

## Labor productivity growth in wholesale trade, 1990–2000

*Use of information and communication technologies in the fastest-growing wholesale trade industries spurred strong labor productivity growth in the sector as a whole, over the 1990–2000 period*

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According to the most recent economic census, there were more than 453,000 wholesale trade establishments in the United States in 1997, with total sales exceeding \$4 trillion. These sales substantially exceeded total sales in the retail trade sector and also exceeded the value of all manufacturing industry shipments in the same year. BLS data show that 7.3 million workers were employed in wholesale trade industries in 2000, or about 6.5 percent of total business employment.

The wholesale trade industry provides an important link in the supply chain connecting producers with consumers in the economy. Wholesale firms act as intermediaries between goods-producers and the business customers that buy their products. These customers may be retail establishments, manufacturers, mining establishments, contractors, other wholesalers, or government agencies, among others. Wholesale establishments are characterized by the fact that they usually do not sell directly to household consumers—with few exceptions, their customers are businesses or institutions.

Wholesalers provide services both to the producers of the products that pass through their operations as well as to their customers who purchase those goods. In addition to the basic distribution function, wholesalers may be involved in marketing, sales, customer support, and market research—activities that benefit the wholesaler's supplier. For the benefit of the cus-

tomers, wholesalers provide ready access to products in appropriate quantities, information on product characteristics and availability, sales advice, credit and financing, customer service, and technical support.<sup>1</sup>

The rapid diffusion of information and communications technology throughout the sector and the economy has led to shifts in the nature of the wholesale business. These shifts, in some cases, may threaten the traditional structure of the industry. In addition, heightened competitive pressures can place at risk the survival of many small local and regional wholesale firms that typify the industry.

Both the wholesale and retail trade industries are involved in getting the products of the goods-producing sector to consumers and other end-users. The wholesale-retail partnership in the distribution function invites comparisons between the two sectors, yet their differences are more striking than their similarities. In 2000, wholesale trade's 7.3 million workers were less than a third of the nearly 25 million employed in retail trade. At the same time, wholesale sector sales exceeded sales in retail trade, reflecting much higher levels of sales per employee in wholesale establishments. On average, employees in wholesale trade earn more per hour and work longer hours per week than workers in the retail sector. These differences reflect the presence of higher levels of skilled workers and fewer part-time workers in the wholesale sector. Wholesale trade's lower labor

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intensity and more highly skilled workforce, relative to retail trade, are likely to have played a role in the extent to which wholesalers were able to more quickly adapt to technological change.<sup>2</sup>

Wholesalers invested heavily in computers and other high-tech equipment and in computer software, allowing them to take advantage of technological advances more rapidly and to a greater extent than did retailers.<sup>3</sup> For example, wholesalers' quick adoption of new technology made it possible for them to take advantage of the growing use of Universal Product Code symbols on the products they handled to automate their operations. These advances, in turn, made feasible new production strategies such as just-in-time inventory management—the process in which shipments of production inputs are received just prior to their use. This strategy increases efficiency and helps to reduce inventory holding costs, benefiting both wholesalers and their customers. Wholesale firms were able to improve their efficiency in handling products and to offer new services to their customers.

These factors are reflected in relatively rapid labor productivity growth in the wholesale trade sector. Labor productivity, defined here as output per hour of labor input, grew at an average rate of 3.4 percent per year in wholesale trade from 1990 to 2000—substantially exceeding the 2.4-percent average rate in retail trade and the 2.1-percent per-year growth rate for the business sector as a whole. The strong growth in wholesale trade made an important contribution to overall labor productivity growth in the 1990s.<sup>4</sup>

Trends in wholesale trade labor productivity and its components, output and labor input, are examined in this article. (Throughout the article, references to 'productivity' denote labor productivity.) Analysis is based on recently-introduced BLS productivity measures for the sector that cover overall wholesale trade; the two major groups of industries within wholesale trade (wholesale durable goods and wholesale non-durable goods); and the 18 industries classified in wholesale trade at the 3-digit level of the U.S. Standard Industrial Classification (SIC) system.<sup>5</sup> The data series currently cover the period from 1987 to 2000; they are updated as additional source data become available.<sup>6</sup>

Productivity trends are often analyzed over the course of a full business cycle in order to minimize cyclical effects on the results. The latest complete cycle stretched from a peak that occurred in July 1990 to the most recent business cycle peak in March 2001. Accordingly, this article focuses on trends over the 1990–2000 period. Output and productivity growth rates began to accelerate near the middle of the decade, particularly in certain 'high-tech' industries such as the manufacture of computer equipment, electronic components and accessories (including semiconductors), and communications equipment. This speedup has attracted a great deal of scrutiny by researchers. Many of these studies have compared

growth rates before and after 1995 to determine the magnitude of the acceleration. To investigate the question of whether there was a productivity speedup in wholesale trade, trends over the 1990–95 and 1995–2000 periods are examined.

## The wholesale trade sector

Wholesalers reduce transactions costs throughout the supply chain by specializing in areas their suppliers and customers do not. Suppliers need not contract with many customers, and customers' time and monetary costs of searching for and transporting materials are reduced.<sup>7</sup>

Distribution functions include storing, handling, and transporting of goods. Storage generally takes place in wholesaler-owned or -leased warehouses. One of the wholesaler's most fundamental functions is the breaking up of large quantities of goods into smaller quantities and selling to many customers. While products are in inventory, wholesalers may sort, package, refrigerate, or assemble products. Then, they deliver, or arrange for the delivery of, the products to customers.

Wholesalers also provide customers with product information, customer service, and credit services. Wholesalers offer sales and marketing support to their customers by sponsoring events or promotions, or by providing display casing and signs.

*Types of wholesale operations.* There are three main types of wholesale operation: merchant wholesalers, manufacturers' sales branches and offices (MSBOs), and wholesale agents and brokers. Merchant wholesalers represent the largest proportion of the three types in terms of sales, total employment, and number of establishments. In 1997, merchant wholesalers operated 376,330 establishments (83 percent of all wholesale trade establishments) that employed 4.6 million people (79 percent of total wholesale trade employment), and had sales of more than \$2.3 trillion (57 percent of total wholesale trade sales). Merchant wholesalers take ownership of goods, perform distribution and other services, and then sell the goods. Manufacturers' sales branches and offices (MSBOs) are the second largest type of wholesaler both in terms of total sales and number of employees. MSBOs perform wholesale functions much like merchant wholesalers, but do so for a single manufacturer by which they are owned and operated. Manufacturers' sales branches hold a stock of goods while sales offices do not. MSBOs generally run the largest operations of the three types. In 1997, MSBOs had, on average, about seven times the sales per establishment and two and a half times the employees per establishment as did merchant wholesalers. Wholesale agents and brokers have the lowest sales and fewest employees of the three types. Agents and brokers primarily act as intermediaries, arranging sales between two parties.

