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E-Commerce: Impacts and Policy Challenges

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ABSTRACT/RÉSUMÉ

E-commerce -- an application of the Internet -- has expanded exponentially over the past 5 years and is widely expected to continue to develop rapidly in the medium-term. Much, however, remains to be done to fully exploit the opportunities offered by e-commerce. And as e-commerce develops, it could have profound impacts in individual sectors of the economy as well as for macroeconomic performance and economic policies. This paper assesses the potential outcomes and economic impacts of e-commerce in the business to business and business to consumer spheres; the forces underlying its expansion and the possible implications for structural and macroeconomic policy management.

JEL Code: L10, M2

Keywords: E-commerce, Internet, Competition Policy and Economic Impacts of E-commerce

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Le commerce électronique -- une application d'Internet -- s'est développé d'une manière exponentielle au cours des cinq dernières années et cette tendance devrait se poursuivre à moyen terme. Cependant beaucoup reste à faire afin d'exploiter pleinement les opportunités offertes par le commerce électronique. Et son développement pourrait avoir d'importantes conséquences sur certains secteurs de l'économie ainsi que sur les performances macro-économiques et les politiques économiques. Ce document évalue les résultats potentiels et les impacts économiques du commerce électronique dans le domaine du commerce inter-entreprises et dans celui du commerce entre entreprises et consommateur ;il étudie aussi les forces sous-jacentes à son expansion et les conséquences possibles sur les politiques structurelles et macro-économiques.

Classification JEL : L10, M21

Mots-clés : Commerce électronique, Internet, Politique de la concurrence et Les Incidence économiques du commerce électronique

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E-COMMERCE: IMPACTS AND POLICY CHALLENGES¹

by Jonathan Coppel

I. Introduction

1. In 1991, the Internet had less than 3 million users around the world and its application to e-commerce was non-existent. By 1999, an estimated 250 million users accessed the Internet and approximately one quarter of them made purchases online from electronic commerce sites, worth approximately \$110 billion. If the expansion in e-commerce continues at this rapid pace, as is expected, then in four to five years from now, e-commerce transactions between businesses (B2B) and between businesses and consumers (B2C) will account for about 5 per cent of inter-company transactions and retail sales respectively. Looking forward, the potential for e-commerce transactions to gain a sizeable share of consumer and business purchases appears to be large, although it is difficult to quantify.

2. The prospect that e-commerce transactions may gain a sizeable share of overall commerce is only one dimension of why the Internet is generating such interest. The open structure of the Internet and low cost of using it permit the interconnection of new and existing information and communication technologies, and offers businesses and consumers a new and powerful information system and a new form of communication. This makes it possible for buyers and sellers to come together in more efficient ways and is creating new marketplaces and opportunities for the reorganisation of economic processes. It is also changing the way products are customised, distributed and exchanged and how businesses and consumers search and consume products.

3. In the decades to come, exploiting the full potential of these developments could have profound impacts in individual sectors of the economy as well as for macroeconomic performance and economic policies. At the aggregate level, productivity and economic growth could rise, at least for some time, as a result of more efficient management of supply and distribution, lower transaction costs, low barriers to entry and improved access to information.² Moreover, even if the impact of e-commerce on GDP is small and uncertain it could enhance welfare because, for example, of saved time, greater convenience and access to a wider selection of goods and services more finely tuned to individual needs. Nonetheless, to fully exploit the opportunities much remains to be done to ameliorate user and consumer trust, improve access to the Internet infrastructure and services, and to create a stable, predictable regulatory

1. The author is a senior economist in the Director's Office of the Economics Department. He would like to thank his colleagues Alessandra Colecchia, John Dryden, Martine Durand, Jørgen Elmeskov, Mike Feiner, Phil Hemmings, Tony Kleitz, Geoffrey Owens, Sam Paltridge, Nick Vanston, Graham Vickery, Ignazio Visco, Simon Woodside and Dimitri Ypsilanti for comments and suggestions on previous versions of the paper. He also thanks Debra Bloch for technical support and Susan Gascard and Brenda Livsey-Coates for secretarial assistance.

2. See OECD (2000a) for an analysis of economic growth performance in OECD countries.

environment.³ Assessing the potential outcomes and economic impacts of e-commerce, the forces underlying its expansion, and the possible implications for structural and macroeconomic policy management is the focus of this paper.⁴ Given, however, the recent advent of the Internet and the fact that only scattered empirical information is available it needs to be stressed that the policy consequences of e-commerce can at this stage only be speculated about and are in many respects distant.

II. Defining and measuring e-commerce

4. The term e-commerce has no widely accepted definition. In a loose sense it means doing business over the Internet, selling goods and services which are delivered offline as well as products which can be “digitised” and delivered online, such as computer software.⁵ Trades can be among businesses or between businesses and consumers. But the Internet also encompasses a wider spectrum of potential commercial activities and information exchanges. For instance, it offers firms, individuals and governments an electronic infrastructure which enables the creation of virtual auction markets for goods and services where previously they did not exist. EBay.com, for example, was among the first successful sites to provide a framework where consumers can trade a wide diversity of goods and services with each other (consumer to consumer, C2C) and, at least in principle, with businesses (consumer to business, C2B). Likewise, in some countries, including Australia, the United Kingdom and the United States, governments are beginning to reorganise the management of public procurement systems -- equivalent to some 10 per cent of GDP -- over the Internet, opening the prospect of sizeable B2G transactions. The technology is also being used by governments for the transmission or receipt of information (G2B, G2C) to improve the convenience and lower the cost of payment systems and tax compliance (C2G), and by businesses to manage after sales service and to develop direct consumer marketing. This paper, however, focuses mostly on two parts of the e-economy: B2B and B2C, where most development and progress to date has taken place and which is in this paper, collectively referred to as e-commerce (Figure 1).

Figure 1. E-commerce and broader Internet applications

	Government	Business	Consumer
Government	G2G e.g. co-ordination	G2B e.g. information	G2C e.g. information
Business	B2G e.g. procurement	B2B e.g. e-commerce	B2C e.g. e-commerce
Consumer	C2G e.g. tax compliance	C2B e.g. price comparison	C2C e.g. auction markets

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3. These issues and others were raised at the Ottawa OECD Ministerial on Electronic Commerce held in 1998. The Ministerial Conference agreed on an action plan to address obstacles to the future development of e-commerce and ways to maximise the benefits of e-commerce. For more details see the OECD Internet site http://www.oecd.org/subject/e_commerce/.
 4. More detailed discussion on some of these issues can be found in OECD publications specific to e-commerce such as OECD, 1999a, OECD, 1999b and OECD, 2000b.
 5. “Digitised” means the physical form of a good or service can be coded using digital technology and thereby distributed over the Internet.

