



The Parcel Service Industry in the U.S.: Its Size and Role in Commerce

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Notes: This is the complete technical report of this project. Two other reports are also available—a brief Executive Summary (about 6 pages) and a single sheet folder. All can be read or printed at the website:

<http://www.seas.upenn.edu/sys/logistics/parcelstudy.html>

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ABSTRACT

The carrying of parcels has grown to be a very significant part of the transportation system, as large or larger by many measures than most of the major traditional elements of the freight transportation system—airlines, pipelines, railroads, etc. Yet very little is known about the parcel industry. This report provides an overview of the industry and its importance to U. S. commerce. One measure of the size of the parcel industry is its revenues. In 1997, the four carriers that account for well over 90% of U.S. parcel activity—Airborne, FedEx, UPS, and the U. S. Postal Service-- had \$37.9 billion in transportation revenue. This exceeded the domestic transportation revenue of all major freight modes except trucking. Another way of looking at the size of the parcel industry is to examine the goods it delivers. In the BTS' 1977 *Commodity Flow Survey*, only 3.2% of the value of goods shipped went via parcel carriers. But by the latest survey, in 1997, that percentage had grown to 12.3%. We believe there are fundamentally two reasons why parcel service has become so important in recent years. One consists of changes in the way goods and services are produced and distributed in our economy—globalization, customized mass production, lean inventory management, rapid customer response, and growth in e-commerce, among others. The other is parcel service itself, which is at the vanguard of transportation service modernization with such features as differentiated time-definite service options, intermodal service, in-transit visibility, and data integration with the management systems of customers. Thus parcel service is a major element of the transportation infrastructure of the nation. It is essential for modern commerce. And current trends suggest that parcel service will assume an even more significant role in the future.

EXECUTIVE SUMMARY

Introduction

The carriage of parcels has grown to be a very significant part of the transportation industry, as large or larger by many measures than most of the major traditional elements of the freight transportation system—airlines, pipelines, railroads, etc. Yet very little is known about the parcel service industry. This is largely due to the traditional modal view of transportation, a view in which any type of intermodal transportation often falls through the statistical cracks.

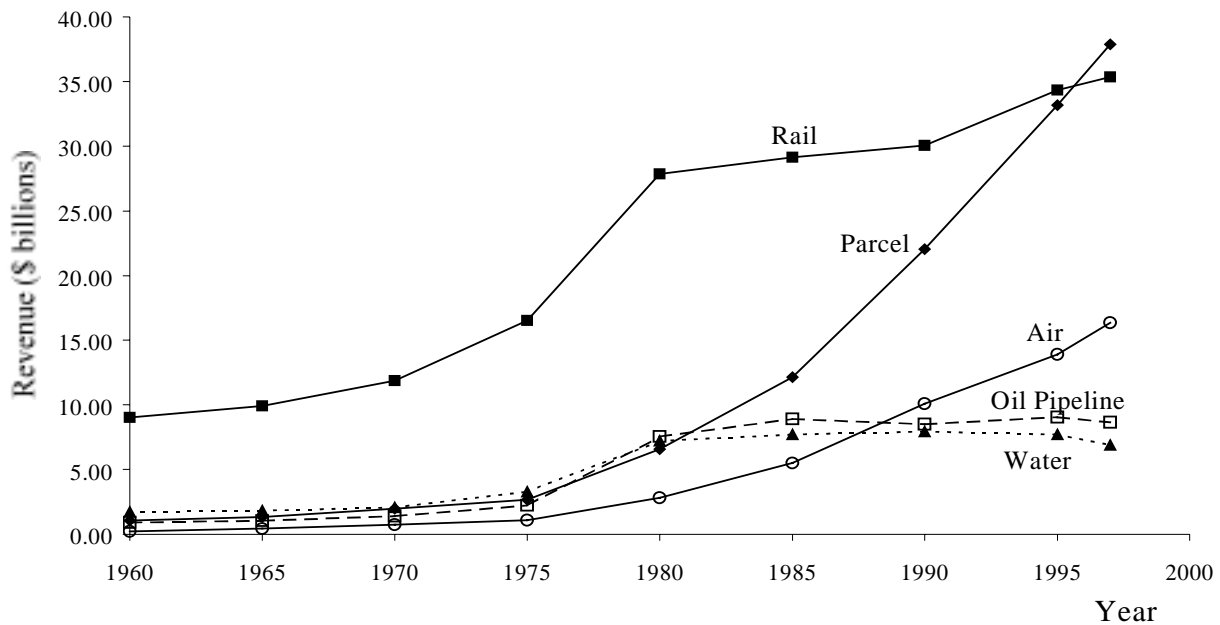
The intent of this report is to provide a brief overview of the parcel service industry and its importance to U. S. commerce. It summarizes many of the findings of a recent study of the parcel industry completed at the School of Engineering and Applied Science of the University of Pennsylvania.

Parcel Service Industry Revenues

One measure of the size of the parcel service industry is its revenues. The domestic parcel service industry is dominated by four carriers—Airborne Express, Federal Express, United Parcel Service, and the U. S. Postal Service. We estimate that these four carriers account for over 90% of all domestic parcel shipments and revenue. In 1997 these four carriers had revenue of \$37.9 billion from domestic transportation service. This exceeded the domestic transportation revenue of all major freight modes except trucking:

- Parcel carriers	\$37.9 billion
- Railroads	35.4
- Airlines	16.3
- Pipelines (oil)	8.7
- Water	7.7
- For-hire trucking	159.7
- Private trucking	230.6

The parcel carriers' revenue in 1997 was equal to 8.0% of all domestic freight charges. Back in 1960 (the first year for which we were able to assemble reasonably reliable data), the parcel business represented only about 2.2% of national freight expenditures. But its percentage has steadily grown, at about one and one-half times the rate of freight overall. As shown in the figure below, parcel carriers' revenue has steadily exceeded the revenue from freight of air transport; it overtook water transport by 1985; and passed rail transport by 1997.



Cargo Transported

Another way of looking at the size and role of the parcel service industry is to examine what it delivers—literally! The Bureau of Transportation Statistics' *Commodity Flow Surveys* of 1977, 1993 and 1997 provide the basis for this. In the 1977 survey, only 3.2% of the value of goods shipped went via parcel carriers. But, by the latest survey, in 1997, that percentage had grown to 12.3%. While the survey of 1977 was far less comprehensive than the later two, its limitations probably overstated the relative importance of parcel in that year. Thus, these data confirm the growing importance of parcel service to the economy. And, the growth in just the four years from 1993 to 1997 was extraordinary, the parcel percentage of shipment value growing from 9.6% to 12.3%, for a growth rate of 6.4% per year.

Another measure of the importance of parcel service is to look at the percentage of the value of goods shipped via parcel carriers compared to the Gross Domestic Product. This percentage was only 2.1 % in 1977, but grew to 10.6% in 1997. This means that parcel carriers deliver over 10% of the value of all goods and services produced in the U. S.

The goods shipped by parcel carriers reads like a list of products used in most of the fastest growing segments of our society. These include

- Pharmaceuticals,
- Medical supplies,
- Chemicals,
- Plastics,
- Electronic products,

Computers and related equipment,
Precision instruments,
Printed matter,
Apparel, and
Repair parts,
among others. Of course, parcel carriers deliver more than goods that would appear in the *Commodity Flow Surveys*. These other goods include contracts, legal documents, copy for magazines and newspapers, and numerous packages sent from households and organizations that are not included in the survey.

Growth of Parcel Service

All this naturally raises the question of why parcel service has become so important in recent years. We believe there are fundamentally two reasons. One is based on changes in the way goods and services are produced and distributed in our economy. The other is due to changes in the nature of parcel services.

Turning first to changes in production and distribution, broad trends are toward reducing inventories and rapid customer response. This means faster delivery, often at or by a specified time. Parcel carriers have been at the forefront of providing this type of service. Parcel service is widely used for final products like computers or consumer goods, as well as for critical parts such as those needed to repair broken machinery in order for a factory or office activity to continue. The emphasis on reducing inventories to reduce the overhead cost of manufacturing and distribution of all sorts of goods has resulted in the need for faster delivery. And the trend toward more customized products has also resulted in supply chains that rely on make-to-order or rapid replenishment of goods, in order to avoid having large inventories of stock that might not be sold. The cost savings and increased customer value from such products and business practices require rapid transport, time-definite delivery, and the transportation of small quantities of just the right items to the right destination. By definition, this is parcel service.

Equally important, however, is the fact that parcel carriers have created new transportation products that are designed to meet these needs. They do not simply load shipments (parcels) onto a truck and carry them from one location to another, but also provide an array of transport and related services that are designed to enhance their customers' products--goods as well as services. It is parcel carriers who really developed the concept of offering a variety of delivery speeds and times, between virtually all points in the U.S., and perfected the means to guarantee on-time delivery. It is these parcel carriers who have been at the vanguard of putting together the different modes of transportation so as to provide the various delivery services at least cost. Such intermodal transport is now expanding to other areas of transportation, with truckers sending their trailers—with their customers' cargo--over long distances by rail, and ocean carriers having their own trains for inland delivery. This variety of integrated transport services has enabled much of the change in production and distribution described earlier, resulting in lower cost of delivered goods for consumption.

Another example is the tracking of the shipment from pick up at origin to delivery to the destination, and the integration of movement data with other data at the premises of the shipper and the receiver of the freight. Such data—whether on the Internet or via Electronic Data Interchange—are critical to many customers. Clearly, knowing whether medical supplies will be delivered on time can be absolutely essential to the provision of medical services at a hospital. Thus delivery of information is often as important as the delivery of the shipment itself. And now at least one parcel carrier is connecting the transportation of shipments and information with the transmission of funds, in a further attempt to facilitate commerce. The connection between this and the explosion of e-commerce between businesses, and between business and households, is obvious.

Conclusions and Implications

The implications of this study can be grouped into two categories. One relates to the parcel industry directly and another relates to transportation in general.

In the first category, the most obvious conclusion is that parcel service has grown from a small part of U.S. freight transportation in the 1960s to become a major component of the system. Its revenues now outstrip those of all the major traditional modes of freight transportation except trucking, exceeding air, rail, and water transport revenues. Parcel service is very important to the economy. Parcel carriers transport over 12% of the value of all goods transported, and this represents over 10% of the U.S. Gross Domestic Product.

Parcel transport is also growing very rapidly. Revenues in the last ten years have grown more rapidly than those of all modes of freight transportation except air, which has approximately the same growth rate as parcel service. National and world economic trends point to a continued expansion of parcel service. Globalization, just-in-time logistics, customized mass production, rapid customer response, and e-commerce, along with other trends, all point to greater use of parcel service in the future.

Two critical features of these trends stand out. One is that parcel carriers are inherently multimodal (using air and truck for overnight vs. three day delivery, respectively, for example), and they are inherently intermodal (coordinating the transportation of each shipment via road and rail, or road and air). The second is that parcel service is a relatively expensive form of transport, compared to shipping full truckloads or boxcars of the same commodities, for example. These trends signal a major change in the way transportation is organized and used in the economy. Transportation is looked at as an element of supply chains, with firms shipping goods via the means of transport that gives the best overall value for the product delivered. No longer is transportation cost minimized. Spending more on transport may reduce other costs such as inventory costs, and improve customer satisfaction. And shippers want the transportation to be as efficient as possible, often leading to the use of more than one mode for the delivery from origin to destination.

There are also broader implications of this study, particularly for government. One is that the traditional modal view of transportation, in which the transportation system is looked

at as a collection of modes and their companies or agencies, is no longer adequate. The term *mode* in this context refers to the technology used to produce transportation—road, railroad, water, etc. Modes in this sense of technology have been the primary basis for most government involvement in transportation, in organization, funding, policy, regulation, and oversight.

What are the implications of these trends? Fundamentally it is that the traditional modal structure of governmental involvement with transportation is in need of overhaul. Clearly this structure has been changing, but the weight of two centuries of primarily modal thinking and approaches is substantial.

One important area of change relates to data gathering on the state of the transportation system. In order to have a complete picture of transportation, data must be gathered not only on the individual modes, but also on intermodal and multimodal transportation services, including parcel service. This would provide a baseline and indicators of the growth and health of these elements of the transportation industry. The methods used in this study provide a basis for such data gathering, for the parcel service industry.

A second category of needed change extends far beyond this study, but the general direction is clear. Modally based institutional structures, policies, funding mechanisms, and regulations are not likely to serve the transportation system or our society well. New transportation services are vitally important in meeting the emerging needs of modern production and distribution systems. Many if not most of these new services, like parcel service, are intermodal or multimodal in nature. This means that traditional modal structures should be evaluated, and revised as appropriate, so that they encourage and support rather than stifle innovation and improvement. While such efforts may take many years to complete, changes can, and should, be introduced incrementally, as suggested in connection with data.

Note: The full report, the Executive Summary, and a single sheet folder summarizing the findings, can be read or printed from the website:

<http://www.seas.upenn.edu/sys/logistics/parcelstudy.pdf>

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1. INTRODUCTION

1.1. Purpose

This report is intended to provide an overall picture of the size and impact of the parcel transportation industry in the U.S. today. While it has been widely acknowledged that this industry is a very important component of the transportation system, and increasingly important as an element of modern supply chains for the production and distribution of goods and services, there is surprisingly little comprehensive information about the industry. In order to provide this picture, we concentrate on four themes:

The first is a description of the services provided, with particular emphasis on features that distinguish it from other forms of transportation.

The second element is the size and growth of this industry.

The third is its role in society, with an emphasis on its increasing role in the production and distribution of goods and services, and

The fourth is an examination of its prospects for the future in terms of its role in a world that is likely to be heavily reliant on e-commerce and global trade.

The final topic is a discussion of the implications of this study, for governmental data gathering, programs, and policy-making.

It should be noted that this is not a history of the various firms that provide parcel service or a detailed history of the services provided or technologies used. Rather it is intended to give an overall picture of an important segment of the transportation system that has not been treated coherently elsewhere.

1.2. Why is this study needed?

A natural question is: Why is there no comprehensive picture of the parcel industry? The answer is rooted in the history of the field of transportation, in which the advent of each new mechanized mode created new markets, new opportunities, and new problems, which were generally dealt with on a modal basis. The answer also reveals much about how the transportation system is being transformed in the modern economy, and about how the conceptual view which underlies the structure of traditional transportation institutions—public and private-- is also being transformed.

