

## Chapter 2

# THE IMPACT OF ELECTRONIC COMMERCE ON THE EFFICIENCY OF THE ECONOMY

### Introduction: a friction-free economy?

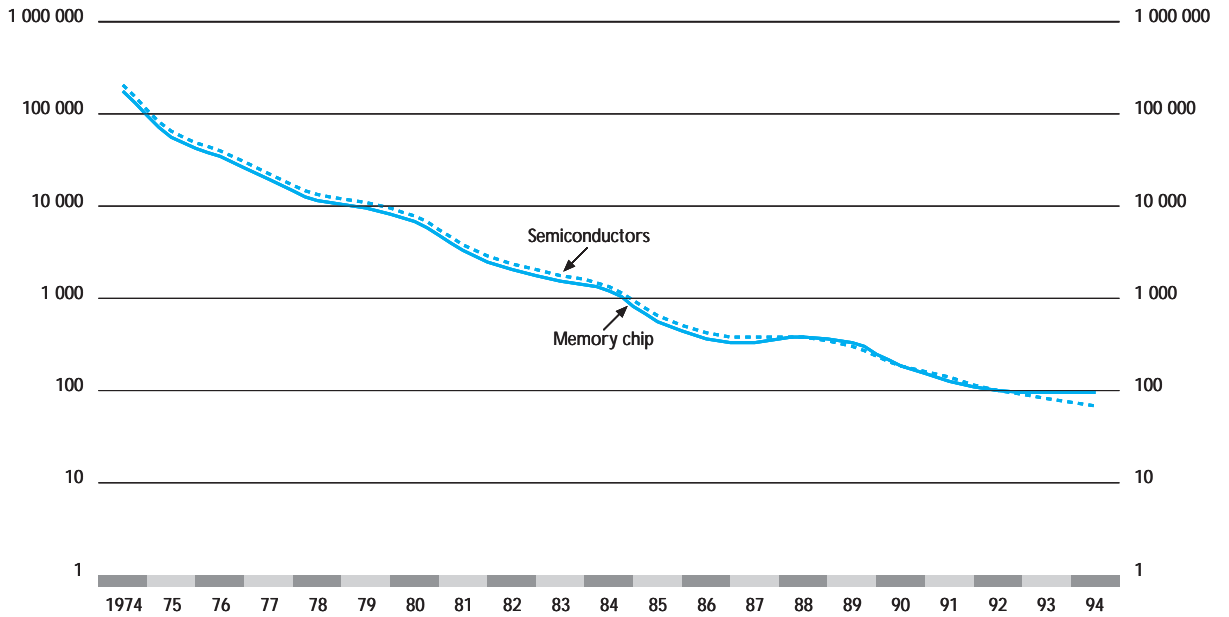
Rapid technological progress in information and communication technologies (ICTs) along with their widespread diffusion have led to speculation about “frictionless” economies in which transaction costs are nearly zero, barriers to entry and contestability disappear, and markets clear instantly. Some think that electronic commerce, with producers selling directly to consumers over computer networks such as the Internet, will eliminate existing intermediaries (“disintermediation”) and drastically reduce transaction costs.<sup>1</sup> These lower production costs will encourage the entry of new businesses and thus increase competition and pressure to pass lower costs on to consumers as lower prices. In addition, consumers will be able to search among thousands of merchants for the lowest prices, thereby increasing the downward pressure on prices and leading to a shift in market power from producer to consumer (Hagel and Armstrong, 1997). In general, it is thought that electronic commerce can significantly improve the efficiency of economies, enhance their competitiveness, improve the allocation of resources, and increase long-term growth.

Because electronic commerce is still at a very early stage in its development, much of this thinking is based on speculation or anecdotal evidence. This chapter begins to analyse these claims by looking first at price declines in key technologies that enable electronic commerce: information processing, communication, and data storage. The price declines in these supporting technologies allow firms to replace old inputs and processes by new, less expensive inputs, thereby changing the firm’s production function and reducing its production costs. Because these are information and communication technologies, the main impact is on transaction costs. However, given the intangible nature of e-commerce, new transaction costs are generated, many of which are associated with creating trust and managing some of the risks perceived to exist on the Internet. The impact of e-commerce on transaction costs is analysed both for firm-specific transaction costs and for costs incurred between firms. Equally important is the redistribution of some of these costs among the various parties, including consumers. Finally, the potential impact of changes in firms’ costs on prices is examined. Changes in these costs have a direct impact on business models and market structure; this is analysed in Chapter 3.

### The falling cost of information and communication technologies

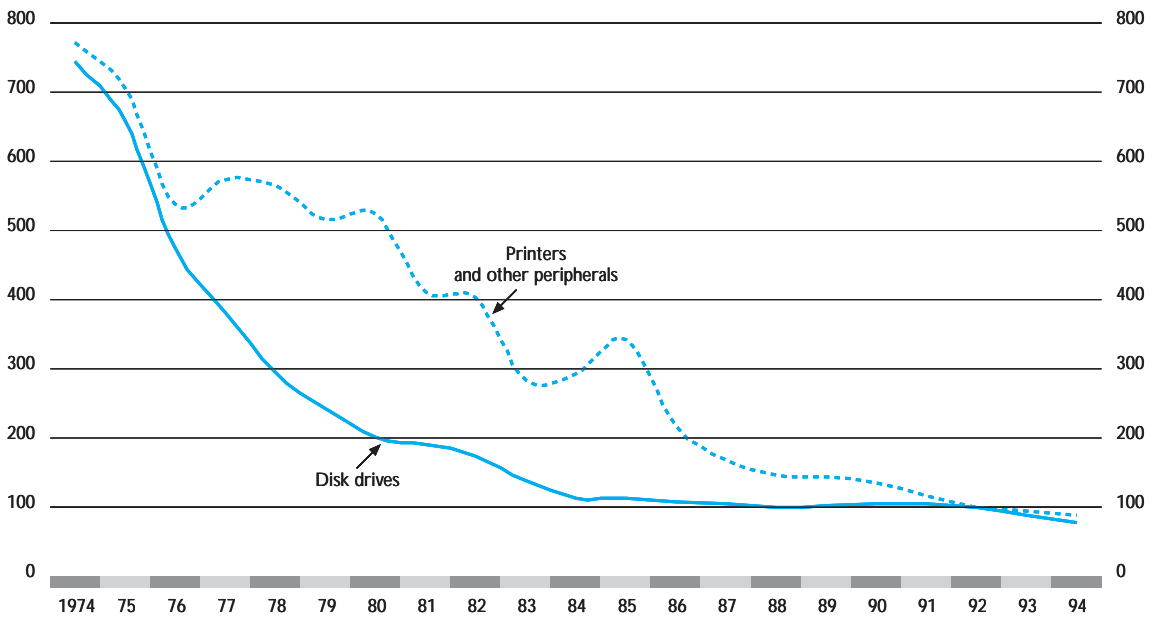
Electronic commerce is an Internet application. It runs on an infrastructure composed of computers, software and communication systems and uses the Internet’s key infrastructure applications (e-mail, the World Wide Web, the browser). This constellation of technologies has supported the development of electronic commerce and in turn is the source of much of electronic commerce’s value. As Figure 2.1 shows, advances in microelectronics have caused the price of memory chips (*e.g.* DRAM) and semiconductors (*e.g.* microprocessors) to decline steadily. While these price declines are among the most spectacular, many other elements of computing – disk drives for data storage, printers and other peripherals – have also seen significant price declines (Figure 2.2), so that the overall price of a mainframe has generally fallen by a factor of three between 1984 and 1994 and that of PCs has fallen by a factor of five (Figure 2.3). These falling prices allow firms to switch to new ICTs, which allow them to engage in

Figure 2.1. **World-wide memory chip and semiconductor price indices**  
 Index: 1992 = 100 (Log scale)



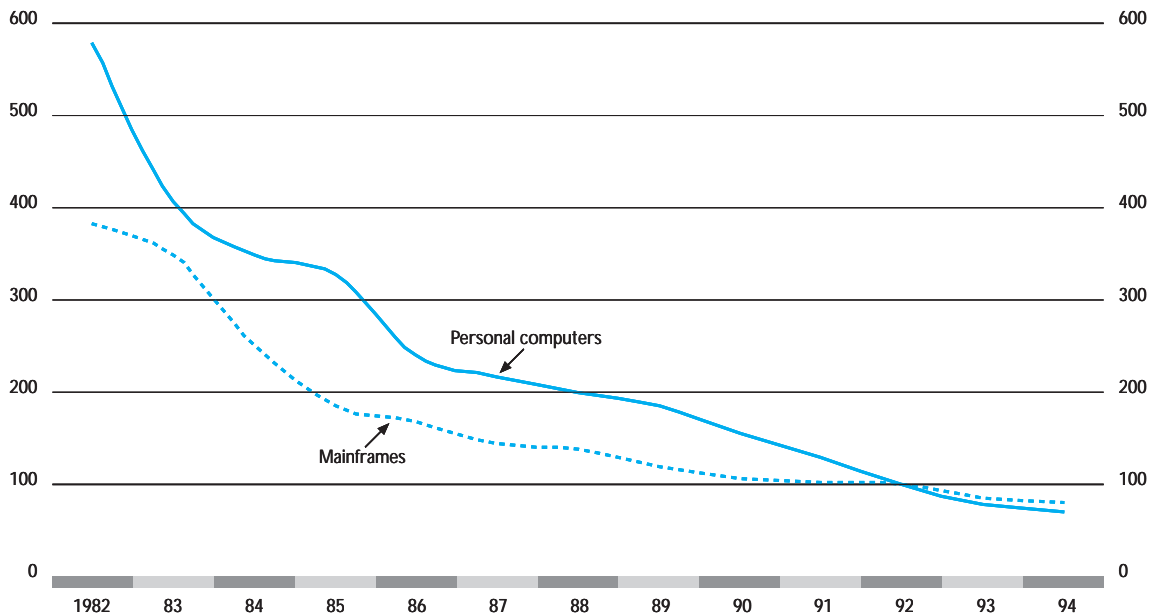
Source: Triplett, 1996.

Figure 2.2. **US disk drives, printers and other peripherals price indices**  
 Index: 1992 = 100



Source: Triplett, 1996.

Figure 2.3. **US mainframes and personal computers price indices**  
Index: 1992 = 100



Source: Triplett, 1996.