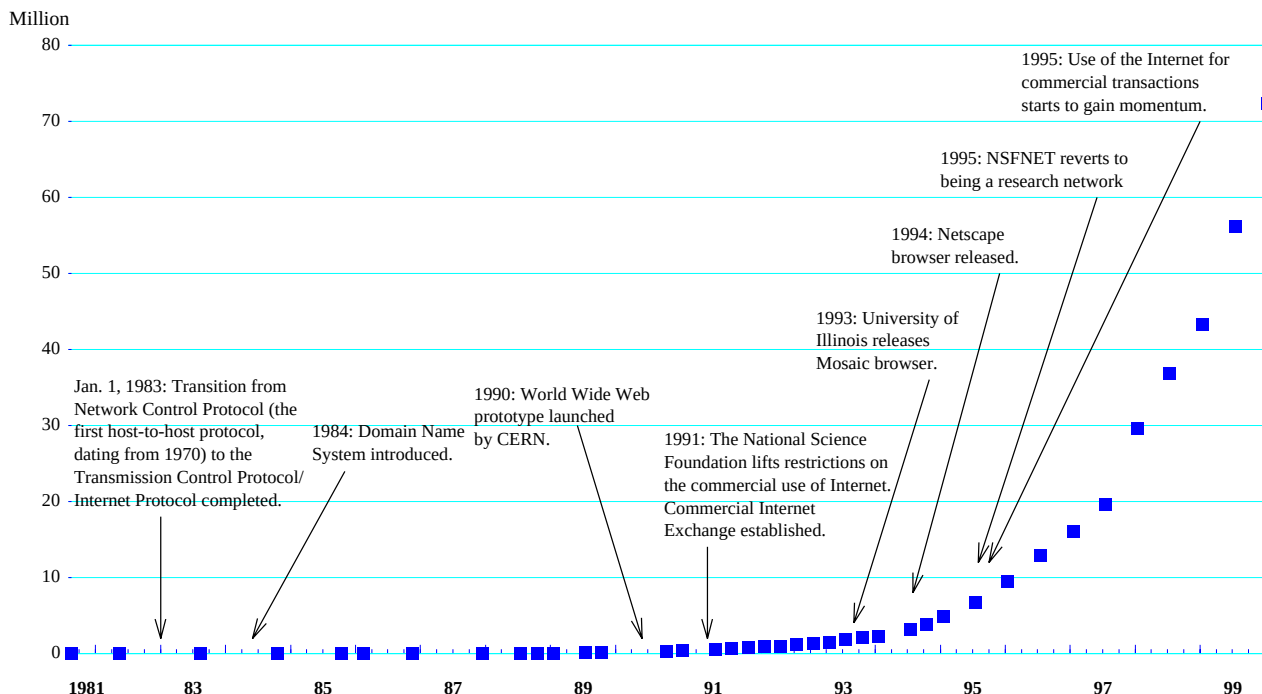
5. It is difficult to measure how widespread e-commerce is. Two often-cited indicators that can be compared internationally are the numbers of Internet hosts and secure servers.⁶ These indicators show e-commerce expanding at a very brisk pace. In March 2000 there were 66 810 secure servers, up 97 per cent compared with a year earlier and Internet hosts have increased at exponential rates (Figure 2). Other indicators of Internet usage, such as the number of web users, web sites and new domain name registrations also imply rapid growth (Thompson, 1999). But disparity across countries and regions is wide. Over 90 per cent of Internet hosts are in OECD countries, and relative to population, English speaking and Nordic countries generally have the highest density of secure servers and Internet hosts (Table 1).

Table 1. Number of Internet hosts and secure servers in OECD countries

	Secure servers March 2000		Internet hosts September 1999	
	number	per million inhabitants	number (thousands)	per thousand inhabitants
United States	47 056	170	44 230	160
Japan	1 946	15	2 373	19
Germany	2 835	34	1 676	20
France	1 058	18	778	13
Italy	619	11	534	9
United Kingdom	3 243	55	2 073	35
Canada	2 689	87	2 346	76
Australia	2 227	119	1 037	55
Austria	344	42	229	28
Belgium	240	24	302	30
Czech Republic	133	13	108	11
Denmark	210	40	317	60
Finland	281	54	634	123
Greece	69	6	70	7
Hungary	49	5	116	11
Iceland	54	194	27	97
Ireland	177	48	52	14
Korea	154	3	318	7
Luxembourg	37	87	21	49
Mexico	127	1	200	2
Netherlands	462	29	817	52
New Zealand	355	93	241	63
Norway	219	49	391	88
Poland	119	3	155	4
Portugal	89	9	65	7
Spain	619	16	382	10
Sweden	631	71	615	69
Switzerland	672	92	315	43
Turkey	96	1	79	1
OECD	66 810	60	60 502	54

Source: OECD (www.oecd.org/dsti/it/cm/), Netcraft (www.netcraft.com) and Telcordia Technologies (www.netsizer.com).

6. Internet hosts are defined as any computer system with an Internet Protocol address connected to the network. The data do not provide a full count of users because surveys do not capture all computer systems connected to the Internet (*e.g.* computers behind firewalls) and thus provide an indicator of the minimum size of the Internet. Secure servers allow users to encrypt information on, for instance, credit card data which facilitates e-commerce. A count of secure servers, therefore, gives a reasonable measure of the distribution of e-commerce activities across countries.

Figure 2. Number of Internet hosts

Source: OECD (www.oecd.org/dsti/sti/it/index.htm); Internet Software Consortium (www.isc.org); CERN (public.web.cern.ch/public/); NSF (www.nsf.gov); Hobbes' Internet TimeLine v.5.0 (www.isoc.org/zakon/internet/history/hit.html).

6. Even more difficult to measure is the value of e-commerce transactions.⁷ Few statistical agencies systematically measure electronic transactions, although a number of countries intend, or are in the process of developing indicators related to electronic business processes.⁸ A number of consulting groups, however, have published estimates of e-commerce transactions. These vary widely, due to diverse definitions and scope.⁹ Nonetheless, taken together they all reveal extremely rapid growth -- doubling the

7. One of the most comprehensive surveys on e-commerce is conducted by the University of Texas Centre for Research in Electronic Commerce. It divides the Internet economy into four parts: the Internet infrastructure; Internet applications; Internet intermediaries; and Internet commerce. Nonetheless, it remains very difficult to isolate e-commerce transactions and avoid double counting since many companies are engaged in more than one of these areas.

8. A major problem compiling statistics on e-commerce transactions is to keep the business register up to date. As the majority of companies enabling e-commerce did not exist several years ago, they are mostly small sized and many do not survive. But progress is being made. The US Census Bureau of Economic Analysis, now publishes the estimated dollar value of Internet retail sales. Other national statistical agencies which conduct or are about to conduct surveys on Internet transactions include Australia, Canada, France, and the Nordic countries. For a more detailed discussion on the problems defining and measuring electronic commerce see Colecchia, Pattinson and Atrostic (2000, forthcoming).

9. Disparities among consulting firm estimates of e-commerce in part reflect the diverse needs of their customers. It is also difficult to reconcile their estimates, since transaction values are based on surveys for which the questions and answers are not usually made available to the public; sample sizes vary considerably across surveys and little information is available on the respondents.

value of transactions every 12 to 18 months -- from virtually zero¹⁰ in the middle of the 1990s and all anticipate continued rapid growth over the immediate future (Table 2). The most conservative estimates expect fivefold growth over the next three to four years and the most optimistic prognoses more than a tenfold increase.

