

1.0 Freight and the Tennessee Economy

Tennessee's economy in recent years has been characterized by output growth in a diverse set of industries and improving domestic and international trade links. Those industry sectors which may be considered freight dependent are especially important to the statewide economy. These trends have contributed to the overall growth of the state's economy, which expanded by 20 percent between 2000 and 2008, reaching \$210 billion.¹

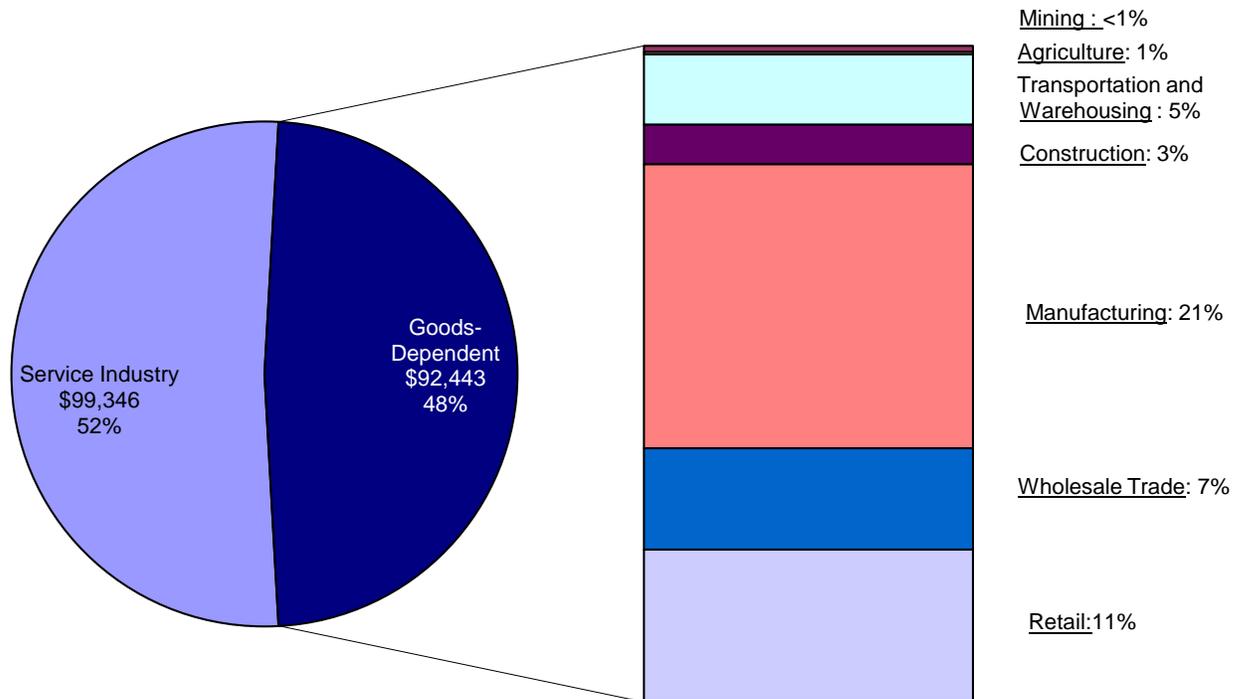
1.1 ECONOMIC OUTPUT BY INDUSTRY

In 2008, the goods and goods movement sectors - which includes agriculture, forestry, fishing and hunting, mining, manufacturing, wholesale and retail trade, and transportation and warehousing - accounted for 48 percent of Tennessee's economic output as measured by Gross State Product (Figure 1.1). Manufacturing alone accounted for 21 percent of the state's overall GDP, and 43 percent of goods dependent sector output. Retail and wholesale trade made up the next largest shares at 11 percent and seven percent respectively. Service industries, which include conventional service sectors such as information and accommodation as well as utilities,² accounted for the remaining 52 percent of the state's economy.

¹ Bureau of Economic Analysis. Figures are in constant 2000 dollars.

² The service industries are strictly private service sectors and do not include government and public service providers.

Figure 1.1 Service and Goods-Dependent Industry Output as a Percentage of Tennessee State GDP
2008, in Millions of Chained 2000 Dollars



Source: Bureau of Economic Analysis, U.S. Department of Commerce

1.2 DOMESTIC TRADING PARTNERS

Tennessee conducts most of its domestic trade with nearby states and regions, but it also has important trading partners throughout the country. Most of the freight moving to and from Tennessee is carried by truck, so continued

population growth within Tennessee and in other regions of the country will lead to additional truck trips in the state and the region.

Figure 1.2 shows Tennessee's total domestic trade volumes by TRANSEARCH region.³ Tennessee trades the most with nearby states in the southeast and others along the eastern seaboard. The East South Central (Kentucky, Mississippi, and Alabama) and South Atlantic (Florida, Georgia, the Carolinas, the Virginias, Delaware, Maryland, and Washington D.C.) regions each generated over 60 million tons of trade with the state in 2007. Tennessee exchanged between 40 and 60 million tons of goods in 2007 with each of the West South Central and East North Central regions. The state tends to trade less with the remaining TRANSEARCH regions, and volumes generally decrease over longer distances. The exception is the Mountain region, where higher volumes are probably driven in part by rail shipments of Powder River coal from Wyoming.

Since the TRANSEARCH database contains county detail for neighboring states, it is possible to calculate trade flows between Tennessee and the eight other states with which it shares a border. States usually trade the most with their immediate neighbors, and Tennessee is no exception, as shown in Table 1.1.

