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Manufacturing in Ohio

Ohio is still very much a state that makes things. The 638,000 workers employed in manufacturing place Ohio third among the states in terms of total manufacturing employment, behind only California and Texas. As the analysis in this article will show, manufacturing is a constant throughout Ohio's diverse economies – including that of Central Ohio.

Status of Manufacturing at the National and State Level

The past decade was not kind to manufacturing employment nationwide or in Ohio. As Exhibit 1 shows, manufacturing employment fell throughout the decade. This chart shows employment on an index basis, so it plots cumulative employment changes beginning in 2001. While total employment grew 6.3 percent nationally from August 2003 (the labor market trough following the 2001 recession) through January 2008, U.S. manufacturing employment declined 4.5 percent. Ohio's manufacturing employment decline over that period was 8.8 percent. Recessionary declines from January 2008 through December 2009 subtracted a further 16.6 percent from U.S. employment and 19.6 percent from employment in Ohio. But for a change, manufacturing employment has increased in the current recovery. U.S. manufacturing employment is up 4.2 percent, while Ohio employment is up 7.4 percent. These are the first sustained manufacturing employment increases since the early 1990s.

This is a well-known story; the story in Exhibit 2 is less well-known. This shows cumulative changes in the value of the output (gross domestic product) of these manufacturers over the same period. National manufacturing output grew steadily until the recession, increasing 27.6 percent between 2001 and 2007. Dividing output by employment gives output per worker – a key measure of productivity. This increased 49.2 percent nationwide between 2001 and 2007 and 73 percent between 2001 and 2011. The implication is that while shifting production overseas certainly did occur during this period, it was not the driving factor behind the employment declines in Exhibit 1. These jobs did not move out of the country; they disappeared altogether as employers substituted technology for labor in their production processes. (If production transfers overseas were the controlling factor, output would have stagnated or declined rather than increasing.)¹

¹ A more correct way of measuring this effect is to use the value added by manufacturers rather than total output. However, value added is not available at the state level, and performing the analysis at the national level produces almost exactly the same productivity growth (47.7 percent between 2001 and 2007 rather than 49.2 percent).

Exhibit 1
Manufacturing Employment Growth, Ohio and U.S., 2001-2011



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

Exhibit 2
Manufacturing Output Growth in Constant Dollars, Ohio and U.S., 2001-2011



Source: Gross Domestic Product by State, U.S. Bureau of Economic Analysis.

The output growth of Ohio manufacturers prior to the recession is much less favorable. Growth was similar to the U.S. until mid-decade, when it stagnated. (This corresponds to the beginning of the sharper-than-average Ohio manufacturing employment declines plotted in Exhibit 1.) The net effect is output growth of only 10.8 percent from 2001 to 2007 and increase in output per worker of 35.1 percent rather than 49.2 percent. The employment contraction during the recession was more severe at the state level, but so was the output decline. Ohio output per worker fell 14.7 percent between 2007 and 2009, compared to only 1.2 percent nationally. Productivity growth resumed after the recession ended, increasing 16 percent in Ohio, close to the 17.3 percent national average.

An important implication of this analysis is that we cannot expect U.S. or Ohio manufacturing employment gains to continue at their current pace. It was the adoption of new technology that enabled manufacturers to generate the output gains shown in Exhibit 2. It may be that the employment growth that has occurred in manufacturing since the beginning of 2010 is due to production processes hitting a productivity wall; the 49 percent increase in only six years is enormous. As new technologies take hold, the tradeoff between technology and labor will likely cause employment growth to level off and eventually reverse. The national and statewide manufacturing employment declines experienced since August may be the beginning of this longer-term trend. It will be important to keep in mind that the health of the underlying firms will be better than what the employment trend will suggest. However, the employment trend does create a set of workforce and community challenges that are discussed later in this article.