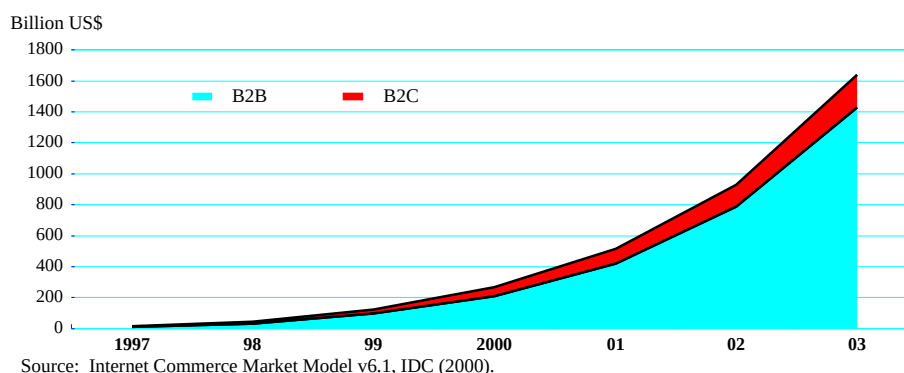
Table 2. **Consultant estimates of world-wide e-commerce**

	<i>Billions \$</i>		
	1999	2003	Average annual growth
e-Marketer	98.4	1 244	89
IDC	111.4	1 317	85
ActivMedia	95	1 324	93
Forrester Low ^a	70	1 800	125
Forrester High ^a	170	3 200	108
Boston Consulting Group	1 000	4 600	46

a) includes Internet-based EDI.
Source: Cited in *e-Marketer* (2000) and Boston Consulting Group (1999b).

7. The largest share of e-commerce takes place between businesses (at present, they account for 70 to 85 per cent of all electronic sales) and B2B e-commerce is expected to experience more rapid progression than B2C over the next few years (Figure 3). Part of the progression in B2B sales is linked to the rapid migration of supply chain management from relatively expensive closed EDI networks towards the Internet. But it is also being driven by the potential for businesses to disintermediate and deal directly with suppliers and thereby lower purchasing and inventory costs and the ability to use the technology to promote a more efficient and effective customer service.

10. Electronic Data Interchange (EDI) developed earlier. An EDI is a standard for processing and transmitting information between computers over private communication networks called value-added networks (VANs). It requires expensive and complex custom software, dedicated communication links and in many cases strictly compatible equipment. The main users are large businesses and their first-tier suppliers. The EDI standard is now less used because of their relatively high costs, compared with the more Flexible Transmission Control Protocol/Internet Protocol (TCP/IP) based Internet systems.

Figure 3. Recent and projected values of B2B and B2C e-commerce

8. Despite the extremely rapid growth in B2C e-commerce sales, they still account for a very small share of overall transactions (Table 3). In the United States, where most Internet transactions take place -- and largely among US residents -- sales in the final quarter of 1999 were equivalent to about 2/3 of a per cent of retail sales.¹¹ In Europe, B2C penetration is just 0.2 per cent of retail sales, although in some countries including Sweden, the Netherlands and the United Kingdom it is similar to the rate of penetration in the United States. Not included in these statistics are offline sales where the Internet has been used as an information source (*e.g.* for price comparisons) and influenced purchases. This can be especially important for expensive items such as cars.¹² The relatively low penetration of B2C e-commerce reflects the still limited number of Internet users for commercial purposes. Apart from the United States, only about 10 per cent of Internet users make purchases over the Internet and these are typically small value transactions.¹³

9. In certain sectors, however, e-commerce sales have achieved quite a significant level of penetration with, for example, the Internet accounting for over one quarter of share trades in the United States. More generally, a study by the Boston Consulting Group on B2C e-commerce (1999a) found that the Internet in the United States and Europe accounts for more than 2 per cent of equity brokerage services and sales of computer hardware and software, books, music and videos (Figure 4). Moreover, goods and services that can be “digitised” and delivered over the Internet, such as financial and investment services are growing the most rapidly and have a large potential to gain a sizeable share of the overall market. In contrast, the main sectors for B2B transactions are motor vehicles, shipping, chemicals, industrial and high technology equipment, with an increasing number of companies in these sectors integrating their supply chain through the Internet.

11. This number excludes online travel services, financial brokers and dealers, and ticket sales agencies. For more information see <http://www.census.gov/mrts/www/current.html>.

12. A study in 1998 by Cyber Dialogue, an Internet consultancy firm, estimated the value of US offline orders influenced by the Internet at approximately \$50 billion, equivalent to double that year’s estimated value of online purchases. Another estimate claims that although 2.7 per cent of new car sales in the United States in 1999 took place on the Internet, as many as 40 per cent involved the Internet to compare prices, to look at the latest models and gather information.

13. In Australia, for example, two thirds of the number of B2C transactions are purchases worth less than \$300, Australian Bureau of Statistics (2000).

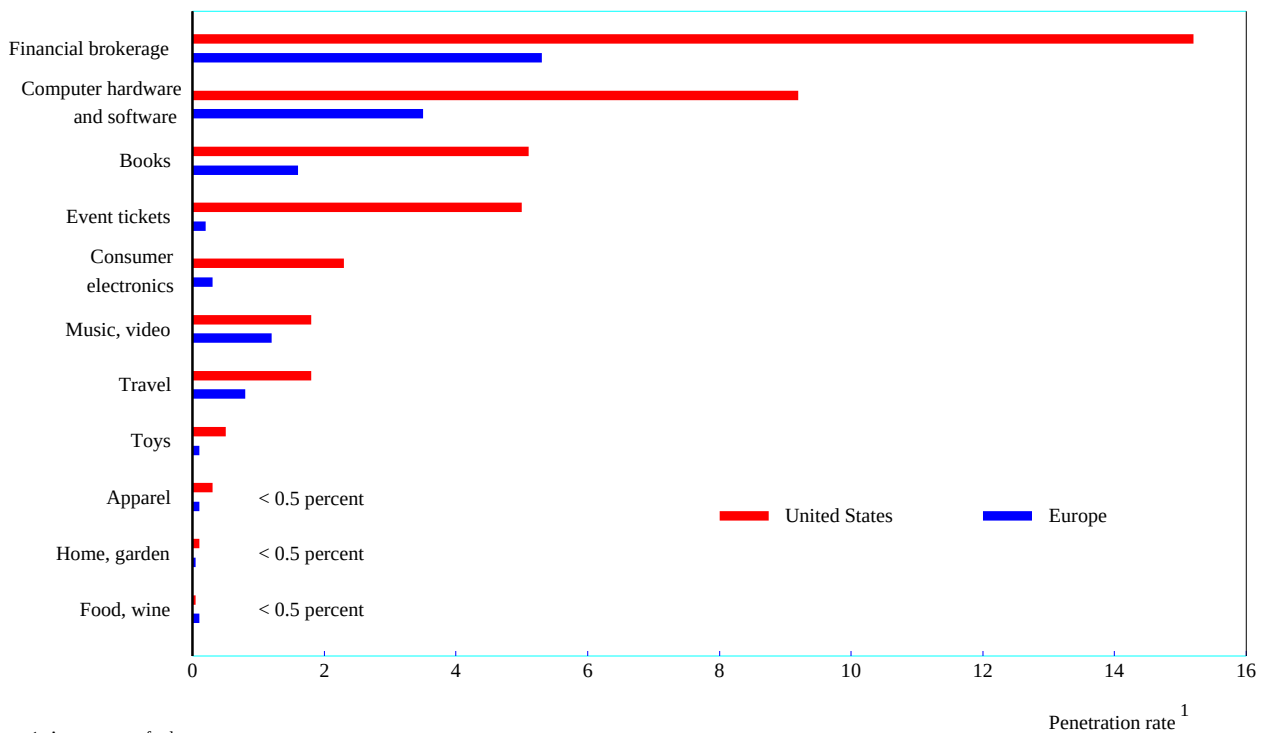
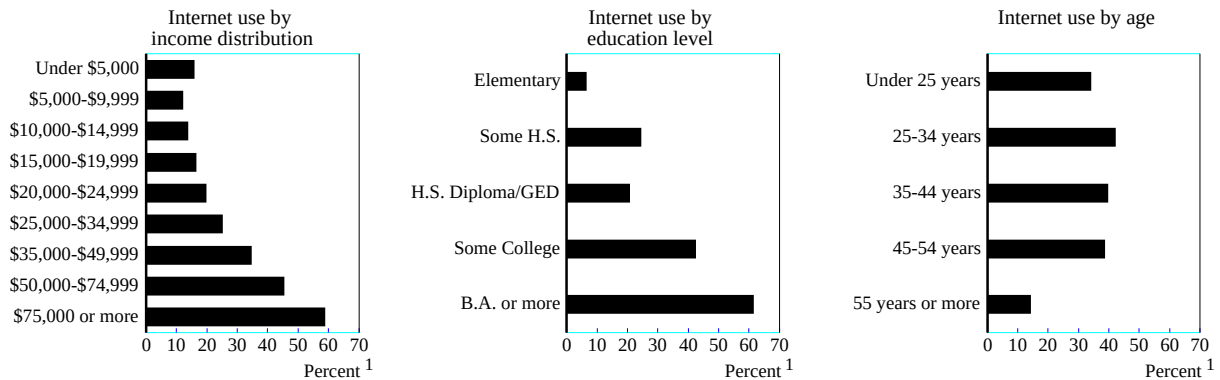
Table 3. B2C e-commerce in selected OECD countries