- Overall, freight shipments between Tennessee and these states totaled nearly 147 million tons in 2007, about half of the state's total domestic trade.
- Kentucky and Georgia were Tennessee's largest domestic trading partners by far. Tennessee receives large amounts of coal and nonmetallic minerals from Kentucky, while shipping a significant amount of nonmetallic minerals and secondary traffic. Tennessee sends a lot of coal, minerals, and secondary traffic to Georgia while receiving metallic ores and clay, concrete, glass and stone products.
- Arkansas and Mississippi each accounted for about five percent of Tennessee domestic trade by weight (16.5 and 15.7 million tons respectively). Tennessee imports nonmetallic minerals, farm products, and secondary traffic from these states, and ships secondary traffic, nonmetallic minerals, and wood products to them.
- Alabama constituted nearly five percent of the total (14.5 million tons), followed by North Carolina, Virginia, and Missouri. Important commodities moving between Tennessee and these states include food products; clay, concrete, glass or stone; nonmetallic minerals; coal; and farm products.

³ The TRANSEARCH database divides the country into nine regions, which are analogous to Census divisions.

Figure 1.2 Tennessee Domestic Trade Tonnage by TRANSEARCH Region
2007

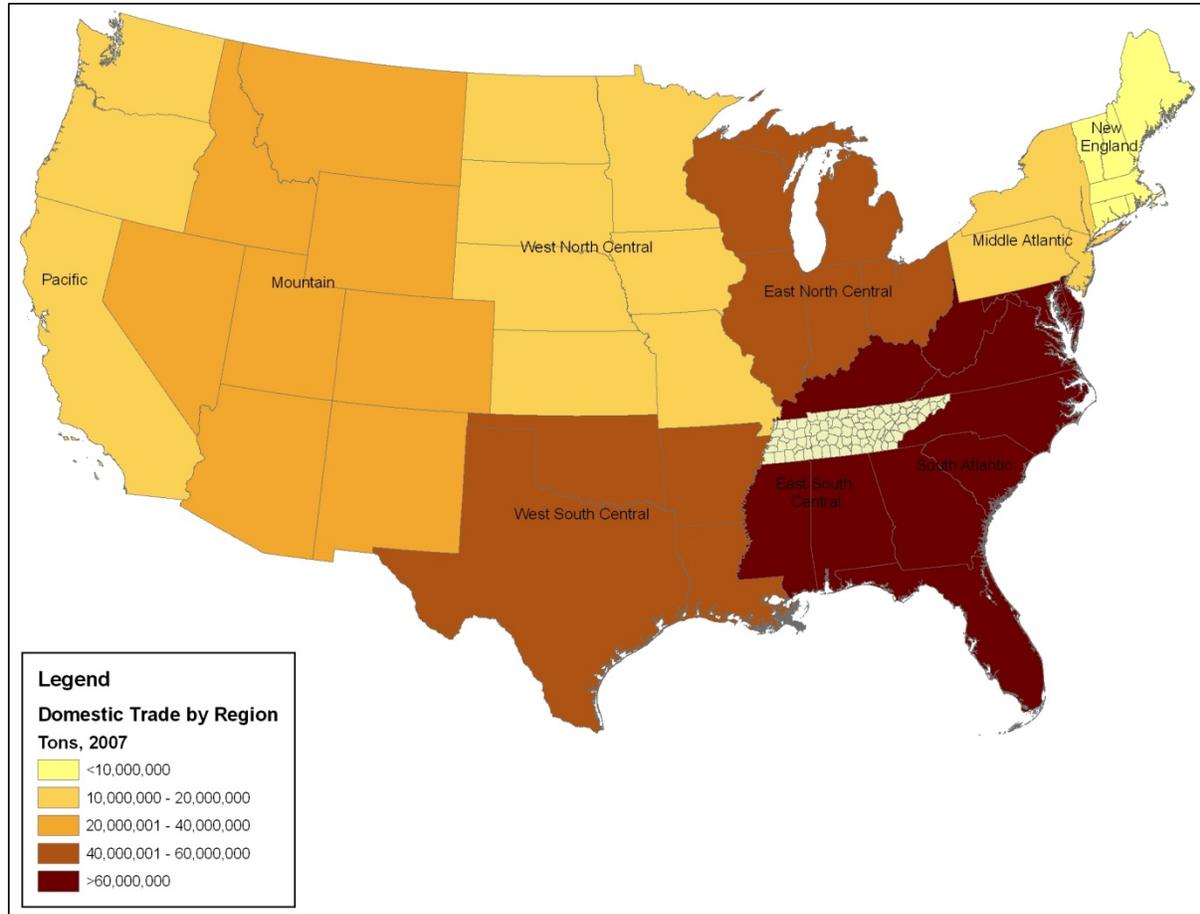


Table 1.1 Tennessee Domestic Trade Tonnage by Neighboring State
2007

| State | Weight (Millions of Tons) | |
|----------------|---------------------------|------------------|
| | 2007 | Percent of Total |
| Kentucky | 36.4 | 11.8% |
| Georgia | 35.0 | 11.4% |
| Arkansas | 16.5 | 5.4% |
| Mississippi | 15.7 | 5.1% |
| Alabama | 14.5 | 4.7% |
| North Carolina | 11.0 | 3.6% |
| Virginia | 9.5 | 3.1% |
| Missouri | 8.1 | 2.6% |

| | | |
|--------------------|--------------|---------------|
| Total | 146.8 | 47.7% |
| All Other States | 160.9 | 52.3% |
| Grand Total | 307.7 | 100.0% |

1.3 INTERNATIONAL TRADING PARTNERS

Aside from its trade with the rest of the United States, Tennessee has substantial trading links with other countries worldwide. Understanding Tennessee's foreign trade relationships will help planners identify how growth in other countries will affect the freight transportation system within the state. TRANSEARCH does measure Tennessee's total export and import volumes, but it does not provide information about which specific countries Tennessee trades with, or the volume or value of trade by country. However, export value data is published annually by the Census Bureau for each state; this data includes the total value of each state's exports by country, for the state's top 25 export markets.