Agents and brokers usually do not take ownership of the goods nor do they own facilities to deliver the goods.

## Factors affecting productivity trends in wholesale trade

A primary catalyst for change in wholesale trade, as in other sectors, was the strong growth in information and communication technology that began in the 1980s. The growing use of computers and networks made possible a number of innovations that transformed the wholesale industry. These developments, in turn, set the stage for a new business climate in the industry that featured increased competition and increasing scale of operations.

While the 1980s saw a rapid acceleration in the use of information and communications technology in wholesale trade, the foundations for this transformation were formed up to a decade earlier. The development of the machine-readable Universal Product Codes (UPCs), or bar codes, provided a means of automatically identifying products and cataloguing relevant information about them. This made it possible for wholesalers to automate the movement of goods through their distribution network, yielding rewards in terms of speed, accuracy, and efficiency, and leading to reduced unit costs.<sup>8</sup> The emergence of Electronic Data Interchange (EDI) standards to enable the transfer of information between independent information systems made quick and automatic transmission of business data along the supply chain possible and allowed wholesaler-distributors to take full advantage of the benefits of automation. The development of Automated Clearing House (ACH) networks helped to facilitate electronic financial flows. The growing use of electronic payments under ACH auspices supported the growth of electronic commerce (e-commerce) transactions. Together, these developments created the necessary infrastructure for the growth of technology-based systems in wholesale trade.

Some observers saw the rise of the Internet and the growth of e-commerce and business-to-business electronic transactions as signaling the decline of the wholesaler-distributor, but this has not occurred. Wholesalers have adapted to the new environment and have managed to retain much of their customer base.

*Technology-based factors.* The wholesale sector's extensive use of information technology (IT) is well-documented.<sup>9</sup> Though Internet-based transactions are growing in wholesale trade, most e-commerce transactions in the sector are made over Electronic Data Interchange (EDI) ordering formats. Typically, these systems are not Internet-based and have been available for more than 25 years.<sup>10</sup> EDI technologies include systems designed to improve operating efficiency, track inventory, and reduce decision time, labor input, and paper flow.

With EDI, wholesalers have the ability to provide inventory management for their customers.

The Universal Product Codes are at the heart of the EDI technology. Unique codes are placed onto products. These codes are then used to organize information about those products. Wholesalers utilize UPCs for keeping track of their inventory. When a coded product enters stock, the UPC is scanned, and the product is registered into inventory. When a coded product leaves stock, it is scanned again and removed from registered inventory. This allows wholesalers to keep a constant count of how much of each particular product is in stock. Inventory replenishment software, when provided with customer inventory information, can project the timing and composition of future shipments. Logistics software plots starting and destination points and calculates the most cost-efficient and least time-consuming route. Audit verification software increases accuracy in accounts payable by comparing invoices to purchase orders and immediately paying the matching invoices.<sup>11</sup>

When a wholesaler uses some of these systems together, they can provide their customers with inventory management services in which the wholesaler provides the service of being responsible for the timing and composition of new shipments. By tracking customer sales using UPCs as the tracking tool, the wholesaler can view customer inventory levels at any time. The wholesaler then uses inventory replenishment software with prearranged shipping parameters installed to forecast timing and composition of new shipments. When customer inventory levels reach a certain point, the wholesaler can send the shipment without further consultation with the customer.<sup>12</sup> This operation shifts customer inventory management responsibility from the customer to the wholesaler, allowing the wholesaler to charge for providing the service.

These developments facilitate the just-in-time delivery strategy that, by its nature, involves cooperation and information-sharing between wholesalers and their customers. The just-in-time approach first took hold in the automobile manufacturing industry as American manufacturers attempted to remain competitive with the Japanese automotive industry by emulating Japanese production techniques. While it is often thought to benefit mainly manufacturers, just-in-time inventory control benefits wholesalers as well. In addition to representing an additional service that a wholesale firm can offer, the same systems that allow wholesalers to supply their customers on a just-in-time basis also allow them to economize on their own inventory holdings—leading to wholesale industry productivity increases.<sup>13</sup>

*Online exchanges.* Online exchanges allow buyers and sellers to communicate directly with each other via the Internet. Sellers post catalogues containing product listings and information; buyers can then shop the catalogues on their Web

browser. The buyer and seller complete transactions, arrange payment, and arrange shipment directly on the Internet. Wholesalers especially benefit from online exchanges, as they may act as both buyer and seller. Wholesalers can browse supplier catalogues for hard-to-find products or for lower prices while incurring minimal transaction costs. Acting as a seller, wholesalers can reach out to a larger population of customers and can market products at a limited cost.

Online exchanges can be detrimental to the wholesale sector by making it possible for customers to purchase directly from manufacturers. This may reduce or eliminate some wholesaler functions or even completely displace them in the supply chain.<sup>14</sup> Online exchanges can also affect industry structure by allowing easy access into previously exclusive local markets. Resulting heightened competition may have been detrimental to less-efficient wholesalers.

While the technological basis for e-commerce has existed for many years, in most wholesale industries only a modest share of sales by merchant wholesalers are completed through electronic channels.<sup>15</sup> However, three large wholesale industries rely on e-commerce sales much more extensively—drugs, drug proprietaries, and druggists' sundries wholesale; motor vehicles and automotive parts and supplies wholesale; and professional and commercial equipment and supplies wholesale. Together, these three industries accounted for 63 percent of all e-commerce sales by merchant wholesalers.

*Changes in the business environment.* The diffusion of technology and technology-related innovations through the sector made it possible for wholesale firms to more effectively manage larger collections of goods and to service a larger and more geographically expansive customer base. This environment provided an opportunity for wholesale firms to obtain scale economies through expansion. At the same time, consolidation and increasing concentration were occurring among wholesalers' customers. It has been argued that consolidation in customer markets is one of the primary influences leading to consolidation in wholesale industries.<sup>16</sup> Larger wholesaler-distributors covering a wider geographic area have a competitive advantage over small local firms in dealing with large regional or national customers, such as retail chains.

There is evidence that consolidation is a continuing trend in the wholesale trade sector, and that increasing concentration is taking place in certain industries. A study based on surveys of wholesale industry firms documents "significant consolidation between 1985 and 1995" in a majority of detailed wholesale trade industries.<sup>17</sup> Data from the Censuses of Wholesale Trade show an overall decline in the number of wholesale trade establishments between 1987 and 1997—accompanied by substantial increases in the average size of wholesale establishments as measured by the average number of employees per establishment.

