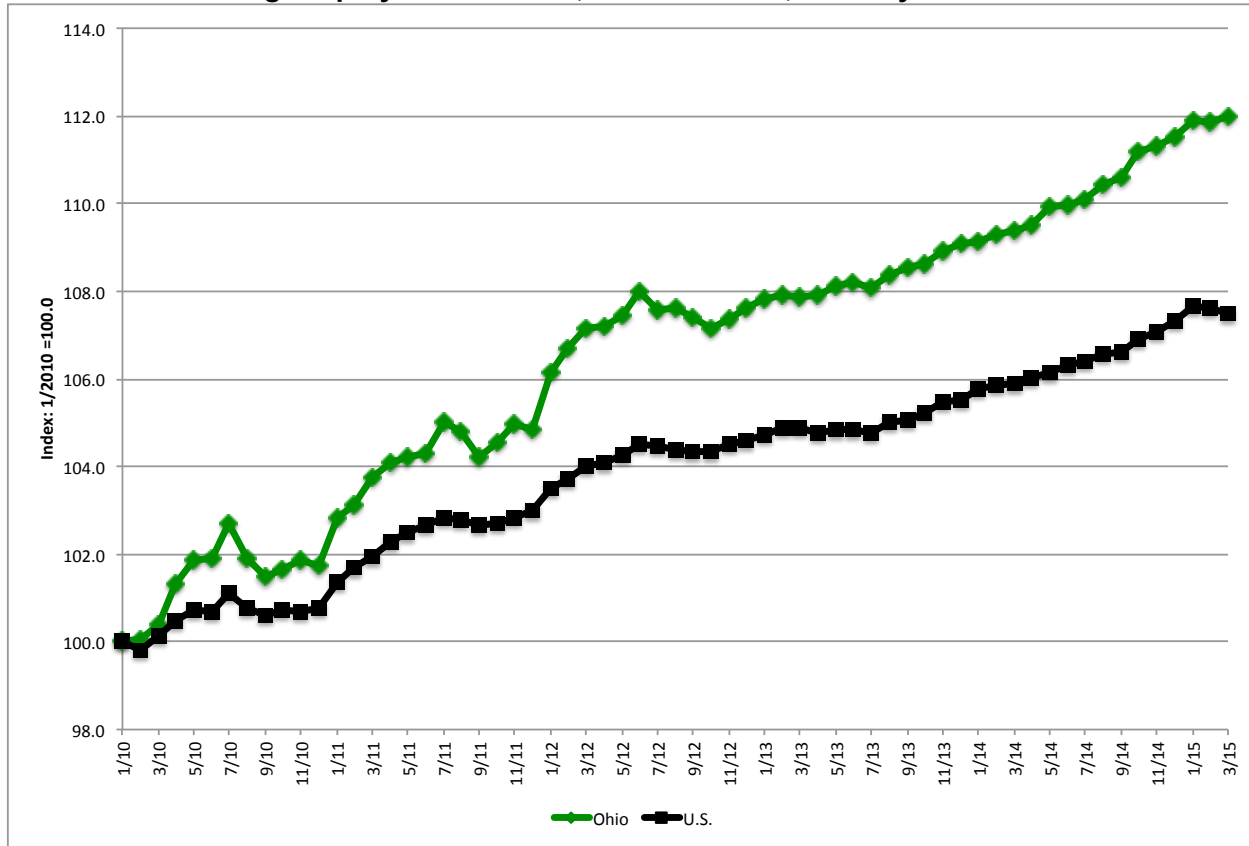
Employment Trends

Figure 1 on the next page compares monthly Ohio manufacturing employment growth to the U.S. average from January 2010 (the beginning of the employment recovery) through March 2015. The chart is constructed by converting each employment series to index values, with state and national employment in January 2010 set to 100. The result is a chart comparing cumulative employment growth. These are seasonally-adjusted employment totals from the Quarterly Census of Employment and Wages, so they are highly accurate counts of total employment.