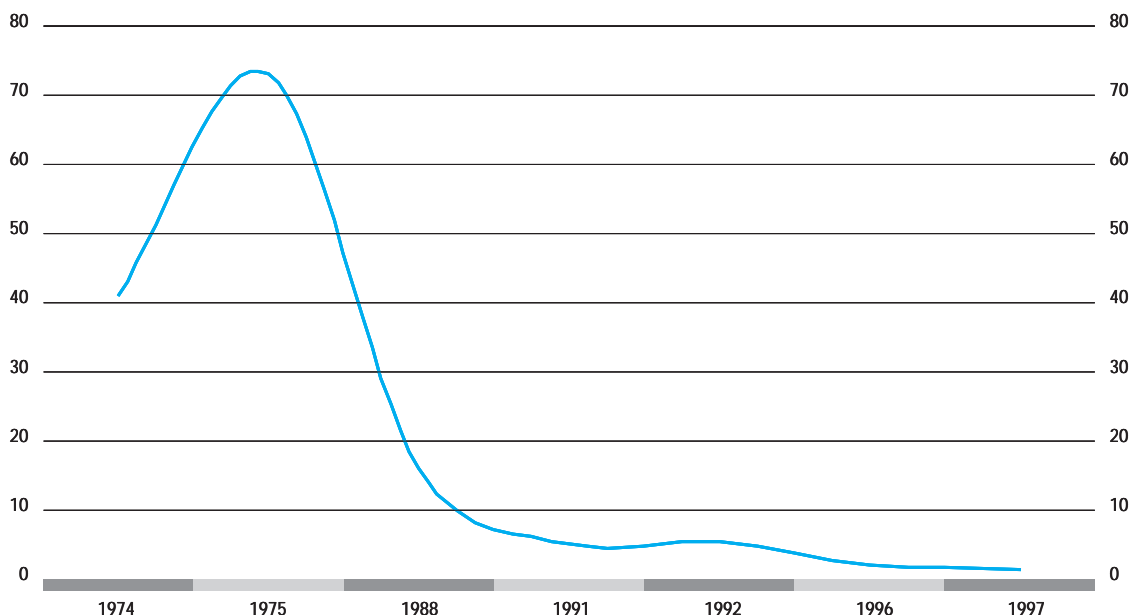
electronic commerce. In fact, the cost of processing, analysing, storing and presenting data has fallen to such an extent that computing power is now widely diffused in seemingly frivolous applications like shoes, skis, and greeting cards.

Fibre optics technology, and radio and satellite transmission as well, have also fuelled large price declines in communications costs (Figure 2.4). However, because of the networked nature of the communications sector and its regulatory environment, the overall drop in phone call prices has been more modest (Table 2.1). Segments that are exposed to competition, such as the tariff basket for business communication charges in competitive markets and the price of leased lines (1.5/2 Mbits per second), have seen annual average declines of 4.1 per cent and 6.6 per cent, respectively, between 1990 and 1996 (OECD, 1997a). Likewise, the average price for Internet access charges in the OECD area, based on 20 hours of usage a month, fell by more than a factor of three, from \$68 in 1995 to \$20 in 1996, where it has since stabilised (OECD, 1997a).

New technologies such as digital subscriber lines (DSL), continued liberalisation of regulations, the arrival of new entrants, and the addition of significant new capacity (Table 2.2) have led some to suggest that communication prices may begin to follow a similar performance-to-price path as information technologies (Gilder, 1994; Forge, 1995).

The Internet and electronic commerce use a mixture of information and communication technologies (routers, ATM switches, the existing communications network) to connect PCs to servers. Many of these contain huge databases and maintain sophisticated software applications that ensure that the entire system operates smoothly. Thanks to the digital capability of this network and its packet switching protocol, data, voice, audio and video transmission can use the same system simultaneously, thereby vastly increasing the capacity and flexibility of the current communications system while undercutting the costs and prices of traditional modes of transmission. For example, the Internet can support a manufacturing EDI system at about one-quarter the cost associated with using a value-added network over a leased line (Meeker, 1997); the price of an Internet switched telephone call is approximately 20 per cent that of a traditional phone call (Atkins, 1997).

Figure 2.4. **Cable cost per voice path, 1974-97**  
US\$ thousand



Source: Telegeography, 1997.

### The impact on production costs

Assessing the collective impact of these technological developments and their associated price declines on production costs, productivity, and prices is very difficult. Indeed, the impact of computers alone on productivity has been extraordinarily difficult to ascertain and has led to a sub-field of economics that tries to explain the “productivity paradox”: why the widespread introduction of computers has not resulted in increases in the official productivity statistics. As work on this question progresses, it is becoming clear that the paradox is unlikely to have a single solution, and the issue of whether or not computers significantly increase productivity has not been resolved. This is not surprising, since the broader impact of the telephone, which has been widely diffused for generations, on social interaction, location decisions, and business structure is still not well understood (Fisher, 1992).

A key element of this technological convergence is a shifting of the former trade-off between the richness of information (amount, customisation, interactivity) and its reach (exposure, coverage) (Evans and Wurster, 1997). Previously, a rich information flow was only obtained through the focused use of a few dedicated channels for a select audience (*e.g.* specialised publication, small meeting), while wide coverage meant sending a much more general message to a wide variety of recipients (*e.g.* TV, a company-wide memo). This trade-off dictated how interactions occurred, how businesses structured themselves, and how businesses interacted with each other and final customers (Coase, 1937; Williamson, 1975). While the combined effects of ICT on costs, productivity and prices for electronic commerce are likely to be difficult to determine, it may be that the sum of these technologies generates much greater utility than their individual parts, so that the productivity impact will be clearer. The Internet could represent that union, with electronic commerce as a key commercial application.

### Changing firms' cost structure

The impact of electronic commerce on firms' internal production and transaction costs falls into three broad categories: the cost of executing the sale, costs associated with the procurement of production inputs, and costs associated with making and delivering the product. This list probably represents only a

Table 2.1. **OECD trends in collection charges**  
Average of peak one minute to OECD countries expressed in US\$<sup>1</sup>

	1991	1992	1993	1994	1995	1996	1991-96 Exchange rate	1991-96 Local currency
Australia (Telstra)	1.38	1.37	1.30	1.12	1.25	1.26	-8.42%	-7.26%
Austria	1.23	1.20	1.28	1.18	0.94	1.06	-13.76%	-23.58%
Belgium	1.13	1.10	1.12	0.76	0.77	0.88	-22.34%	-28.33%
Canada	1.37	1.29	1.22	1.00	0.94	0.96	-29.76%	-19.47%
Denmark (Tele Den.)	0.80	0.74	0.82	0.77	0.69	0.62	-21.84%	-24.48%
Finland (Telecom Fin.)	0.99	0.93	0.69	0.63	0.63	0.58	-41.72%	-9.34%
France	1.14	1.13	1.02	0.88	0.81	0.89	-21.54%	-26.12%
Germany	1.00	0.97	0.97	0.91	0.93	0.65	-34.88%	-32.19%
Greece	1.36	1.18	0.97	0.81	0.78	0.81	-40.15%	-10.12%
Iceland	1.54	1.52	1.35	1.09	1.25	1.11	-28.14%	-19.45%
Ireland	1.43	1.30	1.37	0.79	0.81	0.84	-41.30%	-41.76%
Italy	1.44	1.36	1.37	0.87	0.77	0.69	-52.27%	-34.21%
Japan (KDD)	2.19	2.36	2.51	2.85	2.77	2.16	-1.59%	-38.83%
Luxembourg	1.26	1.04	0.97	0.96	0.81	0.80	-36.68%	-33.81%
Mexico	n.a.	n.a.	n.a.	2.96	2.78	2.03	-31.21% <sup>2</sup>	-32.91% <sup>2</sup>
Netherlands	1.01	0.99	0.97	0.92	0.89	0.78	-23.34%	-18.46%
New Zealand (TCNZ)	1.66	1.54	1.36	1.38	1.48	1.64	-0.93%	-9.79%
Norway	0.93	0.72	0.71	0.58	0.55	0.49	-47.07%	-36.94%
Portugal	1.39	1.37	1.56	1.25	1.14	0.97	-30.22%	-19.71%
Spain	1.77	1.73	1.57	1.25	1.03	1.08	-39.05%	-27.16%
Sweden (Telia)	1.06	1.04	1.08	0.80	0.70	0.66	-38.26%	-20.33%
Switzerland	1.17	1.14	1.00	0.90	0.94	0.79	-32.55%	-38.85%
Turkey	2.74	2.11	2.35	1.78	1.28	0.83	-69.60%	
United Kingdom (BT)	0.89	0.79	0.78	0.66	0.59	0.61	-31.13%	-19.48%
United States (AT&T)	1.34	1.33	1.33	1.40	1.42	1.57	-16.84%	-10.74%
<b>OECD average<sup>3</sup></b>	<b>1.34</b>	<b>1.26</b>	<b>1.24</b>	<b>1.06</b>	<b>1.01</b>	<b>0.95</b>	<b>-29.46%</b>	<b>-23.00%</b>

1. The average of a one minute tariff based on one initial minute plus three additional minutes, divided by 4. OECD average is a straight average. All calculations are in exchange rates 1990-95, except for the last column. The average in last column is the average of the reduction rate of each country.

2. Mexico is excluded from the OECD average or as a destination country. Mexican data are for 1994-96.

3. All averages in local currency exclude Turkey.

Source: OECD, 1997a.

subset of the cost impacts associated with electronic commerce as firms implement the technology, since by and large they only represent savings over existing processes and thus do not factor in quality improvements. Similarly, beyond mere substitution, it is likely that electronic commerce techniques may foster completely new ways of conducting business. While these are hard to envision, they may lead to more significant cost savings. For example, when electricity first replaced water power, it typically used the same site near the water and the machines were vertically aligned to take advantage of the belts connected to the water wheel. While this represented an improvement over water power, large productivity gains were only obtained when new, horizontal buildings were constructed to fit the technology, allowing for the formation of assembly lines (David, 1990). A similar pattern may occur for electronic commerce.

### *The cost of executing a sale*

The key areas of cost reduction when carrying out a sale via electronic commerce rather than in a traditional "bricks-and-mortar" store involve physical establishment, order placement/execution, customer support and after-sales service, and staffing.

*Physical establishment.* Estimates of the costs of setting up and maintaining an e-commerce Web site range from e-commerce in a box at \$349 (Jackson, 1998), to about \$8 000 for start-up and \$10 000 for yearly maintenance for a service (Joachim, 1998), to hundreds of millions of dollars for a state-of-the-art site.<sup>2</sup> However, it is less expensive to maintain such a storefront than a physical one because it is always "open", can be accessed by millions around the globe, and has few variable costs, so that it can scale up to meet demand. By maintaining one "store" instead of thousands, duplicate inventory costs are eliminated.