On the other hand, measures of concentration, such as the proportion of sales accounted for by the largest firms, indicate increasing concentration from 1987 to 1997 in only a few wholesale industries at the 3-digit SIC level. The data for the overall wholesale sector show little change in concentration between 1987 and 1997. Despite some movement towards increasing concentration, wholesale trade remains less concentrated than other sectors—local and regional wholesalers still account for the vast majority of firms in the industry.<sup>18</sup>

Traditionally, wholesalers' revenue has been based on a fixed markup over cost. Under this approach, customers who are nearby or who require few special services are charged at the same rate as customers who are more costly to serve. There is little correlation between the rates charged by the wholesaler and the level of services they provide on a customer-by-customer basis.<sup>19</sup> The industry, however, has begun a move toward fee-for-service. Under this approach, the wholesaler charges only a small standard markup over cost; beyond that, each customer pays specifically for services they obtain from the wholesaler. The electronic-based systems tracking product by UPC make these fees for service possible.

Other variations in the traditional business model of the wholesaler-distributor have begun to emerge under the heightened competitive pressures that now exist in wholesale trade. Of note is a strategy that rejects the conventional approach under which a wholesaler purchases products, holds them in inventory, then sells them to customers as demand conditions dictate.<sup>20</sup> Under the alternative approach, the wholesaler-distributor holds minimal stock in inventory. As their orders are received, they locate a supplier for the products and arrange for them to be shipped directly to the customer. Under this model, the wholesaler acts essentially as an agent/broker in the sense that they do not take possession of the goods and are not directly involved in distributing them to the customer. A more complete variation from traditional models includes "integrated supply" arrangements under which, in some cases, the customer outsources their entire procurement operation to the wholesaler.<sup>21</sup>

A new category of wholesale operation, first reported in the 1997 Census of Wholesale Trade, illustrates the extent to which businesses throughout the supply chain are highly integrated and, in some cases, intermingled. It also shows how shifts that occur over time can further complicate the task of distinguishing certain types of businesses and can undermine the precision of the measures. The outsourcing of domestic manufacturing operations to foreign countries—often because of relatively low foreign labor costs—has given rise to a class of wholesalers whose business differs from the traditional form of wholesale operation. These "own brand importer-marketers" are essentially manufacturing firms that have shifted their production overseas. Their ac-

tivity is included in the wholesale sector because they are primarily engaged in importing and distributing their products. Unlike a traditional wholesaler, however, an own brand importer-marketer typically engages in many of the same activities as would a manufacturer. They are involved in product development or acquisition; obtaining patents and trademarks; licensing the manufacture of the products abroad; and advertising and marketing the product to a degree not characteristic of wholesalers.<sup>22</sup> Overall, own brand importer-marketers make up a small share of wholesale trade (3.4 percent of wholesale trade sales in 1997), but they represent a significant share of wholesale trade imports. They account for the majority of imports in certain wholesale industries. For example, in 1997, own brand importer-marketers made up more than 80 percent of imported wholesale motor vehicles

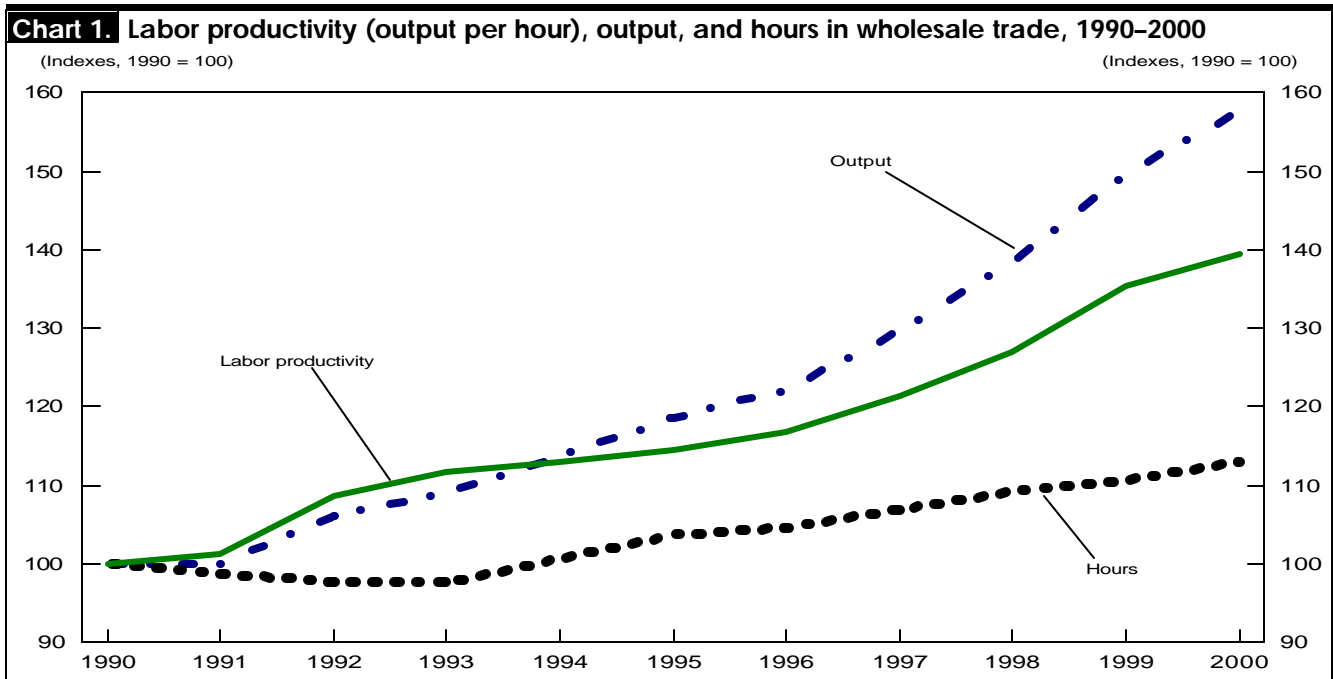
and automotive parts and supplies, and more than 11 percent of total sales in the industry.