Table 1.2 shows the top 10 international export markets for goods from Tennessee in 2005 and 2008.

- The total value of Tennessee's exports grew by 20 percent over the past four years, in spite of the global economic recession. The economic climate has led to slowing foreign trade for Tennessee (for example, exports to Canada have only grown by five percent during this time), but the overall trend remains positive.
- Canada and Mexico are by far the most important export markets for Tennessee, which is to be expected due to geographic proximity as well as the effects of trade liberalization brought about by the North American Free Trade Agreement (NAFTA). Canada in particular accounts for goods worth about \$6.4 billion in 2008 – nearly one third of the total foreign trade value. Exports to Mexico were about \$2.5 billion in 2008, or 12 percent of total export value.
- China and Japan were the third and fourth largest export destinations for Tennessee in 2008; together they made up 12 percent of the total foreign trade value (about \$2.4 billion). Exports to China dropped slightly between 2005 and 2008, but shipments to Japan surged by 31 percent.
- Various European countries, led by the United Kingdom and Germany, accounted for 15 percent of Tennessee's export value in 2008, or about \$3.2 billion.
- Although Tennessee exported less to other nations during this period, export value to many of these trading partners grew quite rapidly. For instance, the

value of the state's exports to Belgium increased by 76 percent, while those to Brazil grew by 74 percent.

Shipments to Tennessee's biggest export markets (notably Canada) are likely to continue on an upward trend in the longer term as the global economy recovers. Trade growth between Tennessee and its North American Free Trade Agreement (NAFTA) partners, as well as other export markets in Europe and Asia, will lead to more freight traffic in Tennessee, particularly along major trade corridors such as I-40 and I-75.

The Census data does not include information on what specific commodities are being shipped to these countries, but according to the International Trade Administration important commodities exported from Tennessee include transportation equipment, chemicals, computers and electronics, and miscellaneous manufactured products.⁴

**Table 1.2 Top 10 Tennessee Export Markets by Value
2005 and 2008**

| Country | 2005 | 2008 | Percent of Total (2008) | Percent Change |
|-----------------|-------------------------|-------------------------|--------------------------------|-----------------------|
| Canada | \$6,147,000,000 | \$6,438,000,000 | 32% | 5% |
| Mexico | \$1,894,000,000 | \$2,497,000,000 | 12% | 32% |
| China | \$1,419,000,000 | \$1,364,000,000 | 7% | -4% |
| Japan | \$819,000,000 | \$1,071,000,000 | 5% | 31% |
| United Kingdom | \$739,000,000 | \$1,032,000,000 | 5% | 40% |
| Germany | \$677,000,000 | \$811,000,000 | 4% | 20% |
| Netherlands | \$637,000,000 | \$694,000,000 | 3% | 9% |
| Belgium | \$380,000,000 | \$667,000,000 | 3% | 76% |
| Australia | \$426,000,000 | \$610,000,000 | 3% | 43% |
| Brazil | \$275,000,000 | \$478,000,000 | 2% | 74% |
| Other Countries | \$3,331,000,000 | \$4,508,000,000 | 22% | 35% |
| Total | \$16,744,000,000 | \$20,170,000,000 | 100% | 20% |

⁴ http://www.trade.gov/td/industry/otea/state_reports/tennessee.html

2.0 Tennessee Commodity Flows

In 2007, goods moving to, from, within, and through Tennessee totaled just over 1 billion tons, amounting to about five percent of total U.S. freight volumes. By 2035, these movements will grow to 1.57 billion tons, representing 4.2 percent of the total U.S. freight market by weight. These flows are comprised of several movement types, commodities, and freight modes.

2.1 OVERALL COMMODITY FLOWS

Table 2.1 lists Tennessee freight flows by commodity and movement type for 2007.

- Due to the state's strategic central location, through movements comprise the majority of freight moving in Tennessee, at about 640 million tons in 2007 (61 percent of the total). This means that Tennessee's freight infrastructure is critical to trade flows throughout the country and world. Through movements are the largest component of overall flows for virtually every commodity group.
- Coal is the top overall commodity moving in the state at nearly 158 million tons. The majority of it (92 million tons) is simply moving through the state, although nearly 46 million tons was shipped to Tennessee for electrical power generation.
- Nonmetallic minerals are the second most important commodity by weight at 116 million tons. Of that total, more than 48 million tons was shipped within the state. This is to be expected since this commodity group includes construction materials like gravel, broken stone, and rip rap which are often produced and consumed within a small geographic area to minimize transportation costs.
- Farm products make up the third largest commodity group at 109 million tons, most of which was shipped through the state (primarily grains traveling by barge down the Mississippi River).
- Chemicals comprised 106 million tons of freight in 2007, again dominated by through movements. However, Tennessee is also a significant producer of chemical products, with over 12 million tons shipped in 2007.
- Secondary traffic rounds out the top five commodities at about 91 million tons. This commodity group consists of truck drayage movements between origin or destination points and a transshipment facility, such as an intermodal rail yard. It is most often composed of consumer goods.