The Role of Manufacturing in Ohio's Regional Economies

The key theme of the August 10 and October 12 issues of *On the Money* (Volume 129, No. 42 and 46, respectively) was that Ohio consists of a set of very different regional economies. Accordingly, no survey of Ohio manufacturing is complete without exploring the employment trends and composition of the manufacturing sector at the regional level. The August 10 issue considered the six largest Metropolitan Statistical Areas (MSAs) – Akron, Cincinnati, Cleveland, Columbus, Dayton, and Toledo – while the October 12 issue developed a regional breakdown of Ohio's smaller MSAs and rural counties. The map of these regions is reproduced in Exhibit 3 on page 4. This yields a total of 13 regions to be analyzed – the seven regions mapped in Exhibit 3 plus the six MSAs.

Exhibit 4 on page 4 shows manufacturing employment changes for each of these areas prior to, during, and after the recession. Among the six MSAs, only the Ohio portion of the three-state Cincinnati MSA outperformed the national average for the total period, despite barely growing in the recovery. On the other hand, Dayton lost half its manufacturing jobs between 2001 and 2010 before enjoying growth in the recovery nearly twice the national average. Among the seven regions outside the large MSAs, Western and East North Central Ohio each outperformed the national average changes before and after the recession; the East North Central region also did better than average during the recession. Southeastern Ohio suffered the worst employment decline of any of the 13 regions prior to the recession and continued to underperform during the recession. But like the Dayton MSA, the Southeast recovered strongly between 2010 and 2011, charting by far the best growth of any region. Even this wasn't enough to reduce its employment loss for the decade below 40 percent.

Exhibit 3 Ohio Regions



■ MSA
 ■ Northeast
 ■ Southeast
 ■ South
 ■ West
 ■ Northwest
■ West North Central
 ■ East North Central

Exhibit 4 Regional Manufacturing Employment Changes Between Troughs and Peaks

	2001-2007	2007-2010	2010-2011	2001-2011
US	-15.6%	-17.0%	1.9%	-28.6%
Ohio	-19.3%	-19.6%	2.8%	-33.3%
Northeast	-24.6%	-21.7%	4.9%	-38.1%
Southeast	-30.7%	-22.4%	6.9%	-42.5%
South	-15.8%	-22.3%	1.0%	-33.8%
West	-9.8%	-17.5%	3.3%	-23.1%
Northwest	-15.0%	-22.8%	3.2%	-32.3%
West North Central	-19.3%	-22.1%	3.6%	-34.9%
East North Central	-13.4%	-14.5%	2.0%	-24.5%
Akron	-17.8%	-20.1%	3.6%	-32.0%
Cincinnati*	-14.0%	-15.8%	0.2%	-27.4%
Cleveland	-20.9%	-18.2%	2.8%	-33.5%
Columbus	-19.2%	-17.8%	1.8%	-32.4%
Dayton	-27.8%	-27.3%	4.4%	-45.2%
Toledo	-18.8%	-21.3%	4.4%	-33.2%
Total non-MSA	-18.5%	-20.3%	3.6%	-32.7%
Total MSA	-19.6%	-19.2%	2.5%	-33.4%

*Ohio counties only.

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

Regional Economic Structure of Ohio Manufacturing

The two panels of Exhibit 5 show the structure of manufacturing employment within the state as a whole, each of the six large MSAs, and the seven other regions in terms of relative employment concentration of each of the 21 primary manufacturing subsectors. Relative concentration is the percentage of total local employment in a given sector divided by the total U.S. percentage in that sector. Thus, a relative concentration greater than 1.00 indicates a sector with a larger-than-average share of total regional employment.

Deriving employment totals at this level of detail for individual counties 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 can be inferred. 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. These 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, so the county employment totals include private-sector employment only and thus cannot be used to calculate relative concentration. This is calculated instead using total county employment from the Quarterly Census of Employment and Wages for March 2010 – the date of the County Business Patterns data. The resulting estimates are not exact, but are likely close enough to yield reliable conclusions.

