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ELECTRONIC COMMERCE, INTERNATIONAL TAXATION, AND TAX ADMINISTRATION

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Abstract

This paper discusses international taxation issues related to electronic commerce, paying special attention to administrative aspects. After explaining some merits of source-based taxation from the viewpoint of enforcement, the paper suggests that electronic commerce makes not only source-based taxation but also income taxation in general difficult to implement. The VAT system is also faced with serious challenges. In order to cope with difficult problems in international taxation, it is essential for tax authorities to strengthen international cooperation in tax administration.

Key words: International taxation; Tax enforcement; Electronic commerce
JEL classification: H25; H26; H87; K34

I. *Introduction*

This paper is to discuss some of the taxation issues that are or can be caused by the development of electronic commerce (e-commerce) from an economic point of view. It is widely recognized that the main taxation issues on e-commerce are related to international taxation and/or tax administration. For example, see the OECD report on e-commerce and taxation [OECD (1998a)]. International taxation and tax administration are both essential, reflecting the global and technological nature of electronic commerce, and they are closely related to each other. Although much literature analyzes international issues concerning e-commerce taxation from legal points of view, economic literature on these issues is still scarce. Also, there is not much literature that analyzes administrative aspects of e-commerce taxation.

In this paper, we try to tackle some aspects of e-commerce taxation issues in the international context, paying due attention to tax administration (or enforcement) problems. In order to consider explicitly taxpayers' compliance behavior within an international setting, we use a very simple model, in which multinational firms with monopolistic power just minimize their tax burden. These multinationals are also assumed to produce software in order

to consider typical issues of e-commerce, especially issues related to "digitized products."

In Section II, a simple model is explained, and in Section III, international taxation issues, including a comparison between residence-based and source-based income taxation, are discussed without explicit references to e-commerce. In Section IV, some problems related to the difficulty in implementing income taxation on e-commerce activities are considered. Section V examines whether VAT (value added tax), can be implemented smoothly in the e-commerce environment. Section VI concludes the paper.

II. *Model*

Let us assume that a multinational firm, which is a resident of Country A, produces software and sells it in both Country A and Country B. To make the model as simple as possible, it is assumed that the demand function for the software in Country A is identical to that in Country B. The world consists of only two countries, although we introduce the third country, a tax haven, later. The multinational firm is based in Country A and all the shares of the firm belong to those people living in Country A, but the firm has a branch in country B. For convenience, this firm is named as Firm 1.

The cost for Firm 1 to produce the software is simply the fixed cost expended on developing the software, and once it is developed, the marginal cost to produce another unit of the software is negligible. Firm 1 is a monopolist and meets all the demand in both Country A and B, although Firm 1 is under some pressure of competition from a potential new entry. In order to prevent a new entrant producing software that is a good substitute of Firm 1's software, Firm 1 cannot raise the price above a certain level. Firm 1 sells the fixed amount of software both in Country A and B at that price level.[1] Thus,

$$\text{Profit} = \text{Revenue(fixed)} - \text{Cost(fixed)} - \text{Tax Burden}.$$

Note that Firm 1's profit is maximized when its tax burden is minimized.

The tax authorities of Country A (B) can observe the price of the software and the sales volume of the parent company (the branch) in Country A (B), but have no information on Firm 1's cost. The true cost is C1 and, if correctly calculated, half of the cost is attributable to activities in Country A, and the other half, to Country B. For simplicity, the true income of Firm 1 is normalized to be 1 in Country A and also 1 in Country B, that is,

$$\text{Revenue in Country i} - C^1/2 = 1 \qquad (i = A \text{ or } B).$$

Firm 1's reported income to the tax authorities of Country A is X_A, and to Country B, X_B. Then, X_i (i=A or B) also indicates the ratio of the reported income to the true income, reflecting the compliance level of Firm 1. The tax authorities of Country A and B decide whether or not to audit Firm 1 after observing the reported income.

Firm 1 believes that the probability of the audit is higher when the reported income is lower. Let P_i be the subjective probability of being audited by the tax authorities of Country i (i=A or B). Thus,

$$P_i = P_i(X_i, \theta_i), \quad (P_{iX_i} < 0) \qquad (i = A \text{ or } B). \qquad (1)$$

[1] This price level is assumed to be lower than the price at which the monopolist maximizes its profit.

