

Taxing Electronic Commerce

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Abstract

Electronic commerce is expected to increase tremendously in the next years. As electronic commerce is an exchange of goods and services, it is also subject to value added taxation. Hence, the question of how a tax system should be designed to include these activities arises. We address this question by reviewing the two basic cross-border commodity taxation systems and the associated pros and cons in terms of efficiency and information requirements. A discussion of the application of these taxation principles to electronic commerce is presented in section 4 and 5. We conclude that the origin principle is likely to be the more appropriate tax system to deal with electronic commerce. Unfortunately, the political applicability of this tax system is limited as the question of tax revenue distribution among countries is still unsettled.

1 Introduction

The evolution of new information technologies in the last two decades has fundamentally changed the way society interacts. Computers can be found in many applications and the exchange of information via computer networks solves problems which were difficult or even impossible to solve without the use of modern information technology. Decentralized production as well as office systems, via electronic information exchange are good examples of how the organization of transactions changed due to the existence of computer networks. In general, companies use the information network for coordinating the production and distribution of goods and services more effectively. Another prominent example is the Internet. It enables the worldwide exchange of information at relatively low transaction costs. One of the most significant uses of the Internet is in the field of commerce. Many goods and services can already be bought on the Internet and are accessible worldwide by customers. Information

services produced in one country can now be exported to any country without incurring extensive transaction costs.

To some extent, this new form of commerce is different to traditional ways of commerce. Especially, there are some prerequisites which are crucial for the development of electronic commerce. Besides technological prerequisites, numerous commercial, as well as legal aspects, become important for electronic commerce. Examples include the provision and regulation of information infrastructure, the protection of intellectual property rights, and the taxation of this new type of commerce.¹ Therefore, public arrangements dealing with these issues have an important impact on the evolution of electronic marketplaces.

The taxation of electronic commerce has become a central legal issue. The European Union, as well as the United States, have agreed on not hindering the usage of electronic services and the corresponding infrastructure by imposing special taxes on electronic commerce transactions. Electronic commerce should be taxed in the same way as traditional commerce. However, this agreement implicitly assumes that electronic transactions can be taxed like any non-electronic transactions.

The question under consideration in this paper is whether electronic commerce can be taxed at all and if so, how the basic principles of commodity taxation can be applied to it. In short, the paper describes the implication of electronic commerce on the ability of the state to raise revenues. Therefore, the paper is organized as follows: in section 2 a brief overview on electronic commerce is given. Some technical and economic aspects of electronic commerce are presented.

Section 3 reviews normative principles of taxation commonly accepted in the theory of public finance. The application of these principles to the taxation on electronic commerce is analyzed in section 4. Finally, section 5 summarizes and draws some conclusions.

2 Electronic Commerce

As already mentioned, electronic commerce is experiencing a growing popularity among customers. A wide range of products can be bought over the Internet. The worldwide net of consumers has access to computer software, entertainment products, information services, professional consulting, financial services, business statistics and

¹ A more detailed list of commercial and legal aspects is given in OECD (1997a), Garcia, D.L. (1995), Spaanderman, J. and D. Ypsilanti (1997) and Mansell, R. (1996).

even medical diagnostics. The supply and demand of these services over the Internet increases rapidly as the Internet enables new types of commercial transactions and serves as a substitute for traditional types.

2.1 Types of Electronic Commerce

Commerce occurs in different ways as table 1 shows. Traditionally, the exchange of goods and services was organized in a non-electronic way. The purchase, the payment, as well as the delivery occurred on a face-to-face basis. Mail ordering enabled the customer to order products by mail or phone and to pay by either check or credit card. The delivery was done with the help of common carrier. The evolution of electronic commerce changed this dramatically. Basically, two types of electronic commerce can be distinguished. On the one hand, tangible products can be sold using the Internet. This is normally done by sending an order to the seller over the Internet or by browsing through a virtual catalogue and ordering products by clicking the catalogue. The products are delivered to the customer by using common carriers. Except for the way the order is placed, this kind of electronic commerce is similar to traditional types of commerce such as mail ordering. Therefore, this is also called electronic buying. However, when talking about electronic commerce, most people have a different kind of transaction in mind: the sale of intangible products. In this context intangible

Activity	Purchase	Payment	Delivery
Traditional Commerce:			
Tangibles	face-to-face	face-to-face	face-to-face
Services	face-to-face	face-to-face	face-to-face
Disintermediated Commerce:			
Mail order	mail/ phone	check/ credit card	common carrier
Electronic buying	on-line	on-line	common carrier
Electronic commerce	on-line	on-line	on-line

Source: McLure, Ch. E. Jr., (1997)

Table 1: Types of Commerce

products are digitized information transmitted over the Internet.² Examples of this type of product include computer software, electronic books, business statistics, and newspapers. As this type of electronic commerce differs more from the traditional exchange of goods and services, it is likely to be the more interesting type of commerce with respect to the way taxation occurs.