Although Ohio employment growth has continued faster than average throughout the period, both national and state growth has decelerated. This is a recurring trend in manufacturing, as the substitution of technology for labor allows more output from the same number – or fewer – workers. It is like using a lever to lift a heavy weight: the longer the lever, the more weight that can be lifted.

This increasing reliance on technology makes Ohio manufacturers more competitive, but it means that job growth can be small or even negative as the sector's output continues to expand. This happened with a vengeance in the employment expansion of 2001-2007, with output increasing 12 percent even as employment declined 18 percent. This same trend happened nationwide, with output expanding 25 percent and employment contracting 14 percent.

Figure 1
Manufacturing Employment Growth, Ohio and U.S., January 2010 – March 2015



Source: Quarterly Census of Employment and Wages, U.S. Bureau of Labor Statistics, seasonally adjusted by Regionomics.

Manufacturing Characteristics and Trends in Ohio's Regions

Manufacturing employment comprises a larger-than-average share of employment in 73 of Ohio's 88 counties. Manufacturing employment shares range from a low of 2.2 percent of wage and salary employment in Monroe County to a high of 44.5 percent in Shelby County. Among the six large metro counties, manufacturing is 9.8 percent of total employment in Cuyahoga County, 5.1 percent in Franklin County, 9.6 percent in Hamilton County, 11.1 percent in Lucas County, 10.4 percent in Montgomery County, and 11.4 percent in Summit County. Each of these employment shares is less than that of the corresponding MSA, while the four counties with the smallest employment shares are all in Southeastern Ohio. The fact common to these two observations is that large tracts of low-cost, developable land are less common in these counties. Land is more expensive nearer to large cities. Although land is relatively inexpensive in the Southeast, the hilly terrain makes the cost of development high. In contrast, the flat terrain of Northwestern Ohio is certainly one reason why manufacturing is more heavily concentrated there.

The regional diversity of Ohio's economy makes a study of manufacturing at the regional level important. This study makes use of the familiar 13 regions that have been used consistently in these articles. These include the six largest Metropolitan Statistical Areas (MSAs) and seven other areas encompassing smaller MSAs and rural areas, and designated on the basis of some

level of economic similarity among adjacent counties – primarily based on manufacturing and agriculture. The regions are mapped in Figure 2.

**Figure 2
Ohio Regions**



Northwest Toledo MSA West North Central Cleveland MSA Akron MSA
 Northeast West Columbus MSA East North Central Dayton MSA
 Cincinnati MSA South Southeast

Table 1 summarizes basic characteristics of manufacturing employment in these 13 regions. The table presents the region’s 2014 annual average manufacturing employment, the percentage of total wage and salary employment, the manufacturing employment location quotient, and employment change between 2010 and 2014. Location quotient is the percentage of total local employment in manufacturing divided by the total U.S. percentage in manufacturing. Thus, a location quotient greater than 1.00 indicates that manufacturing accounts for a larger-than-average share of total employment in the region.

Table 1
Regional Manufacturing Employment, Concentration, and Growth

Region	Employment	Pct.of total	Location quotient	Chng. 2010-2014
US	12,155,092	8.9%	1.000	5.8%
Ohio*	674,229	13.0%	1.462	8.7%
Northeast	71,848	15.8%	1.777	9.3%
Southeast	11,231	9.0%	1.011	-9.3%
South	19,301	13.6%	1.529	-0.6%
West	70,708	25.8%	2.899	18.2%
Northwest	21,641	30.6%	3.437	17.4%
West North Central	48,312	22.9%	2.569	7.6%
East North Central	30,483	27.4%	3.079	15.7%
Akron	39,592	12.6%	1.418	6.0%
Cincinnati**	85,460	10.8%	1.218	3.4%
Cleveland	123,780	12.5%	1.404	6.2%
Columbus	69,789	7.3%	0.820	8.0%
Dayton	38,833	11.0%	1.231	8.6%
Toledo	42,294	14.9%	1.676	19.0%
Total non-MSA	273,524	19.7%	2.214	10.7%
Total MSA	399,748	10.8%	1.218	7.3%

*Includes 957 jobs not assigned to any county. **Ohio counties only.