θ_i is a parameter that indicates the degree of strictness in enforcement and P_i is assumed to be increasing in θ_i. Let $E(T_1)$ be the expected tax burden of Firm 1. Then,

$$E(T_1)=\Sigma(1-P_i)t_iX_i+P_i(t_i X_i+s_i(1-X_i)), \qquad (i=A, B) \qquad (2)$$

where t_i is the tax rate applied to the reported income and s_i is the penalty rate applied to the difference between the true and the reported income when audited by the tax authorities of Country i(i=A, B). It is assumed that $s_i>t_i$.

Firm 1 chooses X_A and X_B so that $E(T_1)$ is minimized. If we assume that the interior solution exists, the solution should satisfy

$$t_i+P_i'(1-X_i)s_i-P_is_i=0. \qquad (i=A, B) \qquad (3)$$

Note that X_A and X_B are independent and that Firm 1 chooses the level of income reported to Country A and B separately. Totally differentiating (3), we can easily confirm that X_i is increasing in θ_i if P_i" is non-negative and Pi' is independent from θ_i. We should note that an interior solution does not necessarily emerge and we assume that Firm 1's reported income is zero if the probability of audit is always zero, that is,

$$X_i=0 \text{ if } P_i=0. \qquad (i=A, B) \qquad (4)$$

As a numerical example, if the probability of audit is a linear function of the reported income, we can actually calculate X_i. If

$$P_i=P_{iMAX}-k_iX_i, \qquad (5)$$

then,

$$X_i=1/2+(P_{iMAX}-t_i/s_i)/k_i. \qquad (6)$$

P_{iMAX} is a probability of being audited if Firm 1's reported income is zero. (We do not consider the case in which the firm reports negative income, a loss.) From (6), we can see that the compliance level depends on the ratio of the tax rate to the penalty rate and other enforcement parameters (P_{iMAX} and k_i).

It is not difficult to introduce reputation effects, which might be important for multinational firms in the real world. Let us assume that Firm 1's reputation is affected by r1 if the tax authorities audit the firm. It is possible to argue that a part of r_1 reflects the administrative cost that the firm has to bear when tax inspectors visit the firm. Thus, from (2),

$$E(T_{1r})=\Sigma(1-P_i)t_i X_i+P_i(t_i X_i+s_i(1-X_i))+r_1P_i \qquad (i=A, B). \qquad (7)$$

T_{1r} indicates the tax burden plus the reputation cost for Firm 1. If we assume the linear audit probability function of (5), we can calculate X_i that minimizes (7).

$$X_i=1/2+(P_{iMAX}-t_i/s_i)/k_i+r_1/2s_i. \qquad (8)$$

Naturally, Firm 1 reports correctly ($X_i=1$) if the reputation effect (r_1) is large enough.

The model explained above is just a special case of a traditional income tax evasion model developed since Allingham and Sandmo(1972). Also, the income tax in the model is treated as a lump-sum tax and the price of the product (software) is determined exogenously. We made these assumptions in order to examine explicitly compliance issues in the international context. In the next section, we use the above model to discuss some issues on international taxation.

III. *International Taxation Issues*

Tax administration issues actually play an important role in international taxation, but they are not always treated explicitly in economic literature. In this section, we apply the simple model explained in Section II to the international setting and discuss issues related to choices between residence and source principles of taxation and to the feasibility of international cooperation in tax administration. In particular, we emphasize some merits of source-based taxation from the viewpoint of ensuring effective implementation under the assumption that it is more difficult to tax foreign-sourced income than to tax domestic income.[2]

First, we compare the outcome of source and residence based taxation rules in the simplest case. Here we define that Firm 1's income accrued in Country B is taxed by Country B under the source rule, and that it is taxed by Country A under the residence rule. (We do not discuss legal issues in this paper. Under the standard legal framework, the business income of Firm 1 should be taxed in Country B if its branch is regarded as a "permanent establishment", and the discussion is focused on the conditions under which the branch is considered a "permanent establishment".)

Under the source rule,

$$\begin{aligned} T_A \text{ (Tax revenue of Country A)} &= t_A X_A, \text{ and} \\ T_B \text{ (Tax revenue of Country B)} &= t_B X^S_B. \end{aligned} \tag{9}$$

Under the residence rule,

$$\begin{aligned} T_A \text{ (Tax revenue of Country A)} &= t_A X_A + t_A X^R_B, \text{ and} \\ T_B \text{ (Tax revenue of Country B)} &= 0. \end{aligned} \tag{10}$$

Thus, Country A would prefer the residence rule and Country B would prefer the source rule, if we assume that both countries prefer larger amount of tax revenue. However, we should note that, even if $t_A = t_B$, the total tax revenue of both Country A and B could be different depending on the adopted rule because X^R_B could be different from X^S_B.

