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A Quantitative Assessment of Electronic Commerce

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A Quantitative Assessment of Electronic Commerce

by

Rosa Pérez-Esteve and Ludger Schuknecht*

Abstract

This paper tries to assess quantitatively the role of electronic commerce in economic activity and in trade and tariff revenue collection. The share of value added that potentially lends itself to electronic trade represents around 30 percent of GDP, most importantly distribution, finance and business services. Electronic commerce is also likely to boost trade in many services sectors significantly. Despite the growing importance of electronic commerce for economic activity and trade, tariff revenue loss from electronic commerce is likely to be minimal. Trade in potentially digitizable media goods (such as music, software or books) which currently faces a tariff in some countries represents less than one percent of total world trade. The revenue collected on these products amounts to less than one percent of total tariff revenue in most countries. Even if some of this trade moved “online”, tariff revenue loss would be only a very small share of tariff revenue.

Keywords: Electronic commerce, international trade, services trade, tariffs, tariff revenue, technological change

JEL Code: F1, O3

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Introduction

Electronic commerce is burgeoning as a means of doing business and shows every sign of continuing to expand at a rapid rate. The rise of this new medium is attracting increasing attention in policy circles. Nevertheless, a lack of adequate data on the magnitude and relevance of electronic supply has made policy-making decisions all the more difficult. This paper attempts to shed further light on e-commerce and its role in trade and economic activity more generally. Electronic commerce can be divided into three stages: first, the pre-purchase stage including advertising and information-seeking; second, the purchase stage, including purchase and payment; and third, the delivery stage. In principle, all types of products can be advertised and purchased over electronic networks. The potential for electronic delivery, however, is more limited. It requires that a final product can be presented as digitalized information and transmitted electronically, typically over the Internet. Many services can be supplied as digitalized information, including financial transactions or legal advice. Some information and entertainment products typically characterized as goods, such as books, software, music and videos embody digitized information that can also be supplied electronically over the Internet. Although all three aspects or stages of electronic commerce defined here may have certain trade policy implications, our focus is primarily upon the electronic supply of final products, or in other words, on the third stage.

The paper is divided into six sections. In the first section, we evaluate the potential importance of electronic commerce in economic activity. Secondly, current trade in digitizable media products and its evolution is analyzed. With these results, we estimate, in a third section, what the fiscal implications would be if all products susceptible to supply through electronic means which are currently supplied on physical carrier media and traded as goods –predominantly but not exclusively entertainment products such as videos and music products, as well as packaged software –were indeed traded electronically. The fourth section looks at the rôle of e-commerce in services trade. This is followed in the fifth section by an examination of the amount of trade that takes place in service sectors that may rely on e-commerce. The sixth section considers the growth prospects of e-commerce related services trade. This is followed by conclusions to the paper.

I. The importance of electronic commerce for economic activity

How significant might electronic commerce become in terms of overall economic activity, and which are the sectors in which the greatest impact is likely to be felt? We can assess the potential importance of Internet-based electronic commerce from different angles. We can analyse what share of value-added in an economy is likely to be directly or at least strongly affected by growing electronic commerce, and especially the Internet. A similar analysis is possible with respect to intermediate inputs and final demand. From this, we can obtain a crude picture of the overall effect of electronic commerce on the economy, and which sectors are going to be most strongly affected. It should be emphasized at the outset that an analysis of this nature rests on a number of assumptions and must be treated as partly speculative. The assumptions upon which the estimates reported below are based are summarized in the Methodological Annex.

Table 1 looks at the share in GDP of services sectors which are likely to be strongly affected by electronic commerce in a number of OECD countries. Communication services will probably be affected most strongly through the emergence of Internet telephony and other Internet services such as e-mail, video conferencing etc., as these complement or replace traditional mail or telecommunication services. Nevertheless, these services have a smaller impact on GDP than other services such as wholesale and retail trade and financial and business services, as we can see from Table 1. Wholesale and retail trade will be affected by both the Internet as a new medium of exchange and the use of the Internet to rationalize logistics and other overhead expenses in these sectors. E-commerce will impinge upon some of the functions of wholesalers and retailers by connecting producers and consumers directly. Thus, they are likely to adopt new distribution methods to avoid being bypassed as a result of the information technology revolution (for example providing web-portals and thus becoming "metamediaries"¹). Electronic commerce is also likely to transform the way many financial and business services are provided, including accounting, computing and advertising. On the other hand, some business services, such as doctors' visits, may not be much affected. Social and community services, including the provision of medical services and education will be affected to a degree, but probably not as much as a number of other sectors. Personal services such as household help, or government services such as primary education are unlikely to be

¹ For more information see: OECD (1999), "Wholesale trade in services", Working Paper TD/TC/WP(99)18; April, Paris.

much affected by electronic commerce whereas university education, tax collection etc. can move "online" to a greater degree.