The first point to note is one that was made in the October 12 issue of *On the Money*: manufacturing employment is much more heavily concentrated in smaller MSAs and rural counties than in the major MSAs. The relative concentration of manufacturing in the six largest MSAs is 1.214, meaning that manufacturing employment is 21.4 percent greater than average. In the remainder of the state, however, relative concentration is 2.149, implying that manufacturing employs more than twice the number expected. But a scan across the rows of the table makes clear how different the manufacturing makeup is from one region to the next. Even this obscures considerable variability within the regions. For example, manufacturing's relative concentration in the Columbus MSA is 0.79, but Franklin County's is 0.54, Licking County's is 2.37 and Union County's is 2.68.

Food manufacturing is one of the sectors that is particularly focused outside the major MSAs. In part, this may be to take advantage of proximity to agricultural areas. On the other hand, one of the highest concentrations of beverage manufacturing is in Columbus – including the Anheuser-Busch brewery. Plastics are important in most regions, both inside and outside the major MSAs. The high concentrations in primary metals in a number of especially smaller regions testify to the fact that Ohio is still very much a metal-producing state. Fabricated metal products are also a focus in many regions, as are machinery and appliances. Transportation equipment (motor vehicles and parts, aircraft, and ships and barges) is the one statewide constant, with above-average concentrations everywhere but Southeastern Ohio.

Exhibit 5
Relative Concentration of Manufacturing Subsectors by Region, March 2010

	Ohio	Akron	Cincinnati*	Cleveland	Columbus	Dayton	Toledo
Mfg. total	1.449	1.329	1.187	1.446	0.787	1.320	1.553
Food	0.917	0.421	0.846	0.481	0.498	0.602	0.819
Beverages	0.799	0.850	1.499	0.249	1.768	0.147	0.113
Textile mills	0.323	0.206	0.235	0.150	0.058	0.050	1.690
Textile products	0.605	0.168	1.195	0.232	0.519	0.495	0.439
Apparel	0.242	0.391	0.117	0.580	0.028	0.258	0.038
Leather products	1.158	0.031	0.161	0.074	0.000	0.093	0.000
Wood products	0.792	0.233	0.311	0.215	0.547	0.467	0.398
Paper	1.395	1.248	1.888	1.054	0.679	1.596	1.114
Printing	1.244	1.818	1.551	1.195	0.878	1.661	1.533
Petroleum & coal products	1.224	0.115	1.283	1.191	0.253	0.515	4.511
Chemicals	1.312	1.683	1.660	1.599	0.957	0.538	1.120
Plastics & rubber	2.205	4.142	1.047	1.707	1.028	1.464	2.311
Mineral products	1.600	0.521	0.856	0.713	1.867	0.786	3.696
Primary metals	2.708	1.413	1.623	3.370	0.515	1.184	1.429
Metal products	1.882	1.710	1.276	2.803	0.843	2.055	1.828
Machinery	1.717	1.756	1.074	1.936	0.680	2.255	1.076
Computers & electronics	0.715	0.592	0.804	1.150	0.348	1.993	0.740
Appliances	1.908	1.864	1.237	1.364	0.727	1.123	1.025
Transportation equipment	2.040	1.077	2.063	1.359	1.284	1.742	3.179
Furniture	1.156	0.606	0.525	2.063	0.367	0.707	3.244
Miscellaneous	1.071	1.924	0.796	1.402	0.916	0.913	0.505

*Ohio counties only.