	Value of transactions - 1999, \$US million	Value of transactions - growth rate (1999/98)	Penetration rate, per cent of retail sales	Number of buyers, thousand, end 1998	Number of buyers, as a per cent of Internet users	Number of buyers, as a per cent of working age population
United States	24 170	195	0.48	19 666	39	11.1
Japan	1 648	334	0.06	..	..	..
Germany	1 199	200	0.30	1 370	13	2.4
France	345	215	0.14	310	8	0.8
Italy	194	145	0.09	360	12	0.9
United Kingdom	1 040	280	0.37	970	11	2.5
Canada	774	166	0.26	811	12	4.0
Australia	..	..	..	803	13	6.4
Austria	96	210	0.23	120	13	2.2
Belgium	82	420	0.16	90	11	1.3
Denmark	46	220	0.20	90	8	2.5
Finland	51	160	0.22	160	10	4.7
Greece	..	..	..	30	11	0.4
Ireland	..	..	..	40	13	1.6
Netherlands	182	210	0.34	320	13	3.0
Norway	61	200	0.26	100	10	3.5
Portugal	70	185	0.06	50	11	0.7
Spain	70	185	0.06	220	11	0.9
Sweden	232	170	0.68	260	10	4.6
Switzerland	127	110	0.29	130	12	2.7

Sources: OECD Secretariat; Boston Consulting Group; Warburg Dillon Read; Retail Council of Canada; MITI (Japan); and Australian Bureau of Statistics.

10. Income, education and age are the main factors determining the profile of Internet users and B2C e-commerce buyers. In the United States, for instance, the rate of Internet use among university graduates is about three times the level of those with a high school diploma or less, and over half the population with annual household incomes above \$50 000 access the Internet compared with less than 20 per cent for those with annual household incomes of \$20 000 or less (Figure 5). These broad patterns of usage are repeated among other OECD countries which collect statistics on the profile of Internet users. Two notable differences, however, are the age profile of Internet users and the proportion of users which make online purchases.¹⁴ In the United States almost half the number of Internet users in 1998 made an online purchase over the past six months, compared with 13 per cent of Australian adults accessing the Internet in the 12 months to November 1999 and 11 per cent of European users during the first quarter of 1998 (International Data Corporation, 1999). However, in those countries where data are available, the number of household Internet users who make online purchases as a proportion of all users is rising quickly.

14. In the US, middle aged persons have the highest usage rates, while in other countries, youths are the most active and fastest growing group of users. This difference may reflect the fact that US data classified by age include users below the age of 25, while in other countries it covers young adults, but excludes children below 18 years of age.

Figure 4. E-commerce penetration by product, 1999**Figure 5. Profile of the US Internet user, 1998**

11. Business use of the Internet reveals a dichotomy, with usage substantially higher among large firms than small firms and also differing widely according to the sector in which firms are engaged. Finance, legal and other service industries have higher Internet penetration rates than those in manufacturing and mining, and in Japan, for example, Internet penetration among firms with more than 300 employees has reached 80 per cent, but is only 20 per cent in firms with less than six employees. The main uses of the Internet by firms include accessing commercial databases or services, advertising, ordering goods and services, monitoring prices and email applications.

III. Framework conditions for the development of e-commerce

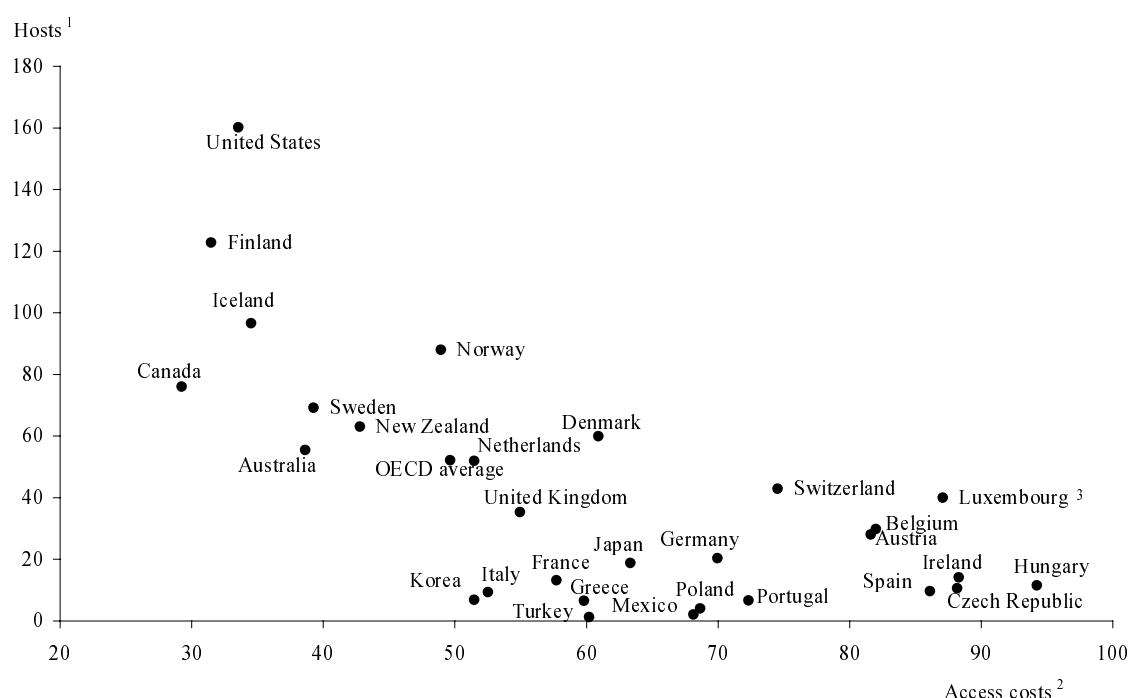
12. The rapid growth in both the number of people who use the Internet and its commercial applications has been stimulated by technological innovations and their diffusion. Together with economic and regulatory reforms, notably in the telecommunications sector, these technological advances have lowered the cost and improved the quality of accessing the Internet. Productivity gains in the production of computers -- the main device currently used to access the Internet -- have led to sharply lower computer prices. In 1999 the US price index for computers adjusted for quality had fallen by over 90 per cent, compared with the beginning of the decade.¹⁵ Cheaper computers have stimulated their diffusion into households. Over the past decade, the percentage of households with computers in OECD countries where the data are available has more than doubled to reach approximately 40 per cent in 1998 and the pace of diffusion has increased in recent years. Indeed, Internet usage by households follows the diffusion of computers, although not proportionately across countries. In Italy, for instance, 18 per cent of households have access to a personal computer yet less than 5 per cent have access to the Internet, compared with 42 and 26 per cent respectively in the United States.