2.2 Economic Aspects of Electronic Commerce

Electronic commerce experienced a tremendous growth in the last years and is expected to continue to expand rapidly. The OECD (OECD, 1997c, p. 14) estimates an annual growth rate of over 200%. However, measuring the dynamics of electronic commerce is difficult for a number of reasons. First, a commonly accepted definition of electronic commerce has not been agreed upon yet.³ Second, even with a precise definition sales figures cannot be obtained as easily as in the case of traditional commerce. One reason is that separating electronic from traditional commerce is rather difficult especially in case of firms engaging in both kinds of commerce.⁴

Table 1 presents a list of total sales estimates given by the International Data Corporation, Forrester and Yankee. Differences in estimates can be attributed to the above mentioned measurement difficulties.

Institutions	1995	2000
International Data Corporation (IDC)	1,000	117,000
Forrester	518	6,579
Yankee	850	144,000

Source: OECD (1997c)

Table 2: Internet sales in Million of US\$

The table shows that electronic commerce will become more important in the future and therefore, potential problems for the state taxing such companies must be analyzed in detail before a serious fiscal problem arises. An economic explanation for the increasing use of electronic commerce can be given by assessing the resources necessary

² Intangible products are also called "content".

³ The definition of electronic commerce given in section 2 is widely accepted but not the standard. Organizations such as the European Commission and the OECD use different definitions, and consequently, the diversity of definitions leads to a huge variability of growth estimates.

⁴ For a more in depth analysis of measurement difficulties see OECD (1997c).

for the organization of the transaction. If the costs for negotiating, writing and enforcing a contract (transaction costs) are high, the transaction is likely to be organized within a hierarchy (e.g. a firm). Low transaction costs call for a market solution.⁵ Electronic commerce offers the possibility to conduct transactions with lower transaction costs since gathering information, finding market actors, placing orders, negotiating and executing transactions will become easier (Picot, A. et al, 1997). Information about market participants can be accessed more easily by browsing through the Internet. The placing of orders and the execution of the transaction can be organized directly. The evolution of electronic cash systems will contribute to a further reduction in transaction costs. Consequently, electronic commerce and, in general, information and communication technology favors markets as a coordinating mechanism. For transactions formerly carried out within a hierarchy, a market organization will become more attractive which will intensify the increasing use of electronic commerce.

2.3 Technical Aspects of Electronic Commerce

In this section, a brief overview is given on what the Internet is and how it works. This is only done as far as the explanation provides a better understanding of the implications of electronic commerce for taxation. The Internet is a worldwide net of computers which consist of a number of autonomous subnets. These nets, in turn, may contain further numerous autonomous nets. The subnets are connected to each other and, therefore, communication among them is possible. Three kinds of subnets can be characterized: the so-called intranet, networks run by scientific or educational institutions, and networks run by commercial providers. First, the intranet is a net used for intra-firm data communication. Different computers within an organization are connected to each other and communicate without using a public network. It is not necessary that all computers must be located at one geographical location. Computers at different locations, e.g. subsidiaries of a multinational firm, can form such a private network (intranet). Second, a variety of networks are used for scientific and educational serv-

⁵ The general framework for analyzing this issue is given by the New Institutional Economics (NIE) and especially by transaction cost theory. Besides transaction costs, the specificity of the transaction and the uncertainty of the environment determine the organization of the transaction. For simplicity, we only focus on transaction costs. For a detailed presentation of NIE and electronic markets see Malone, Th.W., J.A. Yates and R.I Benjamin (1987) and Picot, A., C. Bortenlänger and H. Röhl (1997).

ices. They are run by universities, science foundations, and other non-commercial institutions. The third kind of network is used for commercial purposes. Service providers rent networks and offer access to these nets to their customers.