Historically the transportation field has usually been conceptualized as a collection of modes, or technologies for producing transportation. In this view we think of the transportation system as being comprised of road transport, railroads, airlines, ship lines, pipelines, etc. This is reflected in the organization of the U.S. Department of Transportation, with its Federal Highway Administration, Federal Railroad Administration, and so on. Similarly, most of the older companies in transportation have concentrated on offering service using only one mode. In fact, this segregation by mode was enforced by much regulation, spanning almost the entire history of mechanized

transport. Data is largely gathered and published in modal terms as well. For example, the *National Transportation Statistics*¹ published by the U. S. Dept. of Transportation has presented most data in terms of modes, for revenue, cargo and passenger traffic, safety, fleet size and other assets, etc.

But this view is now being supplanted by another vision of the system, which starts by looking at the functions of the system in society and the economy. In this view, the critical feature of the freight transportation system is the service that it provides—what can be sent, and where, how long it takes for delivery, the ease of use including such aspects as providing pick-up service and the integration of transport carrier and shipper (and receiver) data networks, etc. In this context, the modes or technologies are not the central point of focus, but rather should be chosen so as to optimize the movement, from a cost and service quality standpoint. Furthermore, the optimization is from the standpoint of the user of the system, ultimately in the overall delivered cost of goods, not transport costs alone. Modes, and the organizations that own and operate them, are still important, but are seen as a means to an end, rather than representing an end in themselves. This new view is exemplified by such recent landmark federal surface transportation funding and policy legislation as the Intermodal Transportation Efficiency Act of 1991 (ISTEA) and the Transportation Equity Act for the 21st Century of 1998 (TEA-21), and the formation of the Office of Intermodalsim in the U.S. Department of Transportation, among others.

Parcel service has always fallen through the cracks when the system is looked at in terms of the traditional modal breakdown. One reason is that parcel service is inherently multimodal, requiring a small truck, auto, or messenger for pick-up and delivery, and another mode such as truck, rail or air for the line haul. And in looking at the history of parcel service, the large and successful parcel carriers have been distinct from the modal transportation companies. The U. S. Postal Service and United Parcel Service, among others, are all obvious examples of parcel service providers that clearly do not have a distinctly modal identity. The first national parcel service, the now-defunct Railway Express Agency (owned by but distinct from the railroads), naturally originally relied on rail service for long distance movement. But by the late 1920s it offered expedited service via air, and before its demise in 1975 its own truck and air service had supplanted most of the rail transport of parcels. Today, as in the past, parcel carriers are major users of the major modal transportation companies, but offer a distinct type of service that those transportation companies simply do not offer.

Until very recently, virtually all of the data that has been gathered on freight transport emphasized the modes, their revenues and market shares, etc. This is evident from U.S. Bureau of the Census *Statistical Abstract of the United States*, as well as most of the data documents historically produced by the U.S. Department of Transportation. Parcel service simply does not fit neatly into this framework, and thus is often nearly invisible. As might be expected, this is now changing, reflecting the broader view of transportation that we alluded to earlier. An excellent example is the 1996 Bureau of Transportation Statistics report on the transportation system and the environment. It included much

¹ U.S. Department of Transportation (1987). , *National Transportation Statistics* Annual Report, 1987, Report DOT-TSC-RSPA-87-6, U.S. Government Printing Office, Washington, D.C. and later editions.

information about the system as a whole, its role in society and the economy, and environmental impacts. Especially noteworthy from our perspective is that it included much information on parcel service (precisely, a category Postal, Parcel, and Courier service), based on the 1993 Commodity Flow Survey, and noted that this (parcel) category was second only to trucking in the value of goods transported².

The text of this report pointed out the importance of separating out intermodal services including parcel carriers, in order to present an accurate picture of transportation commodity flows today. These intermodal carriers had previously been lumped together with the traditional modes (e.g., air) in ways that obscured their role and growth.

And finally, parcel service surely was not considered as important as the carriage of the massive amounts of basic goods that are very visibly transported by the traditional modes. A mile long train loaded with coal is obviously an essential element of the production of the electricity that we all depend on. Similarly the ocean vessel laden with hundreds (actually typically thousands) of containers seen from a bridge overlooking a port has an obvious role in the global economy. The criticality of the goods moved by these modes for our society and everyday life is obvious, and thus they are a natural focus of attention. A small parcel delivery van simply does not conjure up the same image of a critical link in the supply of goods and services.

²U.S. Dept. of Transportation, Bureau of Transportation Statistics, *Transportation Statistics Annual Report 1996*, p. 15.

2. THE PARCEL SERVICE INDUSTRY

2.1. Definition and Description

There is no uniformly used definition of parcel service. However, the meaning of it is generally clear, in the sense that many companies are thought of as being parcel carriers, and their service offerings are clearly distinct from those of other transportation providers. These providers include such household names as Federal Express and UPS, and of course the U.S. Postal Service with its Parcel Post and other products. We take as a definition of the parcel business the following: The parcel business consists of carriers or organizations that transport shipments that typically are sufficiently small to be handled by one person without aid, but which are normally larger than a single letter. While not essential, normally important features of the service are the options of carrier pick-up at the origin, and of carrier delivery to the destination. Of course, the transportation must normally be between different persons or organizations, or different locations, thus excluding movement carried out by a firm of its own goods and other items within a single plant or business location.

The technology of providing parcel service is somewhat unique in the transportation industry, and also explains how the parcel carriers relate to the traditional modal carriers. In order to provide the movement of a small package at a reasonable cost, parcels must be aggregated into larger units for movement, and this *aggregation*, and subsequent *disaggregation*, largely defines how they operate. Starting with a simple parcel service that uses only road transport, the operation proceeds as follows. Parcels are normally picked up by a driver with a small *local area vehicle* at the shipment's origin, and hundreds are often picked up before the vehicle goes to a *hub* or terminal. This is the *origin hub* for this shipment—the first hub reached on its journey. There the shipments are sorted, by outbound *line haul truck*. After loading, the line haul truck departs for the next *hub* or terminal on the parcel's route. At that location, the line haul truck is unloaded, and the parcels are again sorted. If this is the *destination hub* of all the parcels on that truck, they would be sorted into local area vehicles for delivery, and delivered the next day. In many cases, however, there are insufficient parcels to fill a line haul truck for each possible destination hub, and thus the truck will carry parcels for many destinations beyond that hub. Thus the inbound line haul truck's parcels will be sorted for both other destinations and for the local area, the latter parcels being sorted a second time for the local delivery vehicles. The shipments going beyond will be placed on another line haul vehicle, and continue their journey, with more sorting and line haul transfers at *intermediate hubs* until they reach their destination hub. There each parcel is delivered to its destination recipient by a driver in a local delivery vehicle. This process is portrayed in Figure 1.

While most parcel companies operate their own pick up and delivery services, they often use other transportation companies for the line haul links. Thus the U.S. Postal Service is a major user of commercial truck carriers for line haul movement. Also, railroads are often contracted with and become part of the movement, both to carry truck trailers (piggyback service) and also to carry containers (essentially truck trailers without the wheels). This may be for either economy or speed reasons, or both. It might be noted that UPS is the largest single customer of the U. S. railroad industry, and the U.S. Postal

Service is another major customer³. And of course Overnight and Second Day services must use aircraft instead of trucks for the line haul, over long distances, in order to meet the delivery time guarantees. If the package is moving over a short distance, the line haul is usually truck, as it is far cheaper than air. This is true even if the name of the service includes the word “air”, because the shipper really does not care about the modes (technologies) used, only that the shipment is delivered on time and intact. Rail is also used for some moderate distance services. There are many variations to this process, of course.

Parcel carriers are often referred to as *integrated carriers*. The reason is that they must integrate the operations of different types of transportation (package delivery vehicles, large over-the-road trailer trucks, etc.) and different modes (rail and air along with road transport) in order to provide their service. Often different companies own and operate these different vehicle types and the different modes, and thus the parcel carrier must coordinate and integrate the operations of these other firms. Moreover, this must be done with a precision that is usually far greater than that found in other areas of transportation. This is due to the stringent time guarantees that usually apply to parcel delivery. To move packages across the U.S. reliably overnight for delivery the next morning, while losing three hours due to time changes in one direction, is no simple task. And of course such a movement involves, at minimum, two different local area vehicle movements, one but typically typically two air links, and sorting at one or more hubs (usually at least three), as well.

³ : Los Angeles Times (2000), “Top Rail Customer UPS Requests 2-Year Halt to Industry Mergers,” <http://www.latimes.com/business/20000309/t000022666.html> (read March 20, 2000).

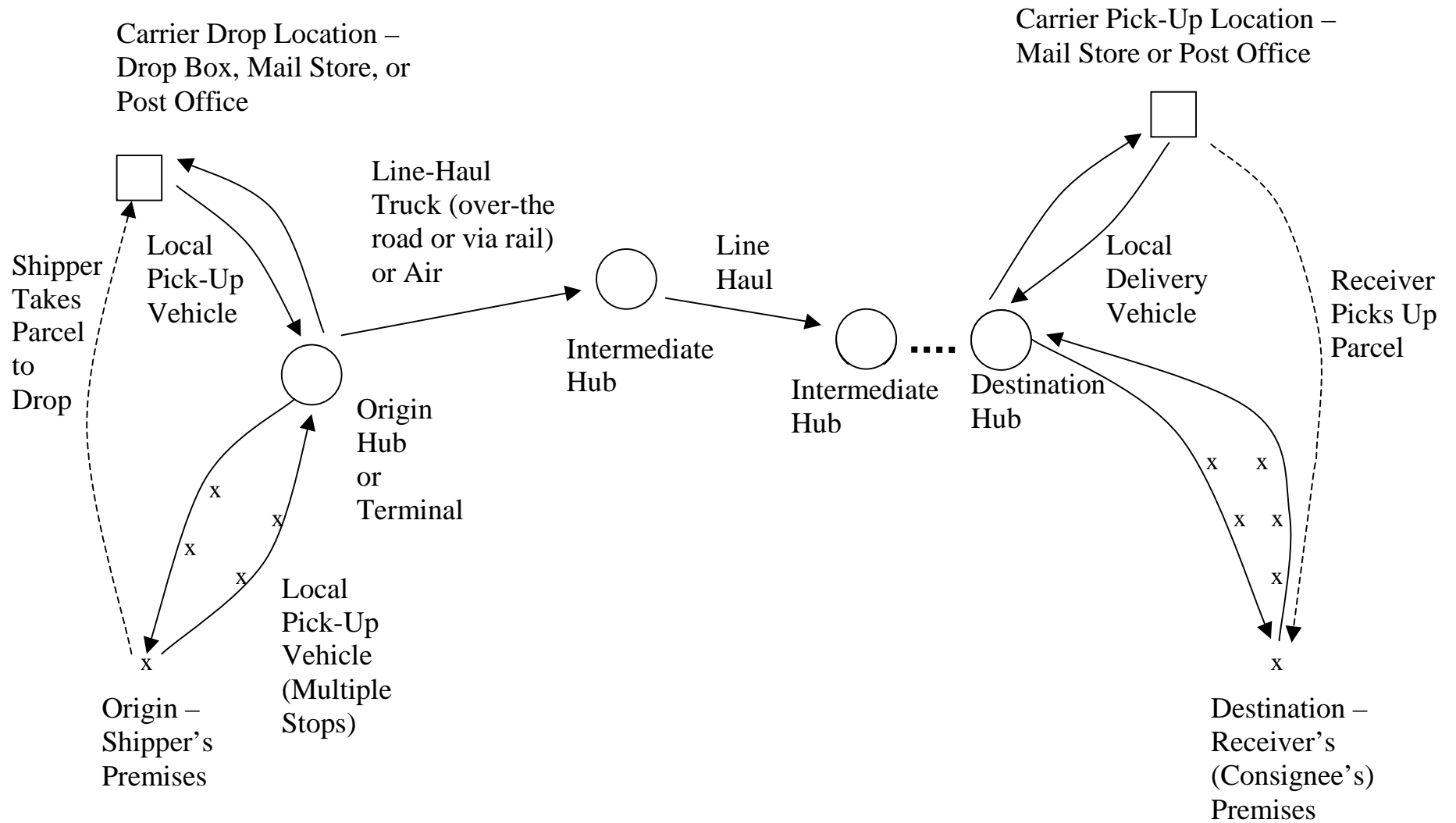


Figure 1. Typical steps in parcel movement from origin to destination.

2.2. Service Offerings of Parcel Carriers

As mentioned above, parcel carriers usually offer many different service variations in *in-transit times* (the time from origin to destination), whether or not there is a delivery time guarantee, and whether the item is picked up by the carrier or must be delivered by the shipper to a drop-off location. Variations in the in-transit time are usually expressed in terms of time of delivery, e.g., the next morning before 8:30 AM, before noon, or second day before noon, etc. This necessitates deadlines for giving the parcel to the carrier, of course, on the day of shipment. This can be accomplished either by pick-up by the carrier at the shipper's premises, placement in a drop box of the carrier, or delivery to the carrier facility (e.g., to a post office). There are also services without specific delivery guarantees but which have a usual time for delivery which is made known to the shipper, e.g., the U. S. Postal Service's Priority Mail normally delivers goods within two business days to most addresses in the U.S.

Naturally there is a trade-off between the speed of delivery and the price. Figure 2 presents the offerings of the major carriers in terms of speed and price, for moving a 20 lb. package from Philadelphia to Chicago--a distance of about 668 miles. These rates are for pick up at a business address and delivery to another business, except as noted on the figure. (Sometimes there is a premium for residential delivery.) The general pattern of a substantial cost premium for speed is readily apparent, from about \$85 for the fastest service—overnight with early next morning delivery-- to about \$10 for three day service. Also noteworthy is the wide range of possible transit times, from overnight to many days. (It should be noted that, between many locations same day delivery is also available.) There are often two prices for essentially the same service in terms of time of transit, but these in fact represent services with different features, such as different cut-off times for pick-ups, and availability of tracking, among others.

Figure 3 focuses on the effect of variations of weight on the price, for the same Philadelphia to Chicago movement, and the two-day delivery option. There is a modest change in price with variations in weight, and these affect the average price per lb.-mi. as shown in the figure. The 20 lb. Package had a rate of 0.243¢/lb.-mi, but this drops to 0.181 ¢/lb.-mi. for a parcel weighing 60 lb. This is to be expected of course, as the extra expense of the parcel carrier caused by a larger package is small, up to the point where a different method must be used to handle it, e.g., two persons needed to lift it.