13. Aside from the diffusion of computer hardware, differences across countries in the number of Internet users relative to population is also linked to telephone access costs. While usage costs have dropped, in part linked to the liberalisation of fixed telecommunication networks, in some OECD countries access to the Internet has lagged due to the high local communication charges -- one of the most significant costs for engaging in e-commerce for consumers and small business (Figure 6). Access costs typically comprise 3 components: fixed and usage telecommunication charges and the fees of an Internet service provider (ISP). The total cost on average in OECD countries has fallen from \$92 for 40 hours at peak rates in 1999 to \$76 by March 2000.¹⁶ But among OECD countries there is quite a wide range of prices and price disparity has increased. Usage costs in the United States, Canada, Mexico, Finland and Australia are about half the OECD average and some 3 times lower than in Belgium, the Czech Republic, Hungary and Poland, the most expensive countries for 40 hours of peak access. Those countries with more expensive Internet communication costs also tend to have a pricing structure where the local call charge comprises a relatively large proportion of the overall cost. On average, local telephone tariffs currently account for about two thirds of the total monthly cost for 40 peak hours of Internet access, whereas in the four most expensive OECD countries it accounts for about 75 per cent. Price structures, however, are evolving with ISPs in some countries now offering users a set number of hours of access per month, with local communication costs already included in the subscription price, or alternatively ISP providers are remunerated from the telecommunication operator and offer their services at no direct charge to users.

15. Not all OECD countries use so-called hedonic price indices to adjust computer prices for quality improvements, but similar falls in adjusted prices are likely given that computers are internationally traded.

16. The OECD monitors Internet access prices in Member countries for the largest telecommunication operator for 20, 30 and 40 hours of access per month at peak and off-peak rates in US dollars converted from national currencies using both exchange rates and purchasing power parities (PPP). The figures quoted in the text are in US PPP dollars. Each price series has fallen over the past two years by varying degrees reflecting the pricing structure for telephone use. For example, countries with unmeasured local calls become relatively cheaper as the number of access hours increases or if peak rates are considered.

Figure 6. Access costs and usage of the Internet



1. Number of Internet hosts per thousand inhabitants, July 1999.

2. Average cost of accessing the Internet for 20 hours per month at off-peak times, 1995-2000, in \$US PPP.

3. Data on hosts for Luxembourg is from mid-1999.

Source : OECD (www.oecd.org/dsti/sti/it/cm) and Telcordia Technologies (www.netsizer.com)

14. Pricing Internet access is likely to continue to change, as new and faster access devices penetrate the market and once the “local loop” -- one of the main obstacles to cheaper access -- of telecommunication networks is liberalised.¹⁷ The advantage for Internet shoppers in countries with unmetered local calls is that they have the opportunity to browse and purchase without being concerned by per minute charges. On the other hand, not charging for the duration of connection to the network could create network congestion problems and reduce the utility of e-commerce.¹⁸ B2B commerce, in contrast, principally relies on high speed leased lines, which is key to making the Internet attractive to use. As for households, the cost of access varies substantially and is typically higher in countries where incumbent telecom firms continue to dominate. For instance, on a route where competition is not permitted at both ends, a leased line can be sold for 14 times the best available price in liberalised markets, where prices are plunging sharply (OECD, 1999b).

17. The “local loop” is the last link between the telephone network and the home or office connection. In the past, the major local telecommunication operator had a monopoly on the “local loop”. In 1998 the European Union decided to liberalise the provision of local voice telephony services and reform access regulations to the “local loop” infrastructure. And in April 2000, the European Commission adopted a Recommendation on full local loop unbundling -- allowing elements of the local loop, such as switches to be separated and rented by service providers -- to be implemented by the end of the year.

18. Such problems are more likely to occur when telecommunication operators are in a non-competitive and strictly regulated environment.

15. Two major factors likely to influence the future expansion of e-commerce are the extent to which IT companies invest in network capacity and the speed of data transmission. Both are important in order to ensure greater utility from the Internet and largely depend on the level and nature of investment outlays. In aggregate terms, investment in information and communication technologies (ICT) has risen strongly in virtually all OECD countries and is believed to be one of the main drivers underpinning the remarkable performance of the US economy (see OECD (2000a), Council of Economic Advisors, 2000 and OECD, 2000c). This is, *inter alia*, generating a rapid increase in high capacity, broad bandwidth (*e.g.* optic fibre, wireless and digital subscriber line technologies) at relatively low prices per unit of capacity and will enable web-site stores to enhance their attractiveness and give household users much faster access than the dial-up modem in use today.¹⁹

16. The relative level of capital spending on communication infrastructure and Internet application software development generally tends to be higher in those countries which liberalised their telecommunication markets earlier (United States, United Kingdom, Japan, Finland, Sweden and Australia).²⁰ Most of these countries have among the highest private line capacity and tend to have the greatest number of e-commerce sites. Five OECD countries maintain a monopoly over the provision of fixed network telecommunication services, but all are on the path towards liberalisation, which itself generally has a strong positive effect on the productivity and the quality of services and a strong negative effect on prices (see Boylaud and Nicoletti, 2000). More generally, there is convincing evidence that competition is favourable for the diffusion of innovation (Romer, 1990).

17. Despite the phenomenal growth in the Internet for commercial purposes there are a number of legal and technical obstacles which could hinder the full potential of e-commerce from being reaped. For example, the virtual environment of electronic markets makes it more difficult to determine who the contracting parties are, where an electronic commerce operator is established and whether that operator is complying with all relevant legal obligations and regulatory regimes. This can create legal and regulatory uncertainty about which jurisdiction will be competent and about the applicable law in disputed cases and thus makes it difficult for e-commerce companies to adapt their sites to conform with national rules. For example, regulations on advertising outlaw the use of English in France, advertising to children in Denmark and comparative advertising in Germany, yet the content on the Internet is essentially borderless. It is not yet clear how countries will apply such rules to the Internet.

18. Regarding technical problems, consumers have concerns over privacy, consumer protection, security of credit card purchases, order fulfilment and delivery. And the absence of commercial codes and legal recognition covering areas such as the acceptance of electronic signatures and documents, contract enforcement and greater certainty *vis-à-vis* liability for damages that may arise as a result of electronic transactions, will limit the take-up of e-commerce, particularly in the B2B sphere.²¹ These concerns are magnified when trading across borders. In addition, there are a number of issues concerning the governance of the Internet itself. The increase in electronic commerce will expand the number of Internet addresses required and accelerate the need for further reform of the Domain Name System (DNS). It will be important that such addresses are easy to acquire and reliable, with mechanisms for dispute resolution and structured such that there is scope for expansion. Reform of the DNS and the Internet Protocol (IP)

19. For example, a conventional copper line telephone dial-up would require about an hour to download a 3.5 minute video file, whereas cable or a Digital Subscriber Line connection would require less than 30 seconds.