## Wholesale trade productivity trends

The 3.4-percent annual increase in wholesale trade labor productivity from 1990 to 2000 resulted from annual output growth of 4.7 percent and labor hours growth of 1.2 percent. (See table 1 and chart 1.) Productivity growth rates varied substantially across the sector, rising 5.6 percent per year in the durable-goods wholesale trade major group but only 0.7 percent per year in nondurable-goods wholesale trade. More than 80 percent of wholesale trade's productivity growth occurred in three durable goods industries: 42 percent can be attributed to profes-

**Table 1.** Annual percent change in output per hour and related series: Wholesale trade industries, 1990–2000, 1990–95, and 1995–2000

SIC code	Industry	2000 Employment (thousands)	Annual percent change								
			1990–2000			1990–95			1995–2000		
			Output per hour	Output	Hours	Output per hour	Output	Hours	Output per hour	Output	Hours
<b>Wholesale trade</b>											
50, 51	Wholesale trade .....	7,290	3.4	4.7	1.2	2.7	3.5	.7	4.0	5.8	1.7
<b>Wholesale durable goods</b>											
50	Wholesale durable goods .....	4,337	5.6	7.1	1.4	4.9	5.6	.6	6.3	8.6	2.2
501	Motor vehicles and automotive parts and supplies ...	540	3.3	4.6	1.2	2.8	4.6	1.7	3.8	4.6	.8
502	Furniture and home furnishings .....	187	1.2	3.0	1.7	1.7	2.0	.3	.8	4.0	3.2
503	Lumber and other construction materials .....	302	-1.7	.6	2.4	-3.3	-2.0	1.4	-.1	3.3	3.4
504	Professional and commercial equipment and supplies .....	976	17.1	19.5	2.0	16.0	15.9	-.1	18.3	23.3	4.2
505	Metals and minerals, except petroleum .....	165	-.9	.7	1.6	-1.0	-.1	.9	-.8	1.5	2.3
506	Electrical goods .....	599	9.2	11.0	1.7	8.6	9.0	.4	9.8	13.1	3.0
507	Hardware and plumbing and heating equipment and supplies .....	326	1.7	2.8	1.1	1.8	2.6	.8	1.6	3.0	1.4
508	Machinery, equipment and supplies .....	871	2.4	3.0	.5	1.6	1.3	-.3	3.3	4.6	1.3
509	Miscellaneous durable goods .....	372	3.9	4.9	.9	2.3	4.8	2.5	5.6	5.0	-.6
<b>Wholesale nondurable goods</b>											
51	Wholesale nondurable goods ...	2,953	.7	1.7	1.0	.2	1.1	0.9	1.2	2.3	1.1
511	Paper and paper products .....	277	2.2	2.9	.7	2.4	3.0	0.5	1.9	2.8	.9
512	Drugs, drug proprietaries, and druggists' sundries .....	263	2.3	5.5	3.1	2.7	4.0	1.2	1.9	7.1	5.1
513	Apparel, piece goods, and notions .....	233	1.3	2.3	1.0	-2.0	.2	2.2	4.6	4.5	-.1
514	Groceries and related products .....	988	.6	2.0	1.3	.9	2.0	1.1	.4	2.0	1.6
515	Farm-product raw materials ...	105	3.7	1.3	-2.4	2.3	.7	-1.6	5.1	1.9	-3.1
516	Chemicals and allied products .....	168	-.6	1.1	1.8	.0	1.3	1.3	-1.3	.9	2.2
517	Petroleum and petroleum products .....	156	-.1	-2.4	-2.3	2.1	-2.4	-4.4	-2.2	-2.4	-.2
518	Beer, wine, and distilled alcoholic beverages .....	165	.1	1.2	1.1	-1.3	-.9	.4	1.5	3.3	1.8
519	Miscellaneous nondurable goods .....	598	.3	1.4	1.1	-2.0	.2	2.3	2.7	2.6	-.1



sional and commercial equipment and supplies; 24 percent to electrical goods; and 15 percent to motor vehicles and automotive parts and supplies.<sup>23</sup> (See table 2.) While these three industries are relatively advanced in the wholesale trade sector in terms of technological and managerial

innovation, rapid growth in the high-tech products handled in two of them—wholesale professional and commercial equipment and supplies and wholesale electrical goods—has a substantial effect on these two industries’ output and productivity growth, as well as that of the durable goods major group and overall wholesale trade.

**Table 2. Wholesale trade sector growth in labor productivity and industry contributions, 1990–2000 (annual percent change and percent change contributions)**

SIC code	Industry	Output per hour
50, 51	Wholesale trade .....	3.4
501	Motor vehicles and automotive parts and supplies .....	.5
502	Furniture and home furnishings .....	.0
503	Lumber and other construction materials .....	-.1
504	Professional and commercial equipment and supplies .....	1.4
505	Metals and minerals, except petroleum .....	.0
506	Electrical goods .....	.8
507	Hardware and plumbing and heating equipment and supplies .....	.0
508	Machinery, equipment and supplies .....	.2
509	Miscellaneous durable goods .....	.1
511	Paper and paper products .....	.1
512	Drugs, drug proprietaries, and druggists’ sundries ..	.1
513	Apparel, piece goods, and notions .....	.0
514	Groceries and related products .....	.1
515	Farm-product raw materials .....	.1
516	Chemicals and allied products .....	.0
517	Petroleum and petroleum products .....	-.1
518	Beer, wine, and distilled alcoholic beverages .....	.0
519	Miscellaneous nondurable goods .....	.0

NOTE: The sum of the annual percent change contributions for individual industries is approximately equal to the annual percent change for the sector.

*Durable-goods wholesale trade.* The durable goods wholesale major group includes firms that buy and sell many of the high-tech products that were in such high demand during the 1990s. Productivity in the group of industries increased 5.6 percent per year, reflecting output growth of 7.1 percent per year and annual hours growth of 1.4 percent. Seven of the nine industries in the durable-goods wholesale trade group recorded productivity increases during the period.

The most rapid productivity increase among all wholesale trade industries, 17.1 percent per year, occurred in the professional and commercial equipment and supplies industry. Output expanded at a rate of 19.5 percent per year, while hours increased at a rate of only 2 percent per year. A substantial portion of output growth in the industry can be attributed to particular goods. Computer equipment and supplies made up 60 percent of industry sales in 1997, up from 48 percent in 1987. Demand for these products was increasing during the 1990s, as they became business and household staples by the end of the decade. The industry also ranked third in all of wholesale trade (second in the major group) in percentage of sales made via e-commerce.<sup>24</sup>

The electrical goods wholesale industry had the second highest rate of productivity growth from 1990–2000, 9.2 per-

cent per year. Output in the industry grew 11 percent per year, while labor hours increased 1.7 percent per year. The industry includes high-tech products such as semiconductors and cellular phone parts and equipment that were in heavy production and high demand during the period. Reflecting sales of these high-tech products, industry sales jumped to \$370 billion in 2000 from \$139 billion in 1990—an increase of 165 percent.