Figure 4 depicts the effect of variations of distance on the price for moving a 20 lb. package for the same two-day delivery. The effect of distance is more pronounced than that of weight, but similar in that unit price per lb.-mi. drops with increasing distance.

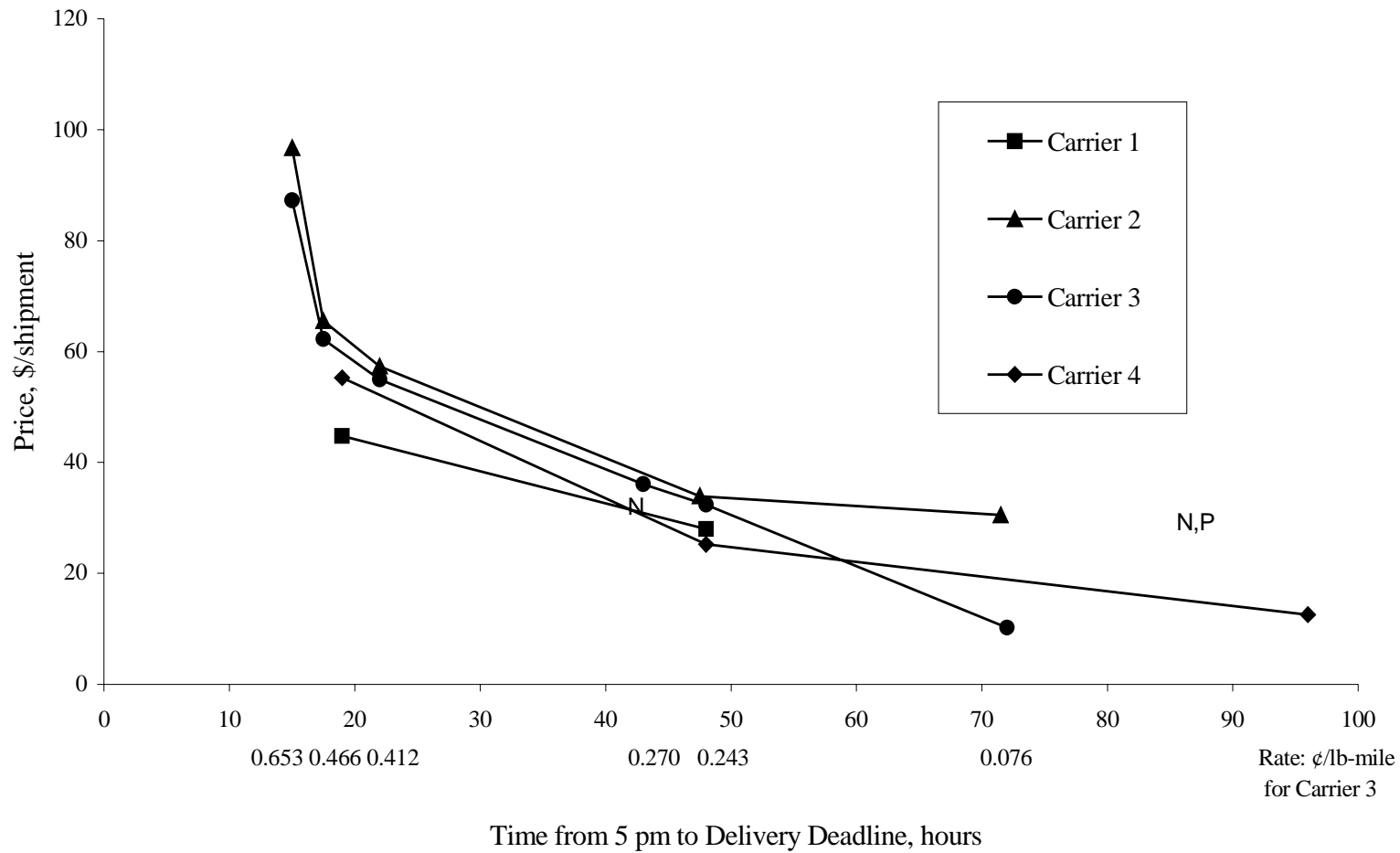
It should be noted that these effects—of speed, weight, and distance -- continue into the range of larger sizes of shipments that are made by other forms of transportation. There is a substantial premium for speed, and the unit cost per ton-mile decreases with increasing shipment weight and with increasing shipment distance.

As indicated in these figures, most parcel carriers offer guarantees of delivery, at least for the faster and/or higher priced services. This is because the timely arrival of the shipment

Figure 2. Trade off between speed of delivery and price in parcel transport.

20 lb. shipment (box) from Philadelphia to Chicago, pick-up from business and delivery to business.

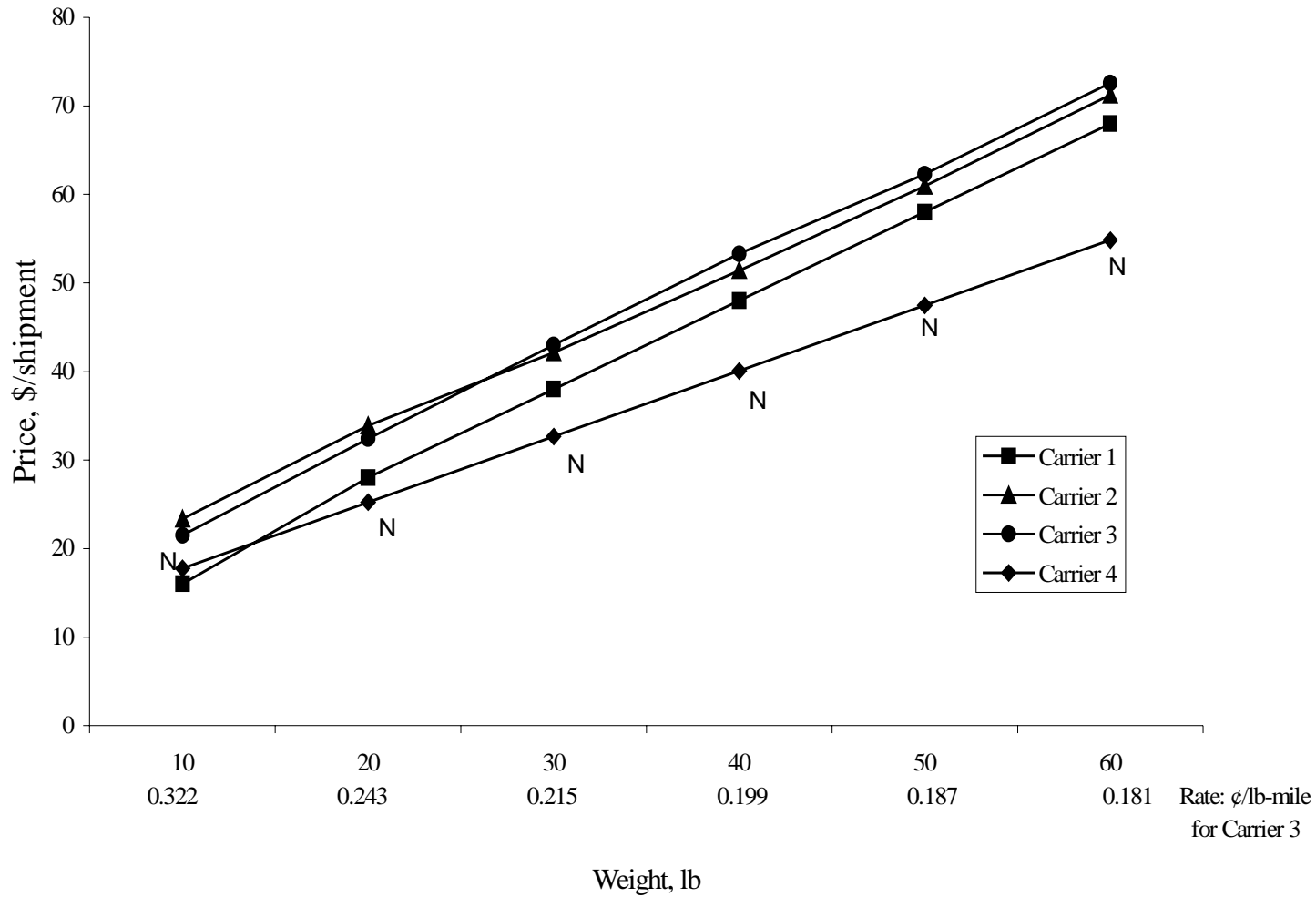
N indicates delivery time not guaranteed, P indicates pick-up unavailable.



Source: www.smartship.com, www.usps.gov on 03/08/2000

Figure 3. Effect of variations of shipment weights on parcel transport price.

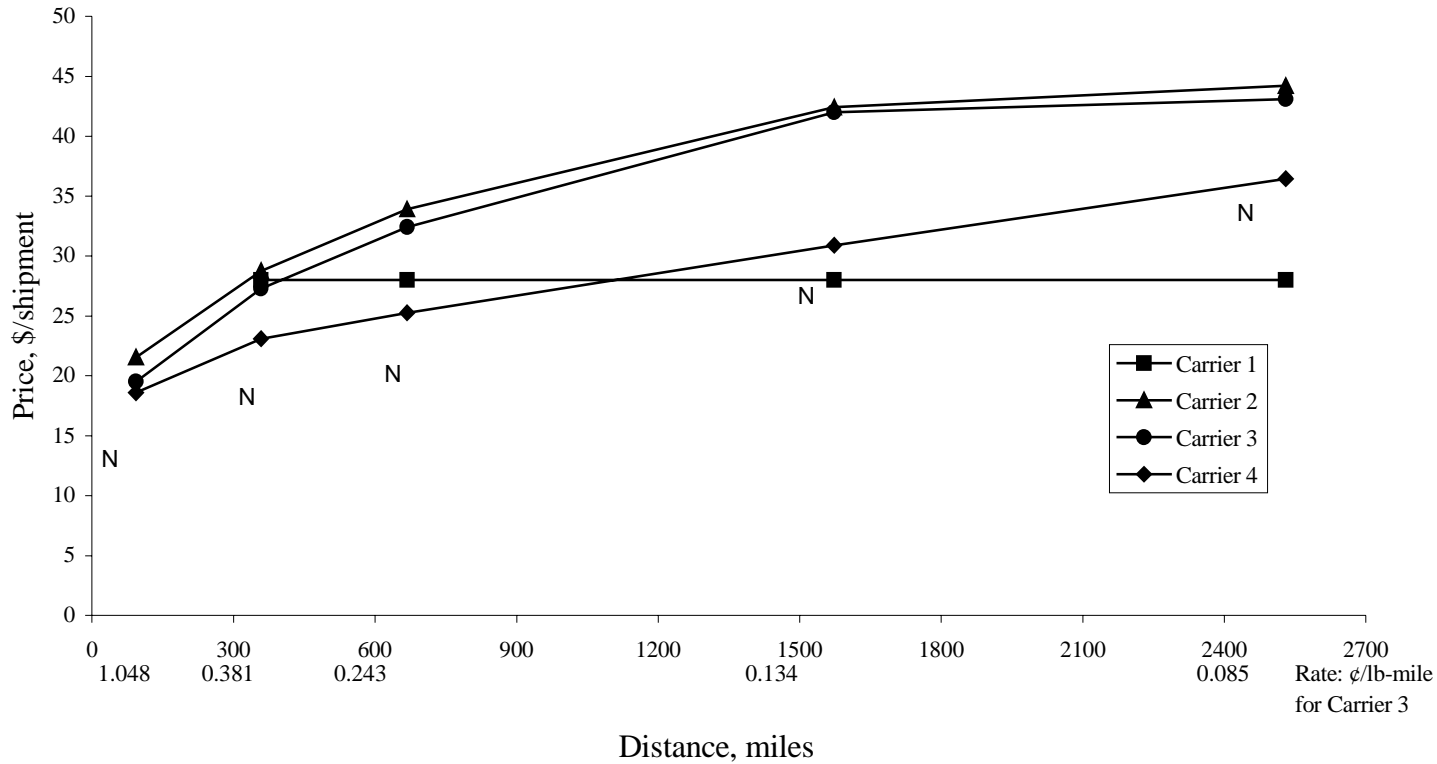
Shipments from Philadelphia to Chicago, pick-up from business and delivery to business, with delivery on second day by 5pm. N indicates delivery time not guaranteed.



Source: www.smartship.com on 03/08/2000

Figure 4. Effect of variations of shipment distance on parcel transport price.

20 lb shipment (box), pick-up from business and delivery to business, with delivery on second day by 5 pm. N indicates delivery time not guaranteed.



Shipment distances are Great Circle Distances from Philadelphia to Baltimore, Cleveland, Chicago, Denver and San Francisco respectively

is often essential to the customer's business. A good example of this is a repair part for a machine that is on an assembly line. If the machine is not operative, the entire line must be shut down, at a cost of thousands of dollars. The value of the on-time delivery is obviously worth much more than the retail value of the part and the freight charge, in such cases. Absent reliable parcel services, the part probably would have been transported by an employee, flying either on an airline or on a corporate or other private jet.

In addition to the physical movement, many customers regard the *tracking* of shipments—often termed *in-transit visibility*--as essential. A variety of advances in technology have made this possible, including reliable bar-code scanners, the electronic exchange of information, satellite tracking of vehicles, and satellite and cell phone mobile communication technology. The result is that the more advanced parcel carriers offer their customers the option of tracking a shipment from origin to destination. This enables them to gauge the arrival time of the shipment, and to make plans based on that time. And of course if the shipment is likely to be delayed, based on this information, alternate plans to minimize disruption can be made. This was one of the differences between carriers in Figure 2. Carrier 4, which was the cheapest carrier in some cases, does not offer the tracking option, and of course does not offer any data integration of this information with the shipper or addressee of the parcel.

Some parcel carriers also offer many related value-added services that enhance the parcel service and are designed to help their customers improve their business operations that relate to transportation and commerce. These include warehousing and order fulfillment, electronic information exchange (as between shipper and receiver of goods), and the facilitation of financial transactions (a modern version of the old concept of Cash-on-Delivery). These will be discussed in Section 4.