20. For more detail on the liberalisation and market structure of telecommunication markets in OECD countries see Boylaud and Nicoletti (2000) and OECD (1999b).

21. In the United States, legislation is currently before the Congress (the e-sign bill) which would recognise nation-wide digital signatures as legally binding. And in November 1999 the European Union adopted a directive recognising e-signatures.

Numbering System may also prove important for exercising regulatory oversight, law enforcement, consumer protection, taxation compliance, protection of intellectual property rights and protection of minors.²²

IV. Economic impacts and prospective policy challenges of e-commerce

19. If in the decades to come e-commerce continues to grow at a rapid pace, it could have significant effects on the structure and functioning of economies at the firm, sector and aggregate level. The impacts of these changes are diverse and likely to impinge on prices, the composition of trade, labour markets and taxation revenues. Adapting policy frameworks and institutions to these changes and ensuring that the full potential benefits of e-commerce are reaped will pose a number of challenges for structural policy. Moreover, the sheer scale of structural shifts is likely to have interlinkages with macroeconomic policy and economic performance, which could modify how policymakers interpret conjunctural developments and may even impact on the ability to conduct and effectively implement macroeconomic policy. This section provides an overview of these issues, which given the still nascent development of e-commerce are necessarily speculative.

Impact on prices

20. Electronic commerce is widely expected to improve efficiency due to reduced transaction and search costs, increased competition and more streamlined business processes. Greater efficiency may manifest itself in a number of ways, including lower prices, finer albeit more frequent price modifications and a narrower dispersion of prices for identical products. Lower search costs may possibly also lead to Internet consumers being more sensitive to price changes. So far, however, the available empirical evidence is mixed. Some of the first studies found that prices of goods sold through the Internet were on average higher than their equivalent purchased through traditional retailers.²³ A more recent study, however, (Brynjolfsson and Smith, 1999) found prices for books and CDs on average to be about 10 per cent lower on the Internet compared with traditional retailers in the United States.²⁴ These studies and others (e.g. Clemons, Hann and Hitt, 1998 focussing on airline tickets) also find that price dispersion is no lower online and that prices tend to change more frequently reflecting lower menu costs -- the costs a retailer incurs when changing a posted price -- in Internet markets. Evidence on demand sensitivity to price is also mixed, with some work suggesting a low (Degeratu, Rangaswamy and Wu, 1998) and others a high price elasticity of demand (Goolsbee, 1998).

21. Taken together, these findings provide limited support to the prediction that at least B2C e-commerce raises competitive pressures and improves economic efficiency. Part of the reason is that certain reductions in cost are offset by higher overheads elsewhere. For example, distribution switches

22. The DNS and IP Numbering System are like the "signposts" on the "Information highways" and enable the networks to function.

23. See for example, Bailey (1998) for books, CDs and computer software, Lee (1997) for used cars and Goldman Sachs (1997) for a basket of 30 products. For a review of the available empirical literature see Smith, Bailey and Brynjolfsson (1999).

24. The early results of higher prices on the Internet than traditional retailers for identical products could be linked to limited competition during the first development years of B2C e-commerce. On the other hand, the lower prices for some consumer goods now found on the Internet may reflect the intense competition between B2C firms to establish market share and brand name recognition. The large and rapidly growing volume of sales despite mounting losses among many B2C e-commerce retailers provides some support for this interpretation.

from high density channels (warehouses to shopping centres) to lower density routes (factories to residential areas). Some of these additional costs, however, may also reflect added benefits to consumers, such as less time spent in shopping centres and thus higher prices need not be associated with lower efficiency. Another explanation is that e-commerce retailers may have a better view of their clients' preferences,²⁵ that makes more direct marketing and mass customisation of products possible and could also lead to more finely differentiated and sophisticated price discrimination for products. If prices are based on understanding individual consumer valuation, there is no reason to expect prices to gravitate to a single value across retailers or customers. Moreover, a diversity of prices for broadly similar goods does not necessarily imply inefficiency. In this regard, the critical issue is whether price discrimination increases or decreases the size of the market.²⁶

22. The greatest possibilities for e-commerce to reduce prices exist for goods and services which can be digitised, thereby allowing substantial economies in production and delivery costs, and for B2B e-commerce and B2B exchanges where opportunities exist for efficiency gains via lower procurement and inventory costs and better supply chain management. Many companies claim that putting their supply chains online has led, or will lead, to major cost savings. According to a Goldman Sachs (2000) study these gains range between 2 and 40 per cent of total input costs depending on the industry and could lead to an economy-wide price reduction of almost 4 per cent, although such estimates depend on numerous assumptions and are inherently uncertain (Table 4).²⁷ Hence interpretation of these results requires considerable caution. Moreover, estimates of the impact of e-commerce on prices cannot adequately take into account other characteristics of e-commerce which businesses appreciate, such as increased information and choice.

25. This may be obtained via "cookies", that is software which enables a website to monitor who is accessing their site and for how long. In combination with purchasing information it is possible to assemble a highly customised data base. Website monitoring results vary widely, however, depending on the tracking system used, and some sites have artificially boosted their visitor numbers and hence advertising revenue potential by using software programs that provide their website with spurious traffic.

26. For further details see Varian (1985).

27. The potential cost savings are likely to be higher in Europe and especially Japan given less competitive product markets, with higher distribution margins and average mark-ups (Oliveira Martins, Scarpetta and Pilat, 1996). In general, the longer the supply chain, the bigger the potential gains from B2B e-commerce, since the technology allows firms to reduce the number of intermediaries.

Table 4. **Potential cost savings from B2B e-commerce in US industries**

As a per cent of total input costs

Industry	Cost savings
Aerospace machinings	11
Chemicals	10
Coal	2
Communications/Bandwith	5-15
Computing	11-20
Electronic components	29-39
Food ingredients	3-5
Forest products	15-25
Freight transport	15-20
Healthcare	5
Life science	12-19
Machining (metals)	22
Media and advertising	10-15
Maintenance, repair and operating services	10
Oil and gas	5-15
Paper	10
Steel	11

Source: Goldman Sachs (2000).

Impact on competition and competition policy

23. Persistence of price dispersion across Internet markets and the absence of noticeable price reductions has led to concerns that the cost structure of some Internet markets could ultimately result in less competitive outcomes. The scope for non-competitive behaviour is perhaps strongest among “digital” and knowledge intensive products. For such products, once the first copy of, for example, a software application is produced, the cost of a second copy is close to zero. Such a cost structure implies increasing economies of scale. The challenge to firms is to find a way to price their output so as to sell to a broad enough audience and thereby recoup the high initial per unit cost of production. One way to do this is to differentiate the underlying good or service so as to appeal to different market segments. Information services, for instance, are sometimes differentiated by offering different levels of quality such as degree of convenience, more timely and frequent updates, access to technical support, broader coverage and more sophisticated user interfaces.²⁸ The risk, however, is that the scope to differentiate output is limited and leads to a situation whereby the firm with the largest production is able to undercut and ultimately force out of business its competitors.²⁹

24. Closely related to increasing economies of scale, the Internet also appears to be a prime example for the existence of “network” externalities; each additional user of the network increases its value to other

28. For a more detailed discussion of market structure and behaviour for knowledge intensive products see Varian (1999).

29. Meijers (1999) showed that the cost structure of many sectors and notably software products is shifting to larger fixed costs and smaller marginal costs and consequently the average mark-up over marginal costs has gone up.

users. In these circumstances, firms in network industries have a strong incentive to expand their customer base and a strategic interest to do so as early as possible. Start-up companies may find it difficult to enter due to the large marketing costs needed to develop visibility and a brand name. It is still too early to know how big these barriers are and whether the Internet will favour, or not, contestable e-commerce markets.³⁰ Low contestability could result in highly concentrated “winner-takes-all” scenarios which could hinder innovation and competition and may thus require the attention of policy.