Besides this view, the Internet can also be described as a collection of resources which can be used by those who have access to the physical net. These services can partly be used free of charge (e.g. e-mail, search engines). Other services provided over the Internet are priced such as electronic banking, the provision of business statistics, and electronic journals. The latter kind of services are of interest as these belong to electronic commerce. Due to the fact that the subnets are autonomous, some form of a common language is necessary for communication between them. The common standard for intersubnet communication is the communication protocol TCP/IP (Transmission Control Protocol/Internet Protocol) while a variety of other protocols are used in subnets. The TCP/IP is responsible for routing data through the net. In order to understand the routing process, some knowledge about routing technology is necessary. The Internet uses packet-switching technology. That means data streams are transmitted over the Internet by breaking them up into packets which are routed independently to its destination. The information necessary for routing is contained in the header of each packet so that at each router (nodes in the net) the packet can be sent to the next node according to the destination. At the final destination, the TCP/IP is responsible for reassembling the packets to the original data stream. Therefore, in contrast to a circuit switching technology, a connection between the origin and destination does not have to be set up before the data stream can be transmitted and closed after transmission.⁶

Up to now, data streams sent over the Internet are not encrypted. If a third party is able to reassemble the packages to its original data stream, information is accessible to outsiders and the integrity of the data is not assured. However, integrity and privacy protection are considered as essential ingredients to any commerce system (Peña, J.M and R.P. Strauss, 1997). Therefore, it is likely that the encryption of data streams will become the standard.

⁶ For further explanations of technical aspects see Halsall, W. (1996) and MacKie-Mason, Th.W. and H. Varian (1994).

3 Principles of Taxation

It is widely agreed upon in public finance that a tax system should be designed according to the following principles⁷:

- **Administrative simplicity:** The tax system should be easy to administer. It should be easy for tax authorities to determine and collect the tax in order to reach high net revenues.
- **Low compliance cost:** The private sector should not be burdened with too many obligations by the collection and clearance of the tax in order to minimize tax avoidance.
- **Economic efficiency:** The tax system should finance the budget with a minimum of economic distortions. This principle is explained in more detail in section 3.1.
- **Equity:** In general, society's notion of equity should be reflected by the tax system. This principle is operationalized by the concept of vertical and horizontal equity. Horizontal equity requires that similar transactions are taxed similarly. A violation of this principle would be, for example, a consumption tax regime which treats consumers with identical consumption differently. While horizontal equity refers to the taxation of similar transactions vertical equity means that different transactions should be taxed differently. One application of this concept is the income tax system of almost all countries as households with a higher ability to pay are taxed higher.

In practice, it is difficult to pursue all principles simultaneously as a variety of trade-offs exists among them. Equity versus efficiency is the most discussed trade-off in the literature of public finance but is only of minor interest in this context. Here, the relevant trade-off exists among efficiency and low compliance cost. This trade-off can best be explained if the process of taxation is understood as a state action which takes place in an asymmetric information environment.

In general, the state has little information concerning the characteristics and behavior of the tax payer making it difficult to define and control a tax base. The state tries to overcome the information asymmetry by increasing the requirements for reporting the tax base which, in turn, leads to higher compliance cost. The principle of economic

⁷ For a discussion of these principles see any introductory book in public finance, i.e. Rosen, H.S. (1998).

efficiency is subject to many approaches of designing a tax system. The basic results of the efficient taxation approach are summarized in the next two sections.

3.1 Commodity Taxation and Economic Efficiency - General Results

Taxation is not only a pure transfer of resources from the private sector to the state, but it also affects the behavior of the tax payer. In general, a change in behavior due to taxation can be distinguished in an income and a substitution effect. The former describes changes in behavior due to a decrease in income whereas the latter refers to changes in behavior resulting from a substitution of a higher taxed good for a lower taxed good. The substitution effect is the source of distortions arising from the tax system as it alters the relative attractiveness of consumption and production activities that would otherwise prevail without taxation. Therefore, the efficient taxation (ET) approach seeks to minimize these distortions for raising a given amount of tax revenues.

A tax system with no distortions arises if all goods are taxed at the same rate (first-best tax system). As the relative attractiveness of consumption is unchanged, taxation does not lead to substitution effects. Distortions are minimized to zero. Unfortunately, not all goods can be taxed in practice (e.g. leisure). Under this restriction on tax instruments, it is no longer optimal to levy a uniform tax rate on all goods. Non-uniform taxation leads to lower distortions (second-best tax system). The ET theory suggests a tax system which taxes goods with low substitution possibilities at a higher rate than goods with high substitution possibilities. This rule of thumb ensures a relatively low overall substitution effect and distortion. For the special case of perfect substitutes, the ET approach recommends taxing both types of goods in the same manner. Otherwise a perfect shift from the more taxed to the less taxed good would arise resulting in higher welfare losses compared to the taxation of imperfect substitutes. The tax would be used in a discriminating manner which is not the intention of a tax with a pure financial character.