Overall, Table 1 suggests that electronic commerce will affect a large share of economic activity. The share of value-added from the relevant service sectors amounts to 30 per cent of GDP on average, and exceeds a third of GDP in the United States, Spain and Australia. Distribution, finance and business services account for almost three quarters of this.

Another way of assessing the economic impact of electronic commerce is to look at countries' input-output tables. The input-output table for the United Kingdom, for example, indicates that 36 per cent of intermediate inputs come from sectors which are likely to be affected strongly by electronic commerce and the Internet (Appendix table 1). The share of intermediate inputs which might be provided electronically in the future is highest in service sectors, but is also above average in the pharmaceutical, telecom equipment and clothing industries. If we knew the sectoral production functions and the effect of electronic commerce on input prices, we could estimate the effects on sectoral and overall economic output and prices. In the absence of this, we can still hypothesize that electronic commerce and the Internet are likely to reduce prices and increase productivity in a number of services and even some manufacturing sectors. Since the share of inputs and output affected is large, we can also expect a strong positive overall effect on productivity and efficiency, as already hypothesized by other studies (for a survey, see Bacchetta, Low, Mattoo, Schuknecht, Wager and Wehrens, (1997)).

Finally, one can estimate the share of electronic commerce-related sectors in total final demand. Here, we approach the question of the economic importance of electronic commerce from the consumption side of GDP as opposed to the production side presented in Table 1. In the U.K., one quarter of final demand is in services sectors which are likely to be transformed by electronic commerce (see the last column of Appendix table 1). This number is almost identical to the percentage of value-added affected by electronic commerce as presented in Table 1. In other words, in the case of the U.K., estimations of the economic importance of electronic commerce yield very similar results from the consumption and production side.

II. Trade in digitizable media products

Considering that electronic commerce will play an important role in transforming large shares of the economy, it is worthwhile discussing how trade is likely to be affected by electronic commerce. Electronic commerce will probably have most impact on two types of products. First, a number of products which traditionally have been delivered as "goods" can now be sent across networks in digital form. Second, electronic commerce will strongly affect trade in services. The former category of products is basically software and media products, and includes film, various types of printed material, video games and various recorded information on carrier media such as tapes, CDs, CD-ROMs and diskettes (for a list including SITC and HS codes, see Appendix Table 2). Newer items entering trade on an increasingly systematic basis, such as software, have been progressively included in the categorization list under a number of previously existing codes, in particular under recorder media (SITC 898.6 and 898.7 or HS 8524).

Starting with the first group of products, which can be delivered in a physical carrier medium or sent across networks, Table 2 provides a product breakdown in 1990 and 1996. World trade in these products amounted to about US\$ 44 billion in 1996, or less than 1 per cent of total world trade. Printed matter and recorded tapes, CDs, packaged software, etc. account for 60 per cent of the total. While the overall numbers are relatively small, trade in several products has increased rapidly in recent years. Average annual trade growth for digitizable media products was about 10 per cent between 1990 and 1996, 1.5 times as fast as total world merchandise trade. Trade growth in recorded media such as CDs and packaged software was still higher, at an average annual growth rate of almost 17%.

Appendix Table 3 provides a country breakdown for imports of these products. The EU (including intra-EU trade) accounts for 45 per cent of world imports or about US\$ 20 billion. For most countries, imports of digitizable media products account less than 2 per cent of total trade.

From these figures, we can conclude that trade in digitizable media products is currently not very large. But this may change to some extent in the near future. Physical trade in such products will most probably continue to grow, at least until access to personal computers (PCs) increases further, internet access becomes more widely available and the band-width of phone lines expands, making the downloading of information faster. Indeed,

even though the number of internet users world-wide has grown dramatically in the past few years, access is still limited mostly to developed countries (roughly two-thirds of all users are currently from the United States and Canada²). In addition, it is expected that only 55 per cent of the existing installed base of PCs and numerical control software (NCs)³ will be connected to the Web by the year 2001. Nevertheless, increasing access to the internet is likely to result in a stagnation, and possibly an eventual decline, in physical trade in these products due to their substitution by trade in electronic form. Even though a complete shift to trade on-line of digitizable products is unlikely, the significantly lower prices offered through the Web should have a strong impact on the physical trade in these highly substitutable products.