It is usually expected that $X^R_B < X^S_B$ because it is generally more difficult for the tax authorities to tax foreign-source income. For example, in the case of the linear audit probability function of (5), it is natural to assume that the probability of audit when the reported income is zero is higher when the taxpayer is located within the jurisdiction of the tax authorities. In other words, it is expected that P^S_{BMAX} is likely to be larger than P^R_{BMAX}. Then, if t_i/s_i and k_i are assumed to be the same in both countries, we can conclude that $X^R_B < X^S_B$ by using (6). This model indicates that the compliance level is lower in the case of residence-based taxation, and that the total tax revenue of both countries will be lower when the residence rule is adopted.

Even if $X^R_B < X^S_B$, the tax revenue of Country A is still larger under the residence-based taxation and the tax revenue of Country B is larger under the source-based taxation. Therefore, it is difficult for two countries to agree to adopt the source-based taxation. The introduction of a foreign tax credit system cannot change this situation considerably, but it can encourage cooperation between two tax authorities. Under a foreign tax credit system,

[2] Frenkel, et al. (1991) suggests that to control international capital flows might be necessary if foreign-sourced income is more difficult to tax. However, such a policy would be faced with serious practical and other problems.

Country B imposes a tax on the income accrued in Country B, but Firm 1 can deduct this tax amount from its tax burden to Country A. Suppose that the tax information gained by Country B is sent to Country A[3] and that Country A imposes a penalty rate not only on the evasion detected by Country A, but also on the evasion detected by Country B.[4] Then although Firm 1's total tax burden is the tax paid to Country A, the effective rate of audit is larger than in the case of the residence rule. Let P^F the probability of audit when the foreign tax credit system is introduced. Then, $P^F = P_B + (1-P_B)P_A$. Because P^F is larger than P_A for any level of the reported income, the compliance level of Firm 1, indicated by X^F_B, is higher in the case of a foreign tax credit system than in the case of the residence rule (X^R_B). Under the foreign tax credit rule,

$$T_A = t_A X_A + t_A X^F_B - t_B X^F_B, \text{ and}$$
$$T_B = t_B X^F_B.$$

Some remarks are necessary on the foreign tax credit system. First, this system can preserve the "capital-export neutrality", which is realized under the residence rule,[5] if the full deduction of foreign-paid tax is granted.[6] Second, if there is some limit of taxation by Country B, in particular, if the tax rate of Country B is lower than t^F_B, where

$$t^F_B X^F_B = t_A(X^F_B - X^R_B),$$

then Country A would agree to adopt the foreign tax credit system, although Country B's tax administration would have to be the same as in the case of the source rule even if $t^F_B < t_B$. Third, the foreign tax credit system might raise tax administrative costs compared with residence or source rule.

So far, countries were assumed to collect as much tax revenue as possible. Alternatively, one can assume that countries maximize "welfare" defined as the sum of the consumers' surplus, the firm's profit, and the tax revenue.[7] Note that the consumers' surplus (CS) and Firm 1's profit are constant in the model. Thus,

$$W^A = CS_A + (2 - T_A - T_B) + T_A = CS_A + 2 - T_B, \text{ and}$$
$$W^B = CS_B + T_B. \tag{11}$$

W^A and W^B indicate "welfare" of Country A and B. Under the residence rule, $T_B = 0$ as shown in (10). In this case, both W^A and W^B are constant and neither Country A nor Country B is interested in the compliance level of Firm 1. Under the source rule, Country A prefers the lower compliance level of Firm 1's branch in Country B. For Country B, the higher compliance level of Firm 1's branch is desirable. Two countries are forced to play a zero-sum game and in such a situation, it is extremely difficult to promote international cooperation in tax administration.

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[3] This requirement is usually met because the firm has to provide the information on tax paid in Country B to the authorities of Country A in order to claim the foreign tax credit.

[4] This assumption is made to make the discussion simpler, and to drop this assumption does not essentially change the argument.