3. SIZE OF THE PARCEL SERVICE INDUSTRY

As measured by revenue, the transportation of parcels has been the fastest growing major segment of the freight transportation business in the United States for the past three decades. Since the 1950s, the parcel industry has grown from a small, specialized part of the private-sector transportation business, plus a major U. S. Postal Service (USPS) activity, to a business with revenues in excess of those of most other forms of freight transportation.

3.1. The Big Four Parcel Carriers

The domestic parcel service industry is dominated by four large carriers. These are (with their 1998 domestic revenues in \$ billions): Airborne (\$2.707), Federal Express (\$11.070), UPS (\$20.650), and USPS (\$6.895). The total domestic revenue of these four carriers was \$41.322 billion. We will use these four carriers' revenues for our primary revenue-based measures of the size of the parcel industry, for three reasons. First, these carriers represent at least 90% --most likely closer to 95%--of the industry revenue (these estimates being detailed in Appendix D). Secondly, all of the other carriers appear to be very much smaller than these four, with one exception. That exception is DHL, which may be close to Airborne in domestic revenue, but unfortunately almost no information is available on DHL, as it is privately held. Third, considerable information is available on all four carriers, as the three private firms—Airborne, Federal Express, and UPS—now have publicly traded stock, and the fourth—USPS—is a government agency that publishes much data. Only limited or virtually no time series data is available on the other carriers. And finally, web-based sources for information on the options for shipping parcels provide information on the services of these four carriers and not others, confirming our belief that these are the major domestic carriers. Thus we feel confident in using the revenues and operations of these four carriers as a primary indication of the size of the industry, and we will refer to them as the *Big Four* parcel carriers.

Table 1 places the Big Four's \$41.32 billion revenue into perspective. It is more than the total revenue of all railroads (\$34.64 billion), of all domestic water (inland and coastal) transport (\$ 7.37 billion), of all petroleum pipelines (\$8.78 billion), and of all domestic air cargo operations (\$ 16.91 billion). Only the trucking mode exceeds the parcel industry in this measure—estimates of intercity trucking costs being \$275.86 billion and of local (primarily urban) trucking costs being \$149.2 billion. (Expenditure replaces revenue as the trucking measure because so much of trucking is private—undertaken by the firm owning the goods being transported. In 1997, the last year for which data are available, only about 41% of trucking was for-hire, the remainder was private trucking.) Of course, the nature of parcel carriers, using as they do various modes --primarily air, rail, and truck-- to transport cargo (as discussed in Section 2), means that a considerable fraction of the parcel revenue is included in the modal revenues.

Parcel service thus represents a significant portion of freight transportation in the U. S. Table 2 show how large this is in comparison to the nation's Freight Transport Bill. This Bill includes all domestic transport, plus the cost of imports. This bill was \$527 billion in 1998, of which the Big Four parcel carriers revenue was 7.83%. Ten years ago (1988)

these carriers had revenues less than one-half the current value, and it represented only 5.7% of the Freight Transport Bill. Since 1988 parcel service revenues of the four firms has grown at a compound rate of 8.74 % per year, while our total freight bill has grown by just 5.36% per year. By most measures, parcel service has been growing more rapidly than other parts of the freight transportation industry, reflecting to a large extent changes in the nature of our economy, as will be discussed in more detail in Section 4.⁴

Table 1. Revenues of Big Four parcel carriers compared to revenues of traditional modes in 1997 and 1998.

Carrier Type	Revenue (\$ billions)	
	1997	1998
Big Four Parcel Carriers (Airborne, Federal Express, United Parcel Service, and U.S. Postal Service)	37.9 ^a	41.3 ^a
Railroads (freight)	35.35 ^b	34.64 ^b
Water (freight)	7.23 ^b	7.37 ^b
Air (freight)	16.35 ^b	16.91 ^b
Oil Pipelines	8.74 ^b	8.78 ^b
Trucking		
Local	143.74 ^b	149.20 ^b
Intercity	257.81 ^b	275.86 ^b
Total trucking	401.35	425.06

Note: 1997 data is included here because 1997 data is the latest available for many aspects of the parcel industry that will be covered later in this report.

^a Source: Appendix A, Table A1

^b Source: Eno Transportation Foundation, Inc. (1998). *Transportation in America*, p.40 (The Nation's Freight Bill). Only domestic revenue is included in our table. Supplement to the 16th edition, *Transportation Quarterly*, Vol. 53, No.3, Summer 1999, p v.

3.2. Growth 1960 to Present

The parcel industry has been becoming more significant in the freight transportation arena for decades. It has emerged in the last thirty plus years from a very small portion of the freight transportation industry to, as we have seen, one of the largest players in that industry. Data tracing this change in position is provided in Table 3, which presents the estimated revenues of parcel carriers from 1960 to the present. Because this table goes

⁴ It should be noted that some portion of the parcel industry expenditures (or revenues) is not included in the Nation's Freight Bill. For example, U. S. Postal Service expenditures on parcel sorting facilities and activities are not included. This is undoubtedly at least partly due to the complex relationship between the USPS and the rest of the transportation system. Some parcel service costs or revenues are included by virtue of including truck movement costs and other modal activities. Other USPS expenditures, such as for sorting facilities, include joint activities for regular mail as well as parcels. These combine to make any addition for parcel service difficult.

Table 2. Growth of Big Four parcel carriers revenues and the National Freight Bill, 1988-1998.

\$ Millions

<u>Year</u> ^a	<u>Big Four Parcel Revenue</u> ^b	<u>National Freight Bill</u> ^c	<u>Ratio of Parcel Revenue to Bill, %</u>
1988	17,872	313,040	5.71
1989	19,948	329,103	6.06
1990	22,046	350,831	6.28
1991	24,184	355,215	6.81
1992	26,145	375,093	6.97
1993	28,389	396,306	7.16
1994	30,909	419,904	7.36
1995	33,181	444,452	7.47
1996	35,635	467,510	7.62
1997	37,877	503,491	7.52
1998	41,322	527,659	7.83
Growth, %/yr	8.74	5.36	3.21

^a Calendar year.

^b Includes Airborne, FedEx (including RPS), UPS and USPS only. See Appendix A, Table A1 for data sources and estimation procedures.

^c Sources: Years 1988-1994: Eno Transportation Foundation, Inc. (1997). Transportation in America: Historical Compendium 1939-1995, p.12-13 (The Nation's Freight Bill); years 1995-1997: Eno Transportation Foundation, Inc. (1999). Transportation in America, p.40-41 (The Nation's Freight Bill). Supplement to the 16th edition, *Transportation Quarterly*, Vol. 53, No.3, Summer 1999, p v.

back so far in the past, the data sources and carriers included necessarily change from those used for 1998 and later years (presented in Table 2). In particular, in the early part of this period, the largest parcel carrier other than the U. S. Postal Service (USPS), was a firm that no longer exists, the Railway Express Agency (REA). REA provided door-to-door service much like current parcel companies, as well as drop off locations at many railroad stations. It used truck, rail and air service. In addition, parcel transport was a major adjunct to the intercity bus business, which at that time connected almost all towns in the U. S., and had some type of ticket and parcel agency in many if not most towns. There were two major national bus carriers as well as numerous regional companies, thus providing a national network much like those of present day parcel companies, but the service was primarily station to station. Thus revenues of REA and the bus parcel service are included. Also included are UPS trucking revenue and revenues of airlines that primarily carried small packages (including Federal Express), based on regulatory agency data, as presented in an Eno Transportation Foundation data series. It should be noted that both the UPS and air data series exclude some parcel revenues, based on our analysis of this data series for recent years. Also, some primarily truck-based parcel services are

clearly omitted. But these are the only data available for such a long span of years, and thus they are used. For these reasons, we refer to the pre-1988 data series in Table 3 as *approximate parcel service industry revenue*, thereby emphasizing its limitations.

Table 3. Parcel service industry revenue, 1960-1998.

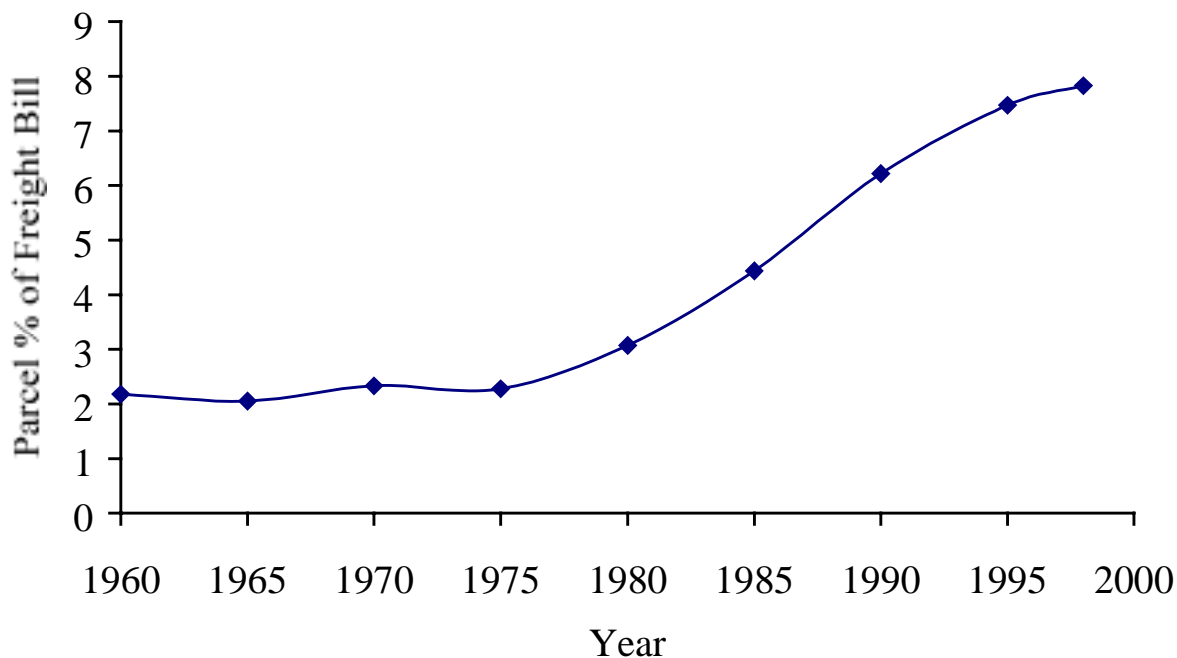
\$ Millions			
<u>Year</u>	<u>Parcel Revenue</u> ^a	<u>National Freight Bill</u> ^b	<u>Ratio of Parcel Revenue to Bill, %</u>
1960	1,042	47,767	2.18
1965	1,328	64,931	2.05
1970	1,958	83,978	2.33
1975	2,645	115,839	2.28
1980	6,567	213,736	3.07
1985	12,139	273,612	4.44
1990	21,833	350,949	6.22
1995	33,181	444,452	7.46
1998	41,332	527,659	7.83

^a Source: To 1985, Appendix C, Table C1; 1990 and later, Table 2.

^b Source: Eno Transportation Foundation, Inc. (1997). Transportation in America: Historical Compendium 1939-1995; 1990 and later, Table 2.

Figure 5 plots parcel service revenue as a percentage of the National Freight Bill, from 1960 to 1998, using the approximate data series for years prior to 1990, and our data on the Big Four for 1990 and later (the percentage in 1990 is almost identical in both series). This figure reveals that parcel service grew from only 2.18 % of the nation's Freight Bill in 1960 to over 7 % by 1995. The rapid growth of the parcel "share" since 1980 is especially striking.

Figure 5. Parcel service industry revenues as a percentage of U.S. National Freight Bill, 1960-1995.



Source: Table 3.

Table 4 compares the parcel industry's revenue over this period with the freight revenue of all the major (traditional) modes of transportation. In 1960 the parcel revenue of \$1,042 billion was less than the revenue of any of the major modes except air. According to these estimates, the parcel industry surpassed the domestic water transport industry in revenues by 1985, and by 1998 exceeded railroad freight revenues. These data clearly show the emergence of parcel service as a major component of the transportation industry in the last three decades.

Table 4 also presents the growth rates of the various components of transportation over the 1960-1995 period. Parcel growth at over 10 % per year exceeded the growth rate of all the traditional modes of transportation in this period, except for air. Of course, parcel service is a major user of air transport, so its growth is necessarily reflected in the air data.

Figure 6 presents these same data. It is included here because it very forcefully portrays the growth of the parcel industry.

Table 4. Approximate parcel service revenue compared to traditional mode revenues, 1960-1998.