Table 2.1 Tennessee Commodity Flows by Commodity and Type of Movement
2007, in Tons

| Commodity | Inbound | Outbound | Intrastate | Through | Total |
|---|----------------|-----------------|-------------------|----------------|--------------|
| Coal | 45,944,366 | 17,613,487 | 1,735,343 | 92,397,958 | 157,691,153 |
| Nonmetallic Minerals | 21,719,176 | 19,320,228 | 48,512,226 | 26,530,267 | 116,081,896 |
| Farm Products | 12,830,025 | 7,634,274 | 3,872,237 | 84,948,166 | 109,284,702 |
| Chemicals Or Allied Products | 9,690,205 | 12,152,075 | 1,146,292 | 83,084,796 | 106,073,367 |
| Secondary Traffic | 13,538,010 | 15,600,453 | 24,849,965 | 37,000,228 | 90,988,657 |
| Food Or Kindred Products | 9,940,124 | 9,431,880 | 2,264,247 | 63,017,345 | 84,653,595 |
| Primary Metal Products | 5,807,651 | 3,765,354 | 1,015,407 | 35,728,487 | 46,316,899 |
| Petroleum Or Coal Products | 9,092,865 | 3,902,144 | 2,847,210 | 29,398,986 | 45,241,206 |
| Clay, concrete, glass or Stone | 7,599,461 | 7,269,457 | 11,109,335 | 17,240,726 | 43,218,979 |
| Lumber Or Wood Products | 6,171,755 | 5,809,874 | 2,431,848 | 23,431,155 | 37,844,632 |
| Pulp, paper or Allied Products | 2,566,065 | 5,779,145 | 1,016,415 | 24,837,141 | 34,198,766 |
| Fabricated Metal Products | 3,974,264 | 4,235,934 | 697,051 | 19,095,748 | 28,002,997 |
| Transportation Equipment | 2,766,803 | 5,172,148 | 2,567,959 | 16,256,970 | 26,763,881 |
| Rubber Or Misc Plastics | 1,278,956 | 2,783,582 | 906,933 | 20,571,082 | 25,540,553 |
| Misc Mixed Shipments | 4,449,720 | 4,347,109 | 64,681 | 5,544,352 | 14,405,862 |
| Machinery | 1,702,397 | 1,997,446 | 260,856 | 9,837,187 | 13,797,886 |
| Waste Or Scrap Materials | 3,412,394 | 1,751,343 | 180,860 | 7,634,697 | 12,979,293 |
| Metallic Ores | 3,553,740 | 458,040 | 33,515 | 8,883,664 | 12,928,958 |
| Electrical Equipment | 1,790,980 | 1,633,965 | 116,992 | 8,772,189 | 12,314,125 |
| Textile Mill Products | 507,285 | 536,037 | 76,135 | 4,700,553 | 5,820,009 |
| Printed Matter | 769,146 | 699,105 | 341,072 | 3,551,610 | 5,360,934 |
| Apparel Or Related Products | 554,118 | 526,326 | 19,637 | 3,851,961 | 4,952,042 |
| Furniture Or Fixtures | 450,340 | 1,075,083 | 175,930 | 3,246,251 | 4,947,604 |
| Misc Manufacturing Products | 485,467 | 739,068 | 30,192 | 2,292,234 | 3,546,961 |
| Crude Petrol. Or Natural Gas | 0 | 6,494 | 0 | 3,498,115 | 3,504,610 |
| Instruments, Photo Equipment, Optical Equipment | 217,552 | 109,964 | 5,872 | 1,407,180 | 1,740,568 |
| Shipping Containers | 299,880 | 406,840 | 20,840 | 778,000 | 1,505,560 |
| Fresh Fish Or Marine Products | 426,703 | 48,769 | 0 | 805,018 | 1,280,490 |
| Misc Freight Shipments | 86,435 | 33,269 | 1,000 | 1,127,912 | 1,248,617 |
| Leather Or Leather Products | 145,926 | 135,918 | 6,591 | 634,199 | 922,634 |
| Mail Or Contract Traffic | 369,055 | 428,522 | 0 | 16,800 | 814,377 |
| Tobacco Products | 16,451 | 4,616 | 0 | 165,168 | 186,235 |
| Waste Hazardous Materials | 14,320 | 5,240 | 7,800 | 92,440 | 119,800 |
| Freight Forwarder Traffic | 15,080 | 29,920 | 0 | 34,320 | 79,320 |
| Forest Products | 1,441 | 243 | 21 | 51,160 | 52,864 |

| | | | | | |
|-----------------------------------|--------------------|--------------------|--------------------|--------------------|----------------------|
| Ordinance Or Accessories | 1,639 | 27,019 | 0 | 13,860 | 42,517 |
| Shipper Association Traffic | 240 | 440 | 0 | 20,200 | 20,880 |
| Small Packaged Freight Shipments | 7,040 | 2,800 | 0 | 1,800 | 11,640 |
| Hazardous Materials Or Substances | 0 | 269 | 0 | 23 | 293 |
| Total | 172,197,077 | 135,473,881 | 106,314,461 | 640,499,945 | 1,054,485,363 |

Table 2.2 shows overall mode shares by movement type.

- Like most states, Tennessee relies on trucks to move the preponderance of its freight. Overall, trucks carried over 573 million tons of goods to, from, within, and through Tennessee in 2007.
- Rail was a distant second at 291 million tons, followed by water at about 188 million tons. Rail and water were especially well represented in through moves, which accounted for 65 percent and 75 percent respectively of the total tonnage for those modes, compared to about 54 percent for trucks. This reflects the comparative advantage of these modes for shipments over about 500 miles, particularly for low value bulk commodities like coal. By contrast, trucks handled nearly 94 percent of intrastate shipments in Tennessee.
- Only about two million tons of freight moved via air in 2007, which is unsurprising since air transport is expensive and therefore limited to light, high-value commodities.

Table 2.2 Freight Mode Shares by Movement Type
2007, in Millions of Tons

| Mode | Inbound | Outbound | Intrastate | Through | Total |
|--------------|----------------|-----------------|-------------------|----------------|----------------|
| Truck | 75.0 | 89.6 | 99.6 | 309.1 | 573.3 |
| Rail | 58.7 | 38.9 | 3.6 | 190.0 | 291.2 |
| Water | 37.4 | 6.1 | 3.2 | 141.3 | 188.0 |
| Air | 1.1 | 0.9 | 16.4 | 0.001 | 2.1 |
| Total | 172.2 | 135.5 | 106.3 | 640.5 | 1,054.5 |

Table 2.3 presents 2007 and 2035 total tons and annual growth rates by commodity.

