

# Economy

## The Rapid Change in both Manufacturing and Service Sectors <sup>1</sup>

### ■ Executive Summary

This paper traces the evolution of the ongoing shift from manufacturing to services and its impact on goods movement. While the manufacturing sector has not diminished in terms of its contribution to the GDP, the service sector has taken on far greater importance in terms of sheer size and employment levels. This shift is neither a new nor a short-term phenomenon. Earlier productivity improvements in agriculture, communications, and resource extraction permitted the development of an efficient manufacturing sector, which in turn set the stage for the rapid growth in services that occurred following the World War II. Growth in the service economy has led to new demands and expectations of transportation providers; these in turn have led to changing expectations and requirements of transportation providers in the manufacturing sector.

These changes have an important impact on the movement of goods, both directly and indirectly:

- *Customers demand service that is more flexible, reliable, on-time.* Carriers must tailor service offerings closely to shipper product and delivery requirements. While some customers prefer inexpensive transportation, others require fast and reliable transportation. The net result has been far greater differentiation in transportation service offerings than has been the case in the past.
- *Traffic growth is greatest for smaller shipments.* A variety of factors including the proliferation of products and suppliers, increased direct delivery to end users, and “lean” inventory strategies are driving down the average shipment size.
- *Employees expect better working conditions; employers, better educated and trained employees.* The shift to the service economy colors the expectations of all businesses, customers and employees.

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<sup>1</sup> This working paper was prepared by Reebie Associates, a member of the Battelle Team providing research and analysis support to the Federal Highway Administration Office of Freight Management and Operations. It is one in a series of working papers providing initial analysis and discussion of the trends and issues affecting freight transportation productivity in the United States and North America. The series is available at <http://www.ops.fhwa.dot.gov/freight/adfrmrk/index.htm>. The working papers were prepared under contract DTFH61-97-C-00010, BAT-99-020. The opinions expressed in the working papers are those of the authors, not the Federal Highway Administration. The working papers are being circulated to generate discussion about emerging freight issues and may be updated in response to feedback from public and private sector stakeholders.

- *Society is more concerned with transportation's effect on the environment*. Society is concerned about the environment, whether from the impact of more trucks on neighborhood streets, a new intermodal terminal in a rural environment, or the long-term effect of emissions on global warming.
- *Demand for traditional, high volume transportation service will continue to grow, but account for a smaller portion of the transportation industry's revenues and volume.* This relates closely to the finding that traffic growth is greatest for small shipments. Users of high volume transportation service are primarily in the resource extraction, agricultural, as well as certain manufacturing sectors that have all experience slower growth.

These impacts, in turn raise two critical transportation policy questions: Can carriers effectively meet the changing expectations demanded by the manufacturing and service sectors? And, will society be willing and able to provide the resources necessary for meeting these expectations?

## ■ Trends in the Transition to a Service Economy

The freight transportation system has evolved in response to and in anticipation of the needs of the economy and the country. In an initial review of freight transportation over the past 20 years, nine themes within this evolutionary process were identified. This paper discusses one of these themes, namely the shift from a manufacturing to a service economy and its impact on goods movement. This is neither a new nor a short-term phenomenon. Technological innovation, managerial improvements, improved education, and other factors have allowed the United States to become more productive and more prosperous. Productivity improvements in agriculture and communications have allowed a major shift in resources from agriculture, mining, and forestry to other activities, notably manufacturing. Productivity improvements in manufacturing, aided by continued technology gains, have allowed another large-scale shift in resources toward providing a broad range of services related to health, education, travel, legal, entertainment, and many other personal and business services.<sup>2</sup>

From 1980 to 1997, the service component of gross domestic product (GDP) grew much faster than the manufacturing component. In 1980, manufacturing was roughly equal to both services and "FIRE" (finance, insurance, and real estate), the other two leading components of GDP. By the end of this period, manufacturing was a distant third, barely ahead of the rapidly growing trade sector.

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<sup>2</sup> The information and analysis in this paper are based on two major sources. The first, a scan of freight transportation issues, which was conducted in the spring of 2000, was a document review to prepare an annotated bibliography. The second source was a set of 30 interviews and discussions with officials and expert observers. The interviews were relatively open-ended conversations in the spring (11 conversations) or focused discussions based on the draft issue scan and briefing slides in the fall of 2000 (19 conversations).