3.2 Efficient Commodity Taxation of Cross Border Transactions

So far, we have analyzed how commodity taxation system should be designed in order to achieve economic efficiency by implicitly assuming that only one national tax system exists. A problem arising in international trade, is to decide whose country's tax

system to apply. In this section, different value added tax (VAT) policy options are presented which can be applied to the taxation of cross-border commodity transactions.⁸ The question of which tax regime to apply is again a question of economic efficiency. In this context economic efficiency is defined as trade and location neutrality. This means that the tax system should not give incentive to exporters and importers to change their trade and location decisions for tax avoidance reasons. But before the efficiency implications are analyzed in detail, the two basic VAT-systems are introduced.

3.2.1 The Destination and Origin Principle

In the literature, two basic international commodity taxation principles can be distinguished, the destination principle and the origin principle (Frenkel, J., A. Razin and E. Sadka, 1991). Under the destination principle commodities are tax exempted in the exporting country and are taxed according to the VAT-system in the importing country. Therefore, this principle ensures that all commodities are taxed similarly in the country in which they are consumed. Therefore, border tax adjustments are necessary. Commodities crossing the border are tax exempted in the country of origin and are taxed at the VAT-rate of the country of destination. This requires fiscal frontiers for detecting which commodities are exported and not subject to domestic taxation. The same system is necessary to identify imports for taxation. Traditionally, border controls serve as fiscal frontiers. However, border tax adjustments do not necessarily require physical borders. Even with an abolition of border controls, the information can be provided by the first production or distribution stage in the country of destination or the last production or distribution stage in the country of origin. Accounting books of a company can be used by fiscal authorities in order to access the information necessary for implementing the tax system. Consequently, this system may even be implemented in an economic union with different VAT-systems but no border controls.

Under the origin principle commodities are taxed in the exporting country and are tax exempt in the importing country. In contrast to the destination principle, commodities are taxed in the country of production regardless of where they are consumed. Therefore, border tax adjustments are not necessary for this commodity taxation system.

⁸ Here, we concentrate on the technique of value added taxation as this is the most applied technique of taxing consumption.

One feature common to both systems is the identification of a physical location of exporters and importers. If, for a given cross-border transaction, the origin country is not known the origin principle cannot be applied. The same holds true for the destination principle. The lack of being able to identify a destination country makes it impossible to implement the destination principle.

As mentioned above, an optimal commodity tax system of cross border transactions should not affect the trade and location decision of firms and households. Private decisions should be driven by commercial and not by tax avoidance reasons. Though the design of a tax system follows the neutrality principle, it is not always possible to eliminate all distortions arising in the context of taxation. A tax regime eliminates some distortions but creates new ones which are not present in other tax regimes. Therefore, the designing of a tax system means facing a trade-off of distortions and finding an optimal tax system with a minimum of distortions. In the next section, a variety of distortions are listed which arise within the two basic commodity tax systems presented above and must be taken into account when deciding between them.

3.2.2 Distortionary Effects of the Destination and Origin Principle

In this section, we analyze whether the two VAT systems have any of the following distortionary effects:

- distortion of trade flows,
- distortion of location decision, and
- transfer pricing.

A VAT system is trade distorting if exporters or importers have an incentive to deviate from their pre-tax trade decision. To be more precise, consider a simple trade model. Imagine that a homogenous good can be bought in a foreign country as well as in the domestic country. The price of the foreign good in the domestic currency is P_F and of the domestic good P_D . The corresponding VAT-rates are τ_F and τ_D . If tax rates are zero, a consumer will buy the foreign good as long as P_F is lower than P_D and vice versa. The introduction of an origin-based VAT may change the consumer's decision. The after tax prices of the goods are now $P_F (1 + \tau_F)$ and $P_D (1 + \tau_D)$. For $\tau_F > \tau_D$, it becomes possible that the after tax price of the foreign good exceeds the after tax price of the domestic good although P_F is lower than P_D .