Table 2.2. **Deployment of fibre optic cable in the OECD area**

	1993	1994	1995	Compound annual growth rate 1993-95 (%)	Measure
Austria	45 298	64 558	92 320	43	Fibre/km
Czech Republic	1 408	39 187	90 336	701	Fibre/km
Denmark	9 300	10 300	n.a.	n.a.	Km
Finland	164 024	327 416	425 955	61	Fibre/km
Germany	68 400	81 100	86 000	12	..
Greece	2 745	4 615	7 025	60	Cable/km
Iceland	156	180	315	42	Km
Ireland	8 600	9 600	11 200	14	Fibre/km
Italy	1 333 000	1 719 000	1 964 000	21	Fibre/km
Japan	168 300	212 629	248 731	22	Km
Mexico	8 701	16 796	21 610	58	..
Norway	11 400	12 700	13 800	10	Cable/km
Portugal	15 280	99 600	134 128	196	Km
Spain	24 857	29 339	36 041	20	..
Turkey	20 700	24 850	28 300	17	Km
United Kingdom	2 300 000	2 600 000	2 800 000	10	Km
United States	7 545 539	9 055 120	10 714 811	19	..

Source: OECD, 1997a.

**Order placement/execution.** By placing the necessary information on line in an accessible format, electronic commerce merchants generally transfer transaction costs (e.g. obtaining product information, selecting the product) to the customer. As a result, even when customers execute the transaction in a traditional way (off-line), for example by buying a PC over the phone or coming to an auto dealer's showroom to test drive a car, they come "pre-qualified". They know more precisely what they do and do not want and are more likely to buy. This greatly increases the efficiency of the sales process. Micron Computers reports a productivity gain of a factor of ten: their Web sales people spend on average two minutes on the phone with a customer who has looked at their Web site but 20 minutes with traditional customers (Kehoe, 1998). Auto dealers report similar gains: they spend about \$25 to deal with an e-commerce-generated bid but several hundred dollars for a face-to-face transaction.<sup>3</sup>

In addition, e-commerce is very effective at reducing the costs of attracting new customers. While far from "friction-free", advertising is typically cheaper than for other media and more targeted. For example, while Carpoint (an e-commerce auto referral site) typically charges dealers about \$200 in advertising and fees per car sold, car dealers typically spend \$450 per car sold through traditional media (Kehoe, 1998). In addition, many merchants can send e-mail to prospective customers, and the WWW, with its hyperlinks, makes it relatively easy to sell a variety of products ("cross-sell") to existing customers. Cross-selling to a customer is roughly seven times cheaper than attracting new customers.<sup>4</sup>

Finally, the electronic interface allows e-commerce merchants to check that an order is internally consistent and that the order, receipt, and invoice match. While this simple process may seem trivial, both General Electric (GE) and Cisco report that one-quarter of their orders (1.25 million in the case of GE) had to be reworked because of errors. At Cisco, the use of electronic commerce for ordering instead of phone, fax or e-mail has automated the consistency check and has reduced the error rate to 2 per cent. To address the problem, GE has developed its Trading Post Network (TPN), which allows requisitions to be posted electronically for outside bid by any supplier and has significantly reduced the error rate in orders. It has also generated other benefits, such as a 5 to 20 per cent drop in materials costs due to increased supplier competition and a 50 per cent reduction in the procurement cycle (Margherio *et al.*, 1998).

**Customer support/after-sales services.** In what are increasingly knowledge-based economies dominated by sophisticated products, customer service and after-sales service are a major cost for many firms. Traditionally, this meant placing service personnel in the field to visit clients, staffing call centres, publishing extensive documentation, or issuing software. For many firms, these costs are substantial, accounting for more

Table 2.3. **Cisco's e-commerce customer support cost savings**

US\$ million	
Product manual printing costs	270
Software distribution	130
Telephone technical support	125
<b>Total</b>	<b>525</b>

Source: Meeker, 1997.

than 10 per cent of operating costs. Through electronic commerce, firms are able to move much of this support on line so that customers can access databases or “smart” manuals directly; this significantly cuts costs while generally improving the quality of service. A classic example is the Federal Express Internet site which allows customers to order package pick-up, generates a bar-coded label for the package, permits customers to pay for the service and allows them to track the delivery. With over 1 million “tracks” a month, half of which would have meant phone calls to FedEx’s call centre, the system has saved FedEx millions in labour costs (Margherio *et al.*, 1998). Forrester Research estimates that it generally costs \$500 to \$700 to send a service representative into the field, \$15 to \$20 to handle a customer question over the phone, and about \$7 to set up and maintain an Internet-based customer service system (LaTour Kadison *et al.*, 1998).

Cisco, the largest supplier of routers for Internet traffic, provides insight into how aggressive use of e-commerce to provide customer support can significantly reduce costs. As of 1997, Cisco had moved 70 per cent of its customer support on line, including everything from manuals to software to employee recruitment (Meeker, 1997). This has eliminated an estimated quarter-million phone calls a month, saving over \$500 million, which represents about 9 per cent of total revenue or 17 per cent of total operating costs (Margherio *et al.*, 1998) (Table 2.3).

*Staffing.* Changes in the nature of what constitutes a store and the productivity of sales and customer services staff have a direct impact on the number and nature of staff hired. By and large, e-commerce shops require far fewer, but high-skilled, employees. Amazon.com, the e-commerce books merchant, has only 614 employees<sup>5</sup> (for sales of \$148 million), while Barnes & Noble, the largest physical US bookstore, has 27 200 (for sales of \$2.8 billion).<sup>6</sup> While these numbers are not strictly comparable, they give a rough sense of the difference in employment levels and sales per employee (\$267 000 per Amazon employee versus \$103 000 for Barnes and Nobel). A comparison of NECX, a catalogue turned e-commerce seller of PCs, and CompUSA, the largest retailer of PCs in the United States, provides some idea of the impact on skill requirements. In 1996, CompUSA had 106 stores, each of which generated on average \$38.4 million in revenues and employed 103 persons, the majority of whom were cashiers, salespersons, and stockers/warehouse workers.<sup>7</sup> NECX generated \$50 million from its Web site in 1997, but employed only 38 people, half of whom provided skilled, technical support (webmaster, Unix administrator, junior-level support person, four EDI support people, and 12 programmers) to the site (Goff, 1998).

Federal Express reports that their online customer service system has represented a savings of 20 000 new hires (about 14 per cent of their total labour force). Cisco reports that, thanks to its e-commerce Web site, they did not have to hire 1 000 new staff for their sales/support group (out of a total of 4 500 sales and marketing employees and 11 000 total staff).<sup>8</sup> GE reports that their TPN has resulted in the transfer of 60 per cent of their staff involved with requisition and that labour costs associated with procurement have declined by 30 per cent (Margherio *et al.*, 1998). These cases suggest that personnel savings are significant and represent a major cost savings associated with electronic commerce. But as Chapter 4 shows, the nature of employment is also changing: employment that supports an e-commerce Web site is relatively highly skilled. It is more akin to a fixed asset (*e.g.* a building) than traditional retail employment, which is relatively low-skilled and has a variable cost. This will limit to some degree the cost savings obtainable.

#### *Purchase orders/procurement*

Just as electronic commerce can significantly reduce selling costs, it can also lower the costs associated with buying. While the actual transaction takes place outside the firm, the costs associated with pro-

curement constitute significant internal costs. Even for low-value requisitions for office supplies or travel, the typical purchase order costs between \$80 and \$125 to process, a sum that in many cases exceeds the value of the material being bought (Margherio *et al.*, 1998), owing to the error-prone and time-consuming process generally required to control purchasing costs and the fact that a typical purchase must go through several departments. Attempts to circumvent these processes usually result in even higher costs because negotiated discounts are not obtained or incompatible material is ordered. Internet-based e-commerce procedures now make it possible to apply EDI-type systems to relatively small purchases, thereby drastically reducing errors, ensuring compliance with organisational norms, and speeding the process. Estimates of the savings gained range from 10 to 50 per cent (Girishankar, 1997*b*), although in many cases the largest savings are not monetary: MCI reports that using e-commerce to buy PCs reduces its computer purchase cycle from four to six weeks to 24 hours (Margherio *et al.*, 1998), Bell South has cut the time needed to approve an expense report from three weeks to two days (Davis, 1998), and by replacing its EDI system with an Internet-based system, the US General Services Administration (GSA) has more than halved the time needed to complete a purchase (Girishankar, 1997*b*).

### *Inventories*

Directly related to savings in time associated with procurement are savings in inventory carrying costs: the faster an input can be ordered and delivered, the less the need for a large inventory. In aggregate, in the United States, the average value of non-farm inventories represents some 2.3 per cent of yearly final sales and 4.2 per cent of sales of final goods. Since services are typically not inventoried, this may be a more appropriate indicator (<http://www.bea.doc.gov/bea/dn/nipatbls/nip5-12.htm>). This is about the same as the sales of all motor vehicle equipment in the United States. Approximately 37 per cent of all inventories are “carried” by manufacturers, while 25 and 27 per cent of total non-farm inventories are held by wholesale and retail trade, respectively. Each stage of the value-added chain therefore holds considerable inventories. It is estimated that for retailers, the cost of carrying an inventory for a year is equivalent to at least 25 per cent of what they receive in payment for the product (Taylor, 1997). Therefore, a two-week reduction in inventory represents a cost savings of 1 per cent of sales. As most retailers operate on margins of 3 to 4 per cent, this is significant.

The impact on costs associated with decreased inventories is most pronounced in industries where the product has a limited shelf life (*e.g.* bananas), is subject to fast technological obsolescence or price declines (*e.g.* computers), or where there is a rapid flow of new products (*e.g.* books, music). With computers as one of the main products sold via electronic commerce both to consumers and businesses, and the fact that computer components lose about 1 per cent of their value each week, this industry has been an innovator in reducing inventory costs. While the experience of one firm is not generally applicable, it does give insight into some of the potential inventory savings that electronic commerce could provide (Box 2.1).