Source: Quarterly Census of Employment and Wages, U.S. Bureau of Labor Statistics.

As noted earlier, manufacturing employment is particularly concentrated in the Northwest, but also in the West and East North Central regions. Central Ohio's Columbus MSA is the only region of the state with a below-average manufacturing concentration. However, this is true only in Delaware and Franklin Counties; manufacturing provides a greater-than-average share of employment in each of the other eight counties of the MSA. Manufacturing is 29 percent of total Union County employment, 15th highest in the state. In general, manufacturing employment is more heavily concentrated outside of the state's six largest MSAs.

Employment growth exceeded the national average in most regions, with growth particularly vigorous in the West, Northwest, East North Central, and the Toledo MSA. Cincinnati turned in disappointing growth of only 3.4 percent, however, and the South and Southeast suffered employment declines.

The two panels of Table 2 show the location quotient of each of the 21 primary manufacturing subsectors within the state as a whole and the 13 regions. Cells are shaded yellow in cases where the location quotient is 1.50 or greater – in other words, where regional employment in that subsector is at least 50 percent greater than would be expected. As can be seen, different regions have different focus areas within manufacturing.

Table 2
Relative Concentration of Manufacturing Subsectors by Region, March 2013

	Ohio	Akron	Cincinnati*	Cleveland	Columbus	Dayton	Toledo
Mfg. total	1.483	1.502	1.096	1.471	0.787	1.348	1.470
Food	0.972	0.581	0.873	0.561	0.533	0.651	0.657
Beverages	0.765	1.534	1.351	0.444	1.265	0.386	0.006
Textile mills	0.317	0.187	0.354	0.156	0.098	0.071	0.040
Textile products	0.680	0.196	1.169	0.401	0.243	0.334	1.990
Apparel	0.141	0.562	0.075	0.138	0.014	0.435	0.095
Leather products	1.289	0.017	0.319	0.313	0.000	0.014	0.000
Wood products	0.761	0.207	0.255	0.227	0.464	0.306	0.492
Paper	1.388	1.299	1.727	1.085	0.833	1.128	1.303
Printing	1.305	1.951	1.784	1.270	0.920	1.725	1.584
Petroleum & coal products	1.345	0.210	1.268	1.337	0.321	0.206	6.799
Chemicals	1.466	2.480	1.841	1.824	1.069	0.613	1.082
Plastics & rubber	2.297	4.627	0.903	1.622	1.128	1.461	1.902
Mineral products	1.695	0.765	0.846	0.869	2.079	0.757	3.780
Primary metals	2.707	1.568	1.548	3.120	0.752	0.939	1.418
Metal products	1.873	2.046	1.192	2.839	0.714	2.225	1.713
Machinery	1.807	1.876	1.221	2.170	0.576	2.566	1.056
Computers & electronics	0.713	1.164	0.665	1.107	0.391	1.712	0.691
Appliances	1.832	1.486	0.992	1.285	0.508	1.296	0.801
Transportation equipment	1.867	0.749	1.208	1.195	1.189	2.190	2.943
Furniture	0.994	0.264	0.635	1.027	0.410	0.674	3.461
Miscellaneous	1.027	1.601	0.807	1.485	0.742	1.037	0.567