Trade over networks reduces transportation and administration costs considerably, and many products including films and music, software and its upgrading are soon likely to be or are already downloadable over the Internet. Currently, retailing costs account for a large share of the price of such products when sold in a shop. Mail order (by Internet or catalogue) is also expensive – the transportation and administration costs of sending such products across borders are often higher than the value of the product.

In sum, above average growth rates of physical trade in these areas are likely to continue in the near future, even though eventually they will stagnate and even decline due to the increasing electronic trade of such products. If physical trade continues to grow at 10 per cent, it will reach US\$ 100 billion in 8 years. If the growth rate accelerates to 15 per cent, such trade will triple to US\$ 150 billion over the same period.

III. Implications of "duty-free cyberspace" for customs revenue

What are the fiscal implications if international trade in digitizable products currently classified as goods shifts to the Internet, and if no tariffs are levied on such products? We have estimated the tariff revenue countries collect from these products.⁴ Table 3 provides our

² U.S. Department of Commerce, *U.S. Industry and Trade Outlook 1999*.

³ "NC software enables manufacturers to quickly program, set up, and run the machine tools used in various cutting and fabricating operations. (...) The acceptance of concurrent engineering and flexible manufacturing practices is promoting greater use of NC software, as is the growth of Windows NT-based NC software and the less expensive computers on which they run. (...) The installed base of PCs and NCs is often used as an indicator for how big the Internet is or could get." (see *supra*).

⁴ The estimates are reasonably reliable for the most important categories where trade and tariff data were available for the most important countries. A few data problems persist as volume data for some products facing specific tariffs were not available, sometimes the tariff rate was not provided, and applied tariff rates for some of the smaller countries were not available.

best estimate of the weighted average tariff rates applied to digitizable products currently traded as goods, the import values for these products, and the estimated tariff revenue for various countries. The estimates take into account duty-free treatment of intra-EU, intra-NAFTA and Australia-New Zealand trade, and the reduced rates for intra-MERCOSUR trade. However, they are still likely to overestimate tariff revenue as they do not take into account other tariff reductions or exemptions.

Table 3 indicates that the average applied tariff is below 10 per cent in most countries. Of the countries included in the table, only Thailand, Morocco, Korea and India apply tariff rates above 20 per cent. Total estimated tariff revenue, therefore, adds up to only about US\$ 850 million for the world as a whole. The EU, China and Korea are estimated to collect half of the total. No other country collects more than US\$ 100 million, and many below US\$ 10 million.

Data reported in Table 4 puts these figures into perspective by comparing them with total tariff and total fiscal revenue in these countries. On average, tariff revenue on digitizable products amounts to less than 1 per cent of total tariff revenue and 0.03 per cent of total fiscal revenue. Only China and Hungary are estimated to collect more than 10 per cent of tariff revenue from these products, and not a single country collects more than 1 per cent of its total revenue from this source.

This is an important finding regarding the future customs tariff regime for electronically transmitted products (independent of any classification issues which will be discussed later). Some WTO Members have voiced concern about the customs revenue implications of tariff-free cyberspace. We can now conclude that even if all delivery of digitizable media products moved online – an unlikely prospect – the revenue loss would be minimal except for China and Hungary. India, for example, would lose 0.4 per cent of tariff revenue and 0.1 per cent of total revenue. For Chile, the respective figures would be 0.4 per cent and 0.04 per cent and for Morocco, 1.3 per cent and 0.2 per cent. Even if the trade share of such products doubled in the next few years, the revenue loss from "duty-free cyberspace" would be a very small share of total government revenue. We can therefore conclude that there is only a very limited scope for revenue loss arising from a shift towards electronic delivery of products containing digitizable information that previously were delivered via physical carrier media. This says nothing, however, about the revenue implications of "duty-free cyberspace" *per se*.