The shifts in employment over this period are even more remarkable. Manufacturing employment dropped slightly, while employment in services doubled. Whereas the two sectors had similar employment levels in 1980, the service sector had approximately twice as many employees by 1997. A comparison of the jobs within the two sectors is much more complex. Many manufacturing jobs provide high wages and good benefits, while many of the jobs in the service economy provide minimum wage and few, if any, benefits. However, the service economy includes doctors, consultants, lawyers, and programmers as well as waiters, housekeepers, and sales clerks.

Within the manufacturing sector, technological change and investment in modern facilities enable fewer people to produce more products at a lower cost. Indeed, in recent years, manufacturing has consistently posted the highest productivity growth rates among all major economic sectors. Cheaper freight rates allow companies to serve wider markets and allow more products to be shipped over longer distances. Competition among manufacturers to both shippers and ultimately consumers leads to new products, more choices among varieties of the same product, and more marketing opportunities for products. Rising incomes allow consumers to purchase more products, while improved communications allow consumers to search for the lowest price and highest quality goods. Web-based retailing offers consumers a means to purchase more in less time. However, this imposes a heavy responsibility on the transportation system to ensure timely delivery. E-commerce and e-business, which reduce the transaction costs of marketing and distribution, allow small companies to participate in global markets. Thus, one can expect to see more smaller shipment size, despite the relative decline in manufacturing.

To meet demand, many manufacturers are shifting to “customized, mass-market products” along with associated services such as training and maintenance. The General Electric (GE) companies are increasingly concerned with service agreements related to their appliances. General Motors (GM) seeks ways to deliver new cars to the consumer within a few days and to provide convenient locations to purchase GM parts. The availability and convenience of parts can be more important to customers than the price. Procter & Gamble markets perfume and other high value products globally because these products can withstand the transportation costs. Lower value products like soap and toothpaste are commodities that can be produced regionally, but transport costs can be prohibitive in the exportation of these products. Sales are sought from a non-global, but still potentially large regional niche. These examples indicate that, in the service economy, distribution features stand out, and carriers and producers must respond in concert to the needs and desires of their ultimate customers.

In some cases, it is possible to view transportation as part of the service. Home grocery delivery services, web-based or catalog shopping, pizza shops, and Dell computers all tout home delivery as part of their service. In general, the linkages among production and transportation are getting stronger in many “lean inventory” systems. The distinctions among manufacturing, warehousing, customer service, and transportation are being blurred, fueled by major changes in logistics, information technology, and communications.

Of course, some bulk commodities have not yet been affected by these trends. Dupont, for example, has not shifted to customized production, primarily because of the overwhelming economies of large batch production in the chemical industry. They do

provide something akin to smaller shipments and specialized services by placing their product in rail tank cars that can be placed to allow customers frequent access to small amounts of the product. Coal moves in even larger unit trains, and grain still flows down the Mississippi in enormous barges.

The shift to a service economy also has societal implications. These include employment opportunities and educational requirements that differ from those of the manufacturing and raw materials production sectors. Society is concerned about the environment, whether from the effects of more trucks on neighborhood streets, a new terminal in a pristine rural environment, or the long-term effect of emissions on global warming. Thus, the shift from manufacturing to a service economy has various direct and indirect implications for transportation:

- Customers demand more flexible, reliable, on-time service
- Traffic growth is greatest for smaller shipments
- Employees expect better working conditions; employers, better educated and trained employees.
- Society is more concerned with transportation's effect on the environment
- Demand for traditional, high volume transportation service will continue to grow, but account for a smaller portion of the transportation industry's revenues and volume

Each of these implications, which are discussed in the next section, raises issues that are relevant to transportation policy. Two fundamental questions emerge:

- Will carriers be able to meet the raised standards demanded by both the manufacturing and service economy?
- Will society be willing and able to provide the resources required for efficient transportation services?