#### Box 2.1. **Dell, e-commerce and inventories**

Typically, a computer (PC) is made by a manufacturer, sits in a warehouse, and is shipped to a retailer, where it sits on a shelf until it is bought, a process that on average takes two months from production to sale. Since 80 per cent of the cost of a PC represents components and since their average price drops by 30 per cent a year, every day that can be shaved off inventory means that the manufacturer can use cheaper (and in most cases more powerful) components, and can maintain the same profit margin while selling a better product at a lower price. Dell has done this very successfully through electronic commerce and claims that parts only sit in inventory for eight days before being shipped out directly to the customer (Court, 1998). In this way, Dell reportedly enjoys a 100 per cent advantage in inventory turnover compared to traditional competitors, resulting in a 10 to 15 per cent price advantage (Margherio *et al.*, 1998). Competitors are being forced to adopt similar methods, as Dell's cost advantages are reflected in its profits: compared to Compaq, the largest US PC manufacturer, which earned \$16 million in profits on \$5.7 billion in sales in the first quarter of 1998, Dell's profits of \$305 million on \$3.9 billion suggest that this is a very profitable strategy (Court, 1998).



The general tightening of supply chains as business-to-business e-commerce becomes more pervasive is likely to have a significant effect on inventories and their associated costs. Ford's deployment of an intranet which connects 120 000 workstations at offices and factories around the world is attributed with contributing to reducing the time needed to get new models into full production from 36 to 24 months. Ford hopes to extend this system so as to manufacture on demand; the goal is to manufacture and deliver the car two weeks after the order, thereby saving billions of dollars in inventory and fixed costs (Cronin, 1998).

Recent tests by the US Automotive Industry Automation Group (AIAG) Manufacturing Assembly Pilot (MAP) programme, which piloted an EDI system across the Internet to a wide spectrum of suppliers and original equipment manufacturers (OEM), suggest that these benefits could be widespread. The pilot generated a 58 per cent reduction in lead times, a 24 per cent improvement in inventory levels, and a 75 per cent reduction in error rates. When deployed more widely in 2000, it is expected to save the US automotive industry an estimated \$1 billion a year (<http://www.aiag.org/about/accomplish.html>).

A key factor in reducing the costs of inventories is improving the ability to forecast demand more accurately. Electronic commerce merchants who allow consumers to customise their order or select from a wide variety of choices obtain valuable information on consumer preferences. This should improve their ability to forecast demand. In a traditional store, a consumer might buy a computer with unwanted features or lacking certain features because that model was available. In such a situation, the merchant is ignorant of the consumer's true preferences. The electronic commerce merchant who offers a "built-to-order" computer, instead, knows exactly what consumers prefer and can adjust the product line accordingly. In addition, the links that electronic commerce provides along the supply-chain make it possible to pass this information on to partners, thereby lowering their costs and probably the overall price. This practice, known as collaborative planning forecasting replenishment (CPFR), is estimated to lead to a reduction in overall inventories of \$250 to \$350 billion, or about a 20 to 25 per cent reduction in current US inventory levels (Ernst & Young, cited in Margherio *et al.*, 1998). While this estimate seems optimistic, pilot studies on the US auto market obtained a 20 per cent savings (Frook, 1998a). Even a 5 per cent reduction would have a significant economic impact. Gains can also be achieved from having the correct type of stock on hand so that customers can buy what they want, when they want it. Japanese supermarkets like Sotetsu Rosen have used this technique and have basically eliminated (0.04 per cent) out-of-stock items (Ministry of International Trade and Industry, 1998).

### Distribution

Although shipping costs can increase the cost of many products purchased via electronic commerce and add substantially to the final price (see next section), distribution costs are significantly reduced

Table 2.4 **E-commerce impact on various distribution costs**  
US\$ per transaction

	Airline tickets <sup>1</sup>	Banking <sup>2</sup>	Bill payment <sup>3</sup>	Term life insurance policy <sup>4</sup>	Software distribution <sup>5</sup>
Traditional system	8.0	1.08	2.22 to 3.32	400 to 700	15.00
Telephone-based		0.54			5.00
Internet-based	1.00	0.13	0.65 to 1.10	200 to 350	0.20 to 0.50
<b>Savings (%)</b>	<b>87</b>	<b>89</b>	<b>71 to 67</b>	<b>50</b>	<b>97 to 99</b>

1. Traditional refers to a travel agent booking the ticket using a computer reservation system. Internet-based refers to a customer booking an "electronic ticket" directly with the airline.

2. Cost per transaction at a branch bank estimated by Booz-Allen & Hamilton, quoted in Margherio *et al.*, 1998. Cost per transaction by telephone estimated by Booz-Allen & Hamilton, quoted in Margherio *et al.*, 1998. Cost per transaction by Internet estimated by Booz-Allen & Hamilton, quoted in Margherio *et al.*, 1998.

3. IBM preliminary estimates, quoted in Margherio *et al.*, 1998.

4. InsureMarket estimates for agent fees based on term life insurance policy of \$400 000 with \$700 annual premium quoted in Margherio *et al.*, 1998.

5. Bollier, 1996.

Source: See notes.

(by 50 to 90 per cent) for digital products such as financial services, software, and travel, which are important e-commerce segments. For these products, the cost reduction associated with electronic commerce could have large economic impacts and further fuel the migration of these sectors to electronic commerce (Table 2.4). In the case of airlines, electronic tickets now account for about half of all tickets for some major carriers; this has resulted in substantial savings and is forcing competitors to follow suit.<sup>9</sup> For sectors such as music, where songs can be downloaded directly from the producer, or news, where the journalist e-mails the reader directly, huge savings are reaped over traditional forms of distribution. This reduction in distribution costs is especially important for international trade, as the ability to “download” some products without incurring shipping costs is thought to be a strong stimulus to trade, particularly for small and medium-sized enterprises (SMEs). Even for tangible goods, e-commerce methods can reduce the administrative costs associated with trade and customs clearance by over 25 per cent (WTO, 1998).

### ***Changing the cost structure of the value-added chain***

Just as electronic commerce reduces the internal costs of many transactions, it also changes the cost structure that dictates a firm’s relationships with other businesses. This set of relationships is called the value-added chain, the network of upstream and downstream businesses, from raw materials to final sale, through which a product travels. At every stage of processing, an intermediary often performs a service which facilitates this flow – adding value but also adding cost. In many cases, this service is information-intensive – matching a buyer to a seller, certifying parties in a transaction, providing support for the transaction (*e.g.* financial or legal services) – and often involves some type of risk sharing. Electronic commerce, especially in intangible products, may reduce the involvement of intermediaries in the value-added chain and thus lower costs.

The previous section showed that, in some cases, this is true for services that were formerly provided internally by a company but which can now be performed by the consumer thanks to the information and communication technology bundled with electronic commerce. While the cost of inventories has been considered an internal cost to the firm, it is in fact a reflection of a firm’s interactions with others in the value-added chain. This section will analyse the impact of e-commerce on costs incurred by firms to sell their product, principally the use of services provided by third-party agents or brokers. It will also examine how electronic commerce is creating new intermediary functions as well as relying on traditional suppliers.

#### *Disintermediation*

Intermediaries who help producers sell to consumers are of two types: distributors such as wholesalers and retailers, collectively referred to as margins, which are located between the producer of tangible goods and the consumer; and services which act as intermediaries for other services (*e.g.* travel agents selling seats on airlines). To begin to understand the potential economic impact of the disintermediation associated with electronic commerce, the two are analysed separately because the demand for, and provision of, goods versus services by e-commerce differs significantly.

*Margins.* In the chain of activity between the final producer and the final consumer, intermediaries perform three services – transportation, wholesaling, and retailing – known as margins. In most OECD countries, margins typically add about 33 per cent to the final price of goods (Table 2.5). In the United States, for all personal consumer expenditures (PCE) (goods and services), margins add about 15.6 per cent to the final price, of which 0.6 per cent represents transportation, 3.8 per cent wholesale costs, and 11.2 per cent retail costs (Table 2.6). In terms of economic impact, the largest effect would be the elimination of the services provided by wholesale and retail trade.

To explore this, Table 2.6 presents a sensitivity test of the impact of electronic commerce on distribution margins (wholesale and retail trade), which breaks down all US consumer expenditures into three broad categories: sectors that have been, or are expected to be, significantly affected by business-to-consumer electronic commerce; products whose margins account for 50 per cent or more of the final sales price; and broad categories of products unlikely to be affected by e-commerce. In the first sensitivity test, it is assumed that all products currently involved in some e-commerce migrate completely to an e-commerce model, with producers selling directly to consumers, thereby completely eliminating all

Table 2.5. **Distribution margins for goods, selected OECD countries**

	Margin on personal consumption of goods	Margin on food products	Margin on clothing	Margin on leather and shoes	Margin on drugs and medicines	Margin on motor vehicles	Margin on electrical appliances
United States, 1987	38.0	32.8	45.9	50.1	40.8	18.9	38.7
Japan, 1985	34.5	27.8	52.4	33.9	n.a.	28.1	41.5
France, 1987	29.8	29.5	40.9	42.7	41.3	24.6	38.1
Australia, 1986-87	37.4	34.5	46.1	49.0	71.9	30.8	34.8
Austria, 1988	26.8	21.4	38.4	37.6	34.7	16.0	29.8
Netherlands, 1990	36.6	31.8	43.6	38.8	52.9	18.3	36.1
Sweden, 1985	n.a.	21.7	39.3	35.4	44.8	14.4	17.6

*Note:* The distribution margin is the difference between final consumption expenditure at purchaser prices and final consumption expenditure at producer prices. Margins exclude net indirect taxes.

*Sources:* Based on input-output tables as follows: United States from 1987 benchmark input-output table in BEA (1994); Japan from 1985 input-output table in Management and Coordination Agency (1990); France from INSEE (1996); Australia from ABS (1990); Netherlands from CBS (1992); Sweden based on SCB (1989). Austria from EC (1994).

intermediaries. In all, these products represent 27 per cent of 1992 US personal consumer expenditures or over \$1 trillion worth of sales, vastly in excess of most current estimates of e-commerce and above most future estimates when inflation is taken into account. Nevertheless, the impact of disintermediation is relatively modest: a 6 per cent decrease in wholesale trade margins and a 9.6 per cent decline in retail trade margins. If motor vehicle sales are eliminated, the impact is only a 3 per cent decline for both wholesale and retail trade.

A second sensitivity test assumes that, in addition to products already identified as likely candidates for electronic commerce, half of the products for which the cost of wholesale and retail intermediary services represents a significant portion of the final cost (50 per cent or more) will also be traded directly by e-commerce. The assumption that half of these products would be sold through electronic commerce adds an additional \$150 billion in e-commerce sales, raising the total amount of consumer expenditures conducted by electronic commerce to 31 per cent. For 1992, this test results in an additional displacement of 8 per cent for US wholesale activity and 15 per cent for retail.