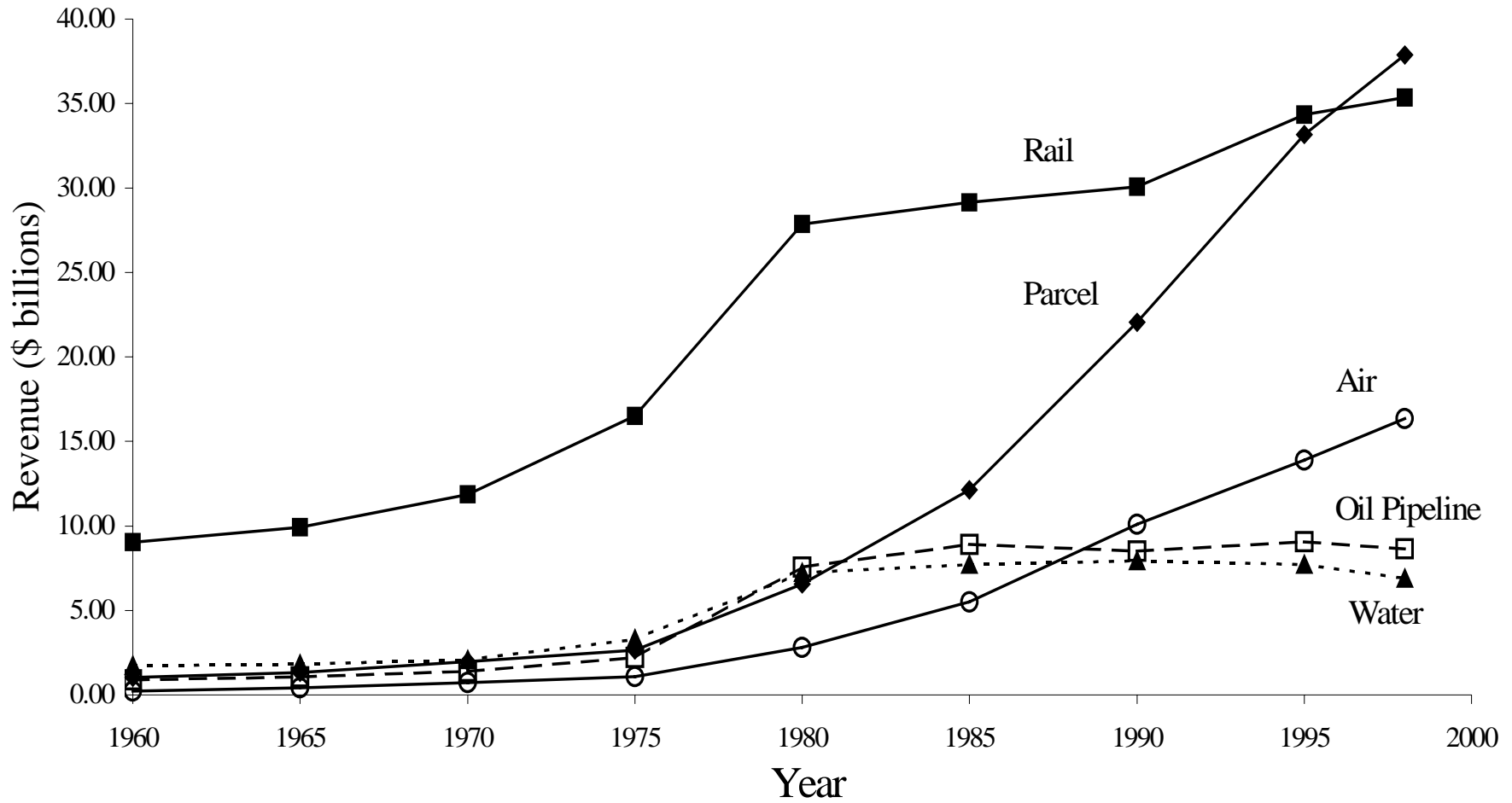
Year	\$ Millions					Truck Expenditures ^b	
	Parcel ^a	Rail ^b	Water ^b	Air ^b	Local	Intercity	
1960	1,042	9,028	1,722	220	14,289	17,958	
1965	1,328	9,923 ^c	1,822 ^c	428 ^c	23,779 ^c	23,628 ^c	
1970	1,958	11,869	2,070	720	28,819	33,553	
1975	2,645	16,509	3,293	1,073	37,287	47,400	
1980	6,567	27,858	7,219	2,802	60,545	94,551	
1985	12,139	29,150	7,703	5,498	82,200	123,200	
1990	22,046	30,067	7,940	10,100	108,350	162,300	
1995	33,181	34,343	7,712	13,897	128,352	219,627	
1998	41,332	35,350	7,700	16,340	143,740	257,810	
Growth Rate, %/yr	10.17	3.66	4.02	12.00	6.26	7.26	

^a Source: To 1985, Appendix C, Table C1; 1990 and later, Table 2.

^b Source: Years 1960-1997 except 1965: Eno Transportation Foundation, Inc. (1998). Transportation in America, p.40 (The Nation's Freight Bill) (Only revenues from domestic transportation are included.). 1998: Eno Transportation Foundation, Inc. (1999). Transportation in America. Supplement to the 16th edition, *Transportation Quarterly*, Vol. 53, No. 3, Summer 1999.

^c Source: Year 1965: Eno Transportation Foundation, Inc. (1997). Transportation in America: Historical Compendium 1939-1995, p.10 (The Nation's Freight Bill).

Figure 6. Parcel service industry revenue compared to traditional mode revenues, 1960-1998.



Source: Table 4.

3.3. International Revenues

So far we have focused on domestic transportation, and this is the focus of this report. However, it is interesting to look briefly at the international scene as well. To accomplish this, we will examine the international revenues of the Big Four parcel carriers. While these firms are all major players in international parcel transportation, there are many other major players as well, such as DHL and TNT. Thus their international revenue is not an indicator of the overall size of the U. S. international parcel business. Table 5 compares their revenues with the total revenues from international air and water freight service, i. e., the transportation of imports and exports. Table 5 presents the growth from 1988 to 1997. The Big Four revenue alone grew at the very rapid pace of 13.21% per year, slightly more rapidly than air freight expenditures and much more rapidly than water transport expenditures. Thus parcel service is not only growing in importance, but is also growing in relative importance, by this measure, compared to the traditional modes in international transportation as well.

Table 5. Growth of Big Four parcel international service revenues and traditional modal international movement expenditures, 1988-1997

	Revenue or Expenditures		Growth Rate, %
	<u>1988</u>	<u>1997</u>	
Parcel (Big Four domestic carriers) ^a	2462	7523	+13.21
Air	2373 ^b	6327 ^c	+11.51
Water – Imports	12220 ^b	17664 ^c	+4.18
Exports	10823 ^d	11773 ^c	+0.93
Total	23043	29437	+3.54

^a Source: Appendix B, Table B1

^b Source: Eno Transportation Foundation, Inc. (1997). Transportation in America: Historical Compendium 1939-1995, p.12.

^c Source: Eno Transportation Foundation, Inc. (1998). Transportation in America, p.40 (The Nation's Freight Bill).

^d Source: Interpolated from 1985 and 1990 data in source c.

4. IMPORTANCE OF PARCEL SERVICE TO THE ECONOMY

Another way to look at the role of parcel service in the economy is to examine its role in the movement of goods. The revenue numbers already presented provide one measure of this, for presumably the value to the society derived from the movement of parcels must be larger than the amount spent on it, or else the movement would not have occurred. But the value can be much larger, so it is important to seek other measures.

4.1. Value and Quantity of Parcel Shipments

One of these is the amount of goods transported by parcel carriers. Data on this is available from the three relatively comprehensive surveys of the flows of goods over the transportation system of the U. S. One such survey was conducted in 1977, a second more comprehensive one in 1993, and a more limited one in 1997. While there are important differences between them in scope and adequacy of the sample, overall these provide a unique snapshot of transportation activity with respect to the goods shipped and the forms of transport used. These differences are described in Appendix D. In particular, it should be noted that the 1977 survey focused on manufacturers, while the later surveys also included warehousing firms selling through catalogs, and some other sectors. Thus the 1977 survey was not as complete as the latter two. None included some sectors of the economy, such as agriculture, but these are probably not significant for parcel service.

Table 6 presents information on the overall amount of goods shipped and the fraction that was shipped by parcel carriers. Three measures are used in the survey and presented here: value of goods shipped, tons of goods shipped and ton-miles of goods shipped. Not surprisingly, parcel service figures more prominently in terms of value of the shipments, rather than weight or distance. This follows from the definition of small shipments, and the fact that parcel service is typically used for high value items. In terms of value of goods shipped, the parcel service share of all shipments grew from 3.12% in 1977 to 12.3% in 1997, a growth rate in market share of 7.11% per year. These parcel shipments, however, represented less than 1% of both tons shipped and of ton-miles in 1977, and still represented less than 1% by both measures in 1997. Parcel service grew considerably over this period. Over this twenty year period parcel traffic growth rates were approximately double those for all shipments for all three measures-- value, tons and ton-miles--as shown in the table.

Table 7 provides some interpretation of these numbers, comparing the value of shipments via parcel service with the value of shipments via the traditional modes of transport. In 1977 the parcel share of shipment value was less than that for rail, truck, and pipeline, but it exceeded slightly that of water transport and that of air transport. But by 1993 the value of parcel shipments exceeded the value of shipments via all other modes --rail, water, pipeline, and air-- except truck. This position was of course reinforced by the year 1997. By 1997 the value of parcel shipments not only exceeded the value of goods shipped via all single modes identified, except truck, but also exceeded the value of goods shipped by all the listed multiple modes combined (rail and truck, water and truck, air and truck, water and rail, and others not identified). Of course, parcel service is inherently intermodal, with much occurring via air or rail for the line haul, and truck as feeder. Figure 7 presents these results graphically, for all modes except truck.

Table 6. Parcel service share of freight movements based on Commodity Flow Surveys of 1977, 1993, and 1997.

	Year			Growth, % per year	
	1977	1993	1997	1977-97	1993-97
Value Originated (\$ Million)					
All transport	1,343,174	5,846,334	6,943,988	8.56	4.40
Parcel	41,853	563,277	855,897	16.29	11.03
%	3.12	9.63	12.33	7.11	6.37
Tons Originated (Thousands)					
All transport	3,311,992	9,688,493	11,089,733	6.23	3.43
Parcel	2,615	18,892	23,689	11.65	5.82
%	0.08	0.19	0.21	4.94	2.53
Ton-Miles (Millions)					
All transport	758,984	2,420,915	2,661,363	6.47	2.40
Parcel	1,497	13,151	17,994	13.24	8.15
%	0.20	0.54	0.68	6.31	5.93

Sources: U.S. Department of Commerce, Bureau of the Census, (1981). 1977 Economic Census, Transportation-Commodity Transportation Survey, Table 2 Shipment Characteristics by Manufacturing Establishments—Commodities and Means of Transportation, Communications, and Utilities (U.S. Government Printing Office, Washington D.C.).

U.S. Department of Commerce, Bureau of the Census, (1993). 1992 Census of Transportation, Communications, and Utilities, 1993 Commodity Flow Survey, Table 6b Shipment Characteristics by Three-Digit Commodity and Mode of Transportation for the United States: 1993 (U.S. Government Printing Office, Washington D.C.), Diskette.

U.S. Department of Commerce, Bureau of the Census, (1999). 1997 Economic Census, Transportation-1997 Commodity Flow Survey, Table 7 Shipment Characteristics by Two-Digit Commodity and Mode of Transportation for the United States: 1997 (U.S. Government Printing Office, Washington D.C.), Diskette.

Table 7. Value of shipments via parcel service compared to traditional modes in Commodity Flow Surveys of 1977, 1993, and 1997. (Million Dollars)

Transportation Mode	Year			Growth, % per year	
	1977	1993	1997	1977-97	1993-97
Rail (1)	229,241	330,476	395,324	2.76	4.58
Truck (2)	885,957	4,403,495	4,981,531	9.02	3.13
Air (3)	30,583	139,087	229,062	10.59	13.28
Water (4)	34,818	77,105	85,852	4.62	2.72
Pipeline (5)	50,374	90,198	113,497	4.15	5.91
Parcel Delivery	41,853	563,277	855,897	16.29	11.03
Other and Unknown (6)	70,348	242,691	282,824	7.20	3.90

Sources: Same as Table 6.

(1) 1993 & 1997 – Includes: Rail, and Truck and Rail survey categories.

(2) 1977 – Includes: Motor Carrier, and Private Truck survey categories.

1993 – Includes: Private Truck, For-hire truck, and Private Truck and For-hire Truck survey categories.

1997 – Includes: Truck (For-hire, and Private Truck)

(3) 1993 – Includes: Air, and Truck and Air survey categories.

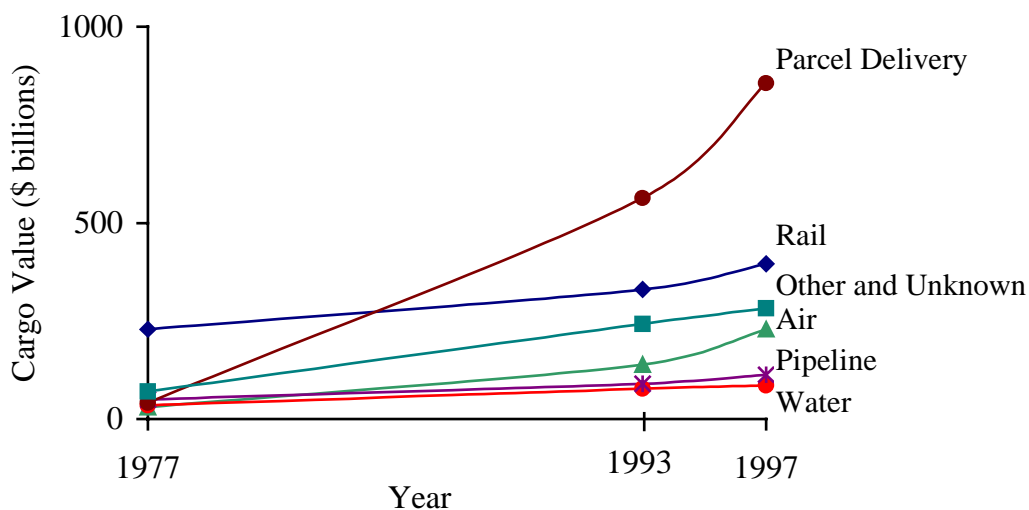
(4) 1993 – Includes: Inland Water, Great Lakes, Deep Sea Water, Truck and Water, Rail and Water, Inland Water and Great Lakes, and Inland Water and Deep Sea Water survey categories

1997 – Includes: Water (Shallow Draft, Great Lakes, and Deep Draft), Truck and Water, and Rail and Water.

(5) 1993 – Includes: Pipeline, and Truck and Pipeline survey categories.

(6) 1997 – Includes: Other multiple modes, and Other and Unknown survey categories.

Figure 7. Value of shipments via parcel service compared to traditional modes in Commodity Flow Surveys, 1977 to 1997.

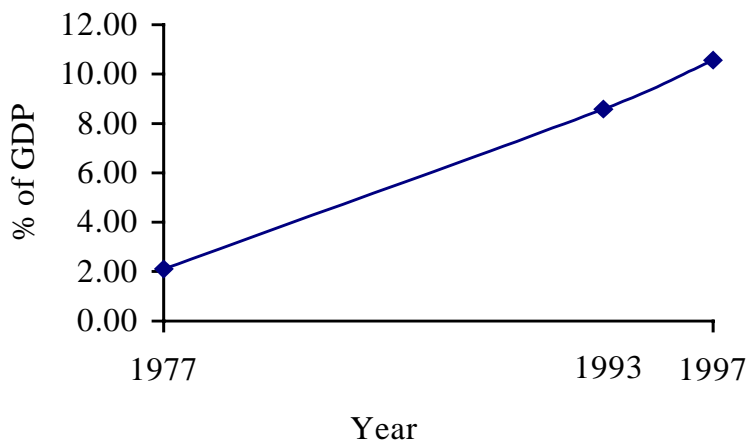


Source: Table 7.