## ■ Implications for Freight Transportation

### Customers Demand Better, More Flexible Service

For the freight transportation system, the most direct effects of the shift to a service economy are the emergence of new demands and new traffic flows. The carriers interviewed noted the increasing demands for service and discussed issues in meeting these demands. United Parcel Service (UPS), Yellow Freight, and other carriers cited recent accomplishments in improving their service. The customers discussed the importance of service and ways to improve it.

Flexibility in service will also become more essential. Some customers prefer inexpensive transportation, others prefer fast and reliable transportation. The carriers verify the

increasing demands for better service, and some describe the variations in performance requirements. Yellow Freight estimates that a third of their freight is not deliverable on the day it is first made available to the customer. A similar situation exists in ports and intermodal terminals, in which freight is left for days before being picked up, even though the intermodal customers demand more rapid and dependable service. Carriers are working to develop better ways to distinguish among shipments with different priorities, and to learn how to market and manage different levels of service. Schneider, one of the major truckload carriers, is seeking ways to develop more customized service niches and opportunities to fuse information and logistics. They expect to price services more effectively, both as a way to justify new offerings and as a way to promote more efficient operations by smoothing the workload.

### **Traffic Growth is Greatest for Smaller Shipments**

With the proliferation of products and suppliers, and e-commerce purchasing, the demand for small package shipments will continue to rise. Competition among manufacturers will lead them to offer high quality services to the customers, and seek fast, reliable transport services to retailers and, increasingly, to consumers. The expectation, therefore, is that the demand for package delivery, air freight, and truck operations will increase. For CSX Intermodal, the trend toward smaller shipments is already evident as there is a decline in direct container loads shipped business to business, while there is a continuing increase in small package shipments (e.g., UPS shipments). For Amtrak, the volume of shipments handled by the Mail & Express division is growing rapidly. A typical shipment is four pallets and the limit on shipment size depends upon the ability of the carriers to manage costs while maintaining quality of service.

Both carriers and shippers can be expected to cooperate in seeking ways to consolidate shipments to avoid the higher costs associated with small units. As Gregory Nugent, VP Intermodal for UPS, stated:

*"We now specialize in logistics, warehousing, financing, and more services for freight shippers. We serve customers by ground transportation short and long haul, as well as by air, ocean container and rail intermodal trailers and containers."*

Procter & Gamble and the GE companies always attempt to ship in truckload lots, since a truckload can be filled up with multiple shipments. This will lead to a variety of intermodal services and partnerships among different kinds of carriers, e.g., express package carriers working in cooperation with the post office and LTL companies working with railroads. But too much emphasis can be placed on the intermodal nature of freight. As Alan Wieman, the Managing Director of GE Capital, stated,

*"the logistical realities of today's marketplace have resulted in the GE companies looking to motor carrier as their primary mode of freight carriage."*

Trucks moving over regional highway networks will be the primary means of pickup and delivery for most customers and shipments.

## Effect on Customer Services and Human Resource Management

The shift to a service economy raises the expectations of businesses, customers, and employees. As more services are offered to the consumer, an expectation of improved service quality becomes more important. Since the consumer has increasingly more choices, options, and extra services in many different arenas, there is an expectation of more choices and options in the workplace. Add this dimension to the workplace, and businesses begin to expect improved service from their suppliers and, in our consideration of freight transportation, from their carriers. Carriers must conform to society's general increased expectations regarding service.

The cultural effect is even more evident in human resources. People have new choices for employment, some of which are very appealing. A railroad or a manufacturer attempting to hire workers for the night shift no longer has an assured supply of applicants simply because they offer the best wages. People are less willing to work nights or weekends away from home, work in unattractive or noisy conditions, or work in well-paid but possibly unchallenging jobs. Transportation companies are now competing with a broader range of employers during a hiring period, whether for entry-level positions such as truck drivers or for mid-level managerial positions. As a Yellow Freight executive stated:

*"Our biggest problem on the labor side is finding front line supervisors. Trucking operations is a 24-hour, 7-day job which faces a lot of competition from employers in other industries."*

The service economy offers many incentives to those hired by the freight carriers.