Productivity in the motor vehicle and automotive parts and supplies industry increased at a rate of 3.3 percent per year from 1990–2000 as output increased 4.6 percent per year and labor hours increased 1.2 percent per year. During this period, the industry experienced much change due in large part to overhauls in the automobile manufacturing industry. Automobile manufacturers led the way in implementing a just-in-time delivery strategy, effectively forcing wholesalers in the industry to do the same.<sup>25</sup> This management strategy encouraged the use of inventory sharing and supplier-managed inventory for seamless ordering and delivery scheduling. Also encouraging the use of inventory sharing between trading partners in the industry is the composition of the industry. The motor vehicle and automotive parts and supplies industry is one of only two wholesale industries in which manufacturers' sales branches and offices (MSBOs) have greater sales than merchant wholesalers. This is especially the case in the motor vehicles portion of the industry where MSBO sales were more than \$142 billion higher than those of merchant wholesalers. In 2000, 20 percent of all industry sales were e-commerce transactions, 99.6 percent of which were completed over EDI formats.

*Nondurable-goods wholesale trade.* Labor productivity in the nondurable-goods wholesale trade group rose 0.7 percent per year on average during the 1990s, quite weak relative to that in durable-goods wholesale trade. While the increase in labor hours of 1 percent per year was somewhat lower than the rate in durable goods wholesale, the average annual output growth of 1.7 percent was far lower. Just as in the durable goods group, productivity growth rates varied substantially among nondurable goods wholesale industries. Unlike durables, however, there were no nondurable goods industries with especially rapid productivity increases.

Productivity increased over the period in seven of the nine nondurable-goods industries. The most rapid increase, 3.7 percent per year, occurred in the wholesale farm-product raw materials industry. Although industry output grew at a modest 1.3 percent per year, this growth was achieved in combination with average annual declines in employment and labor hours (2.1 and 2.4 percent, respectively). Farm-product raw materials are heavily tied to exports. In 1997, 39 percent of industry sales represented sales to exporters, the highest proportion of export sales among the 3-digit SIC wholesale indus-

tries. Agricultural products exports are strongly influenced by economic conditions abroad.

Wholesale farm-product raw materials is one of the industries for which Census data indicate a clear shift toward consolidation and increasing concentration during the period studied. Between 1987 and 1997, the number of firms in the industry dropped to 6,994 from 9,084—a decline of 23 percent. In addition, the proportion of industry sales accounted for by the largest firms increased considerably: the share of sales attributable to the 8 largest firms increased to 34.8 percent from 25.9 percent, and the share attributable to the 50 largest firms rose to 54.8 percent from 44.8 percent. The employment decline in the industry kept pace with the consolidation of firms and establishments. Rather than seeing an increase in the average employment size of each establishment, the average establishment size remained constant at about 10 employees per establishment throughout the period.

The most rapid output growth over the 1990–2000 period in nondurable-goods wholesale trade occurred in drugs, drug proprietaries, and druggists' sundries. Output in this industry increased at an average annual rate of 5.5 percent between 1990 and 2000. This industry also recorded the most rapid increase in labor input in the wholesale trade sector—hours rose at an annual average rate of 3.1 percent, reflecting strong employment growth of 3.2 percent per year. The combination of strong output and labor input growth resulted in productivity growth of 2.3 percent per year.

The drug-wholesaling industry underwent rapid expansion over the period studied. From 1987 to 1997, the number of establishments operating in the industry increased by 64 percent. Increasing concentration in the industry over this period is well documented; it generally followed a pattern whereby a single drug-wholesaling firm acquired another firm and, over time, several firms.<sup>26</sup> The proportion of sales accounted for by the eight largest firms in the industry increased to 40.3 percent in 1997, up from 30.5 percent in 1987. The proportion of sales accounted for by the 20 largest firms increased to 65.4 percent from 51.8 percent.

The moderate productivity growth in drug wholesaling is surprising given the pace of expansion in the industry and the degree to which drug wholesalers have adopted technologically advanced inputs and processes. For example, merchant wholesalers in the drugs, drug proprietaries, and druggists' sundries industry had, by far, the highest proportion of sales occurring through e-commerce channels in the wholesale sector in 2000—nearly 40 percent.<sup>27</sup> However, this industry was also one of the first to invest in high-tech equipment and adopt advanced processes. Many of the largest gains from these investments and process changes may have been realized in the past.

The increased concentration occurring in drug wholesaling during the 1990s might be expected to lead to strong labor

productivity growth as inefficient firms dissolve or are absorbed by larger, more efficient firms. In his study of consolidation in the drug wholesaling industry, however, Adam J. Fein points out that consolidation in this industry occurred mainly through a small number of firms acting as “consolidating agents.”<sup>28</sup> The acquiring firms did not necessarily possess a clear efficiency advantage over the firms they acquired. In addition, cost and efficiency disadvantages can arise when companies are combined, as business organization becomes more complex and differing corporate structures and cultures are merged.<sup>29</sup>

### Was there a productivity speedup in wholesale trade?

Many industries experienced accelerating productivity growth during the second half of the 1990s. This was reflected at the economy-wide level in a speedup of business-sector productivity growth—to a 2.6-percent rate of increase in the 1995–2000 period from 1.5 percent in 1990–95. Productivity growth also accelerated in the wholesale trade sector in the second half of the 1990s, and a substantial share of the