	Northeast	Southeast	South	West	Northwest	WNCentral	ENCentral
Mfg. total	1.770	1.238	1.554	2.575	3.247	2.694	2.956
Food	1.347	1.188	2.049	1.848	3.397	1.685	3.361
Beverages	0.495	0.362	1.702	0.149	0.355	0.216	0.494
Textile mills	0.264	0.009	0.278	0.247	0.000	1.089	2.198
Textile products	0.998	0.594	0.008	0.711	0.766	0.420	2.130
Apparel	0.017	0.239	0.007	0.650	0.369	0.381	0.010
Leather products	7.998	0.038	1.110	0.304	2.474	0.198	14.713
Wood products	1.370	3.119	2.993	1.110	1.270	0.601	6.908
Paper	1.409	1.602	4.569	1.096	1.578	2.056	2.836
Printing	0.753	0.646	0.731	1.605	0.615	1.848	1.339
Petroleum & coal products	1.208	0.507	1.576	2.083	1.513	2.477	2.596
Chemicals	1.069	2.206	2.153	1.340	1.154	1.196	0.992
Plastics & rubber	2.761	1.029	1.689	5.897	6.844	5.793	4.485
Mineral products	2.319	3.752	2.008	1.319	5.858	2.562	4.216
Primary metals	8.192	6.317	1.944	2.912	7.493	3.952	5.017
Metal products	2.416	0.929	0.792	2.436	4.741	2.957	3.045
Machinery	2.063	1.390	0.937	4.152	2.553	3.238	4.833
Computers & electronics	0.171	0.090	0.260	0.329	0.253	0.824	0.172
Appliances	1.785	1.028	1.073	4.220	2.191	14.151	0.918
Transportation equipment	2.139	0.407	2.473	6.277	6.203	3.443	2.644
Furniture	0.804	0.435	0.256	1.080	0.981	1.883	4.184
Miscellaneous	0.883	0.397	1.514	0.645	2.621	0.925	2.830

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

One useful application of the concentrations in Figure 5 – and more detailed ones that could also be developed – is to determine the industries that are important suppliers to the high-concentration industries in a particular region and investigate the extent to which these supplier industries are also present. If not, firms in those industries would be important targets for the region's economic development efforts. A more complete supplier base will keep more of the region's wealth circulating within the local area – thereby increasing employment, income, and standard of living.

Workforce Development in Manufacturing

It may seem strange to raise the issue of workforce development in a sector such as manufacturing which is currently experiencing its first employment growth in nearly 20 years and – if the productivity analysis above is to be believed – may not continue to grow significantly for much longer. But the workforce challenges in manufacturing are very real.

A significant factor in the need for workers is the need to ensure a stream of new hires to replace workers who get promoted, leave the industry, leave the area, die, or retire. This replacement need can overwhelm the net growth or decline in positions. The author examined the need for specific manufacturing occupations in Central Ohio in 2008 as part of a workforce planning project. The result of this study was that although there was projected to be a net employment decline of about 4,100 in the region over the coming eight years, the replacement need was so great that the sector would need nearly 11,000 new workers over the period, despite the net decline in positions. If these workers were not available, the firms in the industry – and hence the regional economy – would not achieve its growth potential. Firms would be less profitable than they could be, and some might transfer operations to locations that offered the needed workforce.

These workers are significantly different from those in the industry 15 or 20 years ago. The technology-driven equipment that makes the productivity growth discussed above possible requires workers who are more technologically competent than their predecessors. They do not necessarily need a college degree, but they do often need focused technical training. Because of the drive for efficiency, the most valuable technicians are those who can fill several roles – so-called “multi-craft workers.” The rapid expansion of technology also requires the repeated retraining of incumbent workers.

But manufacturers have repeatedly indicated that a major deficiency exists in so-called “soft skills”: reliability, the ability to work effectively in organized teams, professionalism, listening skills, and the ability to communicate effectively with superiors and peers. The lack of these skills can cost efficiency and output, and in some cases can be dangerous. Any effective manufacturing job training program must develop these skills in tandem with technical skills.

A final problem in developing a manufacturing worker pipeline is the lack of new entrants to the industry because of the perception among prospective workers that U.S. manufacturing is dying. It is ultimately up to the industry to change this perception and show that meaningful, rewarding careers exist in this field.

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