It is also interesting to note that cargo tons originated by parcel carriers, and the ton-miles carried by parcel companies, are larger than those of the air freight mode (including the air and truck mode). In the 1997 survey, parcel ton-miles were about 18.0 billion, while air freight was about 6.2 billion.

Further evidence of the growing importance of parcel transportation to the economy is presented in Figure 8. This figure shows the growth of the value of parcel shipments as a percentage of Gross Domestic Product (GDP) for the three years covered by the CTS. The parcel percentage of GDP has grown steadily from 2.10% in 1977 to 8.58% in 1993 and then 10.56% in 1997.

Figure 8. Value of parcel service shipments compared to Gross Domestic Product, 1977, 1993 and 1997.



Sources: Value: Table 6; GDP: Congressional Information Service (1998). "GDP in Current and Real (1992) Dollars: 1960 to 1997," No. 715. In *Statistical Abstract of the United States*, 1998. Available from: *Statistical Universe* (Online Service, <http://web.lexis-nexis.com/statuniv> on 03/21/2000). Bethesda, MD: Congressional Information Service.

4.2. Characteristics of Parcel Shipments

Having established the overall share of parcel service in moving freight, it is also instructive to look at the nature of what is carried by parcel service and its role relative to other forms of transport. The two most recent commodity flow surveys, in 1993 and 1997, provide sufficient data for this, while the earlier survey (1977) does not (the smallest category of shipment weight in that survey being 500 lbs.).

Table 8 presents the breakdown of parcel traffic by weight of shipment, in 1997. Looking first at value of shipments, shipments that were in the smallest weight category, less than 50 lb., were a very substantial fraction of all parcel shipments—65.0%. This percentage consistently dropped as shipment size (weight) increased, as might be expected, with almost all parcel service shipments being less than 500 lb. Tons and ton-miles show the same pattern, but the percentage represented

by the smallest size category (less than 50 lb.) is less in both cases. What is noteworthy is that parcel carriers are used for many shipments that are quite large—much larger than typically would be thought of as a parcel. Thus parcel carriers are now providing a more general transportation service than just the movement of very small shipments, and carry a substantial quantity of shipments larger than 100 lb. (It should be noted that the 1993 survey yields very similar results; these can be found in Appendix Table D1. In general, there has been a slight increase in the percentage of shipments via parcel service in weight classes larger than the under 50 lb. category.)

Table 8. Parcel Shipment Value, Tons, and Ton-miles by Shipment Size in 1997

<u>Shipment Size</u>	<u>Value</u> <u>(Mil \$)</u>	<u>Value</u> <u>%</u>	<u>Tons</u> <u>(1,000)</u>	<u>Tons</u> <u>%</u>	<u>Ton-</u> <u>Miles</u> <u>(Mil)</u>	<u>Ton-</u> <u>Miles</u> <u>%</u>	<u>Average</u> <u>Miles</u> <u>Per</u> <u>Shipment</u>
All Weight Classes	855,897	100.0%	23,689	100.0%	17,994	100.0%	813
Less than 50 lb.	556,167	65.0%	10,321	43.6%	8,260	45.9%	819
50 to 99 lb.	114,589	13.4%	3,988	16.8%	2,916	16.2%	729
100 to 499 lb.	155,966	18.2%	7,265	30.7%	5,224	29.0%	723
500 to 749 lb.	19,377	2.3%	1,168	4.9%	834	4.6%	706
750 to 999 lb.	9,258	1.1%	791	3.3%	608	3.4%	760
1,000 to 9,999 lb.	1,383	0.2%	157	0.7%	S	S	970
10,000 to 49,999 lb.	-	-	-	-	-	-	-
50,000 to 99,999 lb.	-	-	-	-	-	-	-
100,000 lb. or more	-	-	-	-	-	-	-

Source: U.S. Department of Commerce, Bureau of the Census, (1999). 1997 Economic Census, Transportation-1997 Commodity Flow Survey, Table 4. Shipment Characteristics by Mode of Transportation and Shipment Size for the United States: 1997 (U.S. Government Printing Office, Washington D.C.), Diskette.

Notes:

- Represents data equal to zero or less than one unit of measure

S Data does not meet publication standards because of high sampling variability or other reasons.

Another way of looking at the role of parcel service is to examine its share of the overall transport market for shipments of different sizes. Figure 9 shows the share of shipments by value using parcel service and other modes in 1997. Parcel's share in the smallest weight category is the largest, at 65.17%, but this drops with increasing weight to 4.91% in the 750 to 999 lb. category (the largest weight for which shipments were recorded as moving via parcel service). Truck service has an increasing share of cargo as weight increases. Air exhibits the same reduction of market share with increasing weight as parcel, albeit with much smaller market share.

Figure 9. Parcel service industry's share of U.S. freight market by shipment weight in 1997
Source: Table 9.

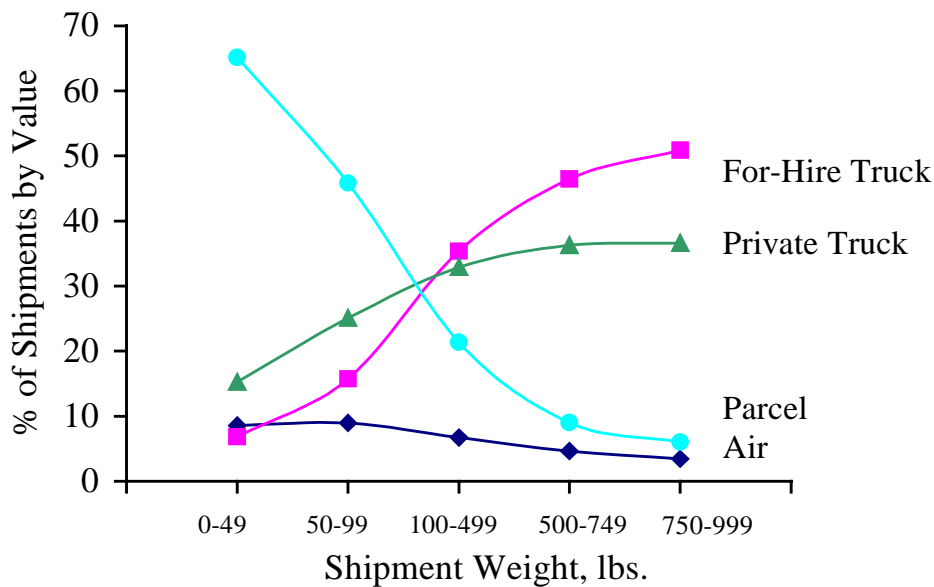


Table 9 provides more detail on market shares, and compares 1997 with 1993 data. It is interesting to note that parcel's percentage of all such shipments in the smallest weight category, less than 50 lbs., increased from 63.35% by value in 1993 to 65.16% in 1997. Its percentage share of tons and ton-miles in the under 50 lbs. category also increased over this period, as can be seen in Part b of the table. Furthermore, parcel's share of shipments in all size categories in which it had any cargo (up to the 750 to 999 lbs. category) increased from 1993 to 1997, for all three measures—value, tons, and ton-miles. This is of course consistent with the prior data on parcel service's increasing share of the national freight market based on revenue.

What is most surprising in Table 9, however, is the significant share that parcel carriers now have of larger size shipments. Clearly they are not only carrying what is traditionally thought of as parcel-sized shipments, but are also carrying an increasing percentage of the larger shipments that would be thought of as less-than-truckload shipments. We conjecture that this reflects shippers' preferences for the quality features of the parcel carriers' service. These features include both transportation services and related logistics services that facilitate the smooth and efficient flow of commerce. In terms of transportation, it includes offering: speed and transit time options (including faster service than land carriers over long distances), guaranteed time-definite deliveries, shipment tracking, and substantial price reductions for the slower services that shippers can trade off with inventory costs and customer response times. The value-added services include, as we discussed earlier, integration of the transportation data networks (EDI and Internet-based) with those of the shippers and receivers, allowing for smooth and almost instantaneous flow of information, integration of transportation with warehousing and order fulfillment, and integration with the flow of funds, both nationally and

Table 9. Parcel carriers' share of freight market by shipment weight in 1993 and 1997

a. Share based on value.		Percent of Value via					
Weight Range	Parcel	Private Truck		Air (Including Air&Truck)		For-Hire Truck	
		Less than 50 lb.					
-1993	63.35%	17.07%		8.59%		7.12%	
-1997	65.16%	15.24%		8.58%		6.84%	
50 to 99 lb.							
-1993	42.31%	27.82%		0.29%		16.58%	
-1997	45.86%	25.06%		8.96%		15.76%	
100 to 499 lb.							
-1993	15.95%	33.02%		0.22%		40.63%	
-1997	21.37%	32.89%		6.70%		35.37%	
500 to 749 lb.							
-1993	4.73%	35.74%		0.06%		51.92%	
-1997	8.99%	36.31%		4.63%		46.45%	
750 to 999 lb.							
-1993	4.91%	33.33%		0.11%		52.79%	
-1997	6.00%	36.62%		3.42%		50.88%	

b. Share based on tons and ton-miles.		Percent of Tons and Ton-miles via							
Weight Range	Parcel		Private Truck		Air (Including Air and Truck)		For-Hire Truck		
	Tons	Ton-Miles	Tons	Ton-Miles	Tons	Ton-Miles	Tons	Ton-Miles	
Less than 50 lb.									
-1993	43.05	77.65	40.63	4.01	2.50	9.95	7.89	6.73	
-1997	48.36	83.07	37.89	3.63	1.62	4.95	6.55	7.12	
50 to 99 lb.									
-1993	25.26	60.02	57.98	9.58	0.04	0.20	11.21	19.33	
-1997	28.08	65.53	54.60	8.97	1.15	5.51	10.06	18.09	
100 to 499 lb.									
-1993	6.67	20.33	68.53	16.95	S	0.28	20.78	53.85	
-1997	8.93	27.07	66.42	16.57	0.78	4.75	19.16	49.46	
500 to 749 lb.									
-1993	2.50	8.48	70.21	19.51	0.01	0.11	24.35	64.78	
-1997	3.12	10.02	69.71	19.35	0.54	3.34	22.66	64.19	
750 to 999 lb.									
-1993	1.42	5.38	71.41	21.57	0.01	0.05	23.99	67.51	
-1997	2.58	9.12	70.22	21.38	0.38	2.09	23.10	65.04	

Source: Appendix D, Table D2.

internationally. (These value-added services will be discussed more fully in Section 5.) Clearly the parcel carriers have been at the vanguard of offering shippers service (and price) packages that they want and use.

Table 9 also reveals the general pattern that the parcel service's share of shipments drops as shipment size increases, as might be expected. For example, in 1997 parcel's share of value for the 50 to 99 lb. category was 45.86%, compared to 65.16% for the smaller size category. It further drops to 21.37% for the 100 to 499 lbs. category. Three other modes identified in the survey are important carriers of shipments in the ranges carried by parcel carriers. These are private truck, air (including the mode air and truck), and for-hire truck. As can be seen from this table, the market share of these modes increases with increasing shipment weight. At 1000 lb. and above, parcel carriers have no share according to the 1997 survey.

A further tabulation reveals that shippers are choosing parcel carriers primarily for higher value shipments and for longer distance transport. This is shown in Table 10, which lists average shipment value per ton and the average length of haul for parcel and the three other modes used for virtually all shipments in these weight categories in 1997. Compared to trucking, which is the most widely used other mode, the data suggest that parcel service is used for longer distance shipments and for shipments of higher value commodities. Parcel carriers have an average haul in the range of 700 to 820 miles, and private trucking, the most widely used alternative mode, has an average haul of less than 70 miles—essentially a local movement. For-hire truckers are probably mostly less-than-truckload-lot carriers, and the average haul length is much larger for these, but still somewhat less than that for parcel shipments. Air is not heavily used, but has the longest average haul, as might be expected. In terms of value of cargo, air has by far the highest average value, but parcel is next in value in the range of \$50,000 per ton for the smallest size shipments, dropping to about \$11,000 per ton for the largest weight category. The two truck modes handle lower value shipments in general, although at the higher shipment weight categories, for hire trucking has a value almost equal to that of parcel.

Table 10. Average shipment value per ton and average haul by shipment size and mode in 1997

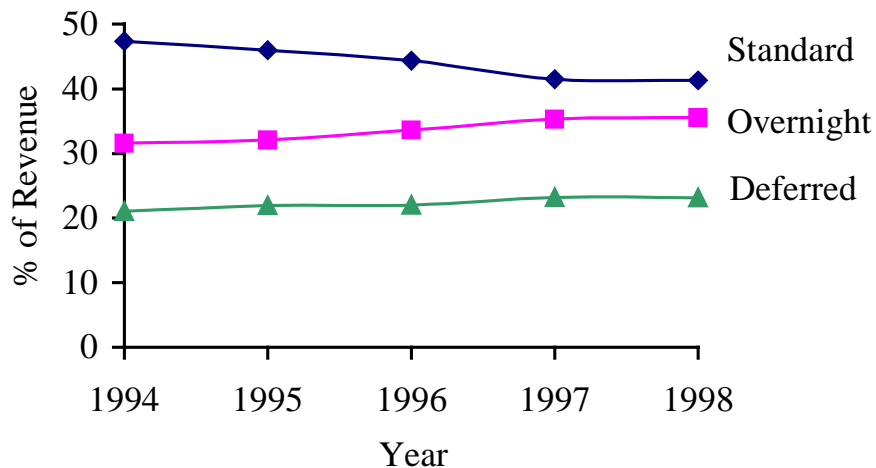
<u>Weight Range</u>	<u>Parcel</u>	<u>Private Truck</u>	<u>Air (Including Air and Truck)</u>	<u>For-Hire Truck</u>
Less than 50 lb.				
Avg. Value, \$(1,000)/ton	53.86	16.07	211.54	41.71
Avg. Haul, miles	819	45	1,367	500
50 to 99 lb.				
Avg. Value, \$(1,000)/ton	28.70	8.07	136.32	27.53
Avg. Haul, miles	729	51	1,498	552
100 to 499 lb.				
Avg. Value, \$(1,000)/ton	21.17	4.38	75.73	16.34
Avg. Haul, miles	723	57	1,456	609
500 to 749 lb.				
Avg. Value, \$(1,000)/ton	16.23	2.93	48.12	11.53
Avg. Haul, miles	706	63	1,409	640
750 to 999 lb.				
Avg. Value, \$(1,000)/ton	11.03	2.48	42.29	10.47
Avg. Haul, miles	760	68	1,225	629

Source: Appendix D, Table D1.

