Education and Manufacturing
Employment in Middle Tennessee

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Knowledge and Economy

• Scope of this presentation:
  – What role does MTSU play in the regional economy?
  – What are the manufacturing employment dynamics in middle Tennessee?
Knowledge and Economy: Trends and Issues

• (1) Education and technological change are the keys to competitive advantage and long-term growth.
• (2) Economic growth is determined by the capacity of individuals and institutions, often referred to as social capacity.
• (3) The manufacturing sector has the highest share of research and development spending in advanced economies.
• (4) The global trend in the manufacturing sector is toward more technology-intensive sectors, and the demand for the skilled labor across manufacturing industries is on the rise.
MTSU’s Contribution to the Region’s Economy Is Substantial …

Direct Impact

- Operating Expenditures ($100 Million)
- Payroll ($80.7 Million)
- Student Expenditures ($182.4 Million)
- Visitor Spending ($16 Million)

Direct Plus Indirect and Induced

- Total Business Revenue: $680.4 Million
- Total Employment (FTE): 9,176
- Total Personal Income: $342.5 Million
- Fiscal Impact: $45.9 Million

Middle Tennessee State University: 1. More Than 22,000 Students in Fall 2004 2. 1,903 Faculty and Staff (FTE) 3. More Than 134,000 Hotel Nights 4. More Than 70,000 Day Trippers
... But That’s Only the Tip of the Iceberg: MTSU Is the Key to Social Capacity Building in the Region.

- High social capacity constitutes the seeds of a competitive manufacturing industry.
- How does MTSU affect social capacity?
  - Knowledge generation (i.e., applied research)
  - Human capital creation (i.e., 3,361 graduates in 2003)
  - Professional development (i.e., 5,879 people in lifelong learning courses)
  - Community service
  - Amenities (i.e., athletic events, library, educational and cultural activities)
- The national trend in the manufacturing sector is toward an increase in the number of skilled workers.
- As the demand for a skilled labor force increases, public educational institutions play a critical role in the process of meeting increasing demand.
What Is the State of the Manufacturing Sector in Middle Tennessee?

### Trend
- Manufacturing employment is highly concentrated in the top five sectors in Middle Tennessee.
  - Tennessee (39%)
  - U.S. (41%)
- In 1998, the top five industries accounted for
  - 44% of manufacturing jobs in Tennessee;
  - 50% of manufacturing jobs in the U.S.

### Issues & Implications
- The job concentration trend in Middle Tennessee is contrary to trends in the U.S. and Tennessee.
- High concentration may increase the vulnerability of the region to economic shocks.

#### Top Five Manufacturing Industries (2003)

<table>
<thead>
<tr>
<th>Industry</th>
<th>Middle Tennessee</th>
<th>MT Metro Counties</th>
<th>MT Rural Counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation</td>
<td>22.3%</td>
<td>20.1%</td>
<td>25.4%</td>
</tr>
<tr>
<td>Machinery</td>
<td>9.0%</td>
<td>8.5%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Fabricated Metal</td>
<td>8.0%</td>
<td>8.3%</td>
<td>Plastics 9.2%</td>
</tr>
<tr>
<td>Food</td>
<td>7.2%</td>
<td>Printing 7.8%</td>
<td>Food 8.1%</td>
</tr>
<tr>
<td>Plastics</td>
<td>7.0%</td>
<td>Electrical 6.8%</td>
<td>Fabricated Metal 7.3%</td>
</tr>
<tr>
<td><strong>Total (%)</strong></td>
<td><strong>53.5%</strong></td>
<td><strong>51.5%</strong></td>
<td><strong>60.0%</strong></td>
</tr>
<tr>
<td><strong>Top five in 1998</strong></td>
<td><strong>51.3%</strong></td>
<td><strong>50.1%</strong></td>
<td><strong>58.4%</strong></td>
</tr>
</tbody>
</table>

Source: BLS and BERC
In terms of counties …

• Five counties account for almost half of middle Tennessee manufacturing employment:
  – Davidson (18%)
  – Rutherford (13.5%)
  – Maury (5.82%)
  – Putnam (4.97%)
  – Sumner (4.87%)

• These five counties represent 17.7 percent of Tennessee’s manufacturing employment.
Structure of the Middle Tennessee Manufacturing Industry: Concentration

Middle Tennessee Manufacturing Sector is less diversified relative to the United States...