IV. Electronic services trade

Electronic delivery already plays an important economic and trade role in many services sectors. It has been crucial for the development of cross-border trade in services. Furthermore, where the supply of certain services across borders seemed unfeasible, such as in health related services, e-commerce has overturned this conception.⁵ E-commerce has led to the development of new forms of supply, such as Telehealth. Overall, the supply of services has been deeply modified by the information technology revolution. Legal advice is given by telephone, news services are transmitted by fax, payments are settled via electronic networks, not to mention that telephone, fax, etc. constitute communication services. Table 5 provides an overview of cross-border services trade which already largely takes place in electronic form. Communication services, computer and information services, and a number of financial services and insurance services, as well as other business services are frequently conducted over telecommunication networks. Cross-border trade in these sectors amounted to about US\$ 370 billion in 1995. This is equivalent to 30 per cent of world services trade, or 6 per cent of total world trade, and it is much more important than trade in the digitizable media products discussed above.

The most important services sector for cross-border trade is "other business services". with world-wide trade worth over US\$ 260 billion. This includes many services from accounting to engineering services, and it is unfortunate that a more detailed break-down is not available. However, services trade in communications, finance, etc. is not negligible either, at US\$ 100 billion. The most important traders are France, Germany, Italy, Japan, the U.K. and the United States amongst industrial countries. China, Korea, Singapore and a number of other developing and transition economies, however, also report significant figures for this type of services trade.

We can expect rapid growth in cross-border services trade as telecommunications costs continue to decline and Internet-based trade becomes more prominent. Electronic commerce over the Internet is much more versatile than the other electronic media, as it allows interactive communication with voice, data and image transmissions and much more. Internet data transmission is also much more efficient than via conventional telephone lines,

⁵ For more information, see: UNCTAD (1998), "International trade in health services: a development perspective", Ed. S. Zarrilli and C. Kinnon; Geneva.

which is likely to reduce transmission costs. This will boost trade in services already conducted over telecommunication networks and it will also facilitate trade in new services and in services which were only traded in physical form before, as has been previously mentioned. Stock trading, automatic downloading of databanks, university courses, and medical diagnosis of x-rays are just examples of what is already done or will soon probably be done on the Internet.

V. Trade-openness in electronic commerce-related services

Table 5 showed the importance of services trade which is already conducted largely in electronic form. However, trade in these sectors still lags considerably behind trade, for example, in manufacturing. The development of electronic commerce could change this picture as many services will become tradeable more easily. Table 6 reports that cross-border trade (exports and imports) as a share of sectoral value-added lies between a low of 2.7 per cent in personal, cultural and recreational services and a high of 26.5 per cent in other business services. Cross-border trade (exports plus imports) for all service sectors is close to one fifth of value added. This compares to over 50 per cent of GDP for total goods and services trade in the OECD countries represented in Table 6. Trade-openness in services is comparatively high in the small service-oriented economies such as the Czech Republic and the Netherlands.

Services trade, according to the WTO definition, also includes sales by companies' foreign affiliates. This is also sometimes referred to as establishment trade or "mode 3" trade under GATS. Affiliate trade data are very scarce and are often not directly comparable with balance-of-payments and national accounts data. The only country that provides relatively comprehensive data is the United States. Table 7 provides data on cross-border and affiliate trade for electronic-commerce-related services sectors. Affiliate exports (or sales by U.S. affiliates abroad to foreigners) of distribution, communication, financial, other business and recreational services mostly exceed the respective figures for cross-border sales to foreigners. The picture is less balanced for imports. Despite the considerable magnitudes of trade, the combined openness indicator for mode 1 and mode 3 trade in the United States ranges from 8.6 per cent to 21.6 per cent (Table 7). Combined trade under both these modes is still below the overall average U.S. trade-openness indicator of 22.7 per cent.

VI. Growth prospects in electronic commerce-related services trade

As previously noted, trade in digitizable media products has grown at a rate 1.5 times faster than total trade. Similar trends can be observed in relation to output and trade in electronic commerce-related service sectors. Output in communication services grew at two to six times the rate of overall economic output in Australia, France and the United States during the first half of the 1990s (OECD, 1997). Other relevant service sectors have also grown at above-average rates. Only financial and insurance services show below-average growth. This could be due to outsourcing (ATMs instead of clerks) or due to the use of deflators which do not fully take into account the price decline in many financial services in recent years. The well-documented rapid growth of international financial transactions in recent years was also due to the spread of electronic payments systems and other means of electronic commerce (Kono, Low, Luanga, Mattoo, Oshikawa, and Schuknecht, (1997)).