The labor issue, with respect to truck drivers, has for years become more noticeable. As one former motor carrier executive emphasized, service performance is intimately linked to the quality and availability of drivers, and it will not be possible for motor carriers to improve service and productivity without a major input from the drivers. Several motor carrier representatives commented on the nature of the driver shortage. UPS, whose drivers are represented by the Teamsters Union, provides above average wages and operates such that most drivers don't work nights and therefore report that driver turnover is close to zero. Likewise, driver turnover is not considered a major problem by Yellow Freight, an LTL carrier with Teamster drivers. The problems are greatest for the truckload carriers, where severe competition since deregulation of the industry in 1980, has depressed profit margins and drivers' wages. JB Hunt recently increased drivers' wages by approximately 50% in a successful attempt to reduce turnover and improve safety. Their turnover rate dropped to under 50% from the more typical rate of 100% annual turnover for the intercity trucking industry.

## Society Is More Concerned with Transportation's Effect on the Environment

Growing concern for the environment is another societal implication of the shift from a manufacturing to a service economy. As the relative importance of the service economy grows, environmental factors become more important. Environment is quality of life issue, reflective of emerging social concerns preceding service economy. If manufacturing

is no longer the dominant basis for the local economy, then the community will be less likely to accept pollution, congestion, or other environmental problems related to either the factory, or to the transportation of goods to or from the factory. Issues related to the environment are addressed at length in Theme Paper 9.

## **Demand for Traditional, High Volume Transportation Service Will Continue to Grow, but Account for a Smaller Portion of the Transportation Industry Revenue**

The rising importance of the service economy will not diminish the need for traditional transportation services. Bulk transportation—by railway, waterway, highway, or pipeline—will continue to account for the great majority of freight transportation ton-miles, even though they will provide an ever diminishing share of freight transportation revenues. Efficient movement of grain, coal, ores, and other bulk commodities will continue to be a basic requirement of the freight system and an underpinning of the national economy. As the service sector of the economy grows, some might expect the relative importance of bulk freight transportation to decline, but the absolute amount of transportation required is quite likely to increase. Coal, grain, and other bulk commodities account for more than half of rail freight, whether measured in tons or ton-miles; they are even more important for the water carriers. Whatever the growth in services, there will still be a steady growth in the demand for energy, food, and construction materials.

Kennecott Copper Company is a good example of a traditional company with declining employment that still produces high demands on the freight transportation system. With the completion of a new smelter in Magna, Utah a few years ago, Kennecott was able to cut employment by two thirds while maintaining its level of production—and its transportation requirements. Such productivity improvements are necessary simply to remain competitive with imports and with other North American producers.

## ■ **Issues**

### **Will Carriers Be Able to Meet the Service Requirements of the New or Changing Economy?**

#### *Will Carriers Be Able to Meet Customer Service Demands?*

The carriers—TruckLoad (TL), Less Than TruckLoad (LTL), rail, and water—are optimistic about the potential for improving service. All of them cite new and innovative uses of information technology as a way to control operations and to provide flexibility in services offered to market segments or to particular customers. They do, however, express concerns about capacity and congestion, and they wonder how public policy will deal with the freight sector as society deals with environmental issues.

Customers do not always obtain better service from carriers. DuPont, which seeks reliability of service more than expediency, agrees that service demands are increasing, but finds that carriers are unable to keep pace. In terms of consistency and reliability,

service is especially inadequate for the rail system, and DuPont deems it necessary to carry additional inventory and to maintain a larger fleet of tank cars. These added transport costs are significant relative to the delivered price of the product, and they may seek out truck transport to lower total logistics costs. DuPont is a major user of truck and rail, with 170,000 truckload and 500,000 to 600,000 LTL shipments per year. DuPont reports an extensive system to monitor carrier reliability, loss and damage, billing errors, and accidents, which is indicative of their concern for service.

The carriers as a group acknowledge their problems in reaching service levels demanded by customers. It is likely that service “demands” from customers will always be somewhat higher than “service requirements” that can be justified economically. Customers will push for better service, and carriers will struggle to respond.