Adding the two sensitivity tests together results in the disintermediation of 14 per cent of US wholesale services and 25 per cent of US retail services (inclusive of motor vehicles, which account for 6.5 per cent of total PCE margins) for 1992. While non-trivial, the total amount of consumer expenditures assumed to be carried out via e-commerce without the benefit of any intermediaries, even under these extreme assumptions, is roughly the same as current US direct marketing sales of \$1.9 trillion. Given that direct marketing sales take place without the aid of traditional intermediaries, the future impact of e-commerce disintermediation is unlikely to be any more pronounced than what has already occurred through direct mail, telephone, newspapers, TV and radio (Direct Marketing Association, 1998).

The relatively small amount of disintermediation associated with margins is due to the fact that many of consumers' major product expenditures are for products which are already sold directly to consumers (e.g. electricity) or for products that are themselves an intermediary service (e.g. stock trading) which does not require any additional intermediary (margins). In fact, many of the sectors identified in Chapter 1 as information sectors where digitisation might easily occur (banking, education, health) and drive migration to electronic commerce use relatively few intermediaries. In the case of tangible goods like books or CDs, the new e-commerce merchants are not disintermediating, they are simply competing with existing intermediaries for the retail role. Moreover, many firms will sell products in both distribution channels in the near term as they experiment with electronic commerce; this is another factor that may limit the amount of disintermediation. In some cases, this experimentation will reveal the complementarity of the traditional store to electronic commerce, insofar as the former allows customers to physically examine and immediately take ownership of tangible products and may provide consumers with a sense of trust that they may lack in a purely cyber-transaction. Thus, "disintermediation" due to the elimination of the wholesale and retail sectors as an intermediary is likely to be important for some sectors, but relatively small overall.

Table 2.6. **Input-output commodity composition of personal consumption expenditures (PCE) in producers' and purchasers' prices, 1992**

US\$ million					
	Producer value	Wholesale margin	Retail margin	Purchaser value	W&R margins as share of purchaser value
<b>Electronic commerce products</b>					
Telephone and telegraph	70 669	0	0	70 669	0.0
Computing equipment and software	7 441	1 054	3 518	12 076	37.9
Household insurance	244	0	0	244	0.0
Physicians	166 429	0	0	166 429	0.0
Dentists	37 636	0	0	37 636	0.0
Other professional medical services	85 216	0	0	85 216	0.0
Veterinarians	5 108	0	0	5 108	0.0
Health insurance	43 224	0	0	43 224	0.0
Brokerage charges and investment counseling	28 719	0	0	28 719	0.0
Bank service charges, trust services	30 934	0	0	30 934	0.0
Services furnished without payment by financial intermediaries	137 479	0	0	137 479	0.0
Money orders	576	0	0	576	0.0
Tax return preparation services	2 888	0	0	2 888	0.0
Postage	6 701	0	0	6 701	0.0
Expense of handling life insurance	69 380	0	0	69 380	0.0
Legal services	44 864	0	0	44 864	0.0
Employment agency fees	1 721	0	0	1 721	0.0
Classified ads	676	0	0	676	0.0
New domestic autos	41 222	1 508	5 727	49 567	14.6
New foreign autos	23 656	866	3 289	28 449	14.6
Net purchases of used autos	17 223	739	13 215	31 177	44.8
New and used trucks	42 637	1 825	8 511	54 069	19.1
Motor vehicle insurance	25 728	0	0	25 728	0.0
Books and maps	9 795	1 809	5 181	17 148	40.8
Magazines and sheet music	7 012	1 128	2 892	11 590	34.7
Newspapers	7 743	397	2 015	10 369	23.3
Video cassette rental	6 290	0	0	6 290	0.0
Cable TV	19 883	0	0	19 883	0.0
Film development	5 099	0	400	5 499	7.3
Motion picture theaters	4 939	0	0	4 939	0.0
Spectator sports	5 131	0	0	5 131	0.0
Commercial amusements, n.e.c.	19 489	25	467	19 981	2.5
Lotteries	9 783	0	0	9 783	0.0
Casino gambling	13 931	0	0	13 931	0.0
Parimutuel net receipts	3 366	0	0	3 366	0.0
Private higher education	28 804	0	0	28 804	0.0
Commercial and vocational schools	13 105	0	0	13 105	0.0
Government higher education	23 624	0	0	23 624	0.0
<b>Total electronic commerce products</b>	<b>1 067 877</b>	<b>9 351</b>	<b>45 215</b>	<b>1 126 485</b>	<b>4.8</b>

*Displacement of intermediary products.* A potentially larger impact involves the displacement of products whose basic function is to convey information that is asymmetrically possessed (by travel agents, insurance agents, stockbrokers, real estate agents, etc.). Even in such cases, however, many sellers will value the buffering and risk-sharing service offered by these intermediaries and will retain them (Hawkins, 1998). The intermediaries most vulnerable to disintermediation are those that act as “human modems” and simply pass on information without adding much value (e.g. times and prices on a standard flight). In nearly all cases, e-commerce accelerates an existing trend. For example, the use of discount brokers in the case of stock trading or the many travel services directly available from the provider.

The bulk of the available evidence concerns the compression of commissions for traditional travel agents and discount stockbrokers, *i.e.* in those cases where electronic commerce has allowed producers to sell directly to consumers or where the electronic nature of the transaction means that commissions based on volume (e.g. dollar value of the stock trade) have been displaced by flat fees. In both these cases, the impact has been large and has resulted in an average annual decline in commissions

Table 2.6. **Input-output commodity composition of personal consumption expenditures (PCE) in producers' and purchasers' prices, 1992 (cont.)**

US\$ million

	Producer value	Wholesale margin	Retail margin	Purchaser value	W&R margins as share of purchaser value
<b>Broad categories of products</b>					
Food, tobacco and alcohol	542 504	53 156	109 661	715 356	22.8
Clothing and leather products	36 161	4 893	27 281	68 652	46.9
Personal articles and services	68 803	2 593	12 701	84 710	18.1
Housing	642 574	0	0	642 574	0.0
Furniture, household supplies and utilities	247 368	11 151	51 969	313 506	20.1
Health equipment and supplies	98 568	7 380	19 802	126 060	21.6
Hospitals	270 322	0	0	270 322	0.0
Personal business services n.e.c.	21 386	72	872	22 354	4.2
Motor vehicle maintenance and fuel	153 668	37 195	32 179	228 535	30.4
Public transportation	36 437	0	0	36 437	0.0
Recreational and sporting products	23 650	2 427	10 731	37 031	35.5
Audiovisual products and services	38 397	5 054	15 944	59 744	35.1
Leisure and entertainment	32 942	13	549	33 573	1.7
Education	23 495	0	0	23 495	0.0
Religious, welfare and non-profit activities	126 235	0	0	126 235	0.0
Travel (net)	-16 358	0	0	-16 358	0.0
<b>Total</b>	<b>2 346 152</b>	<b>123 934</b>	<b>281 689</b>	<b>2 772 226</b>	<b>14.6</b>
<b>Wholesale and retail high margin products</b>					
Shoes and other footwear	14 926	3 382	14 474	32 903	54.3
Women's clothing without luggage	55 724	7 185	57 510	120 938	53.5
Jewelry and watches	13 153	2 541	15 893	31 645	58.3
China, glassware, tableware and utensils	8 156	1 231	9 963	19 577	57.2
Durable house furnishings n.e.c.	8 850	1 433	8 815	19 407	52.8
Hand tools	2 575	748	2 401	5 754	54.7
Writing equipment	1 010	356	934	2 311	55.8
Lighting supplies	2 122	601	1 956	4 778	53.5
Ophthalmic products and orthopedic appliances	4 633	1 143	7 201	13 001	64.2
Stationery and school supplies	2 298	594	2 671	5 721	57.1
Toys and sport supplies	16 183	4 976	11 367	32 882	49.7
Greeting cards	3 745	562	4 571	9 129	56.2
Flowers, seeds, and potted plants	4 541	408	6 475	11 961	57.5
<b>Total</b>	<b>137 916</b>	<b>25 160</b>	<b>144 231</b>	<b>310 007</b>	<b>54.6</b>
<b>Total electronic commerce products</b>	<b>1 067 877</b>	<b>9 351</b>	<b>45 215</b>	<b>1 126 485</b>	<b>4.8</b>
<b>Total broad categories of products</b>	<b>2 346 152</b>	<b>123 934</b>	<b>281 689</b>	<b>2 772 226</b>	<b>14.6</b>
<b>Total wholesale and retail high margin products</b>	<b>137 916</b>	<b>25 160</b>	<b>144 231</b>	<b>310 007</b>	<b>54.6</b>
<b>Total</b>	<b>3 551 945</b>	<b>158 445</b>	<b>471 135</b>	<b>4 208 718</b>	<b>15.0</b>

Source: US Department of Commerce, 1998.

of 57 per cent for the dominant online stock trader and 43 per cent for the commissions paid by one large US airline.

*Air travel.* Travel agents' commissions, marketing and advertising, labour and other expenses for central reservation systems are the airline industry's second largest operating expense, with travel agents alone accounting for about 9 per cent of total operating costs (*Financial Times*, 8 July 1996). Currently, about 80 per cent of all airline tickets are purchased through a travel agent, with the airlines selling directly most of the remainder (Margherio et al., 1998). However, the arrival of electronic commerce has coincided with a steady erosion of agents' commissions and aggressive attempts by the airlines to provide the service directly (Table 2.7).

*Stock trading.* A similar fate is befalling discount stockbrokers who typically simply execute orders from clients without adding value such as investment advice (and for those who do, the trade-off of lower prices is decreasing demand for their services). Discount brokers' commissions now represent about 14 per cent of the 1997 total of all retail stock trading in the United States; and e-commerce brokers currently

Table 2.7. **Impact of e-commerce on commissions**

US\$ per transaction

	Trade of 1 000 shares of IBM stock <sup>1</sup>	Flight from New York to Los Angeles <sup>2</sup>
1993	285	60
1994	285	60
1995	285	50
1996	228	50
1997	228	25
1998	30	10
<b>Annual average decline (%)</b>	<b>57</b>	<b>43</b>

1. IBM stock price as of 29 May 1998; 1993-95 discount broker; 1996-97 Internet discount of 20 per cent; 1998 full Internet trade.

2. Flight based on a \$600 price as of 23 July 1998 (<http://www.travelocity.com>) with rates of \$10 applied as cited in Margherio *et al.*, 1998 and news accounts.

Sources: OECD interview with Charles Schwab (col. 1); Margherio *et al.*, 1998 (col. 2).

account for 4 per cent of that total. While this is small, the arrival of e-commerce brokers has led to significant price competition, with the average commission for the top ten online trading firms dropping from \$34.65 in 1996 to \$15.95 in 1997 (Newsedge, 1998). Indeed, several firms offer trades of 5 000 shares or fewer for less than \$10. While the services provided by these firms are not strictly comparable, they have forced the commissions for standard services of large firms such as Charles Schwab to decline as well, reducing overall profits (Table 2.7) (Wise, 1998).