- One of the fastest growing commodity groups – and the number one commodity by weight in 2035 – is secondary traffic, or truck drayage moves. This is significant because all of these movements are made by trucks, so rapid growth in this category implies additional truck trips within the state. While these trips are essential to support the flow of commerce and supply critical Tennessee industries, they will also impact the state highway network

and contribute to congestion in the urban areas where most such moves take place.

- Coal shipments will grow slowly (less than one percent annually on average) but will still be significant at nearly 193 million tons in 2035. Tennessee is a leader in both hydroelectric and nuclear power, but coal remains a significant source of electricity.
- Other fast-growing commodities include electrical equipment, transportation equipment, machinery, and precision instruments such as optics. These tend to reflect the outputs of several key Tennessee industries, such as automobile manufacturing and appliances.

Table 2.3 Total Tons by Commodity
2007 and 2035

| Commodity | 2007 | 2035 | Compound Annual Growth Rate |
|---|-------------|-------------|------------------------------------|
| Secondary Traffic | 90,988,657 | 223,507,567 | 3.26% |
| Coal | 157,691,153 | 192,832,327 | 0.72% |
| Nonmetallic Minerals | 116,081,896 | 172,666,249 | 1.43% |
| Chemicals Or Allied Products | 106,073,367 | 145,477,287 | 1.13% |
| Food Or Kindred Products | 84,653,595 | 119,359,151 | 1.23% |
| Farm Products | 109,284,702 | 111,144,701 | 0.06% |
| Petroleum Or Coal Products | 45,241,206 | 71,233,481 | 1.63% |
| Primary Metal Products | 46,316,899 | 58,645,425 | 0.85% |
| Pulp, Paper Or Allied Products | 34,198,766 | 49,373,521 | 1.32% |
| Transportation Equipment | 26,763,881 | 48,728,856 | 2.16% |
| Electrical Equipment | 12,314,125 | 44,985,327 | 4.74% |
| Fabricated Metal Products | 28,002,997 | 44,512,756 | 1.67% |
| Clay, Concrete, Glass Or Stone | 43,218,979 | 43,043,781 | -0.01% |
| Rubber Or Misc Plastics | 25,540,553 | 40,843,924 | 1.69% |
| Lumber Or Wood Products | 37,844,632 | 36,832,008 | -0.10% |
| Misc Mixed Shipments | 14,405,862 | 36,036,483 | 3.33% |
| Machinery | 13,797,886 | 33,907,148 | 3.26% |
| Waste Or Scrap Materials | 12,979,293 | 28,237,752 | 2.81% |
| Misc Manufacturing Products | 3,546,961 | 12,719,537 | 4.67% |
| Metallic Ores | 13,331,814 | 12,667,531 | -0.18% |
| Printed Matter | 5,360,934 | 8,774,248 | 1.78% |
| Instruments, Photo Equipment, Optical Equipment | 1,740,568 | 6,680,610 | 4.92% |
| Furniture Or Fixtures | 4,947,604 | 6,384,882 | 0.91% |
| Shipping Containers | 1,505,560 | 4,788,669 | 4.22% |

| | | | |
|-----------------------------------|----------------------|----------------------|-------------|
| Textile Mill Products | 5,820,009 | 4,593,054 | -0.84% |
| Misc Freight Shipments | 1,248,617 | 3,455,806 | 3.70% |
| Crude Petrol. Or Natural Gas | 3,504,610 | 2,564,064 | -1.11% |
| Apparel Or Related Products | 4,952,042 | 2,152,110 | -2.93% |
| Fresh Fish Or Marine Products | 879,074 | 1,152,335 | 0.97% |
| Mail Or Contract Traffic | 814,377 | 781,661 | -0.15% |
| Leather Or Leather Products | 922,634 | 464,506 | -2.42% |
| Waste Hazardous Materials | 119,800 | 198,220 | 1.81% |
| Freight Forwarder Traffic | 79,320 | 174,772 | 2.86% |
| Forest Products | 51,424 | 163,030 | 4.21% |
| Ordinance Or Accessories | 42,517 | 65,301 | 1.54% |
| Tobacco Products | 186,235 | 63,347 | -3.78% |
| Shipper Association Traffic | 20,880 | 43,844 | 2.68% |
| Small Packaged Freight Shipments | 11,640 | 22,790 | 2.43% |
| Hazardous Materials Or Substances | 293 | 279 | -0.17% |
| Total | 1,054,485,363 | 1,569,278,341 | 1.4% |

2.2 REGIONAL COMMODITY FLOWS

The Tennessee Department of Transportation (TDOT) divides the state into four regions, as shown in Figure 2.1. Each region includes several TDOT districts. The regions play an administrative role to support the implementation of TDOT policies and programs in the various parts of the state. Regions 1 and 2 include 24 counties each, Region 3 incorporates 26 counties, and Region 4 consists of 21 counties.

Figure 2.1 TDOT Regions



Tables 2.4 and 2.5 present total trade flows between these regions in 2007 and 2035 respectively (these figures exclude shipments within the same county).

- TDOT Region 3, home of Nashville, the second largest city in the state, has the highest intensity of freight activities statewide with 25 million tons of outbound freight traffic and 28 million tons of inbound traffic.
- Region 4, which contains Memphis, handled less intrastate freight volumes compared to the remaining three regions of the state. This is because a large portion of Tennessee’s domestic and international freight moves to, from, or through Memphis.
- By 2035, intrastate freight demand will grow significantly (Table 2.5). TDOT Region 3 will shift from a predominantly consuming market to become a leading export hub in the state. Population growth is anticipated to drive the demand for goods shipped from other parts of the state in Regions 1 (39 million tons of inbound freight) and 4 (30 million tons inbound compared to 26.6 million tons outbound).