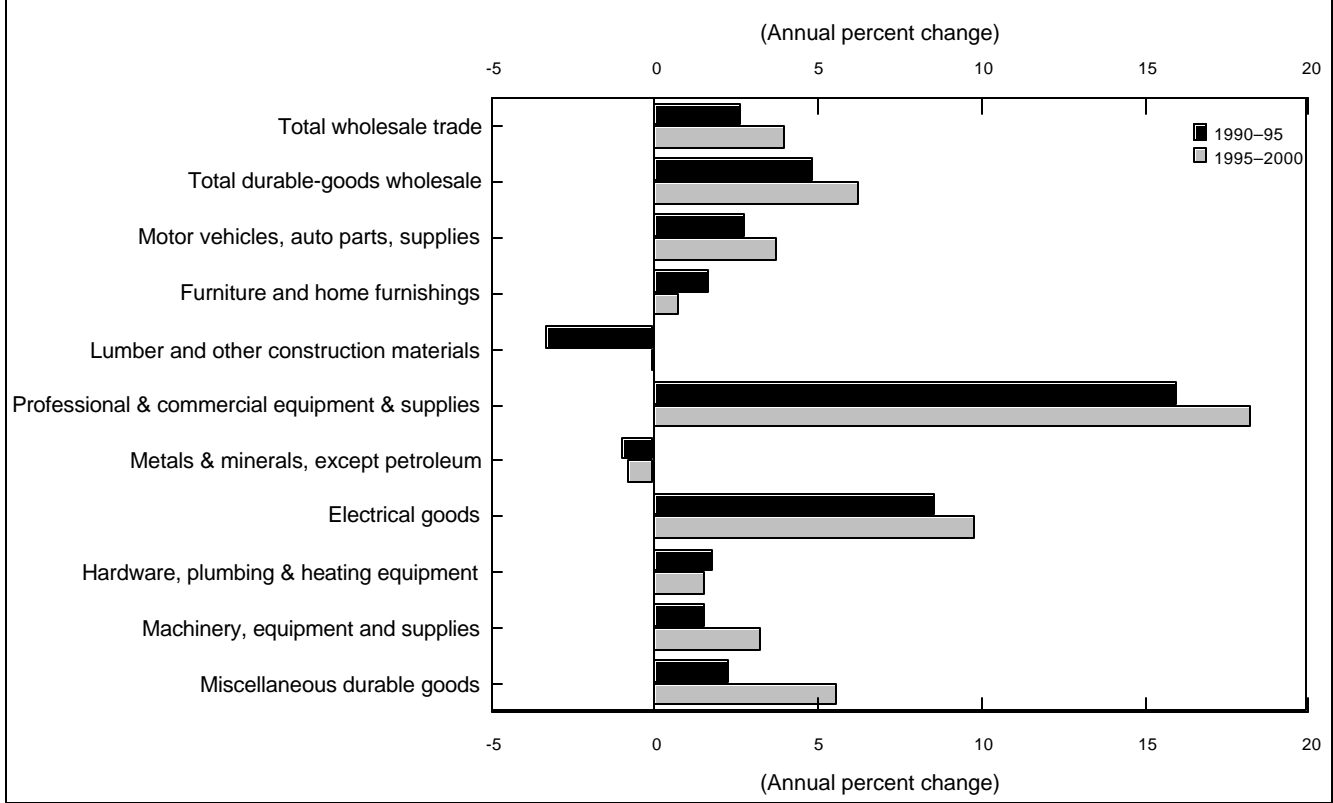
overall productivity acceleration has been attributed to wholesale trade.<sup>30</sup>

Wholesale trade productivity growth expanded to a rate of 4 percent per year in the second half of the decade, up from 2.7 percent per year in the first half—a 1.3-percentage-point increase. This slightly exceeded the 1.2-percentage-point speedup in manufacturing productivity, but was surpassed by the 1.6-percentage-point productivity acceleration in the retail trade sector.

Both durable-goods and nondurable-goods wholesale trade had faster productivity growth in the latter half of the 1990s than in the earlier half. In durable-goods wholesale, productivity growth was more rapid and the acceleration somewhat larger, increasing to a 6.3-percent average rate from a 4.9-percent rate. (See chart 2.) In nondurable-goods wholesale, productivity growth rose to a 1.2-percent average rate from a 0.2-percent rate. (See chart 3.)

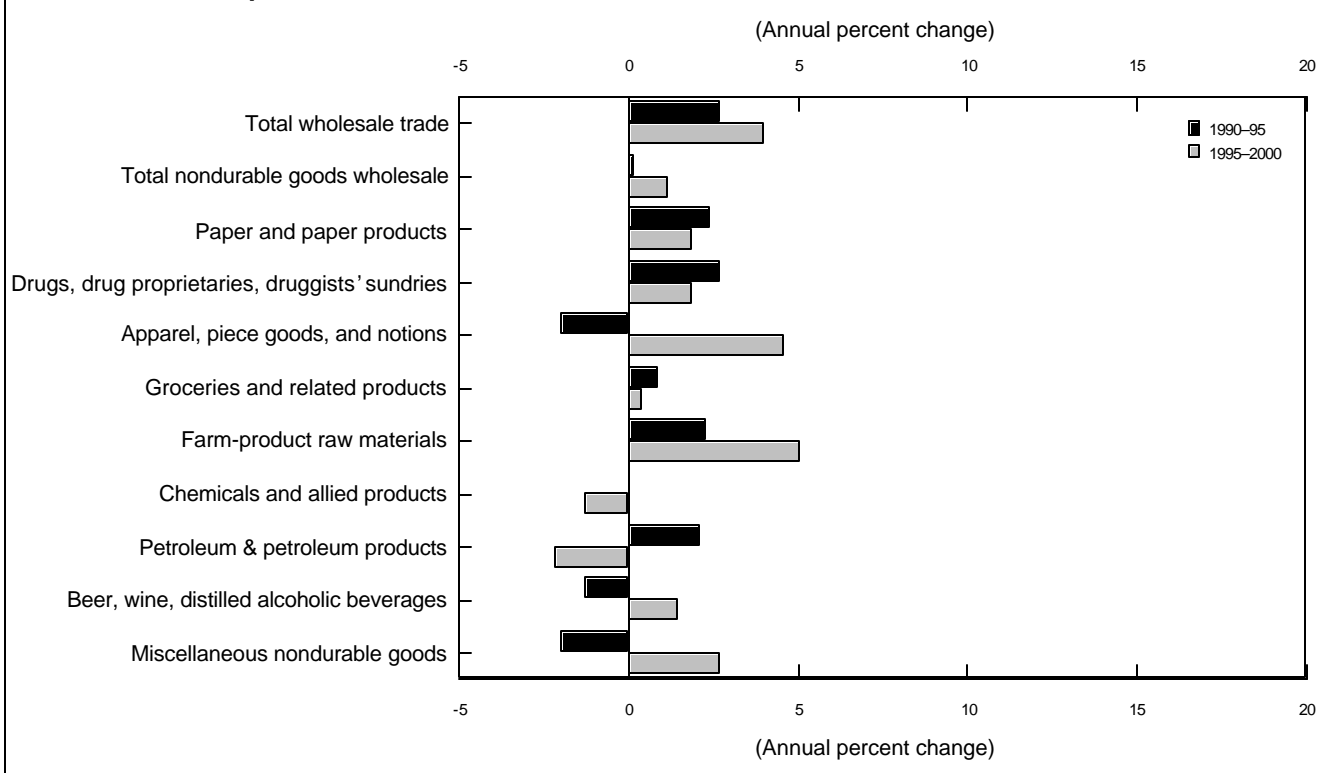
Among the component industries of the wholesale trade sector, occurrences of a productivity acceleration from 1990–95 to 1995–2000 were mixed. Only 9 of the 18 wholesale trade industries had more rapid productivity increases in the later period than in the earlier one. In addition, two wholesale

**Chart 2. Annual percent change in labor productivity: wholesale trade, durable-goods wholesale, and component industries, 1990–95 and 1995–2000**





**Chart 3. Annual percent change in labor productivity: Wholesale trade, nondurable-goods wholesale, and component industries, 1990–95 and 1995–2000**



industries with productivity declines from 1990 to 1995 had lower rates of productivity decline in the 1995–2000 period. On the other hand, seven wholesale trade industries had poorer productivity performance in the second half of the 1990s compared to the first half.