### *Re-intermediation*

As electronic commerce causes the disintermediation of some intermediaries, it creates both greater dependency on others and also some entirely new intermediary functions. The principal service provided by many of these new intermediaries is establishment of trust, a very important factor for electronic commerce businesses, as buyer and seller may never meet and the openness and expanse of the Internet make fraud easier than in traditional commerce. Box 2.2 provides an example of new intermediary activities for which demand is increasing due to electronic commerce.

To give a sense of how these intermediaries could add costs to e-commerce transactions, three of the potentially largest intermediary services are examined: advertising, secure online payment, and delivery.

*Advertising/branding.* The relative ease of becoming an e-commerce merchant and setting up “stores” (Web sites) results in such a huge number of offerings that consumers can easily be overwhelmed. This increases the importance of using advertising to establish a brand name and thus generate consumer familiarity and trust. For new e-commerce start-ups, the process can be expensive and represents a significant transaction cost, one which is also present in the traditional world of commerce but on a narrower geographical scale. One of the disadvantages to the “born global” character of electronic commerce is the fact that competitors are also global, necessitating advertising which is global in reach. This can be expensive, especially for SMEs and start-ups. To some degree, this dynamic may favour merchants with an established brand image (“mind share”) and carry that image into the world of electronic commerce. If so, this would tend to increase the costs of gaining brand recognition for new, purely e-commerce merchants.

Brands are typically created by advertising, which is currently a significant cost of conducting electronic commerce. This is evident in recent deals struck between leading e-commerce merchants and Internet “real estate” with significant consumer traffic. These sites, frequently called Internet “portals”, are search engines like Yahoo!, browsers like Netscape Communicator, and large Internet access providers like America Online (AOL). As Table 2.8 shows, AOL’s advertising revenue has been significant.

Associated with this has been the development of a system of affiliates, whereby e-commerce merchants pay for referrals, direct links from portals, or techniques that drive traffic towards their site. In many cases, commissions paid to affiliates can be large: e-Toys pays 25 per cent of the sale price to the referring affiliate, Amazon.com has 30 000 affiliates and shares from 5 to 15 per cent of the sale (Karpinski, 1998).

## Box 2.2. Network-based intermediaries

**Directories.** Directory service intermediaries provide searching facilities. There are *general directories* (e.g. Yahoo and EInet Galaxy), *commercial directories* (e.g. The All-Internet Shopping Directory) which are the equivalent of paper-based industry guides, and *specialised directories* (e.g. Jeff Frohwein's ISDN Technical Page) which are topic-oriented and may provide consumers with technical and evaluative information about a good or a particular producer, in addition to simple search support. A directory's only source of income is advertising.

**Search services.** Search sites (e.g. Lycos and Infoseek) provide users with the capability to conduct keyword searches of extensive databases of Web sites/pages. Typically, search sites do not allow browsing of the database directly and are rarely topic-specific.

**Malls.** A site that has more than two commercial sites linked to it. It is an intermediary, that, like traditional physical malls, provides infrastructure for the producer/retailer in return for a fee (perhaps rent or percentage of sales). Often these malls have a geographic focus (e.g. The Aloha Mall or The Alaskan Mall). They may target a particular type of producer/retailer (e.g. The Asian American Mall) or they may be composed of a variety of "stores" that sell a variety of products (e.g. The Pinnacle Mall or Cybersuperstores).

**Publishers.** "Traffic generators" that offer content of interest to consumers (e.g. Information Week or Wired Magazine). They may appear more or less to be online newspapers or magazines. They may charge flat fees for advertising or may also extract a transaction fee for sales.

**Virtual resellers.** Malls provide cyber-infrastructure, but they do not own inventory or sell products directly, unlike virtual resellers, who do.

**Web site evaluators.** Sites that offer some form of evaluation and help to reduce some of the risk to consumers [e.g. Point Communications (top 5 per cent of the Web) and GNN]. They may extract value by charging a fee to producers to be evaluated, or they may charge consumers for their service.

**Financial intermediaries.** Payment systems will take many forms, including credit authorisation by major credit card companies such as Visa or Mastercard, electronic equivalents to writing cheques (Check-free), cash payments (Digicash), and sending secure electronic mail authorising a payment (First Virtual). In an electronic commerce environment, these financial intermediaries may extract per transaction fees in order to absorb some of the risk associated with money flows.

**Spot market makers and barter networks.** A new set of intermediaries, similar to auction houses, flea market owners, and commodities exchanges may arise. One thriving example of the use of the network to help create a spot market are the news groups that act as markets for various products. There are often local market groups or local Freenets on college campuses. There are also specialised groups (computer equipment, trading cards, etc.) and those that deal in used goods. In addition to the newsgroup-based facilities, there are also many Web-based services, including Barter Net and netTrader.

**Intelligent agents.** Software programmes that begin with some preliminary search criteria from users, but that also learn from past user behaviour to help optimise searches.

Table 2.8. America Online's deals, 1997-98

Date	Company	Terms
February 1997	Tel-save	\$100 million plus % profits
June 1997	CUC	\$50 million over 3 years
June 1997	Auto-By-Tel	\$18 million over 3 years
July 1997	Amazon.com	\$19 million over 3 years
December 1997	N2K (music)	\$12 million
January 1998	Barnes & Nobel	\$40 million over 4 years
February 1998	Intuit	\$30 million
April 1998	Realtor.com	\$14 million over 40 months

Source: Goldman Sachs, 1997.

The cost of establishing and defending a brand through advertising and affiliate deals represents an important e-commerce transaction cost and is a main reason why many business-to-consumer e-commerce merchants have yet to report a profit. The “bookstore war” between Barnes & Noble and Amazon.com provides an illustrative example. While Barnes & Noble enjoys a brand image from their traditional book shops, it is not turning a profit from its online operation, despite predicted sales of \$100 million in 1998, because it is spending \$30-40 million on marketing and paying \$20 million to AOL.<sup>10</sup> Amazon is not faring much better. With sales of \$148 million in 1997, it generated a loss of \$29.2 million owing to “...heavily [investing] in marketing and promotion, product development and technology, and operating infrastructure development” (US Security and Exchange Commission, 1998). Of these three investments, marketing and promotion account for over two-thirds.

The development of intelligent agent systems that allow consumers to scour the Internet for a particular product reduces the importance of brands and portals. These very new systems have not yet been widely diffused. While they are a potentially attractive option for some products, the nature of the Internet makes creating trust in an unknown merchant located by an intelligent agent difficult. In the near term, therefore, it is unlikely that this development will displace the costs associated with advertising.

*Secure online payment.* The openness, global reach, and lack of physical clues that are inherent characteristics of e-commerce also make it vulnerable to fraud and thus increase certain costs for e-commerce merchants as compared to traditional stores. While a variety of payment systems are being tested, the credit card is the dominant online payment method so far, and e-commerce merchants are exposed to potentially higher levels of fraud resulting from stolen cards or illegally obtained card numbers. Cybersource, a firm that specialises in detecting e-payment fraud, estimates, on the basis of a client survey in October 1997, that 39 per cent of all e-commerce orders (based on numbers of orders) are fraudulent (Cybersource, 1998). The system-wide average fraud rate for credit cards is less than 0.5 per cent (based on value) (de Aenelle, 1997). Other sources report similar e-commerce credit card fraud rates (Krochmal, 1998). Anecdotal evidence suggests that the credit card fraud rate is especially high for digitally delivered products, which tend to be the most popular e-commerce consumer purchases.<sup>11</sup> Because of the rule on distance retail (if the credit card is not physically present, the merchant is liable for all the costs associated with the fraud even if the bank has authorised the transaction), e-commerce merchants could face added costs because of their exposure to fraud.

New techniques are being developed to protect the use of credit cards in e-commerce transactions, but the need for greater security and user verification leads to increased costs. The leading standard for these transactions is the SET (Secure Electronic Trading) system developed by MasterCard and Visa. Unlike normal credit card transactions, this system uses digital certificates to verify the user, making the system about three times slower (20 to 30 seconds) than traditional transaction processing (Nelson, 1998). These additional precautions will also increase costs, depending on the volume and the merchant, by 1 to 6 per cent of the value of the transaction (Institute for Technology Assessment, 1997).

*Delivery/logistics.* A key feature of electronic commerce is the convenience of having purchases delivered directly. In the case of tangibles, such as books, this incurs delivery costs. Given that the good cannot be physically examined or carried home as in traditional commerce, the delivery agent plays an important role in assuring customers that purchases will arrive, and this explains why package tracking services have become so popular. Although advances in delivery now make it possible to ship groceries by plane to any destination in the United States from a warehouse in Texas, delivery costs cause prices to rise in most cases, thereby negating many of the savings associated with electronic commerce and substantially adding to transaction costs (Jackson, 1997b). Goldman Sachs conducted a survey of prices for a market basket of 30 products sold by Wal-Mart both online and off-line; while the prices for the two market baskets did not differ by much, the final price of products purchased online was higher by 9 per cent owing to shipping costs (Goldman Sachs, 1997). While these comparisons are not exact, since the consumer pays indirectly for delivery when shopping at a traditional store, in terms of gasoline, car depreciation and especially time, delivery costs are a large enough factor for some e-commerce merchants that they are relocating to reduce them (Rawsthorn, 1997a). For e-commerce between businesses, the expense of enhanced distribution services may also represent an additional cost, but in many cases the increased cost of delivery is offset by reduced inventory carrying costs. Also the use of advanced fore-



casting systems and third-party, as opposed to internal, transportation services means that trucks run fully loaded, do not incur empty “back-haul” journeys and more accurately deliver what is needed. In the case of one Japanese supermarket, this has resulted in a 20 per cent reduction in the number of deliveries (Ministry of International Trade and Industry, 1998).

The fact that many of the intermediary services required by e-commerce merchants seek to create more trust in transactions suggests that known incumbent intermediaries already trusted by consumers may have an advantage over new ones. This would affect the overall impact of disintermediation and re-intermediation (Hawkins *et al.*, 1998).