Trends
- The manufacturing sector in middle Tennessee is less diverse than the U.S. manufacturing sector.
- The trend is toward even more concentration of manufacturing jobs in a few industries, particularly in rural areas.

Issues and Implications
- Increasing vulnerability
- Need to diversify industries

A manufacturing plant closing in some counties can increase the unemployment rate substantially.
Structural Change in the Middle Tennessee Manufacturing Industry

Trends

• The manufacturing sector has gone through structural changes in advanced economies.

• In general, structural change shifts resources from low to high productivity industries.

• This might generate additional adjustment costs.

Issues & Implications

• The overall shift in Middle Tennessee was significantly lower (6.1 percent).

• This suggests an ongoing transformation in the region’s manufacturing industry makeup.

• Policies should be in place to minimize the trade-off between employment and productivity during this change.

Structural change in the manufacturing sector refers to the reallocation of manufacturing employment among industries within the manufacturing sector.
The Direction of Structural Change …

- Three ways to conceptualize:
  - (1) Technology Intensity (OECD, 1994)
    - Refers to the industries with high R&D expenditures and employment of scientists and engineers; provides high-skill, high-wage employment; and generates large positive spillovers and higher return to capital and labor.
  - (2) Wage Intensity (OECD, 1994)
    - Refers to the classification of industries based on average labor compensation across nine OECD countries.
  - (3) Skill Intensity (OECD, 1994)
    - Refers to the industries that have a low proportion of production workers (assuming they are unskilled).
(1) Employment Composition of Middle Tennessee Manufacturing Industries, by Technology Intensity

High = science-based, product-differentiated industries (i.e., chemicals, computers, electrical equipment)
Medium = primarily scale-intensive industries (i.e., transportation, plastics, primary metals)
Low = natural resource, labor, and some scale-intensive industries
(1) Medium Technology Employment Has a Large Presence.

**Trends**
- Large presence of medium technology manufacturing industries in middle Tennessee: Transportation Industry
- Employment loss in middle Tennessee was 20% in high tech, 9% in medium tech, and 16% in low tech (1998-2003).

**Issues & Implications**
- Technological change for the high-tech and import penetration for the low-tech industries resulted in a large employment loss.
- And the productivity gains in high-technology industries in the 1990s has created a substantial trade-off, resulting in employment loss.
- Gains in medium technology industries in middle Tennessee are driven by increasing domestic demand for and exports of motor vehicles.
(2) Employment Composition of Middle Tennessee Manufacturing Industries, by Wage Intensity

Trend in High-Wage Manufacturing

- High Wage, i.e., chemicals, computers, petroleum, transportation
- Medium Wage, i.e., paper, printing, fabricated metals, plastics
- Low Wage, i.e., wood products, furniture, textiles
While high wage industries' employment share increased, low wage industries' share dropped to the U.S. average (2003).

**Middle Tennessee** has a larger employment share of high-wage manufacturing industries relative to the United States.

- The presence of high-wage industries may ultimately lead to a shift in labor from low- to high-productivity industries.

**Issues and Implications**

- Employment loss between 1998 and 2003 by wage intensity: 7% in high, 14% in medium, and 21% in low-wage industries.
- Rural counties lost 27% of employment in low-wage industries.
- This indicates an ongoing structural change in the rural counties.
- Demand for medium and highly skilled labor is likely to increase in the region.
(3) Employment Composition of Middle Tennessee Manufacturing Industries, by Skill Intensity

Trend in High-Skill Manufacturing Industries

Employment Share of High-Skill Manufacturing Industries is on the rise...

but region is far behind the United States: the U.S. average: 48.7%

Middle Tennessee: -11.9
Middle Tennessee Metro: -6.8
Middle Tennessee Rural: -18.7
(3) Trend in Skill-Intensive Manufacturing Industries

Both skilled and unskilled manufacturing industries experienced substantial employment loss across regions.