	Northeast	Southeast	South	West	Northwest	WNCentral	ENCentral
Mfg. total	1.901	1.124	1.503	2.986	3.589	2.916	3.101
Food	1.653	1.116	2.088	1.961	3.641	1.556	3.309
Beverages	0.493	0.171	0.865	0.358	0.364	0.293	0.806
Textile mills	0.148	0.000	0.373	0.386	0.297	2.957	1.684
Textile products	0.779	1.728	0.008	0.493	1.236	0.408	2.893
Apparel	0.027	0.170	0.049	0.097	0.017	0.285	0.066
Leather products	9.924	0.000	0.000	0.161	2.651	0.000	11.952
Wood products	1.534	1.437	2.815	1.417	1.178	0.570	7.874
Paper	1.287	1.379	3.534	2.011	2.515	2.140	2.933
Printing	0.808	0.495	0.714	1.403	0.657	2.041	1.326
Petroleum & coal products	1.447	0.292	1.754	1.962	1.659	1.689	2.191
Chemicals	1.141	2.006	1.661	1.501	1.420	1.667	1.226
Plastics & rubber	2.799	1.169	1.455	6.234	8.995	7.734	4.701
Mineral products	2.238	2.646	1.580	1.776	5.830	3.633	4.107
Primary metals	8.277	5.567	2.036	3.742	9.261	3.719	4.670
Metal products	2.678	0.898	0.817	2.527	4.282	2.628	2.968
Machinery	2.040	1.911	0.734	4.554	3.506	2.819	4.877
Computers & electronics	0.169	0.125	0.424	0.133	0.199	1.226	0.406
Appliances	1.661	0.635	0.829	5.506	3.958	14.834	1.193
Transportation equipment	2.158	0.436	2.962	6.275	5.567	3.246	2.860
Furniture	0.778	0.461	0.187	1.963	1.474	1.238	5.140
Miscellaneous	0.859	0.346	1.566	0.653	2.014	0.817	2.706

*Ohio counties only. Shading denotes location quotients 1.50 or greater.

Source: County Business Patterns, U.S. Census Bureau.

Deriving employment totals at the level of detail needed to construct Table 2 is a significant challenge. Data for individual employers are confidential, so no government database provides industry-level data in cases where an individual firm's employment total could be inferred from the industry total. The fact that there are many counties – including large counties – with only one or two manufacturers in a given industry means many suppressed values. These values cannot be reliably inferred from the Quarterly Census of Employment and Wages.

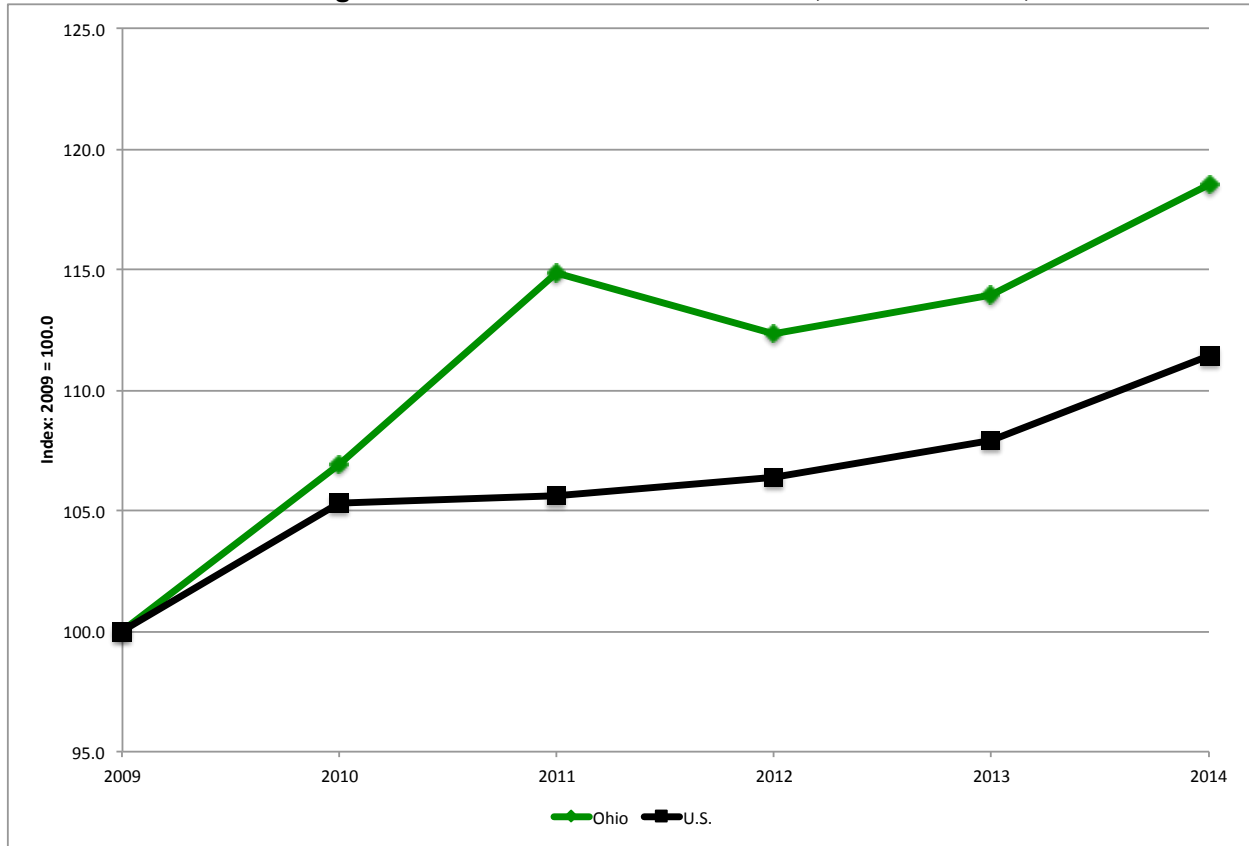
However, a different database, the Census Bureau's County Business Patterns, provides a count of establishments by employment size range for all industries, including those with suppressed employment. Assuming that all establishments in a given size range have employment at the midpoint of the size range and summing the midpoints across establishments gives a first-pass estimate of subsector employment within a county whose employment is suppressed. The resulting estimates are balanced across subsectors and across counties to ensure that employment of the subsectors within the county sum to the county manufacturing total and that the totals in a given subsector sum to the subsector's statewide total. Finally, County Business Patterns omits government employment. This means that the county employment totals include private-sector employment only and thus cannot be used to calculate location quotients. These are calculated instead using total county employment from the Quarterly Census of Employment and Wages for March 2013 – the date of the County Business Patterns data. The resulting estimates are in no way exact, but are likely close enough to yield reliable conclusions.