[5] Here, the "capital-export neutrality" just means that the same tax rate is applied to domestic and foreign-sourced income. We could argue that the neutrality does not actually hold even if the same rate is applied because the level of reported income is different, that is, X_B is generally different from X_A.

[6] If the deduction is granted only up to the amount of the tax imposed by Country A on X_B and if $t_B > t_A$, the outcome would be the same as in the case of the source rule.

[7] In this model, the administrative cost is not explicitly considered.

The somewhat awkward implications of (11) do not depend on the assumption that Firm 1 is 100% owned by residents of Country A. Let us assume that a half of the shares of Firm 1 is owned by residents of Country A, and that the other half, by residents of Country B. Then,

$$W^A = CS_A + 1 + 1/2\ (T_A - T_B), \text{ and}$$
$$W^B = CS_B + 1 - 1/2\ (T_A - T_B). \tag{12}$$

The expressions in (12) indicate that under the residence rule, Country A prefers a higher compliance level, and that Country B prefers a lower compliance level. Under the source rule, a higher compliance level of the parent company and a lower compliance level of the branch are preferable for Country A, and vice-versa for Country B.

Some remarks on the relationship between the tax compliance level and welfare are needed here. First, the model discusses only lump-sum taxes. If the taxes in question distort the resource allocation, the compliance level has other kinds of effects on welfare. For example, the higher compliance level might make it possible to reduce the tax rate, and the lower tax rate is likely to reduce the excess burden, enhancing welfare. Second, the model is static and cannot discuss implications of the compliance level in the long run. For example, wider opportunities to evade taxes could make people invest more resources to evade taxes, thus distorting resource allocation. Third, administrative costs of tax enforcement are not discussed in the model. Welfare economic analysis of tax administration clearly requires that the model treat the administrative costs more explicitly. Fourth, the tax authorities might be interested in the compliance level from the viewpoint of income distribution, which is out of the scope of this paper.[8] Fifth, if we consider the need for the authorities to provide public goods, the welfare is not correctly captured by the total surplus as in (11).[9] In that case, the weight of a certain amount of tax revenue used to evaluate the welfare should be generally larger than the weight of the same amount of after tax profits.

Now we briefly discuss the reputation effects. It is expected that the compliance level of a firm is higher when the firm cares more about its reputation, or when r_1 in (7) are larger. It is also expected that the tax burden of Firm 1 $(T_A + T_B)$ is lower under the residence rule than under the source rule. Therefore, Firm 1 prefers the residence rule regardless of the value of r_1. It might then be legitimate for the firm to assert that it prefers the residence rule although it reports its income correctly under either rule, because it need not deal with the tax authorities of Country B under the residence rule and can enjoy a lower compliance cost. However, Firm 1 also has to think about the behavior of a potential competitor. If the potential entrant has a lower compliance level, the potential competitive pressure might be stronger under the residence rule. Then Firm 1 might be forced to reduce the price of the software to prevent the new entry of the non-compliant firm and might have lower profits under the residence rule.[10] Generally speaking, taxpayers with a higher compliance level have reasons to care about not only their own compliance cost but also the general compliance level, particularly of their rivals with a lower compliance level.

Next, we investigate a case in which there are two multinational firms. Firm 2, which is

[8] In other words, by assuming that the welfare is measured by the total surplus, we implicitly assume that all the consumers are identical.

[9] I thank Prof. Motohiro Sato for raising this important point.

[10] Welfare implications of the effect of the level of compliance on the degree of competition are not discussed in this paper.

100% owned by those residents in Country B, produces a different type of software. For simplicity, we assume that Firm 1 produces software for business use and Firm 2 produces software for final consumers and that markets of these different types of software are completely separate. Firm 2 is based in Country B and has a branch in Country A. The demand and cost structures of Firm 2 is the same as Firm 1. Firm 2's reported income to Country A is Y_A, and to Country B, Y_B.

Under the source rule,

$$\begin{aligned} T^S_A &= t_A X_A + t_A Y^S_A, \text{ and} \\ T^S_B &= t_B X^S_B + t_B Y_B. \end{aligned} \tag{13}$$

Under the residence rule,

$$\begin{aligned} T^R_A &= t_A X_A + t_A X^R_B, \text{ and} \\ T^R_B &= t_B Y^R_A + t_B Y_B. \end{aligned} \tag{14}$$

We can assume that $X^S_B > X^R_B$ and that $Y^S_A > Y^R_A$. Then the total tax revenue of both countries is larger under the source rule than under the residence rule. We cannot generally compare Y^S_A and X^R_B, therefore, T^S_A is not necessarily larger than T^R_A. Thus, there is no certainty whether both countries will agree to adopt the source rule. However, if the compliance level of Firm 1 and Firm 2 are not very different, it is usually expected that Y^S_A is larger than X^R_B and that X^S_B is larger than Y^R_A. (Remember that the "true income" of the parent companies and their branches are all normalized to be one.) Thus, if the amounts of direct investment between two countries are balanced, these countries are likely to agree to adopt source-based taxation.