Therefore, under the origin principle a distortion of trade flows may arise. The destination principle does not have these undesirable effects. The after tax prices under the destination principles are $P_F (1 + \tau_D)$ and $P_D (1 + \tau_D)$. If P_F is lower than P_D , then this also holds for the after tax price and vice versa. Distorting trade effects do not arise under this principle.

So far, the analysis is only done for absolute prices. After all, resource allocation depends on relative rather than absolute prices. Therefore, the results derived above are even more general. The relative after tax commodity price $[P_F (1 + \tau_D)]/[P_D (1 + \tau_D)]$ under the destination principle and $[P_F (1 + \tau_F)]/[P_D (1 + \tau_D)]$ under the origin principle reveal that relative prices are unaffected under the destination principle in contrast to the origin principle. Consequently, trade flows are even more distorted under the origin principle as indicated only by absolute prices.⁹

An additional distortion has to be taken into account if firms and households are mobile. If the origin principle applies, firms have an incentive to relocate the firm in a country with low VAT rates. This lowers the after tax price for the consumer and increases the competitiveness of the firm. Under the destination principle, firms do not have this incentive as the VAT rate is determined by the place of consumption and not of production. Though a destination based VAT system is neutral with respect to the firm's location decision, it gives rise to the relocation of households or at least to buying goods and services in countries with lower VAT rates. While the former is one of many incentives for households to relocate, but definitely not the dominant reason, the latter is more relevant for the design of a commodity taxation system. Direct consumer purchases (cross-border shopping) are a common practice especially in regions close to countries with lower VAT rates. It becomes more attractive with the abolition of border controls. With direct consumer purchases, the destination principle becomes partially ineffective and elements of the origin principle apply.

Transfer pricing is another source of distortion which arises with the existence of multinational firms (MNF). Through strategic transfer pricing, MNF can transfer value added to countries with low VAT rates and thereby, reduce the VAT liability. To ana-

⁹ In this section, we abstract from flexible exchange rate accommodate price level changes which lead to the equivalence of a destination- and origin-based VAT system in a free trade environment. This is done for three reasons: first, we want to keep the analysis as simple as possible, second, within the EC a flexible exchange rate system does not exist, and third, the equivalence result rests on the flexibility of prices (e.g. wages) which does not hold true in the short run. For an in depth analysis of this issue see Genser B., A. Haufler, and P.B. Sørensen (1995) as well as Lockwood, B., D. de Meza and G.D. Myles (1995).

lyze the incentive of transfer pricing, consider a MNF with the parent company in the domestic country and a subsidiary in a foreign country. The subsidiary produces solely an intermediate good I which is exported to the parent company at price P_I . The parent company uses the good I as an input to produce the final good X and sells X at a price P_X in the domestic market. The VAT rate in the domestic country is τ_D and τ_F in the foreign country. If the destination principle applies, the total tax liability T of the MNF amounts to $T = \tau_D (P_X X - P_I I) + \tau_D P_I I$ which simplifies to $T = \tau_D P_X X$. By changing the transfer price P_I , the MNF cannot change the tax liability T and, therefore, cannot use P_I for tax avoidance reasons. Under an origin-based VAT system, the tax liability T is given by $T = \tau_D (P_X X - P_I I) + \tau_F P_I I$ which equals $T = \tau_D P_X X + (\tau_F - \tau_D) P_I I$.

In this case, the tax differential $\tau_F - \tau_D$ plays a crucial role. The transfer price P_I influences the total tax liability and can be strategically set in order to reduce T . If τ_D is lower than τ_F , T can be minimized by transferring value added to the domestic country. To achieve this, the transfer price is set at a low level. The reverse holds true for a domestic VAT rate τ_D exceeding the foreign VAT rate τ_F . A high transfer price of P_I shifts the tax base to the foreign country.¹⁰

4 Application

In this section, a synthesis of section 2 and 3 is given. It analyzes how a commodity tax system for electronic commerce can be designed on the basis of the above presented taxation principles.

The fundamental questions for taxing electronic commerce can be characterized as:

- In which way do distortionary effects of commodity taxation regimes differ when applied to electronic commerce from those arising in taxing traditional commerce?
- Which additional problems exist in defining and identifying a tax base in the case of electronic commerce?

¹⁰ Different VAT systems are not the only incentive for transfer pricing. The capital income system, as well as the market form in different countries, provide an incentive to transfer the tax base to the most preferable country; see on this Genser, B. and G.G. Schulze (1997) and Schjelderup, G. and L. Sjørgand (1997).