Ohio Manufacturing Output Trends

The increasing adoption of technology in manufacturing has resulted in output becoming far less closely linked to employment than in earlier years. However, output trends are important in assessing the ability of Ohio manufacturing to attract wealth to the state's economy and to provide indirect employment among suppliers. They are also needed to measure the productivity of the workforce.

The February 14, 2014, issue of *On the Money* presented a decade-long view of growth in Ohio and U.S. manufacturing Gross Domestic Product (GDP). This analysis showed that Ohio manufacturing GDP growth seriously lagged the national average during the 2001-2007 expansion and suffered a larger-than-average decline in the recession. Figure 3, however, focuses on output trends beginning in 2009 and presents a far more positive view. Despite stumbling in 2012, Ohio manufacturing GDP increased 18.5 percent after inflation between 2009 and 2014, compared to 11.4 percent growth at the national level.

Figure 3
Real Manufacturing Gross Domestic Product Growth, Ohio and U.S., 2009-2014



Source: U.S. Bureau of Economic Analysis.

Table 3 shows GDP levels, concentration, and growth at the subsector level. Note that these totals are for 2013 rather than 2014; GDP estimates at the subsector level are not yet available for 2014. Location quotients here are calculated in the same way as in earlier tables, except that they are calculated on the basis of total state and national GDP rather than employment. A number of GDP location quotients are significantly different from the corresponding employment location quotients because of differences in output per worker among different subsectors. GDP growth comparisons are favorable for many subsectors; motor vehicles stand out because of the near-idling of assembly lines during the recession. However, the news is not good for chemical products and several smaller subsectors.