*Shifting of costs to consumers.* Some portion of the reduction in firms’ costs can be attributed to the shifting of costs formerly borne by the firm to the customer in the form of self-service. For example, customers are now expected to learn about the product, answer their own customer-support questions, and pay for shipment of the product. It is difficult to ascertain what portion of the firms’ lower costs is due to shifting and what portion to actual reduction. As some consumers will prefer not to pay these costs or to accept the lower quality of service, this potentially limits the reduction (Travel & Tourism Intelligence, 1998). At the same time, it is likely that e-commerce firms are now reducing, as a competitive feature, costs that used to be routinely accepted as customer costs. For example, in the online sale of software, sellers now perform many of the support tasks that used to fall to users: installation, keeping track of licences, ensuring that users have the right version, and ensuring that upgrades are made on schedule. Gartner, a consultancy group, estimates that this cuts firms’ internal technical supports costs by 55 per cent (Moad, 1997).

Bailey and Bakos (1997) explore thirteen case studies of firms participating in electronic commerce and find that, for the majority, new roles arise for electronic intermediaries that seem to outweigh any trends towards disintermediation. They identify four functions of market intermediaries: *aggregation* of buyer and seller (to achieve economies of scale/scope and reduce bargaining asymmetry); *agent of trust*; *facilitation* (to reduce operating costs); *matching* buyers and sellers. Although the sample is too small for formal empirical analysis, it indicates that there is a general perceived increase in the role of intermediation services (Table 2.9).

In sum, the evidence is mixed. It appears that more intermediation may be as plausible an outcome as less. In any event, it is clear that the nature of e-commerce and the change in relative costs it generates will cause a restructuring of the intermediation function, with some services gaining while others lose. In many cases, these new intermediary services will address the issues of trust and risk sharing that plague e-commerce. New entrants may often provide the solutions, but, because of need to engender confidence, established intermediaries able to adapt to the new environment may be well positioned. The demand for e-commerce intermediaries will vary considerably by sector, but, in nearly all cases, they will be information-intensive and will exploit the information infrastructure to deliver the service.

Table 2.9. Does the move to electronic markets increase the importance of these intermediation services?

	Sample	Aggregation	Trust	Facilitation	Matching
		Provision of one-stop shopping	Provision of authentication and secure communications	Exchange of messages between customers and suppliers	Provision of marketing information to suppliers
Retail	2	Yes	Yes	Yes	Yes
Business to business					
Retail	3	Maybe	Yes	Yes	Yes
Business to consumer					
Automotive	2	Yes	Yes	Yes	No
Business to business					
Automotive	3	No	Yes	Yes	No
Business to consumer					
Information goods	3	No	Yes	Yes	Yes
Business to consumer					

Source: Bailey and Bakos, 1997.

## Market entry

Changes in firms' relative cost structure affect the competitiveness of existing firms and firms' incentives to enter new markets. Anecdotal evidence suggests that barriers to entering various product markets and international markets have declined and that some characteristics of e-commerce may favour small businesses over large. In terms of stimulating competition, one of the most important impacts of e-commerce has been the emergence of new entrants in product markets where Internet e-commerce has dramatically changed the sector's competitive dynamics. While many observers point to the Internet booksellers' success in forcing their "bricks-and-mortar" competition to come on line and match their price discounts, the largest competitive challenge has probably come from new entrants that provide digital services at a much lower cost than traditional suppliers.

The early stage of electronic commerce makes predictions based on the current situation difficult, but, for some segments of the e-commerce market, small start-ups unencumbered by existing relationships with traditional retail outlets or a large sales force may be at an advantage. In these cases, entrants can adopt a business model that forces larger, established competitors to "cannibalise" their existing relationships or be seen as non-competitive. Examples of this phenomenon include Sony's decision to bypass its traditional retailers and sell music directly<sup>12</sup> or GM's GMBuyPower.com Web site, which "... reduces dealers to little more than test drive centres and distribution points" (Noer, 1998).

While it is typical for smaller firms to lag behind larger firms in their adoption of ICT, a recent Industry Canada/Statistics Canada survey found that expense was the most important factor delaying the implementation of e-commerce by small firms, and that lack of skills and the complexity of e-commerce were ranked as much less important (Industry Canada, 1997). However, as the cost of implementing e-commerce falls and as the benefits become more widely known, small firms' entry should be more pronounced. This is already the case in the United States where "... companies less intimidated to jump in are the smaller ones because they have less to lose, a lot of Gen Xers with some smart ideas" (Scannell, 1998).

Firms' relative cost structure, and the degree of domestic and foreign markets contestability, also contribute to determining firms' business strategies and competitive behaviour. The role of these and other factors in shaping the structure of markets affected by electronic commerce is discussed in Chapter 3.

## Economy-wide efficiency gains

While electronic commerce is a far from frictionless mode of exchange devoid of transaction costs, it offers significant cost savings both within and between firms, especially for the processing and delivery of digital products. Even for tangible goods, e-commerce can provide closer and faster links with suppliers and customers, thereby reducing costs, especially those associated with carrying inventories. Such qualities are fuelling the growth of electronic commerce (Cohen, 1998) and are especially important to wholesalers and retailers for whom the impact of even small savings on typical profit margins of 2 to 3 per cent can be large. Forrester Research estimates that e-commerce can double these margins from 2.2 to 5.6 per cent on average because of payroll reductions due to reductions in sales staff (2.4 points) and catalogue printing and shipping costs (1 point) (La Tour Kadison *et al.*, 1998).

While the profits of some wholesalers and retailers may increase, in some cases, as discussed above, their activity will be reduced or eliminated. To obtain a rough estimate of the potential impact of cost reductions attributable to e-commerce on the economy as a whole, the methodology developed for the OECD's regulatory reform work (OECD, 1997g) was used. Based on an input-output model, electronic commerce was assumed to reduce total wholesale and retail trade activity for consumer expenditures by 25 per cent (similar to the estimates in Table 2.5). It was assumed that this reduction would lead to a decline in the use (cost) of buildings and related services (construction, real estate and utilities) by 50 per cent, or a 12.5 per cent decline in total for retail and wholesale trade. The smaller size of the wholesale and retail sector would lead to less use of labour and capital by these sectors, both of which were assumed to decline by 30 per cent for these services, or 7.5 per cent for the total retail and wholesale sectors. The partial equilibrium resulting from these changes in costs leads to a reduction in aggregate distribution costs of about 5 per cent (United States: -5.2; Japan: -5.3; Germany: -5.9; France: -4.2; United Kingdom: -4.5) and in total economy-wide costs by about one-half to two-thirds of a percentage

point (United States: -0.7; Japan: -0.7; Germany: -0.6; France: -0.5; United Kingdom: -0.6). While small, this is still a considerable gain, since a reduction in these costs is a rough proxy for productivity gains (total factor productivity – TFP) which has only averaged an annual increase of 0.8 per cent across the G7 economies in the recent past (1979-97) (OECD, 1998c).

Given that the cost savings due to business-to-business e-commerce are significant and that the business-to-business segment represents a much larger portion of the overall total, these estimates based on a business-to-consumer scenario are conservative. The economy-wide savings from the substitution of e-payment systems for paper cheques in the United States are estimated at \$30 billion, and the extension of similar efficiencies to the greater economy are assumed to be “...orders of magnitude higher” (Litan and Niskanen, 1997).

### The impact of electronic commerce on prices

The translation of lower costs into lower prices is not automatic. It depends on the presence of sufficient competition. While the potential for this exists, the phenomenon is not, at the moment, broadly evident (see Chapter 3). Many observers predict that electronic commerce will result in very efficient competition that will cause prices to drop and the balance of market power to shift from producers to consumers. As described above, this has only occurred for a few select products, such as commissions for online stock trading or deep discounts on overstocked items. For sectors such as air travel, the reduction in travel agents’ commissions has not been accompanied by a price decline in air fares (Stohr, 1997). However, online trading seems to have had a negative effect on the price of seats on major US stock exchanges (with a seat on the New York Stock Exchange falling by one-third in four months) (Barboza, 1998). Of the four known surveys that measure the impact of e-commerce on prices, each of which has methodological flaws, only one unequivocally finds evidence of price declines (Table 2.10). Morgan Stanley cites the lack

Table 2.10. **A survey of studies analysing the impact of e-commerce on prices**

Survey	Survey date	Coverage	Caveats	Key findings
Ernst & Young <sup>1</sup>	January 1998	Comparison of 3 on-line and off-line vendors for 32 consumer products (n = 96).	Shipping costs and taxes not included Off-line stores all located in Cleveland, Ohio.	Online prices were lower for 88% of products, same for 6%. In total, on-line was 10% less expensive.
Forrester Research <sup>2</sup>	July 1997	150 companies in 12 major industrial categories engaging in business-to-business e-commerce.		Lower costs mean higher margins, most of which are currently being retained.
Goldman Sachs <sup>3</sup>	August 1997	Comparison of a 30-item market basket sold by Wal-Mart.	One store, arbitrary selection of products.	Online prices were 1 per cent higher, 9 per cent with shipping costs included.
OECD <sup>4</sup>	February/March 1997	Comparison of 24 000 prices for three products: books, CDs and software.	Shipping costs and taxes not included. Off-line stores are not strictly off-line but are “hybrids” with both an on-line and an off-line presence. Prices for off-line stores are those posted on their Web sites.	On-line prices are slightly higher than those of “hybrid” stores and change more frequently.

1. <http://www.ey.com/wired/pricing/survey>.

2. <http://www.forrester.com>.

3. Goldman Sachs, 1997.

4. <http://www.oecd.org/dsti/sti/it/ec/>.

of price benefits as a potentially limiting factor for the overall growth of business-to-consumer electronic commerce (Meeker, 1997). A recent survey of the 100 largest firms on the Web found that about half did not display any price information, less than 5 per cent listed prices of competing products, and less than 1 per cent offered any form of dynamic price negotiation or customisation (Information Strategy, 1998).

Among the many reasons for the lack of significant price discounts due to electronic commerce is the rather embryonic state of business-to-consumer electronic commerce. So far, customers have tended to be affluent, young, well-educated males who are experimenting with electronic commerce and cite convenience as a primary reason for using it. Thus, online prices may be higher than off-line because the consumers' affluence allows merchants to extract a higher price. However, the demographics of e-commerce are changing and as they better reflect the population at large and as additional e-commerce merchants increase competitive pressures the situation may change.

On the other hand, online merchants add value in the form of convenience and other characteristics that can be costly, and consumers (especially busy, affluent ones) may be willing to pay for this. The "convenience factor" may mean, therefore, that it is inappropriate to compare prices for products sold on line and off line. Moreover, online shopping may more readily encourage "impulse" purchases, again allowing the merchant to sell at a higher price. Lastly, as merchants experiment with e-commerce, they are unwilling to undercut their traditional distribution and retailing channels and frequently charge the same price even though their online costs are lower.