25. On the other hand, the Internet offers the ability to reduce barriers to entry and make markets more contestable in other parts of the economy. The open and interoperable standards of the Internet, could limit opportunities to dominate markets, by expanding the size of the market. By exposing firms to global competition, the Internet might also expedite progress towards implementing product market reforms. As well, consumers could benefit from the development of more powerful “intelligent agents” which navigate the Internet and automate, for instance, price search and comparison across e-commerce sites. By reducing search costs and increasing the flow of information, the Internet might thus effectively shift power from producers to consumers and make it harder for firms to maintain higher prices.

Tax, trade policy and regulatory issues

26. The rapid growth and development of e-commerce begs a number of questions about taxation and tax policy. Concerns have been expressed that e-commerce could result in the erosion of tax bases. Consumption taxes are levied on the principle of taxation at the place of consumption and according to rates set in individual countries, or in individual states in the case of federal nations. E-commerce, however, has the potential to undermine the application of domestic and national tax rules. Under Value Added Tax (VAT) systems, for example, particularly in the case of business to consumer transactions, the supplier who is normally responsible for collecting consumption taxes may have limited means to prove the location of their customers. The supplier may also be beyond the fiscal jurisdiction of the fiscal authorities where consumption takes place. In practice, this issue appears more acute for products which can be digitised and delivered online. Regarding potential tax loss related to physical products traded across borders, but ordered over the Internet, many countries have a *de minimis* relief for low value transactions, whereby when below the value threshold these products legitimately fall outside the tax net. Emerging issues here are the need to minimise distortion to competition and to find the right balance between the cost of collection and the amount of foregone taxes. Given the present size of e-commerce, serious erosion of the tax base is not in prospect. In the future, however, it may become more of an issue for tax authorities.³¹

27. The technology which underlies e-commerce also opens up a number of opportunities that tax authorities should seize to improve the efficiency of tax administration and to enhance taxpayer service (examples of C2G and B2G Internet applications). The Internet technology has the potential to greatly improve communication between tax authorities and taxpayers and to enhance access to information for tax authorities, so helping them to encourage voluntary compliance with tax obligations. In particular, the Internet facilitates the electronic assessment, filing and collection of taxes. Overall, therefore, e-commerce should not only be seen as a threat to tax yields, but also a means to reduce the cost of complying with tax rules and enhance tax collection.

30. A contestable market is one in which competitive pressures from potential entrants exercise constraints on the behaviour of incumbent suppliers. Conditions for a market to be contestable include no significant entry or exit barriers, potential entrants have access to the same production technology as incumbents and there are no special costs that must be borne by an entrant that do not also fall on incumbent firms.

31. For more information on tax issues, see the OECD web site:
http://www.oecd.org/subject/e-commerce/ebooks/ecom2_1.pdf

28. E-commerce, especially for digital products, blurs the notion of geographical boundaries such as place of supply or residence. Since trade policy -- like tax policy -- is based on such distinctions, governments may find it difficult to determine jurisdiction and tariff revenue rights. Moreover, the laws and regulations a consumer relies on for protection at home may not apply in the merchant's country. Indeed, in some quarters there are concerns that the scope for the Internet to transcend national boundaries could emasculate the ability of regulatory bodies to fulfil their objectives. There is thus a need to update regulatory frameworks and strengthen co-operation between regulatory bodies to achieve the goals of economic regulations, but without jeopardising the efficiencies likely to be associated with the growth of e-commerce.

29. The World Trade Organisation (WTO) has begun to address some of these issues.³² The approach adopted has been to consider e-commerce as another medium for exchange and thus subject to the same rules and regulations as conventional transactions; the principle of equivalent treatment. The WTO members in May 1998 agreed on a temporary moratorium against the imposition of customs duties on electronic transactions per se. Even without new duties, however, a potential barrier to the proliferation of international e-commerce is the uncertain application of existing customs duties. B2C e-commerce shoppers are rarely informed about duties they are liable to pay and vendors find it difficult to provide information on the myriad of customs regulations across countries.³³ Often, therefore, the consumer is uncertain of the final cost and could encounter delivery delays as goods are held until customs clearance. The World Customs Organisation (WCO) has worked on these problems and has advocated procedures for simplified customs clearance, information technology requirements and guidelines for greater transparency.

Employment and labour market policy

30. The development of e-commerce is likely to have both direct and indirect impacts on labour markets as well as the composition of employment. The widely expected rapid growth in e-commerce should boost the demand for jobs in e-businesses, but since the size of e-commerce in the short to medium term as a share of all activity is still likely to be small, these new jobs should not be counted on to relieve existing labour market problems in some countries.³⁴ The latter still needs to be addressed by appropriate policies *vis-à-vis* labour markets.

31. Although the direct employment consequences of e-commerce may not be large, it is likely to drive widespread changes in the labour market, shifting the composition of workers required to produce and deliver a product or service. For example, a retail sale via the Internet probably does not require the same intensity of sales staff, but it requires people with IT skills to develop and program software, operate and maintain computer servers and networks and people skilled in graphics design to keep the web site attractive and others to dispatch orders. In addition, firms will implement modifications to their production processes in order to exploit the potential of B2B and B2C commerce over the Internet. Certain jobs, especially those characterised by the transfer of information from one party to another such as travel agents, insurance and stock brokers are likely to be redefined and become less common. Faster rates of

32 . For more information on trade policy issues related to e-commerce see the WTO web site: <http://www.wto.org/wto/ecom/ecom.htm>

33. A recent survey by Forrester, an Internet research consultancy, estimated that 85 per cent of online companies were incapable of shipping across borders. In fact most e-commerce transactions are within borders. According to a Boston Consulting Group report (1999a), exports beyond national borders account for 7 per cent of European online retailers' revenues.

34. One study for the United States estimated that only 120 thousand jobs have so far been created directly in e-commerce.

innovation and diffusion may also be associated with more turnover of jobs. In such an environment it is important that workers have the opportunity to learn new skills and that policies do not prevent the swift reallocation of labour to the changing needs of the economy. Otherwise, the new opportunities offered by the Internet may be missed or unnecessarily delayed.

Economic performance and macroeconomic policy

32. The role that investment in information and communication technology (ICT) in general and the Internet in particular is playing in OECD economies has been the focus of recent debate on the links between investment, technological progress and growth. The wide diffusion of ICT forms part of a broader debate as to whether or not it represents a basic technological shift, with widespread implications across sectors and long-lasting effects on productivity growth (the so-called “new economy”).³⁵ At the firm or sectoral level, the potential for far reaching economic effects of ICT is partly seen as arising through increased use and development of the Internet.