While accelerating productivity growth throughout the 1990s was somewhat more common among industries in the durable-goods wholesale trade group, both durable-goods wholesale and nondurable-goods wholesale industries made significant contributions to the speedup. Industries handling high-tech products played a role in the speedup, but accounted for only about a third of the overall growth rate increase. Productivity growth in electrical goods increased 1.2 percentage points in the latter period relative to the first half of the decade, and professional and commercial equipment and supplies had a 2.3-percentage-point acceleration. Other durable-goods wholesale industries with significant productivity growth increases in the second half of the 1990s were motor vehicles and automotive parts and supplies (1 percentage point); machinery, equipment and supplies (1.7 percentage points); and miscellaneous durable goods (3.3 percentage points). In the lumber and other construction materials

industry, a productivity decline of 0.1 percent per year from 1995 to 2000 represented a significant improvement over the 3.3-percent-per-year decline the industry recorded in the earlier period. By providing a smaller offset to the sector's productivity growth in the latter half of the 1990s, this industry also had a part in the overall productivity acceleration.

In the nondurable-goods wholesale trade group, the apparel, piece goods, and notions industry had the largest absolute increase in productivity growth in the second half of the 1990s—following a 2-percent-per-year productivity decline in the earlier period, productivity in the industry increased at a 4.6-percent rate in the later period, an overall increase of 6.6 percentage points. Similarly, miscellaneous nondurable goods increased 2.7 percent per year in the 1995–2000 period, following a 2-percent-per-year decline in the first half of the 1990s—a 4.7-percentage-point difference. Significant improvements in productivity growth over the decade also occurred in farm-product raw materials wholesale and beer, wine, and distilled alcoholic beverages wholesale (following a decline in the earlier period); both industries had productivity growth rate increases of 2.8 percentage points relative to their 1990–95 growth rates.

## Measurement of labor productivity and unit labor costs for wholesale trade industries

Indexes of output per hour (labor productivity) for wholesale trade industries are calculated by dividing an index of real output by an index of total hours of all workers in the industry. Indexes of real output are derived by removing price change from (deflating) total sales or revenues. Indexes of total hours are calculated as the product of employment and average weekly hours.

Data on industry sales for wholesale trade industries are published by the Bureau of the Census. For economic census years, total industry sales are published, by commodity line, for three categories of wholesalers: merchant wholesalers, manufacturers' sales branches and offices (MSBOs), and agents and brokers. Sales by agents and brokers are adjusted to remove the value of sales, other than their fees, for which agents and brokers do not take ownership. Total sales reported include sales between establishments within the industry. Data are reported on sales between wholesale establishments by industry.

These sales (sales between wholesale establishments) are netted out of the total sales by industry. The sales of wholesale trade establishments to other wholesalers are assumed to occur within industries and not across 3-digit SIC wholesale trade industries.

For inter-census years, annual industry sales data are published for merchant wholesalers only. After deflation of sales of merchant wholesalers, real output of MSBOs and agents and brokers is estimated based on an extrapolation of the change in real output of the commodities produced by manufacturers. The real output of all wholesalers is adjusted for changes in intra-industry sales. The adjustment is based on a linear interpolation of the intra-industry sales between two economic census years.

Deflators for the wholesale trade industries are developed by the Bureau of Economic Analysis (BEA). These deflators are derived as a weighted combination of price indexes. The price indexes are BLS producer price indexes (PPIs) matching the commodities sold in the industry and BLS import price indexes. Weights are commodity line sales by merchant wholesalers, which are published every 5 years in the Census of Wholesale Trade. These weights are supplemented with import data from the BEA Input/Output tables.

Indexes of labor input, that is total hours of all workers, are derived from data on employment and average weekly hours. Data on employment for all employees and average weekly hours for all nonsupervisory workers are obtained from the Current Employment Statistics (CES) survey. Employment and average weekly hours for all self-employed and unpaid family workers are obtained from the Current Population Survey (CPS). Average weekly hours of supervisory workers are assumed to be constant from year to year. No adjustments are made to the indexes of total hours to account for the changing composition of the workforce arising from shifts in the amount of education and experience. (BLS does produce labor composition measures for the business and nonfarm business sectors.)

Indexes of unit labor costs are computed as the ratio of current dollar total compensation to the index of real output. Compensation is total payroll plus all supplemental payments paid by the firm. Total compensation is reported for economic census years in the Census of Wholesale Trade. Annual payroll is reported by the BLS Covered Employment and Wage Program (commonly referred to as the ES-202 program). Annual supplements for non-census years are estimated using ratios of payroll to compensation derived from the Census of Wholesale trade.

## Notes

<sup>1</sup> *U.S. Industry and Trade Outlook, 2000*, (The McGraw-Hill Companies and the U.S. Department of Commerce), Chapter 41, Wholesale Trade.

<sup>2</sup> Unpublished BLS data show that real capital services per hour of labor input (the capital-to-labor ratio) was substantially higher in the wholesale trade sector than in the retail trade sector during the period studied. In addition, the capital-to-labor ratio grew nearly three times as rapidly from 1990 to 2000 in wholesale trade as in retail trade (a 7.6-percent annual rate in wholesale vs. 2.6 percent in retail) and twice as rapidly over the long-term period from 1970 through 2000 (a 6-percent annual rate in wholesale vs. 3 percent in retail).

<sup>3</sup> Jack E. Triplett and Barry P. Bosworth, "Productivity in the Services Sector." Paper prepared for American Economic Association, session on Productivity in Services, Boston, MA, January 9, 2000, p.6; McKinsey Global Institute, *U.S. Productivity Growth, 1995-2000*, section on Wholesale Trade, on the Internet at: <http://www.mckinsey.com/knowledge/mgi/feature/index.asp>. Data on investment in high-tech equipment by industry can be found in Belinda Bonds and Tim Aylor, "Investment in New Structures and Equipment in 1992 by Using Industries," *Survey of Current Business* (Bureau of Economic Analysis, December 1998), pp. 26-51.

<sup>4</sup> See William Gullickson and Michael J. Harper, "Bias in aggregate productivity trends revisited," *Monthly Labor Review*, March 2002, pp. 32-40. Data supporting this article show that the wholesale trade sector contributed significantly to the growth in multifactor productivity for the private business sector.

<sup>5</sup> *BLS Releases New Series on Productivity and Costs in Wholesale Trade Industries, 1990-2000*, USDLO2-347 (U.S. Department of Labor), June 20, 2002.