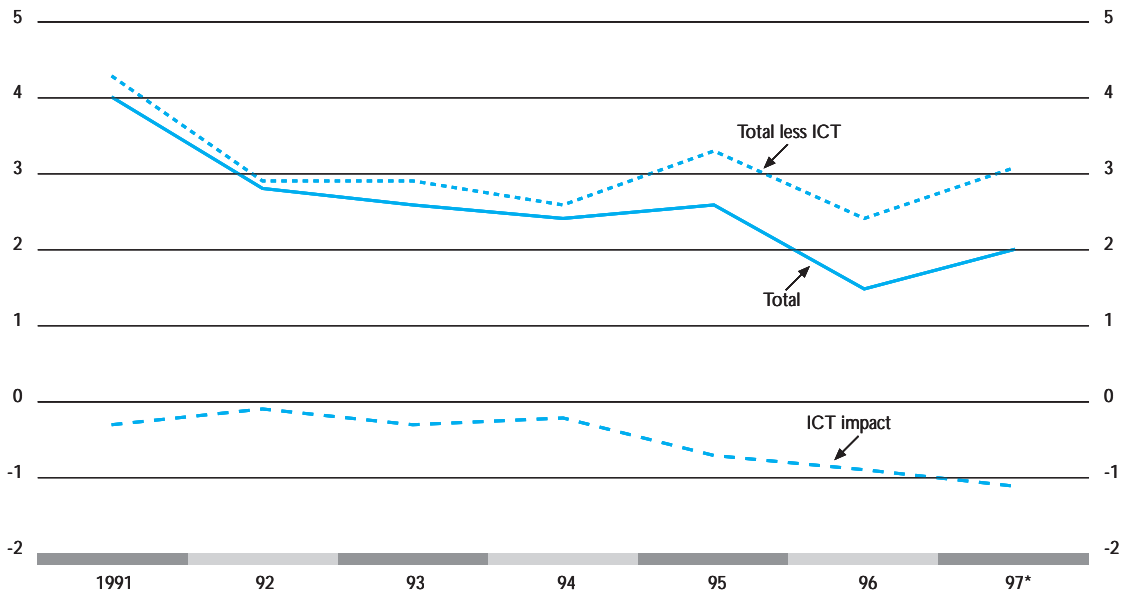
### ***Different pricing schemes***

The interactive online environment and the intangible nature of many of the products sold on line are likely to mean that e-commerce merchants will employ a variety of pricing schemes. The most common is likely to be the widespread adoption of differential pricing. For the business-to-consumer segment, merchants can compile information about consumers' buying habits via devices such as "cookies", which allow for a finer segmentation of the market and make it possible for merchants to charge different prices to different consumers for the same product, or, in economic terms, to reduce the consumer surplus. The low cost of buyer-seller interaction inherent in e-commerce also makes auctions and reverse auctions, where the buyer sets a price, a viable pricing mechanism for a wide variety of products. Forrester Research estimates that online auctions will increase from \$2.9 billion today to \$52.6 billion by 2002 (Frook, 1998b).

For the business-to-business segment, businesses with a large product line used to be locked into set prices because of the high costs and the time required to diffuse new price data to distributors, retailers and salespeople (Cortese, 1998). E-commerce lowers these barriers, making more frequent price changes more likely. New pricing strategies are likely to emerge such as IBM's recent announcement to drop the price of one of its products by 60 per cent in exchange for 20 per cent of the revenue it predicts that the product will generate (Denton, 1997). Just as in the business-to-consumer segment, business-to-business e-commerce transactions can provide in-depth information about clients, allowing firms to adjust prices. Federal Express, for example, uses its transaction data to identify unprofitable customers who are either dropped or charged a higher price (Grant, 1997).

More fundamentally, many of the products currently traded by e-commerce are digital products with high initial development costs (fixed) but low reproduction costs (variable). In addition, many are so-called "non-rival" goods (that is, one person's use of the product does not diminish the value of simultaneous use of the product by others). In a competitive market, the price for such goods would be pushed to the marginal cost which is close to zero. In fact, many digital e-commerce products are priced at zero and given away, thereby contributing to what is known as the "free economy" of the Internet. For some products, trying to establish a brand or a market niche or simply to attract attention (Goldhaber, 1997), this pricing scheme is sensible. Others, however, will follow a pricing strategy that tries to create monopolistic competition by differentiating products so that different prices can be charged to different consumers on the basis of their willingness to pay (Varian, 1996; 1998). This could lead to a wide variety of pricing practices, such as the bundling of various information products, time sensitivity (*e.g.* real time versus delayed), subscriptions, rentals, site licensing, reliance on after-sales fees and flat fees. For example, if software can be downloaded nearly instantly, why should people buy copies? Why would they not rent what they want when they want, as for videos?

Figure 2.5. **Impact of US industry on inflation**  
Implicit gross domestic income price index



\* Estimated.

Source: Margherio *et al.*, 1998.

In general, it is thought that the lower transaction costs associated with the use of the Internet will allow a wide continuum of content aggregation schemes ranging from individual products (separate articles) to small bundles (*e.g.* a software “suite”) to large collections (*e.g.* the complete work of the Beatles). It is expected that these different strategies will reduce the number of consumers who would not buy a product because the price was too high (the “deadweight loss”) as well as the number of consumers who would be willing to pay more than the price being asked (the “consumer surplus”) (Bakos and Brynjolfsson, forthcoming). In sum, while e-commerce may not change current price levels, it may well change the price-setting structure and, in the case of content, make it more efficient.

Ultimately, the impact of e-commerce on prices will depend on competition. As the ability to search thousands of e-commerce stores in a few minutes or through an intelligent software agent improves, and as the expected growth of e-commerce generates more entrants, competition should be sufficient to transfer the cost savings associated with e-commerce into price savings. The overall impact of these price changes on prices is impossible to gauge at this time, although the impact of the underlying ICT technologies on prices in the United States has been significant (Figure 2.5).

### POLICY IMPLICATIONS AND FUTURE RESEARCH AGENDA

A key reason why electronic commerce, especially the business-to-business segment, is growing so quickly is its significant impact on costs associated with inventories, sale execution, procurement, intangibles like banking, and distribution costs. If these reductions become pervasive, e-commerce has the potential to be the application that ushers in the large productivity gains that prove the worth of ICTs. Achieving these gains is therefore contingent on a number of factors, including access to e-commerce systems and the needed skills. However, what is unique about e-commerce over the Internet and the efficiency gains it promises is the premium placed on openness. To reap the potential cost savings fully, firms must be willing to open up their internal systems to suppliers and customers. This raises policy issues concerning security and potential anti-competitive effects as firms integrate their operations more

closely. Another source of efficiency associated with e-commerce is the opportunity for “boundary crossing” as new entrants, business models, and changes in technology erode barriers that used to separate one industry from another. More generally, e-commerce illuminates differences that may exist between products, industries and countries, thereby highlighting the need to reform inconsistent regulations.

- *Work is needed to better assess the economy-wide and sector-specific impact of e-commerce on productivity and to explore the notion that this application may lead to a sustained higher level of economic efficiency.*

While e-commerce can dramatically reduce some production costs, it does not offer a “friction free” environment. Rather, owing to new costs associated with establishing trust and reducing the risks inherent in this type of activity, it requires new intermediaries. Widespread “disintermediation” (producers selling directly to consumers without aid of any intermediaries) is not likely, but the nature of intermediary functions is expected to change.

- *Monitoring of the restructuring of intermediary functions is needed.*

The translation of cost reductions into price reductions is not automatic. It is contingent on sufficient competition. Currently, price reductions attributable to e-commerce have only been evident in a few sectors (e.g. retail stock trading). However, the lower costs associated with e-commerce should lead to greater product, market and international competition, especially in services, and thus to greater price competition.

- *While a general assessment of the impact of e-commerce on prices may be premature, sectoral studies on a variety of consumer and business products should be undertaken to measure its impact and identify factors that encourage and inhibit price competition, including the use of intelligent agents.*

It is clear that electronic commerce will change the structure, if not the level, of pricing as more and more products are subject to the differential pricing associated with customised products, fine market segmentation and auctions, and as the ease of changing prices increases. While these changes will generally improve economic efficiency, they may raise some consumer concerns. While consumers are accustomed to paying different prices for products such as cars, they may be less comfortable with differentiated pricing for smaller, common purchases. In addition, the more widespread use of variable pricing, the advent of greater price competition, and the ability to change prices quickly may affect expectations about prices and therefore have some bearing on monetary policy. In any case, changes in the structure of price setting will affect the ability to measure changes in prices and inflation accurately.

- *Work needs to be carried out to understand how these new methods may affect the structure of price setting and the resulting impact on the frequency of price changes, on markets and on measurement.*

## NOTES

1. Michael Vlahos, Senior Fellow, Progress & Freedom Foundation, <http://www.gip.org/GIP2B.HTM>.
2. E\*Trade's site is estimated to have cost \$485 million, according to Judy Balint, Senior Vice President, Global Marketing & Strategic Business Development, E\*Trade, speaking at IDC E-commerce Forum, 10-12 May 1998, Monaco.
3. "Who will Deal in Dealerships?", *The Economist*, 14 February 1998.
4. J.G. Sandom, Senior Partner, Director of OgilvyOne Interactive, OgilvyOne Worldwide, speaking at IDC E-commerce Forum, 10-12 May 1998, Monaco.
5. 31 December 1997, US Securities and Exchange Commission, Form 10-K405, filed on 30 March 1998, <http://www.sec.gov/Archives/edgar/data/1018724/0000891020-98-000448.txt>.
6. 31 January 1998, US Securities and Exchange Commission, Form 10-K filed on 1 May 1998, <http://www.sec.gov/Archives/edgar/data/890491/0000889812-98-001106.txt>.
7. Form 10-K, US Securities and Exchange Commission, <http://www.sec.gov/archives/edgar>, 22 April 1998.
8. Meeker, 1997; US SEC, <http://www.sec.gov/Archives/edgar/data/858877/0000891618-97-004205.txt>.
9. United Airlines reports that 52 per cent of their tickets are e-tickets while Continental Airlines reports it issues 40 per cent in electronic form. See Caruso (1998).
10. "Barnes and Noble Sees \$100M in Online Sales", <http://www.techweb.com>, 19 January 1998.
11. Software.net, a leading e-commerce merchant for electronically delivered software, had a fraud rate of 60 per cent of orders although these had gone through the standard bank authorisation procedure. See Cybersource (1998).
12. "Surf Music", *The Economist*, 16 August 1997.