33. A number of studies have attempted to quantify the impact of e-commerce at the macroeconomic level. A study by the Australian Government (Department of Communication, Information Technology and the Arts, 1999) estimated the net impact could be a 2.7 per cent increase in the level of national output. Goldman Sachs (2000) suggests that the rise of B2B e-commerce will in the long run increase the level of GDP by 5 per cent.³⁶ These studies, however, are based on a number of quite restrictive assumptions and their results should be interpreted with caution. Moreover, such studies focus on the level of output and they do not evaluate whether the potential growth rate has permanently changed. Research on these issues, however, is fraught with problems concerning the measurement of productivity -- especially in the service sector -- and the compilation of capital stock estimates. Nevertheless, there is broad agreement that at least in some countries (United States, Australia, Denmark, Norway), changes in labour productivity growth rates are related to significant technological changes. There is less macroeconomic evidence, however, to support the argument that ICT in general and Internet usage in particular is adding to trend growth of total factor productivity, or whether it merely represents a way to maintain this growth, as the potential of previous innovations is exhausted. On the other hand, microeconomic studies provide some, albeit mixed evidence that there are productivity effects of ICT outside of the computer and telecommunication sectors.³⁷

34. The Internet could also boost aggregate demand, which raises some additional macroeconomic policy considerations. ICT boosts aggregate demand directly, but also indirectly. In the current situation, the indirect channel operates through higher consumption spending from wealth effects as a result of sharp increases in equity prices, especially Internet stocks, which have risen in expectation of faster future growth in output and profits (Figure 7). Higher share prices and hence a cheaper cost of capital may also be

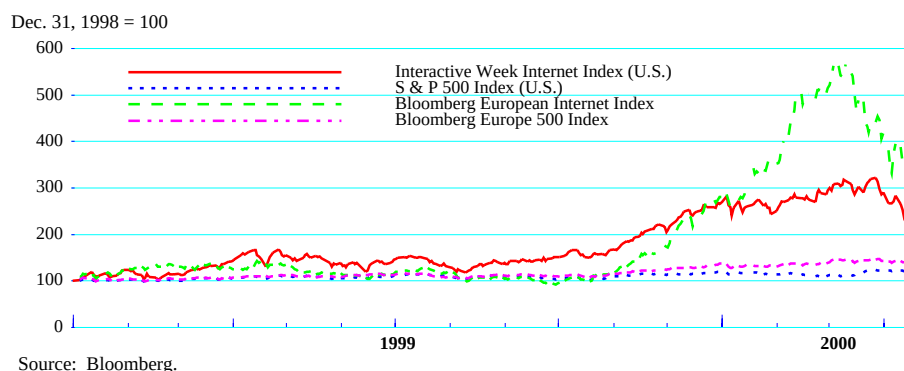
35. For recent evidence on the debate about the “new economy” and the effects of ICT on the US economy see, for example, Oliner and Sichel (2000), Council of Economic Advisors (2000), OECD (2000c) and Schreyer (2000).

36. E-commerce activities could also have effects on the boundary of market output and hence the size of GDP. For instance, electronic banking shifts market production to the household (reducing GDP) while online grocery shopping transfers activities into the market (increasing GDP).

37. In particular, work by Jorgenson and Stiroh (1995) and McGuckin and Stiroh (1999) finds positive labour productivity effects from computing investment in US industry level data. Brynjolfsson and Hitt (1995) and Brynjolfsson (1999) also find a positive link between computers and multi-factor productivity using firm-level data, but Stiroh (1999) finds a negative effect on the basis of industry-level data.

boosting investment.³⁸ This may represent a short-term risk from the macroeconomic policy stance point of view if increases in demand outstrip that in supply and lead to rising inflation. Given volatile equity markets and differentiated wealth effects across countries, it is hard to judge ex-ante how much importance to give to these risks, though in some countries it is a clear concern for policy makers.³⁹

Figure 7. Internet and overall share price indices



35. The development of the Internet and e-commerce could also modify the cyclicity of economies and how payments are made. This in turn may have implications for the setting and operation of monetary policy. The cyclical characteristics of economies may change to the extent that e-commerce facilitates more efficient stock management, leading to lower inventories as a ratio of sales and possibly also modifying the stockbuilding cycle. In addition, increased price competition in product markets may allow the economy to sustain more jobs without stoking inflation for a period of time and might also put greater pressure on companies to curb wage growth and modify the process generating inflation and thereby the cyclical responsiveness of inflation. There could also be changes affecting the operation of monetary policy. Friedman (1999) has argued that Internet related technologies could increase the speed of financial operations, which raises the issue as to how interest rates should be set and whether the short end of interest setting needs to become shorter *i.e.* time units smaller than a day. Some economists have even envisaged a world where technological developments emasculate altogether the monetary controls of central banks (King, 1999). This could occur if new technologies (and regulators) permitted real time pricing and exchange of goods across the Internet without the intercession of an independent monetary system administered by a central bank. In such an environment the government earns no seignorage and would no longer be able to provide liquidity support by printing money.

38. ICT might also increase the marginal efficiency of capital and place upward pressure on the real interest rate over the long run.

39. In this respect, it is apposite to note that of the 700 odd US technology companies that went public in 1992 or later, some 60 per cent were trading at less than their initial public offering price in October 1998, with a median annualised return of -10.5 per cent (Broadview, 1999 and Crisci and Strauch, 1999).

36. More likely to develop without supplanting central banks are electronic money systems, such as “stored-value” cards (SVC) and “network money”.⁴⁰ Electronic cash systems have so far failed to gain a large part of the payments system (Table 5), with most Internet purchases still made by credit card even though users are concerned about the potential for fraud and would prefer to use a more secure payment method. Part of the reason why electronic monies have shown limited appeal are the substantial costs to merchants of setting up the necessary facilities. There also appears to be a lack of acceptance on the part of the public, because of security and privacy concerns since most systems can keep track of what users buy. SVCs are likely to be substitutes for currency and “network” money for deposits. If providers of electronic monies manage to deal with safety and anonymity concerns the potential for their widespread introduction, especially network money would be considerably enhanced. In the event that electronic monies do start to gain a sizeable share of the payments system, their close substitutability with other payment instruments raises issues about the definition of monetary aggregates their stability and the ability for central banks to control money supply. Moreover, seignorage revenues accruing to central banks could fall. Another concern with electronic money is the possibility that they will be used for money laundering.

Table 5. Use of stored value cards in selected EU countries^a

	Stored value cards (thousands)			Average value per (re)loading (ECU) ^b			Average value per purchase (ECU) ^b		
	1995	1996	1997	1995	1996	1997	1995	1996	1997
Austria	17	3101	3400	..	45.8	49.9	..	15	13.2
Belgium	30	761	3430	33.3	33.7	32.1	4.9	4.1	3.9
Denmark	295	390	..	136.5	135.9	..	1.2	1.3	1.3
Finland ^c	846	1175	189	35	48.6	18.9	0.9	0.8	2.2
Germany	..	22000	35000	..	67.4	..	..	13.6	10.3
Italy	..	..	62	..	..	..	..	..	6.8
Portugal	161	299	384	14.1	15.3	16.1	1.9	1.9	1.9
Spain	..	1344	3502	0	15.2	16	..	5.8	3.1
United Kingdom	0	25	113	0	29.7	20.5	0	..	..
EU ^d	1349	29095	46080	20.2	24.1	25.2	1.6	1.9	4

a) “..” signifies not available.

b) The average ECU/US\$ exchange rates are: 1995=0.765; 1996=0.7878; 1997=0.8824.

c) Figures for 1997 include only the new multipurpose card product that has replaced the previous respective products.

d) For those countries shown, where data available.

Source: ECB (1999), *The effects of technology on the EU banking systems*.

40. SVCs are funds stored in electronic form and can be used to make payments at participating merchants and potentially to all other holders of such a card. Once the stored funds have been used, the card can be recharged. Network money refers to funds which are stored on electronic devices, such as a computer hard drive and transferred over communication networks such as the Internet.

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