Table 3
Manufacturing Subsector GDP, Concentration, and Net Change

Subsector	GDP (millions) 2013	Loc. quotient	Net change, 2009-2013*	
			Ohio	U.S.
Manufacturing	\$ 95,503	1.394	14.0%	7.9%
Durable goods mfg.	52,511	1.428	37.0%	24.6%
Wood products mfg.	661	0.755	-17.1%	6.9%
Nonmetallic mineral products mfg.	2,771	2.036	17.8%	5.0%
Primary metals mfg.	5,655	2.633	74.5%	41.6%
Fabricated metal products	10,682	2.260	21.4%	18.3%
Machinery mfg.	7,825	1.602	33.2%	21.6%
Computer & electronic products mfg.	2,471	0.287	38.7%	19.4%
Electrical equipmt. & appliance mfg.	3,497	2.047	-14.1%	-3.0%
Motor vehicles and parts mfg.	11,744	2.520	212.0%	209.2%
Other transportation equipment mfg.	4,467	1.073	-12.0%	4.1%
Furniture and related products mfg.	831	0.998	-10.1%	7.4%
Miscellaneous mfg.	1,908	0.685	-5.8%	0.1%
Nondurable goods mfg.	42,991	1.354	-7.0%	-7.8%
Food and beverage mfg.	10,947	1.379	1.5%	-9.5%
Textile mills and textile product mills	369	0.650	19.5%	3.2%
Apparel, leather & allied prods. mfg.	120	0.341	-28.6%	5.5%
Paper products mfg.	1,776	1.012	-26.1%	-18.5%
Printing and related support activities	1,730	1.390	-9.7%	0.6%
Petroleum and coal products mfg.	10,472	1.827	-7.7%	-21.4%
Chemical products mfg.	11,825	1.013	-17.9%	-4.2%
Plastics and rubber products mfg.	5,754	2.322	11.2%	10.2%

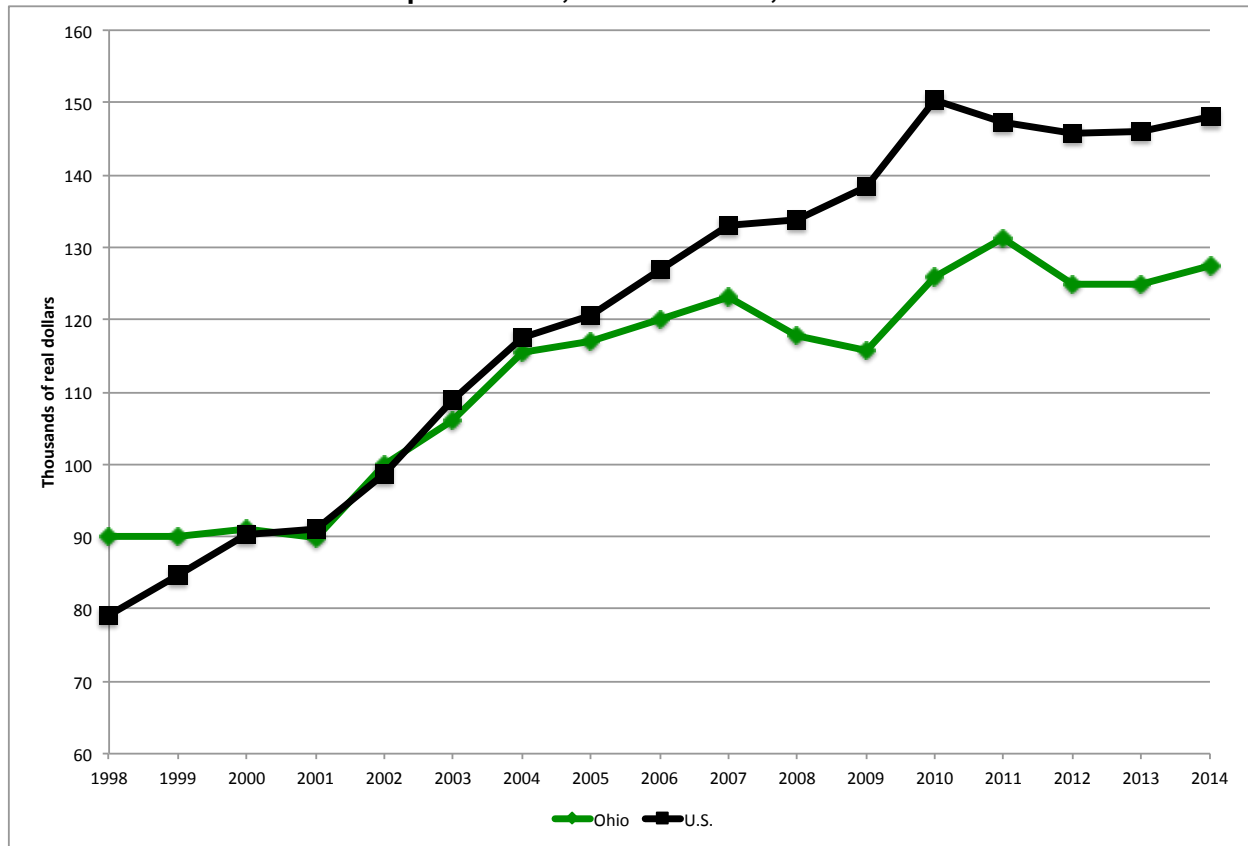
*Excluding inflation.