Note: Average Value per Ton was found by dividing the Value by Tons for each mode of transportation within each weight class.

Additional insight into this is provided by the trends in revenues of parcel carriers for the different service classes that they provide. Broadly speaking, there is the traditional ground service, which is the slowest but the cheapest. The second is the overnight service, which is considerably more expensive. And the third is deferred service, which provides for delivery in two or three days, with a guarantee like the overnight service, and which is priced between the two others. Figure 10 shows the trends of revenues from each of these service classes for the Big Four carriers in the last five years. (Only five years are included because earlier data for UPS are unavailable.) While standard service revenue has been growing, its share of revenues is declining. Overnight service has increased in share the most, representing over one-third of revenues in 1998, and deferred service has also been increasing in share slightly. Thus shippers are choosing faster services and ones which offer guarantees of delivery. It should be noted that both FedEx Ground (formerly RPS) and UPS have added a delivery guarantee to their ground service, for shipments that are delivered to business customers, reinforcing the apparent importance of delivery guarantees.

Figure 10. Share of Big Four parcel revenues from overnight, deferred and standard service, 1994-1998.



^a Source: Appendix A, Table A1. Data includes revenues of Big Four parcel carriers.

Thus these data reinforce what was stated earlier about the role of parcel carriers. The high value of parcel shipments and the long average haul length suggest that parcel is being chosen for its level of service and value-added logistics features, in preference to other modes, trucking in particular.

4.3. What commodities move via parcel service?

The commodity flow surveys also permit an examination of which commodities are shipped via parcel service, and thus by implication which types of industries and services are dependent on parcel service. While it is surely true that virtually all businesses and families in the U.S. depend to some extent on parcel service, there undoubtedly are variations in the degree of direct dependence. One might imagine, for example, that the growth of parcel service usage reflects, at least to some extent, growth in types of businesses and activities that naturally use small shipments of high value or time sensitive items. These data shed some light on this.

As we have seen, in 1997 12.3% of all goods transported moved via parcel carriers, as measured by shipment value. One approach to looking at unusual dependence on parcel service is to identify those commodities, out of a total of 42 commodities (at the two digit Standard Classification of Transportation Goods--SCTG--code level) for which more than this percentage of their value transported was via parcel carriers. These nine commodities are listed in Table 11. Also listed there are three additional commodities, for which the total value of cargo transported via parcel service in 1997 was quite large (indicated by an asterisk after the commodity name). These twelve commodities represented 94.9 % of the value of all commodities moved by parcel carrier in the 1997 survey.

Table 11. Commodities with large percentages of shipments via parcel service, and growth, 1977-1997.

<u>Commodity (SCTG Code)</u>	<u>% Shipment Value via Parcel</u>			<u>% Growth Of Shipment Value Via All Modes</u>	
	<u>1977</u>	<u>1993</u>	<u>1997</u>	<u>1977-97</u>	<u>1993-97</u>
Pharmaceutical Products (21)	8.24	16.41	32.59	15.13	8.25
Chemical Products And Preparations, N.E.C.* (21)	1.30	5.39	7.89	8.73	3.18
Plastics and Rubber* (24)	1.28	6.18	8.37	7.90	3.43
Printed Products (29)	11.19	**	23.77	8.62	**
Textiles, Leather, and Articles of Textiles or Leather (30)	9.85	13.39	17.81	7.49	-3.87
Articles of Base Metal (33)	1.56	12.66	16.35	1.02	-8.51
Machinery (34)	4.47	16.86	13.21	6.30	9.53
Electronic, Other Electrical, and Office Equipment and Components (35)	8.46	24.54	28.30	11.91	11.43
Motorized and Other Vehicles (Including Parts)* (36)	0.18	4.54	4.25	8.33	4.03
Transportation Equipment, N.E.C. (37)	1.79	10.16	12.26	5.64	-5.93
Precision Instruments and Apparatus (38)	12.60	29.70	48.30	9.58	-5.55
Miscellaneous Manufactures Products (40)	16.65	24.28	27.37	16.38	17.88

Sources: See Appendix D, Table D3.

Some of these commodity categories are self explanatory, like Pharmaceuticals, while others like Transportation Equipment could be a variety of things. To interpret these, we had to revert to the 1993 survey, as the 1997 survey did not have sufficient detail on commodity breakdowns to be clear on the composition. We identified specific commodities from the 1993 survey at the three-digit level that comprised the 1997 two-digit level commodities that were major users of parcel service. We then examined these detailed commodity categories to identify the industries or sectors of the economy in which they are used. Thus we were able to identify industries or sectors which appeared to rely relatively heavily on parcel service, and these are presented in Table 12.

Table 12. Industries that are major users of parcel service based upon interpretation of the Commodity Flow Survey of 1993 and 1997.

Medical Equipment
 Medical Supplies
 Computers and Related Electronic Equipment
 Clothing and Accessories
 Office Supplies
 Military Ordnance and Precision Equipment
 Hardware
 High Technology Engineering and Scientific Activities in Research and Industry
 Musical, Sports and Hobby Equipment and Supplies
 General Industrial Equipment and Parts
 Printing and Publishing (periodicals, books, advertising, etc.)
 Consumer Electronic Equipment (TVs, radios, etc.,)
 Industrial Machinery and Parts
 Aircraft Parts
 Electrical Transmission and Distribution Equipment
 Photographic Equipment and Supplies

Source: Appendix D, Table D4.

It is clear that this list of industries includes many that are central to our economy and are growing rapidly. Particularly noteworthy is the inclusion of the medical field and computer and other high technology equipment. Clearly parcel services are very important in these industries, for distributing products (like PCs and related equipment) and also in the medical field for transporting supplies—often with critical time deadlines for hospital or other uses. Returning to Table 11, it is now clear why the growth rate of value of commodities transported in many of the categories is so high; these are growth areas of the economy, including computers, health care, and high technology goods for science, industry and consumers.

5. TRENDS AND THE FUTURE OF THE PARCEL INDUSTRY

A natural point of departure in looking at trends of parcel traffic in recent years is to try to answer the question of why the parcel industry has grown so rapidly and become such a large sector of the transportation industry. To some degree, the Vice President of General Motors Corp. gave the answer in a statement at a 1994 conference:

“Changing manufacturers’ needs will require smaller lot sizes and more frequent deliveries....

“For the transportation industry, the talking points to remember when making step-function change include the following:

- A manufacturing lot size of one,
- Material continually moving,
- Value added at every step, and
- Manufacturing’s dependence on transportation to move even the smallest lot with the highest frequency and speed possible.”⁵

For a whole variety of reasons, from the standpoint of the producer and seller of goods, the ideal transportation system keeps things moving rapidly and reliably, and does not delay goods in order to accumulate an entire truckload, or railcar load, of cargo. And other users of transportation would surely express similar sentiments—retailers, wholesalers, and certainly individuals and households.

Parcel carriers are basically trying to provide this type of transportation service—moving items individually, or in small batches, quickly and reliably. They also provide the associated services that are often essential for the shipper, including continuous tracking so that the shipper knows where her goods are, pick up and delivery at the customers’ premises, and integration of information flow to facilitate the transactions between shipper and receiver.

But faster transport, in small shipments, comes at a price, so that it is necessary to delve deeper to understand why parcel services have grown and why all projections of which we are aware predict an even larger role for this type of transportation. This is best accomplished by examining different segments of the transportation market, as it serves the manufacturing and service sectors.

In the manufacturing sector, in the last two decades, we have seen tremendous changes, which have brought an unparalleled standard of living to the U.S. as well as unrivaled variety in goods available. These are the result of many developments that are related to the transportation and

⁵ Donald A. Pais, “Keynote Address,” *International Symposium on Motor Carrier Transportation*, Transportation Research Board Conference Proceedings 3 (National Academy Press, Washington, D.C. 1994), p. 11. Pais was Vice President, North American Operations Production Control and Logistics, General Motors Corp.

parcel service. With parcel services delivering a value of goods equal to over 10 % of our Gross Domestic Products, as we have seen, it is clear that they play a very important role in the economy.

The reliance placed on parcel carriers reflects what may be described as four key trends in industry in recent years. These are: mass customization, inventory reduction, use of high technology equipment, and focus on core competencies. These will be discussed, followed by a discussion of changes in the retailing sector and their impact of parcel service.

5.1. Mass Customization

Mass customization refers to the mass production by very efficient means of a much wider variety of goods than heretofore was available. This mass customization has affected almost all consumer goods; personal computers offer an excellent example. Each buyer of a computer now typically wants particular features, including memory size, screen, and optional features such as a modem or audio, among others. If PC makers were to stock all the different combinations, inventories would be enormous, and the cost would be prohibitive. Instead, many have transitioned to making the PC to order, in the sense that the final configuration of each is postponed until the customer's order is received, at which time the exact components are installed and the PC shipped. For the customer to be satisfied, her PC must arrive quickly after the order. Each PC must be sent individually to the proper customer, without delay, arrive undamaged, and its receipt acknowledged for proof of delivery and payment.

Parcel carriers are obviously crucial in this chain of delivery. It is only that type of carrier that can handle a small shipment like a PC, at a reasonable price, and which can offer the guaranteed delivery with authentication that is necessary for such a transaction. Thus the parcel service is an integral part of modern supply chains.

This has opened up a related business for many parcel companies, the business of providing distribution or other facilities, and in many cases actually performing the order taking and distribution activities. For example, when a customer orders a printer from Hewlett-Packard using its Web Site, or via telephone, the order actually is handled by FedEx, which stocks all of the printers that H-P sells online at a dedicated "E-distribution" center in Memphis⁶. FedEx ships the order, and this triggers a e-mail notification to the customer that the printer is on its way, and also a message to H-P that the FedEx center now has one less printer in stock, so that H-P can plan its replenishment production.

A similar relationship exists between UPS and Micron, and Idaho-based electronics firm. UPS actually takes the orders sent to Micron's Web site, and provides the information to Micron so that it can provide the customer with the order status and delivery date⁷. This is all part of the natural expansion of the parcel business into the logistics –the process of deciding what to order

⁶ "Shipping Firms Exploit IT to Deliver E-Commerce Goods," Computerworld, <http://www.computerworld.com/home/print.nsf/all/990802B816> read on 02/09/00.

⁷ Kelly Barron (2000), "Logistics in Brown," *Forbes*, Jan. 10, 2000, p.83.

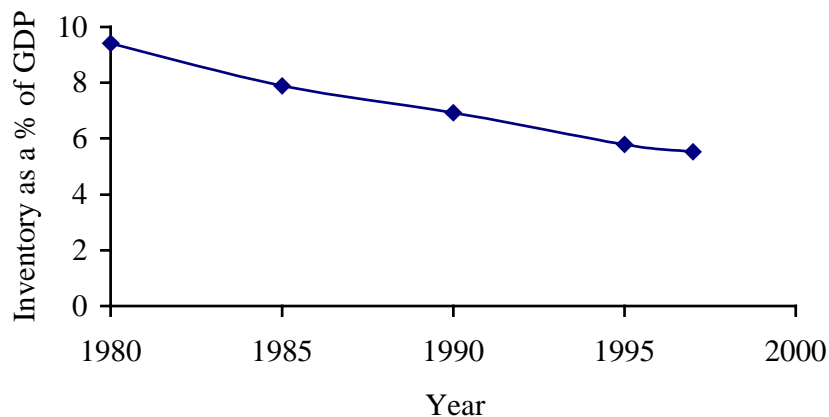
and what to ship where and via what means. This of course is usually tightly integrated with the production and other processes of the customer firm, as it is an integral part of the “product” that firm provides to its customers.

5.2. Reduction in Inventories

Another trend that encourages the greater use of parcel carriers is the reduction in inventories of manufactured products. This was an element in the previous examples, of course. But the trend has been a general one, impacting almost all types of manufactured goods. The amount of inventory that has been removed from supply chains in the last twenty years is amazing. Figure 11 presents data on the reduction in the value of inventory in the U.S. since 1980, from 9.41% of Gross Domestic Product (GDP) then to 5.52% of our GDP in 1997.

Much of this has resulted from using faster and more reliable transportation services, of which the parcel service is a preeminent example. Parcel service helps to reduce inventories in three ways. One reduction comes from the small shipment size; less time is taken accumulating a shipment, and similarly a shipment, being smaller, is used more rapidly at the destination end. The second is a result of the reliability of parcel service, which reduces the need for safety stocks to protect against late deliveries. The third is that parcel service tends to have shorter in-transit delivery times than most other forms of transportation, reducing the in-transit inventory (although this is not included in the data in Figure 11, of course).

Figure 11. Inventory as a percentage of Gross Domestic Product, 1980-1997



Sources: Inventory: Congressional Information Service (1998). "Manufacturers' Shipments, Inventories, and Orders: 1970 to 1997," No. 1237. In *Statistical Abstract of the United States*, 1998. Available from: *Statistical Universe* (Online Service, <http://web.lexis-nexis.com/statuniv> on 03/21/2000). Bethesda, MD: Congressional Information Service. GDP: Congressional Information Service (1998). "GDP in Current and Real (1992) Dollars: 1960 to 1997," No. 715. In *Statistical Abstract of the United States*, 1998. Available from: *Statistical Universe* (Online Service, <http://web.lexis-nexis.com/statuniv> on 03/21/2000). Bethesda, MD: Congressional Information Service.

5.3. Use of Advanced Technology

A third trend is the increasing use of sophisticated technology in almost all sectors of the economy, from testing laboratories to hospitals to factories. High tech equipment is expensive, and as a result parcel carriers often deliver it. Also, duplicate machines are installed only sparingly, and as a result, when a repair part is needed, it is needed immediately. Again parcel carriers, with guaranteed same day and next day services, have provided the essential transportation link. As noted earlier, this has led many suppliers to locate their parts warehouses at major hubs in the parcel air network. For example, in 1996, Federal Express and Amdahl Corp., a national parts supplier established a national network of 50 Express Distribution Depots (EEDs) so that needed parts can be supplied rapidly throughout the nation. Each depot has only a small inventory, this being replenished every time a part is ordered. The delivery of emergency parts is vital to many customers, preventing expensive down time of crucial machines and operations.