<sup>6</sup> The industry productivity data in this article are based on the Standard Industrial Classification (SIC) system. Beginning with the next annual update in 2003, which will incorporate 2001 data, the industry series will be based on the North American Industry Classification System (NAICS).

<sup>7</sup> Don E. Sherman, "The Role of the Wholesaler Distributor," IBM Wholesale Distribution Reference Room, January 12, 1998, on the Internet at: <http://wholesaledistribution.services.ibm.com/WDRefRoom.nsf/WhitePapers>.

<sup>8</sup> Stephen Brown, *Revolution at the Checkout Counter* (Harvard University Press, 1997). See the Introduction by John T. Dunlop and Jan Rivkin, pages 11-13. The comments describe effects in retail trade, but in many cases, they apply equally well to the wholesale trade sector.

<sup>9</sup> See, for example, McKinsey Global Institute, *U.S. Productivity Growth, 1995-2000*.

<sup>10</sup> *2000 E-commerce Multi-sector Report* (U.S. Department of Commerce, Census Bureau), March 18, 2002, available through the E-stats information page, on the Internet at: <http://www.census.gov/eos/www/ebusiness614.htm>.

<sup>11</sup> Buddy Bradford, "The Route Delivery Problem," IBM Wholesale Distribution Reference Room, December 6, 1999, on the Internet at: <http://wholesaledistribution.services.ibm.com/WDRefRoom.nsf/WhitePapers>.

<sup>12</sup> Rick Bushnell, "Typical Distributor Inventory Before and After Electronic Commerce," IBM Wholesale Distribution Reference Room, December 6, 1999.

<sup>13</sup> See W. Erwin Diewert and Ann Marie Smith, "Productivity Measurement for a Distribution Firm," National Bureau of Economic Research, NBER Working Paper Series, Working Paper no. 4812, July 1994. Using data from a distribution firm and an ac-

counting framework designed to track products as they are purchased, held in inventory, and finally sold, the authors demonstrate that such a firm can realize substantial productivity gains through careful management of inventories. They conclude that such "productivity gains are made possible by the computer revolution which allows a firm to track accurately its purchases and sales of inventory items and to use the latest software to minimize inventory holding costs."

<sup>14</sup> Adam J. Fein, Michael J. Skinner, and James Solodar, "The Promise and Peril of Online Exchanges," *Modern Distribution Management*, Vol. 29, No. 3, December 10, 1999, on the Internet at: <http://www.pembrokeconsulting.com/pdfs/Promise-Peril.pdf>.

<sup>15</sup> *2000 E-commerce Multi-sector Report* (U.S. Department of Commerce, Census Bureau), March 18, 2002, available through the E-stats information page, on the Internet at: <http://www.census.gov/eos/www/ebusiness614.htm>. According to the report, which covers only merchant wholesalers, 7.7 percent of merchant wholesalers' sales in overall wholesale trade in 2000 were made using electronic channels. Nearly 90 percent of these electronic sales were made over EDI systems. The start-up costs of installing EDI systems are substantial. In the wholesale sector, where small firms predominate, it may be the case that only the largest firms (those with the widest geographic reach) would benefit enough from installing such a system to justify the cost.

<sup>16</sup> Adam J. Fein, "Understanding Consolidation: What are the Triggers?" *Just-In-Time* (Industrial Distribution Association, September/October 1997).

<sup>17</sup> Results of this study are discussed in the *U.S. Industry and Trade Outlook, 2000*. The study, by the Distribution Research and Education Foundation of the National Association of Wholesaler-Distributors, is titled *Consolidation in Wholesale Distribution: Understanding Industry Change*.

<sup>18</sup> In his discussion of the wholesale trade industry in the *U.S. Industry and Trade Outlook*, Adam J. Fein notes: "To some extent, the low level of concentration reflects the fact that competition among wholesaler-distributors typically occurs in geographically distinct markets. A wholesaler-distributor can dominate one region of the country yet account for a very small proportion of national sales." *U.S. Industry and Trade Outlook, 2000*.

<sup>19</sup> Robert L. Steiner, "A dual-stage view of the consumer goods economy," *Journal of Economic Issues*, March 2001.

<sup>20</sup> Greg Girard, "The e-Changing Face of Wholesale Distribution," *Supply Chain Management Review*, Fall 1999, pp. 17-20.

<sup>21</sup> *U.S. Industry and Trade Outlook, 2000*.

<sup>22</sup> Robert L. Steiner, "The 'Own-Brand Marketer' Debuts in the 1997 Census," *Review of Industrial Organization*, Volume 12, Issues 5-6 (Kluwer Academic Publishers, December 1997), pp. 809-816.

<sup>23</sup> The industry contributions to productivity growth in the wholesale trade sector are calculated as the exponential of the difference between the year-to-year weighted changes in the logarithms of the industry output indexes and the year-to-year weighted changes in the logarithms of the industry hours indexes. The weights used for the industry output indexes are the average industry share (over the 2 years for which the change in output is derived) of the total sales for the wholesale trade sector. The weights used for the industry hours indexes are the average industry share (over the 2 years for which the change in hours is derived) of the total hours for the wholesale trade sector. Average industry contributions over various time periods are derived by chaining together the year-to-year contributions to form

an index. The average annual percent change in this index over a given period represents the average industry contribution over the period.

<sup>24</sup> 2000 *E-commerce Multi-sector Report* (U.S. Department of Commerce, Census Bureau).

<sup>25</sup> See Susan Helper, "Complimentarity and Cost Reduction: Evidence from the Auto Supply Industry," NBER Working Paper No. 6033. The author describes how U.S. automakers adopted the Japanese idea that their suppliers ought to be a source of continuous incremental cost reductions.

<sup>26</sup> Adam J. Fein, "Understanding evolutionary processes in non-manufacturing industries."

<sup>27</sup> 2000 *E-commerce Multi-sector Report* (U.S. Department of Commerce, Census Bureau).

<sup>28</sup> Adam J. Fein, "Understanding evolutionary processes in non-manufacturing industries."

<sup>29</sup> See Konstanze Kinne, "Efficiencies in Merger Analysis," *Intereconomics*, November–December 1999 (1999/06), Hamburg Institute of International Economics (HWWA), on the Internet at: [http://www.hwwa.de/Publikationen/Intereconomics/1999/ie\\_docs1999/ie9906-kinne.htm](http://www.hwwa.de/Publikationen/Intereconomics/1999/ie_docs1999/ie9906-kinne.htm).

<sup>30</sup> McKinsey Global Institute, *U.S. Productivity Growth, 1995–2000*.

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