The two questions are addressed separately. Therefore, first, distortions arising from taxing electronic commerce are presented while abstracting from identification and control problems. To be more precise, it is assumed for simplicity that the physical location of sellers, buyers, servers and hosts, as well as the value of each transaction, is known to all parties interested in the information. In the second part of this section, problems in detecting electronic transactions for third parties (e.g. the state) and to identify the individuals involved in the transactions are analyzed. In particular, possibilities in detecting the origin and destination of data streams from the perspective of the seller and buyer of intangible goods are of interest here.

4.1 Distortionary Effects of Taxing Electronic Commerce

The basic information necessary for the application of any commodity system is the destination and origin of goods and services. This becomes even more important for cross-border transactions as this information is the deciding factor in which commodity taxation regime is relevant for the transaction. The location of the importer and exporter are usually taken as the destination and origin. But in the case of electronic commerce this question cannot be answered clearly.

If the origin principle applies, two definitions of destination are possible: the location of the server on which the web-site of the seller can be found and the location of the seller. The former is extremely vulnerable to distortions. In this case, the seller can relocate the website on a server in a low-VAT country. The transactions costs for this substitution effect are relatively low compared to VAT-differentials between countries. For illustration, even within the European Union, tax differentials amounted to 10% in 1997.¹¹ Taking countries outside the European Union into account, the tax differential will be even larger. This substitution possibility is likely to be used heavily as it enables the supplier to offer their products at a lower after tax price or to realize higher profits.

If the origin of an intangible is determined by the location of the seller, basically, the same kind of distortions arises as in the case of traditional commerce. The seller has an incentive to relocate the firm leading to a reduction of the VAT liability. It should be noted that the relocation of firms for tax avoidance reasons is only one determinant of a firm's location decision. But the relocation of a firm offering intangibles (e.g. a soft-

¹¹ In 1997, the VAT rate (regular rate) in Germany was 15% and in Sweden 25%; Bundesministerium der Finanzen (Federal Ministry of Finance) (1997).

ware firm moving from France to Germany) can be organized with lower transaction costs as the relocation of a firm with production facilities offering tangibles. Another kind of distortion arises within MNF. As mentioned above, transfer pricing is one strategy of MNF to reduce the tax liability. Taxing electronic commerce according to the origin principle may lead to a transfer of value added to a low VAT country. Tax authorities try to limit transfer pricing by determining the "correct" value of the transaction within MNF by finding equivalent transactions carried out between independent firms (OECD, 1997b). In general, this strategy is also available to MNF offering tangibles. However, in the case of exchanging intangibles, it will become increasingly difficult for tax authorities to identify equivalent transactions and therefore, to limit the scope of transfer pricing. In addition, it will become more attractive to offer intangibles only from subsidiaries in low VAT countries. From the perspective of the seller, intangibles have the advantage that consumers do not care so much about the place in the world from where they receive, for instance, the software package as transportation costs do not exist. Therefore, a relocation of the supply on intangibles from one subsidiary to another subsidiary will not have an effect on demand but enables the supplier to offer them at a lower price.

Under the destination principle, two definitions of destination can again be distinguished. The location of the host and of the customer can be used as the destination of an intangible. If the former applies, consumers will choose a provider with a host in a low tax country. As providers will anticipate this reaction, they will remove their hosts to low VAT countries. Therefore, this definition of destination cannot be regarded as a workable solution as it creates massive distortions. Even if one considers the case that providers would not react in the above mentioned way, customers could avoid high VAT by obtaining access to the Internet while staying in a foreign country with a more favorable VAT rate for the customers. This is simply a type of cross-border shopping arising with intangibles. The location of the customer defined as the destination creates fewer problems. In this case, distortions can only occur if the customer changes locations to a low VAT country. As already mentioned in section 3.2, it is not very likely that this is the dominant reason for a household's location decision.

Consequently, compared with taxing tangibles under the destination principle, intangibles will not create new distortions. From the perspective of a tax designer pursuing economic efficiency, the destination principle in combination with the definition of destination as the location of the customer would be the most preferred tax system for

electronic commerce. This tax regime would also pass the test of administrative simplicity and low compliance costs but only because of the assumptions concerning the availability of all tax relevant information mentioned above.

The interesting question now is how the evaluation of the different tax systems changes if the information requirements of each system are taken into account. This may affect the administrative simplicity and compliance costs of the different tax regimes, possibly leading to trade-offs between these principles and economic efficiency.