Table 6 provided sectoral openness indicators for a number of OECD countries in 1995. The relatively low indicators, however, mask the rapid trade growth which most countries experienced in the first half of the 1990s. Between 1992 and 1995, the openness indicator increased for all sectors, most strongly in insurance (from 11.6 to 14.4) and other business services (from 24.5 to 26.5) (see Annex Table 6).

Another way of assessing the growth dynamics of services trade is through foreign direct investment (FDI) flows. FDI reflects the establishment of a foreign commercial presence and leads to affiliate trade. European Union (EU) data on FDI flows in electronic commerce-related service sectors shows strong growth rates in recent years. Between 1992 and 1995, total FDI outflows from EU members almost doubled, from ECU 33 billion to 63 billion (Table 8). Total inflows to EU members increased by about 50 per cent, from ECU 29 billion to 42 billion. Total FDI flows can be sub-divided into intra-EU and extra-EU flows. Intra-EU FDI flows in electronic commerce-related service sectors increased by about 10 per cent per annum (from 25 to 36.3 billion and from 19.5 to 26.4 billion for outflows and inflows, respectively). FDI outflows to non-member countries increased by an average of 42 per cent per year. Inflows from non-members into the EU increased by 19 per cent per year over the same period.

These figures show that cross-border services trade and establishment trade through foreign affiliates have been growing rapidly in recent years. Trade in economic commerce-

relevant services is still less important than trade in most manufacturing sectors. But there is strong reason to expect much more trade integration in the services sectors in the coming years, attributable in no small measure to the development of electronic commerce. Services trade which can easily be conducted in electronic form and which does not face regulatory obstacles may reach similar proportions to trade in many manufacturing sectors.⁶

Summary and conclusions

E-commerce already plays an important part in economic activity and its relevance will continue to grow. According to our estimates, the share of value added that potentially lends itself to electronic trade represents around 30% of GDP in services sectors. Three quarters of this is attributed to distribution, finance and business services. Although electronic provision will primarily affect service sectors, it will also play an important role in certain manufacturing sectors such as the pharmaceutical, telecom and clothing industries. Most probably, e-commerce will entail productivity gains and price reductions in these sectors.

As far as the delivery of products is concerned, the impact of electronic commerce will fall mainly on trade in services rather than trade in goods. Trade of potentially digitizable media goods currently represents less than 1 per cent of total world trade. Of this, 60 per cent corresponds to printed matter, recorded tapes, CDs and packaged software. Nevertheless, trade in such products is growing rapidly, at 1.5 times the growth of world trade. In the short term, this trend is likely to continue until electronic trade in these products takes off. As access to Internet becomes more available world-wide and band-width of phone lines expand, the cheaper prices of these products offered through the Web will cause a substitution effect between the physical and electronic trade of digitizable media products. The extent of this will depend on their eventual degree of substitutability. In the long term, one might expect a stagnation, and even a decline, in the physical trade of these products.

What fiscal implications could we expect if trade of digitizable media products shifts into "duty-free cyberspace"? According to our estimations, tariff revenue currently collected from these products represents on average less than 1 per cent of total tariff revenue and a meager 0.03 per cent of total fiscal revenue. Only China and Hungary seem to collect more

⁶ There are likely to be exceptions. It is not easy to see that international trade in primary education services will ever be very high. A personal teacher-student relation in the same language is

than 10 per cent of their tariff revenue from this source. Moreover, these estimates are based on the implausible assumption that all trade in these products moved on-line. In other words, they are an upper bound estimation. It should be emphasized that while governments have little cause for concern about revenue losses arising from the substitution effect, this paper says nothing about the fiscal implications of "duty-free cyberspace" *per se*.

E-commerce will affect services trade more strongly than trade in goods. If we take the data available for cross-border supply of services, the mode of provision where electronic trade takes place, we observe that 30 per cent of world services trade currently takes place through this mode of supply. This represents 6 per cent of total world trade. However, trade in services is significantly less than trade in goods. Even if we include affiliate trade, that is, the production of foreign service suppliers in the territories of another Member, as we have done for the United States, trade openness in electronic commerce relevant sectors remains limited. This will gradually change with the adoption and development of e-commerce techniques by service suppliers world-wide.

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