### ***Will Metropolitan Highway Networks Support the Freight Service Required by the Service Economy?***

As the service economy expands, transportation within the region becomes ever more important. Restaurants and movie theatres cannot attract customers if access is too time-consuming or if access is limited only to those who can drive a car. Hospitals, schools, and government offices all require reasonable accessibility if they are to serve the public. Small businesses need efficient transportation for their employees, for distributing their products, and for obtaining their supplies. In short, the service economy is bolstered by efficient regional transportation systems and hindered by congestion and lack of access. Since increasing congestion is a fact of life in many cities, concern exists that carriers may be unable to maintain or improve service levels.

### **Will Society be Willing and Able to Provide the Resources Required for Efficient Transportation Services?**

#### ***Will Transportation and Logistics Companies be Able to Attract Qualified People and Still Provide Low-Cost Services?***

There are definite human resource problems within the truckload sector of the industry. As noted above, the high turnover of drivers has been an issue, some carriers have sought to increase wages substantially in an effort to obtain a stable labor force. Like manufacturers, carriers find it more and more difficult to obtain employees for nights and weekends, especially in the area of supervisory and skilled jobs in which there are many attractive and highly paid alternatives for qualified people. The shift to smaller shipments and direct delivery to homes and small businesses increases the need for truck drivers, and the costs of providing this type of service could escalate if driver wages increase. However, the cost of service is not just a matter of wage rates. UPS, for example, is able to provide superior service, even with well-paid union drivers. Congestion and metropolitan mobility are a greater concern because more driving time means fewer deliveries and higher costs. Congestion and metropolitan mobility are problems facing all of our major cities.

### ***How will Conflicts Between Freight Transportation and Environmental Concerns be Handled?***

Efficient freight transportation requires terminals, rights-of-ways, and operations that may well be viewed as noisy, unclean, unsightly, or otherwise intrusive and objectionable by society. Natural desires to mitigate the environmental impacts of transportation facilities may lead to policies that hinder or prevent efforts to enhance transportation capacity and service. Finding space for new intermodal terminals is already a problem, and ports have been under pressure from alternative opportunities for using seaside land. Effective planning can presumably help manage these conflicts, but there are serious questions concerning public agencies' and societal knowledge and concern for freight and logistics activities.

There are no clear answers in the debate regarding the extent to which development depends upon freight transportation. The linkage is highly dependent upon the local conditions and the local prospects for the future. To the extent that the economy is based on agriculture, extraction, and basic industry, the freight transportation system, as seen by the public, is critical. Reasonably efficient linkages to the national and international freight networks are essential for supply chain management and for distribution networks. The major factories that employ most of the workers require rail, highway, river, and port access. The linkage between the service economy and general mobility within a region is more difficult to understand. But it is clear that congestion and declining accessibility are real threats to providing efficient, reliable freight service within many metropolitan regions.

State, regional, and local officials are beginning to take notice of freight priorities. Susie Lahsene of the Port of Portland pointed to the need to make provisions for increasing the capacity of ports and intermodal facilities and highlighted the idea of "freight-oriented development" as a potential feature of future "Smart Growth" plans. Federal legislation, especially ISTEA and TEA-21, has sparked interest in multi-modal planning, but it is still difficult to incorporate freight concerns within public policy debates.

### ***Will it be Possible to Enhance Capacity for Traditional Transportation Services?***

The National Highway System is, in many locations, hampered by congestion. Motor carriers and shippers call for increases in truck size and weight as a means of both increasing productivity and increasing highway capacity. Access to intermodal terminals and ports is a critical issue in locations where truck traffic associated with these facilities is rising rapidly. There are some opportunities for creating specific local freight rail corridors in the style of the Alameda Corridor project but these can entail major investments and changes in land use.

The basic transportation networks for the rail and water modes also require substantial investments. The capacity concerns for the rail system are well known and a source of concern to carriers and customers. While rail intermodal technology has proven to be well suited to the movement of small shipments, the ability of the network to handle continuing increases in traffic is an issue, especially with respect to the location of new intermodal terminals. The barge industry is concerned about the quality and capacity of

the aging infrastructure of the inland waterway system, as many of the locks and dams are more than 50 years old and beyond their design life.

A major concern is the planning and financing of basic investment in the transportation infrastructure. The creation of public/private partnerships for major freight projects must be viewed as a challenge, since the major freight carriers and shippers historically have had little interaction with the state, regional, and local agencies responsible for public transportation policy and funding.