4.2 Identification and Control Problems in Taxing Electronic Commerce

Taxing cross-border activities requires information concerning the import and export of goods and services. Traditionally, border controls provided the necessary information and enabled the state to implement an origin or destination-based tax system. With the removal of border controls in some countries fiscal frontiers replaced them and provided the necessary information.

Applied to intangibles even with border controls, international transactions are difficult to identify. The reason is twofold. First, data streams are sent over the Internet using packet-switching technology. The only way to get information about imports and exports is to reassemble the packages to the original data stream which is almost impossible for the millions of packages sent per hour. Second, even if it is possible to reassemble the original data stream the state does not have any information about the value of the transaction which is the basis of a commodity taxation system. Data streams containing the intangible are normally separated from data streams for the underlying payment of the intangible. The two reasons represent an even higher barrier for the state to collect taxes if data is encrypted. Encryption is made to protect the integrity of the data and the individual privacy. A state which is able to reassemble packages cannot use the data unless it has access to the appropriate keys in order to decrypt it. But this would counteract the intention of encryption: the protection of integrity and privacy. Therefore, it seems to be unlikely that this instrument will be made available to the state. Consequently, border controls cannot be used to detect imports and exports of intangibles. The question arising now is whether fiscal frontiers provide the necessary information to implement a cross-border commodity taxation regime.

Under the destination principle, the location of the consumer determines the relevant tax system. Since the whole range of information necessary for taxation cannot be obtained during the flow of data, the origin or destination of an intangible is the only thing left to identify the whole transaction. If the consumer would report all electronic commerce activities to the domestic fiscal authorities, a destination-based tax system could be implemented. However, this would require the consumer to pay taxes voluntarily as the state faces difficulties to draw samples for tax auditing purposes and therefore, to credibly threaten consumers with fines in the case of tax evasion. On the other hand, the supplier of intangibles could be obliged to report the destination to the state. Hellerstein (1997) proposes to impose the obligation on the supplier to make reasonable efforts in determining the customer's address and to report them to the state. For the case of intangibles which depend on personal information of the customer (e.g. medical diagnostics) it seems likely that the supplier will have access to the address. But many intangibles are exchanged without any need for knowing who receives the intangibles (e.g. business statistics, electronic books). The seller will face difficulties determining the destination and will bear compliance costs if he is obliged to do so.¹² Compliance costs are even higher, as under this tax system, the supplier must have information about the relevant VAT rate in each country and must remit the tax to the customer's state. Thereby, it should be kept in mind that excessive compliance costs provide an incentive to the supplier for tax evasion.

Under the origin system, the customer may have difficulties to determine the origin of the supplier. Perhaps, he is able to determine the location of the server. But this must not coincide with the location of the firm. If origin is defined as the location of the server, the seller may have access to this information. It induces much more compliance costs identifying the location of the firm. Additionally, the customer would have to report the origin of the intangibles purchased to the state which again requires the customer to pay taxes voluntarily. The supplier, as the source of information, seems to be the more workable approach. All commercial activities are recorded by the supplier and can be used for taxation as the listing of sales is sufficient for implementing an origin-based VAT system. In general, the system is vulnerable to tax evasion by not

¹² Hellerstein, W. (1997) proposes a tax system primarily based on the destination principle. Under the proposed tax system, the vendor is obliged to make "reasonable and good faith efforts to determine the purchaser's billing address" (Hellerstein, W., 1997, p. 597). However, the problem for administering this tax system is giving a precise definition of "reasonable and good faith efforts". Consequently, even if a clear cut definition is found both tax principles are applied depending on the effort level of the vendor.

listing all electronic commerce activities. But this is also possible for tangibles and is not a characteristic of intangibles.

Problems also arise in MNF in detecting intrafirm exchange besides the already mentioned difficulty in finding equivalent transactions for limiting transfer pricing (Owens, J., (1997)). Private intranets are widespread in MNF making it more difficult or impossible to distinguish intangibles produced in a firm from those received from other related firms. Due to the information asymmetry, value added can now be transferred more easily to low VAT countries. Taking informational requirements of an origin and destination based taxation system into account, the origin principle seems to be the more appropriate system. It will lead to lower compliance costs and higher administrative simplicity.