Table 2.4 Regional Commodity Flows
2007, in Millions of Tons

| From\To | Region 1 | Region 2 | Region 3 | Region 4 | Total |
|----------|----------|----------|----------|----------|-------|
| Region 1 | 11.4 | 1.4 | 1.1 | 2.4 | 16.3 |
| Region 2 | 4.4 | 6.1 | 6.5 | 3.3 | 20.4 |
| Region 3 | 1.8 | 1.4 | 16.3 | 5.8 | 25.3 |
| Region 4 | 5.1 | 2.0 | 4.5 | 8.2 | 19.7 |
| Total | 22.7 | 10.9 | 28.5 | 19.7 | 81.7 |

Table 2.5 Regional Commodity Flows
2035, in Millions of Tons

| From\To | Region 1 | Region 2 | Region 3 | Region 4 | Total |
|----------|----------|----------|----------|----------|-------|
| Region 1 | 16.9 | 2.3 | 2.7 | 5.6 | 27.4 |
| Region 2 | 6.7 | 13.6 | 6.0 | 4.4 | 30.7 |
| Region 3 | 5.7 | 3.3 | 18.7 | 11.7 | 39.4 |
| Region 4 | 9.6 | 3.0 | 5.6 | 8.4 | 26.6 |
| Total | 38.9 | 22.1 | 33.0 | 30.1 | 124.1 |

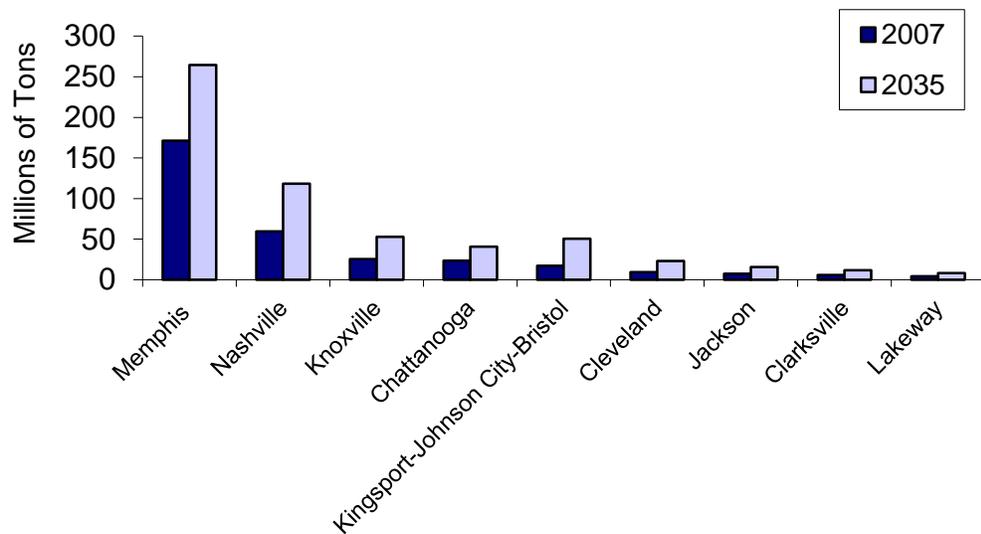
2.3 MPO FREIGHT FLOWS

Tennessee’s metropolitan areas account for the majority of the state’s population and GSP; consequently they also account for a significant share of overall commodity flows in the state. Since Metropolitan Planning Organization (MPO)

boundaries correlate well with urbanized areas, looking at commodity flows in Tennessee MPOs provides a sense of freight activity in the state's larger cities. Figure 2.2 shows total freight tonnage in 2007 and 2035 for all MPOs in the state.⁵

- The Memphis MPO handles by far the largest volume of freight in both the base and future years (171 million tons in 2007, growing to 264 million tons by 2035). In fact, 35 percent of the state's commodity tonnage flows through Shelby County, which encompasses most of the MPO area. This is because of the city's position as a major highway, rail, marine, and air cargo hub and transshipment point.
- Besides Memphis, the Nashville, Knoxville, and Chattanooga MPOs tend to dominate metropolitan area freight flows, which is to be expected since these are the largest cities in the state.
- Commodity tonnage in the combined Kingsport-Johnson City-Bristol MPO will overtake Chattanooga by 2035, and most of the other small MPOs will experience rapid volume growth as well. This will be driven by accelerating economic and population growth in these areas, which will drive increasing freight shipments.

Figure 2.2 Tennessee MPO Freight Flows
2007 and 2035, in Tons



⁵ The Kingsport, Johnson City, and Bristol MPOs are combined due to their close geographic proximity.

Memphis Commodity Flows

Since the Memphis region is responsible for such a large share of Tennessee's freight activity, it is appropriate to highlight commodity flows in Shelby County. Table 2.6 presents the top five commodities by weight for Shelby County in 2035, along with their 2007 volumes and annual growth rates.

- Secondary traffic (truck drayage movements, often in intermodal containers) will become the largest commodity by weight in Shelby County by 2035, propelled by a 2.5 percent annual growth rate. This implies significant additional truck trips in the region.
- Coal will become the second largest commodity moving in Memphis in terms of tonnage, having been supplanted by secondary traffic as the number one commodity. The majority of coal products (91 percent) will move by rail, with most of the remainder (about four million tons, or nearly nine percent) shipped by barge. These modes are more economical for heavy, low-value commodities, especially when they are shipped long distances.
- Miscellaneous mixed shipments are expected to grow by over three percent annually, reaching 20 million tons by 2035. This commodity group consists mostly of consumer goods, many moving via intermodal rail.