An even more interesting example is the recently announced plan by Intermec Technologies Corp of Everett, WA, to provide repair services and repair parts to its North American printer and scanner customers from the UPS air hub in Louisville, KY. A UPS subsidiary, SonicAir, has built a 900,000 sq. ft. Louisville Technology and Logistics Center at the end of the runway at UPS Louisville air hub. SonicAir will provide about 100 highly skilled technicians to repair Intmec's printers and scanners. Items needing repair will be sent to this facility, repaired, and then can be returned via UPS flights for next day delivery. Even if the repair was not completed and the item transferred to UPS until 1 AM in the morning, in most cases it can still be delivered the next morning. In addition, parts previously stored at Intermec's manufacturing sites and repair depots will be relocated to the Louisville facility. This should allow Intermec to reduce its inventory of repair parts, streamline its parts distribution network, and reduce costs while improving customer service. The synergy between the speed of parcel service and the reduction in non-transport customer service costs is significant⁸.

Thus if one wishes to be able to deliver goods in parcel-sized shipments to customers quickly, then the best location is at the hub terminal of a parcel carrier. It comes as no surprise then that many businesses have chosen to locate warehouses and distribution centers at such sites, as we have seen. As air parcel service has grown, more cities now have hubs, and these areas are benefiting from their excellent accessibility to national and international markets in the form of expanded manufacturing and distribution activities.

5.4. Focus on Core Competencies

Other services that enhance the ability and ease of firms to exchange goods are now being introduced by parcel companies. A good illustration is UPS recent entry into secure Internet document exchange. In partnership with Hewlett-Packard, in May 1999, UPS began offering

⁸ UPS (2000), "SonicAir to provide Intermec customers faster repairs and rapid spare parts delivery" 2000 News Releases, <http://www.ups.com/bin/shownews.cgi?20000105sonicair> (read on 03/01/00)

UPS Document Exchange, which is designed to electronically send paper-based documents across the Internet. This enables documents that were once sent via overnight delivery to be sent much more rapidly and cheaply over the Internet, to multiple recipients if desired. The parallel with the earlier statements about the transformation of the transportation field should be evident: Here UPS is offering to replace its traditional movement of things via transportation with delivery of information via electronic means⁹.

Yet another is the recent entry of UPS into the flow of funds¹⁰. This is seen as a natural but clearly innovative expansion from supporting the flow of information associated with delivery to the flow of payments. This is intended to replace the traditional process by which a business gets paid by another. The current model is: a purchase order is prepared, goods are shipped, an invoice is sent, delivery is acknowledged, and signatures or approvals are obtained for payment, and finally payment is made. This involves considerable paperwork, processing, and delay. With the new system, once goods arrive and are signed for—electronically, all the other actions necessary for payment can be executed. This saves an enormous amount of person-hours of effort, and delay in the seller being paid.

All these services offered by parcel companies enable firms to focus on their core competencies, and not expend effort and talent trying to do business support functions that are better done by experts. Just as it would make no sense for all firms to individually try to provide all of their transportation needs, it similarly makes no sense for them to provide all their other logistics and business support functions.

5.5. Retailing

As for the future, all the trends point to greater reliance on parcel services. One set of reasons is that all of the trends that have been discussed above are continuing for the foreseeable future. Another is that global commerce is increasing, as more nations enter the global economy and more goods are shipped longer distances. This increases the amount transported, and this is of course part of the growth of parcel carriers that we have seen.

But another trend is likely to increase the role of parcel carriers significantly. This is the growth of Internet and telephone sales. Retailing is undergoing a transformation in which ordering by a customer to whom the item is then delivered is becoming more and more common. This is exemplified by the explosion in e-commerce that was especially noticeable during the last Christmas season, but the growth is far more than that. And of course the items must be delivered. And that is where parcel carriers are almost alone in their serving of this market.

The growth of retail e-commerce promises to have tremendous impact, rivaling the massive changes that have affected retailing in the last 70 years. The first of these was of course the shift from the multi-layered fixed price selling chain with concentrated downtown stores that

⁹ “Shipping Firms Exploit IT to Deliver E-Commerce Goods,” Computerworld, <http://www.computerworld.com/home/print.nsf/all/990802B816> (read on 02/09/00).

¹⁰ “UPS Capital President addresses banking conference,” 2000 News Releases, Jan. 5, 2000. <http://www.ups.com/bin/shownews.cgi?20000128fundflow-1.c>. (read on 03/01/00).

was toppled by the emergence of large suburban stores in the 1950s and 60s. This was followed in the 1980s and 1990s by mega-retailers which eliminated middlemen and reduced the price of almost all retail goods. These are exemplified by such retail giants as Wal-Mart for general merchandise and Borders for books.

We are now at the beginning stage of another revolution in retailing, in which the Internet is enabling manufacturers and stores to link with customers almost anywhere. No longer is physical proximity an important feature. Customers shop for items on the web, or via other means, and place orders electronically. The goods are then delivered to their homes, or in some cases, places of business.

This emerging reconfiguration of the selling chain is illustrated in Figure 12¹¹. In it electronic shipping and ordering replace the trip to the store, and parcel delivery replaces the return trip home with the goods. Other factors are also contributing to what is expected to be surge in business to consumer parcel volume. One of course is the steady rise in two-wage-earner households. Another is the increase in the workweek. And a third is the increase in the variety of goods available. It is simply increasingly likely that the Internet will be the one place where a buyer can find information about the range of products available. All this leads to more home delivery business.

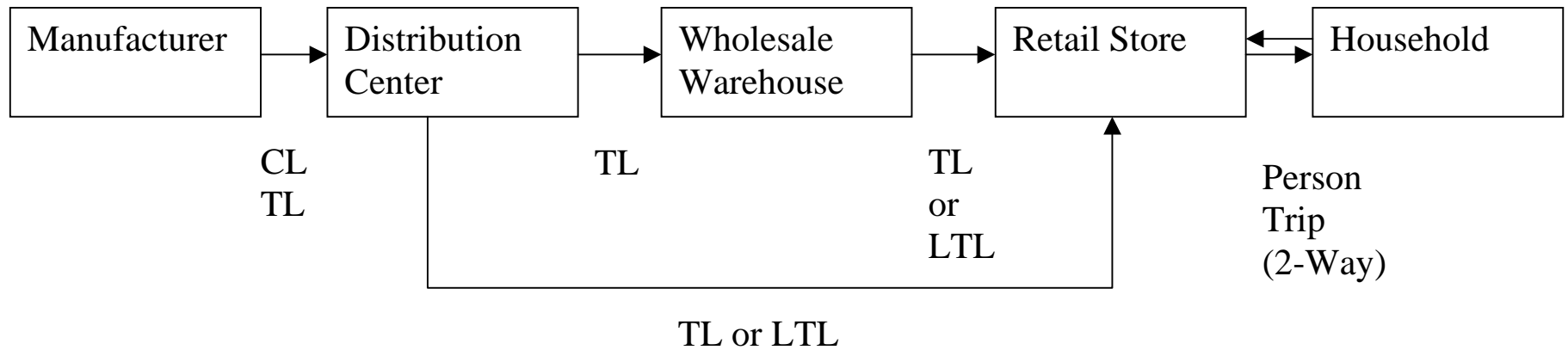
The implications for parcel carriers are obvious, and enormous. As this type of retail selling and buying increases in popularity, so does the business of parcel carriers.

To date only some parcel carriers have sought out this type of home delivery business, as it is a high cost segment of the business. Of course, USPS and UPS have long provided this type of service. The high cost arises from the dispersion of homes and the low volume of deliveries to each site, increasing the distance traveled per delivery. Also, often no one is home, requiring a second or third call by the delivery truck driver (or in the case of the U.S. Postal Service return of the item to the local post office for later pick up by the addressee). And then there is the problem of arranging for pick up or convenient sending of returns. All this has led to what is referred to as the “last mile” problem in business to consumer e-commerce.

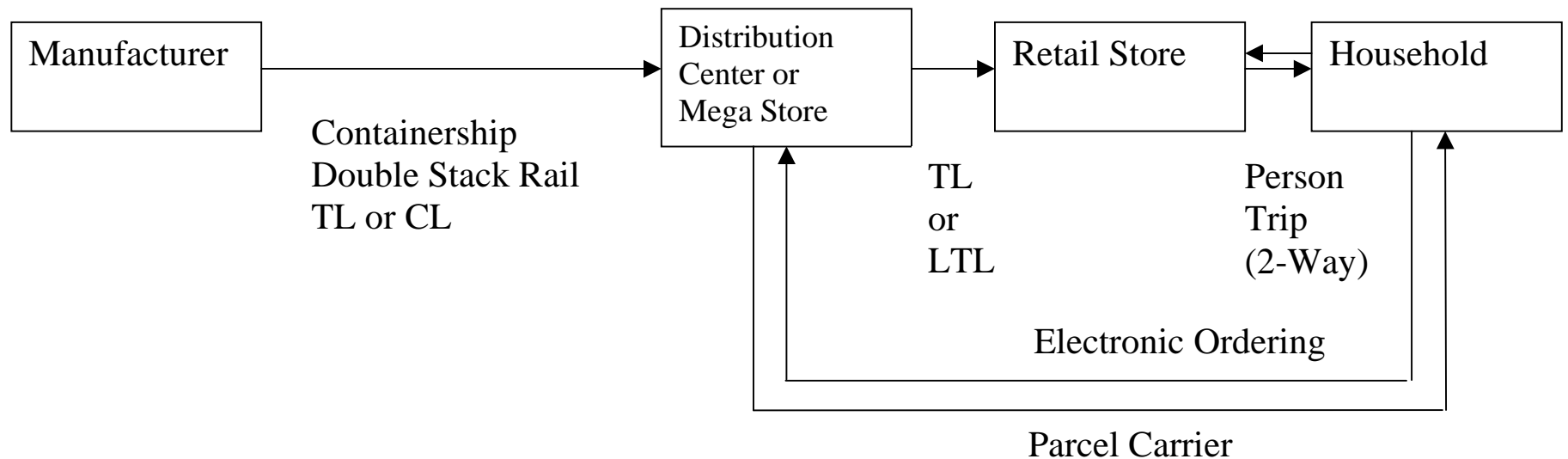
But the growth in e-commerce is expected to be so large that parcel carriers are searching for ways to provide this service, presumably at a profit. FedEx has created a new service for business to home delivery (which was not offered by the previous ground service arm, RPS), under the name FedEx Home Delivery. And in November 1999 Airborne announced a partnership with USPS, called Airborne @ Home, to provide home deliveries.¹²

¹¹ Figure partly based on that in the article: Satish Jindel, “Delivering E-commerce,” Air Cargo World, March 1999, <http://www.jindel.com/html/cargoworld.html> (read on 02/11/00.)

¹² FedEx, Press Release, “FedEx Unleashes the Power of its Brand”, 1/19/00, <http://www.fedex.com/us/about/ground/pressreleases/pressrelease011900.html>, as seen on 8/8/00/
Airborne Express, Press Release, “Airborne Pairs with Postal Service in Offering New Parcel Delivery Service for Business-to-Residential Customers”, 6/3/99, <http://www2.airborne.com/press/item.asp?strRelSeqNbr=74>, as seen on 8/8/00.



a. Traditional pattern through 1980s and early 1990s.



b. Emerging pattern for 21st century

Note: CL indicates carload, LTL indicates less-than-truckload, and TL indicates truck load.

Figure 12. Reconfiguration of the retail selling chain.

6. CONCLUSIONS AND IMPLICATIONS

Over the last few decades the parcel services have grown to become a major player in the transportation field. Their role is especially significant because they typically move items of high value, and often ones whose delivery is so time-sensitive that delay can shut down a factory or impair the ability to deliver medical care. The service that they provide has been at the vanguard of innovations to transportation services and related, customer-supporting services. In the transportation arena, this has included the use of different modes to provide the range of speed vs. price options that shippers want, so that they can optimize their transportation costs, inventory levels, production processes, and customer response. Different modes are integrated to meet these speed and other service requirements at minimum cost. Related services include the shipment tracking, confirmation of delivery, and triggering of funds transfer based on the completion of exchange of goods—and the smooth flow of relevant data electronically between the transport carrier, the shipper, the receiver, and any other parties to the shipment transaction. The role of parcel carriers in transportation has long been under-recognized, largely it seems because of the traditional modal orientation in thinking about transportation. But the wave of the future is clearly in the direction of integrated transportation and logistics service offerings, where parcel carriers are leading the rest of the industry. Such transportation and logistics services permit the user to optimize its supply and selling chain, and thereby reduce the delivered cost of goods and services, and increase customer satisfaction.

What are the implications of this study? One is that the traditional modal view of transportation, in which the transportation system is looked at as a collection of modes and their companies or agencies, is out of date. Freight transportation is increasingly a service that transcends modal boundaries. This trend is exemplified by parcel service, which now has revenues in excess of all of the traditional freight modes except trucking. Its importance to the economy is obvious from the fact that parcel carriers deliver over 10% of our Gross Domestic Product each year. The traditional modal structure of governmental policy making, planning, and regulation is increasingly mismatched to the freight transportation system.

While that structure may take many years to adapt, some changes can be introduced incrementally. This study, with its focus on data describing the parcel service industry, suggests one: to gather data not only on the individual modes, but also on intermodal and multimodal transportation services, including parcel service. This would provide a baseline and indicators of the growth and health of these elements of the transportation industry. The methods used in this study provide the basis for such data gathering, for the parcel service industry.

The second implication is that freight transportation is increasingly seen by businesses as an integral part of their production and selling chains. It is no longer an essentially separate business activity. From this broader perspective, the central issues and opportunities for improving the system are focused on how to use transportation in the overall production and distribution process so as to reduce the delivered prices of goods and services, increase product quality and customer satisfaction, and provide rapid customer response. The types of transportation services that optimize this larger system are not likely to be those that would be chosen looking at transportation alone. The growth of parcel service relative to more traditional forms of transportation provides a

perfect illustration: It is generally more expensive per ton-mile than other forms of transportation, but is increasingly used because of the non-transport benefits to the customer--producers and buyers of goods.

Finally, this implies a broader view of the system that is being optimized, by transportation companies, public sector infrastructure agencies, and government. For transportation service providers, this means that they must be flexible and nimble, and respond to new needs stemming from changes in the production and distribution system. For government, this means that policies and programs based on the older modal view of transportation will need to change as well, in order to pave the way for an increasingly intermodal and multimodal transportation system to adapt to the changing economic landscape of globalization, mass customization, and rapid customer response.