**Unskilled**
- MT Rural
- MT Metro
- U.S.
- Middle Tennessee

**Skilled**
- MT Rural
- MT Metro
- U.S.
- Middle Tennessee

**Trends**
- Job loss in rural counties in both skilled and unskilled industries is higher than in metro counties.

**Issues and Implications**
- While cyclical losses are important to employment decline in skilled manufacturing industries, the relatively larger employment loss in rural counties also suggests the role of structural factors.
- Employers across manufacturing industries are upgrading the skill requirement for new hires.
- Lack of available skilled labor in middle Tennessee is a major impediment for a competitive business environment.
What Is the Skill Composition in Middle Tennessee?

Relative Skill Composition of Middle Tennessee compared to the United States

Deficit

Surplus

Low Skill

Medium Skill

High Skill

Middle Tennessee

Tennessee

United States

MT Metro

MT Rural

Skill Composition from a Comparative Perspective

<table>
<thead>
<tr>
<th></th>
<th>High Skill</th>
<th>Medium Skill</th>
<th>Low Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle Tennessee</td>
<td>20.9</td>
<td>24.5</td>
<td>54.6</td>
</tr>
<tr>
<td>Tennessee</td>
<td>19.6</td>
<td>24.8</td>
<td>55.7</td>
</tr>
<tr>
<td>United States</td>
<td>24.4</td>
<td>27.4</td>
<td>48.2</td>
</tr>
<tr>
<td>MT Metro</td>
<td>25.0</td>
<td>26.6</td>
<td>48.5</td>
</tr>
<tr>
<td>MT Rural</td>
<td>12.1</td>
<td>20.2</td>
<td>67.7</td>
</tr>
</tbody>
</table>

Source: Census & BERC

• Middle Tennessee’s skill composition is slightly better than Tennessee’s, but substantially worse than the United States average.

• While metro counties are positioned relatively well in overall skill composition, rural counties face significant challenges.

Note: Regional skill composition assessment is based on Census educational attainment data for the population over 25 years old.
The Changing Manufacturing Sector Creates a Greater Role for Public Higher Education Institutions in Middle Tennessee …

- A competitive manufacturing business environment requires high social capacity.
- High social capacity means improvements in the quality of
  - human capital and
  - institutional capacity (i.e., market, capital, infrastructure)
- These improvements will lead to innovation and efficiency in the production process.
- Both innovation and a highly skilled labor force are absent from the region.
Education and Innovation

Patents per 10,000 population (1997-1999) and educational attainment (bachelors or above)

41 County Average

Tennessee Average

US Average

Bachelors or Above (%)

Patents per 10,000 population

Williamson

Davidson

Putnam

Sumner

Coffee

Franklin

Tennessee Average

US Average

41 County Average
What Role Can Public Higher Education Institutions Play in the Social Capacity Building Process?

- Public higher educational institutions are well positioned to provide leadership in these areas by
  - initiating graduate science courses in line with industry demand,
  - establishing and expanding research and development centers (i.e., Engineering Technology and Industrial Studies Department (ETIS) at MTSU),
  - administering internship programs and knowledge networks in the region in cooperation with local industries (i.e., MTSU with Cumberland Swan, Nissan),
  - Any other initiative that improves innovation and knowledge base as well as institutional capacity in a broader sense.
Summary and Outlook

• The manufacturing employment trend in middle Tennessee shows critical gaps relative to the U.S.:
  – Manufacturing sector is less diverse, high-tech, and skilled.
  – Rural counties are more vulnerable to cyclical and global trends.

• To boost high-tech industry employment, rural counties should eliminate impediments to a competitive business environment.

• One challenge in rural counties is educational attainment since 68% of the population is “low-skill.”

• Assuming that employment by high skill and technology intensity will converge to the U.S. average over the coming years, there is substantial room to improve in these areas.

• The post recession period is most likely to lead to an increase in demand for high and medium technology industries.
Selected References