Table 2.6 Top Commodities in Shelby County
2035, in Tons

| Commodity | 2007 | 2035 | Percent of Total | Compound Annual Growth Rate |
|---|--------------------|--------------------|------------------|-----------------------------|
| Secondary Traffic | 28,931,577 | 58,056,588 | 24% | 2.5% |
| Coal | 42,245,171 | 49,924,883 | 21% | 0.6% |
| Misc Mixed Shipments Chemicals Or Allied Products | 7,846,860 | 20,048,893 | 8% | 3.4% |
| Food Or Kindred Products | 11,118,984 | 12,323,646 | 5% | 0.4% |
| All Others | 12,248,817 | 11,463,910 | 5% | -0.2% |
| Total | 171,150,679 | 241,702,242 | 100% | 1.2% |

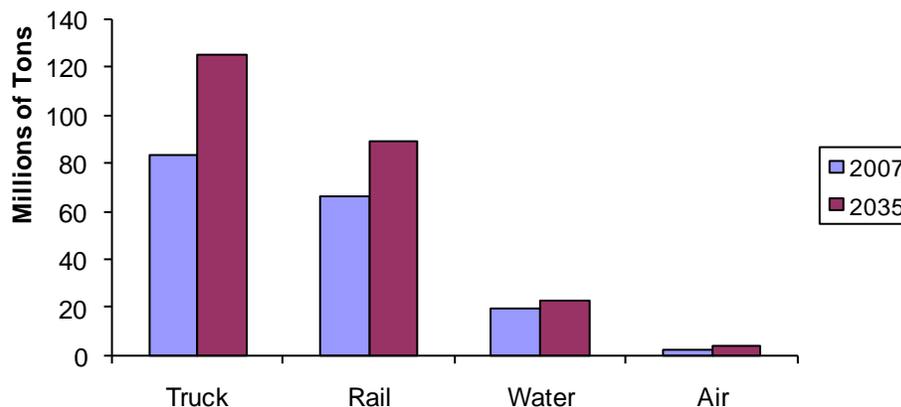
Figure 2.3 shows freight mode splits by weight for Shelby County in 2007 and 2035.

- Trucks carried just under half of Shelby County freight in 2007 (84 million tons), but this will grow to 52 percent by 2035 (125 million tons).
- Trains handled 38 percent of the county's freight in 2007, or nearly 66 million tons, while river barges carried a further 12 percent (nearly 20 million tons). Although overall flows by these two modes will expand in future (to 89 million and 23 million tons respectively), their market share relative to trucks will fall to 37 percent for rail and 10 percent for marine. This implies that

capacity issues for these two modes may make it hard for them to absorb the expected growth in freight demand.

- Air cargo accounted for just one percent of the Memphis area's total freight in 2007, or nearly two million tons. Nonetheless, this is significant since FedEx is headquartered in Memphis and Memphis International Airport is the largest air cargo hub in the world by volume. Moreover, air freight volumes will more than double in Shelby County by 2035, reaching over four million tons. This is important since all air freight moves require a truck move at either end of the shipment, so growth in air cargo will lead directly to more truck trips in and around Memphis.⁶

Figure 2.3 Shelby County Freight Mode Shares
2007 and 2035, in Tons



2.4 IMPACT OF RECENT RECESSION

The recession of 2008-2009 was the most severe economic downturn since the Great Depression, and it caused an unprecedented drop in global trade and commerce. Tennessee followed the national economy into recession, experiencing a decline in employment and output across a wide swath of industries.⁷ At the beginning of 2010 it appeared that the state's economy had

⁶ The exception would be cargo operations where a package merely changes planes, however these moves are not counted in TRANSEARCH.

⁷ University of Tennessee at Knoxville Center for Business and Economic Research. *An Economic Report to the Governor of the State of Tennessee*. January, 2009.

found a bottom, and a modest return to growth is expected for the remainder of the year. Nonetheless, vigorous growth is not expected until after 2012.⁸

These trends will likely impact freight flows in Tennessee in the years to come. Since the TRANSEARCH freight forecast was developed prior to the recession, the specific nature of the recession was not explicitly incorporated. However, the long-term freight forecast does implicitly incorporate the impact of booms and busts in the economic cycle. It is useful to examine post-2008 forecasts from other areas to serve as a proxy for the impact of the recession on Tennessee freight's activity. There are a few updated freight forecasts from around the country that specifically account for the recession:

- **San Pedro Bay Ports Container Forecast.** The San Pedro Bay Ports (Los Angeles and Long Beach) are the premier container gateway in the country. Recognizing the extreme depth of the recent recession and the likelihood of slower economic growth going forward, the ports recently updated their 2007 container forecast. The new forecast projects 2030 container throughput at approximately 20 percent lower than the pre-recession forecast. As a result, the ports do not expect to reach full capacity until 2035, instead of 2023 as in the original forecast. The implication of this updated forecast is that the portion of freight flows in Tennessee that are related to international maritime traffic might need to be reduced by roughly 20 percent.
- **TRANSEARCH National Forecast Update.** Global Insight makes annual updates to its national level freight flow database along with the data sets that feed into it. The 2008-2009 update cycle reflects the recessionary conditions that were prevalent during that time. Although the entire database is not public, Global Insight does provide summary data for the updated national forecast. For instance, on the Atlanta to Los Angeles trade corridor (a major trade lane which includes port-driven container imports as well as U.S. export traffic) the new data set predicts falling overall freight tonnage in 2008 and 2009, followed by modest growth in 2010 and then accelerating growth thereafter. In this forecast, 2008 freight traffic volumes are not reached until 2013.⁹ The implication of this updated forecast for Tennessee is that the freight forecasts presented in this report may need to be pushed out to 2040 rather than 2035.
- **Freight Transportation Research (FTR) forecast.** FTR Associates provides an annual forecast of demand for Class 8 trucks (i.e., tractor-trailers) in its North American Commercial Truck and Trailer Outlook. Since most freight in the U.S. continues to move by truck, this is a good barometer of overall freight

⁸ University of Tennessee at Knoxville Center for Business and Economic Research. *An Economic Report to the Governor of the State of Tennessee*. January, 2010.