Source: U.S. Bureau of Economic Analysis.

Earlier articles have called attention to the unfavorable comparison between manufacturing GDP per worker (a key measure of productivity) in Ohio and nationally. As Figure 4 makes clear, the situation has not improved. GDP per worker in Ohio was equal to or greater than average through 2004, and then began to lag. By 2014, Ohio GDP per worker was \$127,000 annually (in 2009 dollars), 14 percent less than the \$148,000 national average. This carries negative implications for the competitiveness of Ohio manufacturing, and may suggest that employment growth is due for a further slowdown.

It might be alleged that this productivity difference is due to the fact that the composition of Ohio manufacturing is different from that elsewhere. But even if Ohio productivity were not equal to the national average a decade ago and is now significantly less, many subsector comparisons (using the 2013 data) are also unfavorable. This includes machinery, computers, motor vehicles, and especially chemicals. However, food, beverage, and petroleum and coal products manufacturing workers in Ohio are far more productive than their counterparts elsewhere.

Figure 4
GDP per Worker, Ohio and U.S., 1998-2014



Source: Calculated from U.S. Bureau of Economic Analysis data.

Workforce Development in Manufacturing

Ultimately, a large part of the solution to Ohio’s manufacturing productivity problem likely lies in ensuring a steady stream of appropriately trained workers. This point was discussed in an earlier manufacturing analysis (*On the Money*, December 7, 2012, Vol. 129, No. 50) but the point bears repeating: If well-trained workers are not available, the firms in the industry – and hence the state’s economy – will not achieve its growth potential. Firms are less profitable than they could be, and some might decide to transfer operations to locations that offer a better workforce supply.

When analyzing the need for workforce, it is important to understand that this need includes not only workers to fill newly-created positions but also those to replace who are promoted, leave the industry, leave the area, die, or retire. This replacement need can give rise for a need for thousands of workers in a region over the coming years, even when expected growth is minimal or negative. Because of the rise of technology, manufacturers require workers with a far higher skill level than was the case 20 or 25 years ago. Workers do not necessarily need a college degree, but often do need focused technical training. The rapid expansion of technology also requires the repeated retraining of incumbent workers.

The author recently completed a study of workforce needs for Ohio University Regional Higher Education, which included several focus groups of manufacturing leaders in Southeastern Ohio.

These leaders – as well as those in earlier conversations – repeatedly identified deficiencies in “soft skills” as a major barrier to filling positions with successful workers. Soft skills include punctuality, attention to detail, the ability to work effectively in organized teams, professionalism, problem-solving and listening skills, and the ability to communicate effectively with superiors and peers. Because of the importance of teams in manufacturing, employers increasingly look for workers with leadership skills, or at least leadership potential. The lack of these skills can cost efficiency and output, and in some cases can be dangerous. Any effective manufacturing job training program must therefore develop these skills along with developing technical skills.

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