5 Further Implications

In the last section, problems in taxing electronic commerce were presented. The analysis reveals a trade-off between economic efficiency, on the one hand, and administrative simplicity and low compliance costs, on the other. So far, the analysis only refers to intangibles. However, if an appropriate tax system to tax intangibles exchanged electronically is found, the impact on tangibles must also be considered. Depending on the economic relationship between intangibles and tangibles, two polar cases can be distinguished: the case of complements and substitutes. For illustration, an electronic book may serve as a substitute for printed books, whereas electronic books and hardware are complements.

The theory of efficient taxation (ET) presented in section 2 provides insight into how the relationship between electronic intangibles and tangibles should be reflected in the tax system. In the case of substitutes, a different tax treatment of both goods (e.g. electronically exchanged intangibles are taxed lower than tangibles) changes the relative price of the goods leading to a substitution of tangibles for intangibles. The distortionary character of different tax treatment results in a loss of welfare. In the case of perfect substitutes, different taxation of both goods leads to a perfect shift from tangibles to intangibles. The distortionary character of the tax system increases. Therefore, the theory of efficient taxation recommends an equal tax on both goods. An unequal tax treatment would also violate the taxation principle of horizontal equity as consumption activities satisfying the same needs are taxed differently. How likely is it that both types of goods are taxed in the same manner? If, for instance, electronic com-

merce is taxed according to the origin principle (due to information requirements as presented in the last section) and tangibles on a destination basis (the dominant taxation principle in the European Union), it is likely that both types of goods are taxed differently. Distortions created by the unequal tax treatment must be balanced against a reduction of distortions due to the application of the origin- rather than the destination principle. In contrast, if the destination principle (destination defined as the location of the consumer) is applied, electronically exchanged intangibles and tangibles are taxed at the same rate. However, the destination principle can only be implemented if the above mentioned information requirements are fulfilled.

In the case of complementary goods, the demand of these goods is not influenced by relative prices. Consequently, a change in relative prices does not lead to a substitution effect and hence, welfare losses. The only effect left is the income effect which is not welfare reducing from the perspective of the economy as a whole.

Another policy option discussed in the literature is the Bit-tax (Beck, H. and A. Prinz, 1997). Under this tax regime, the amount of data transferred is subject to taxation. However, this policy option is not a substitute for a cross-border taxation system as data transfer itself is not an indicator for an electronic exchange of goods and services. The Bit-tax also taxes transactions with no underlying commercial aspect (e.g. e-mail). Additionally, this tax instrument gives rise to tax avoidance strategies as the volume of data transfer can easily be changed without changing the information transmitted.

6 Conclusion

In this article, the implications of electronic commerce for commodity taxation have been analyzed. This has been done on the basis of taxation principles, which should guide any tax system: economic efficiency, low compliance costs, administrative simplicity, and equity. These principles have been applied to design a tax system for cross-border electronic commerce transactions.

The tax system designer faces two fundamental problems: identification of distortions and how the information requirements of different commodity taxation regimes are fulfilled. While abstracting from the latter problem, the following conclusions can be drawn. An origin-based VAT system for taxing electronic commerce causes massive distortions no matter how the origin is defined (as the location of the seller's firm or the server). A destination-based VAT system has the advantage of creating low distortions if destination is defined as the location of the customer. Additionally, this tax

regime generally ensures an equal taxation of electronic commerce and tangibles. Ignoring the former problem and taking only information requirements into account, the result changes. The origin system is now superior to the destination system.

In sum, the analysis reveals a trade-off between economic efficiency, on the one hand, and low compliance costs and administrative simplicity, on the other. The destination principle causes less distortions but high compliance and administrative cost whereas the origin principle must be favored on the basis of the availability of information necessary for implementation, but creates high distortions. Therefore, in the face of information requirements the origin principle can only be implemented.

In general, policy proposals must be simple and perceived as fair from the viewpoint of public decision makers. A policy reform increasing economic efficiency is not taken into consideration as a reform option if the resulting consequences, other than efficiency, are regarded as not acceptable. A potential barrier for the implementation of the origin principle arises from the issue of tax revenue distribution among countries. Normally, under an origin-based commodity tax system, tax revenues accrue to the country of origin. This could become a serious issue in the political debate. As firms have an incentive to relocate the server or the firm, a concentration of commodity tax revenues in a few countries is not unlikely. In order to gain broad political acceptance of the origin principle, the "one-country" distribution rule must be replaced by other rules favoring a more equal distribution of tax revenues. Unfortunately, such a rule has not been negotiated yet.

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