⁹ Global Insight. 'Trends in North American Freight - Unveiling the Latest Transearch Forecast.' Freight Flow Webcast, September 17, 2009.

market health. In March 2010, FTR forecast that demand for Class 8 trucks would increase by just three percent in 2010, but that this would be followed by growth of over 50 percent in 2011.¹⁰ Some of this large fluctuation in demand is due to the recession, and some of it is due to new diesel engine emission regulations going into effect over the next few years. FTR Associates noted that although the overall economic climate is improving, economic headwinds such as weak consumer spending and a soft housing market augur a slow recovery.

Although none of these forecasts are specific to Tennessee, they do suggest that most analysts do not expect a strong freight market rebound until 2011 to 2012, and that overall freight tonnage will not reach pre-recession levels until sometime after that. Tennessee will probably follow a similar pattern, and indeed this corroborates well with the UT-Knoxville economic forecast. A couple of key conclusions may be drawn from this:

- It is likely that freight flows in Tennessee are now somewhat lower than TRANSEARCH would suggest. Although 2007 base year estimates are probably still reasonable, the recession of the last few years has led to sharply lower levels of domestic and international trade nationwide, which would impact the freight picture in Tennessee.
- Growth in Tennessee trade and commerce over the next few years will probably be slower than in the past, but will eventually begin to accelerate as the statewide and national economies pick up steam.
- More rapid economic and trade growth rates – such as those that were typical over the last few decades – will eventually resume in Tennessee and elsewhere. However, given the depth of the recession and lingering structural changes to the economy, freight flows in Tennessee may not reach TRANSEARCH 2035 levels until sometime beyond the forecast horizon.

¹⁰ FTR Associates, 'FTR Forecasts Slow Improvement in Class 8 Demand Consistent with Year Ago Projections', press release dated March 31, 2010.

3.0 Tennessee Freight Origin-Destination Patterns

In 2009, TDOT commissioned a truck origin-destination study which gathered origin, destination, truck type, commodity, and weight data from trucks at various points statewide. There were 13 survey locations situated at weigh stations or rest stops along Interstates as shown in Figure 3.1.¹¹ Truckers at these sites were asked a series of questions about their last and next stops (city and state), what cargo they were carrying and its weight, and the type of facilities visited (e.g., a factory), among other things. This data can be used to analyze truck trip characteristics on Tennessee Interstate highways.

Figure 3.1. Truck Roadside O-D Survey Data Collection Locations



Table 3.1 summarizes the trip characteristics based on data gathered at each survey location. Trips are categorized as internal (origin and destination within Tennessee), outbound (originating in Tennessee and bound for other states), inbound (originating elsewhere but terminating in Tennessee), and through (both the origin and destination are outside of the state).

- Overall, nearly half (47 percent) of the trucks surveyed were simply traveling through Tennessee. This implies that a significant amount of the freight moving on Tennessee's Interstates is not directly related to economic activity

¹¹ Data were collected in both directions at each survey site except for Cleveland, where construction prevented the collection of data on I-75 Southbound.

in the state. However, it also highlights the importance of Tennessee's infrastructure to national and international trade flows.

- The remainder of statewide truck activity was roughly evenly split between internal (16 percent), outbound (17 percent), and inbound (19 percent).
- Results at individual intercept locations can vary widely. For instance, 61 percent of trucks surveyed at I-65 Southbound in Portland were through trucks, compared to just 36 percent on I-40 Westbound in Mount Juliet. This is probably because Mount Juliet is located near Nashville, so trucks there are more likely to be serving local origins and destinations. The Portland site is located very close to the Kentucky border, which explains why very few of the trucks there were traveling strictly within Tennessee.
- Other survey sites also tend to reflect their geographic location. For example, at I-75 Northbound in Cleveland (close to the Georgia state line), 30 percent of the trucks were traveling to destinations in Tennessee. At I-81 Northbound on the other side of the state, only two percent were coming into Tennessee, compared to 42 percent leaving the state (presumably headed towards Virginia).

Table 3.1 Truck Trip Characteristics at Roadside Intercept Locations

| Location | Number of Surveys Collected | Percent Internal | Percent Outbound | Percent Inbound | Percent Through |
|-------------------------------|------------------------------------|-------------------------|-------------------------|------------------------|------------------------|
| I-40 Eastbound in Mt. Juliet | 65 | 20% | 20% | 18% | 42% |
| I-40 Westbound in Mt. Juliet | 92 | 35% | 22% | 8% | 36% |
| I-75 Northbound in Cleveland | 297 | 22% | 11% | 30% | 38% |
| I-81 Northbound in Morristown | 48 | 8% | 42% | 2% | 48% |
| I-81 Southbound in Morristown | 123 | 9% | 4% | 27% | 60% |
| I-24 Eastbound in Manchester | 324 | 19% | 35% | 5% | 42% |
| I-24 Westbound in Manchester | 239 | 13% | 5% | 27% | 54% |
| I-40 Eastbound in Brownsville | 155 | 25% | 14% | 23% | 39% |
| I-40 Westbound in Brownsville | 153 | 29% | 18% | 14% | 39% |
| I-65 Northbound in Portland | 167 | 1% | 49% | 1% | 50% |
| I-65 Southbound in Portland | 227 | 0% | 1% | 38% | 61% |
| I-40/I-75 EB/NB in | 189 | 17% | 18% | 14% | 50% |

| | | | | | |
|---------------------------------|--------------|------------|------------|------------|------------|
| Knoxville | | | | | |
| I-40/I-75 WB/SB in Knoxville | 233 | 18% | 9% | 20% | 53% |
| Total | 2,312 | 16% | 17% | 19% | 47% |