Now we briefly examine whether it is possible for two countries to have an agreement to implement source-based taxation and to redistribute the tax revenue according to the residence rule. If the tax rate is different between two countries, it is difficult to come to such an agreement because the sum of

$$(t_A X_A + t_A X^S_B) + (t_B Y^S_A + t_B Y_B)$$

is generally different from $T^S_A + T^S_B$. If $t_A = t_B = t$, such an agreement is made feasible by transferring the amount of difference between X^S_B and Y^S_A multiplied by t from one country to another. This is an example of an effect of the tax harmonization to promote international cooperation in tax administration.

It might be more realistic to expect that two countries agree to adopt a foreign tax credit system. Under this system,

$$\begin{aligned} T^F_A &= t_A X_A + t_A X^F_B + t_A Y^F_A - t_B X^F_B, \text{ and} \\ T^F_B &= t_B X^F_B + t_B Y_B + t_B Y^F_A - t_A Y^F_A. \end{aligned}$$

Because $X^F_B > X^R_B$ and $Y^F_A > Y^R_A$, T^F_A and T^F_B could be larger than T^R_A and T^R_B if the difference between tax rates of the countries is not so large. International cooperation in tax administration is feasible in such a situation, and both countries can raise higher tax revenues and can achieve higher levels of compliance of multinational firms. For Firm 1 and 2, the tax rates of the home countries are applied to the income of their subsidiaries as long as the full deduction of foreign-paid taxes is granted. The implications of possible higher administration costs under the foreign tax credit system are not explicitly discussed in this paper.

If both counties maximize "welfare" defined as the sum of the consumers' surplus, profits of the firm distributed to their residents, and their own tax revenue, we again encounter a

difficult situation. Under the source rule,

$$W^{AS}=CS_A+2-t_BX^S{}_B+t_AY^S{}_A, \text{ and}$$
$$W^{BS}=CS_B+2+t_BX^S{}_B-t_AY^S{}_A. \tag{15}$$

Thus, Country A prefers a lower tax rate and a looser tax administration in Country B, and Country B prefers a lower tax rates and a looser tax administration in Country A. Also, both countries try to raise larger amount of the tax revenue from branches of the non-resident multinationals. Similar results emerge under the foreign tax credit system. Under the residence rule, the welfare of both counties does not depend on the level of compliance.

In any case, to promote international cooperation in tax administration is difficult if the objective function of the tax authorities is "welfare", if it is defined as the total surplus. The essential point here is that each country would prefer a lower compliance level of branches located outside the country. If the source country has some right to tax, the higher level of compliance of branches located in the source country just brings about higher tax revenues for the source country, in which the authorities of the residence country in not interested, and the higher level of compliance reduces the profit of the firm to be distributed to the residence country. This argument implies that tax administration issues in the international context should be discussed separately from other policy objectives including industrial or trade policy objectives in order avoid unnecessary conflicts between the countries. The tax authorities should be independent from other branches of the government, and tax policy in the international context should not be used as a means of trade policy. In order to promote international cooperation, it should taken for granted by the authorities that the social value of a dollar collected by the tax authorities is larger than a dollar evaded and consumed in the private sector and that tax evasions of any multinational firms should be prevented regardless of the nationality of shareholders of these firms.

IV. *Implications of E-commerce on Income Taxation*

Now we begin to discuss e-commerce issues. The development of e-commerce, which in itself has of course desirable effects, is likely to raise difficult problems in the context of international taxation. In this section, we assume that both multinational firms (Firm 1 and Firm 2) sell their software through Internet, that is, they conduct "on-line sales" of digitized products. They can sell their digitized products directly to their customers all over the world without any transaction cost.[11] Therefore, these firms no longer need to have branches in a foreign country. The tax authorities cannot observe the cost for developing the software, which is the only cost for the firms. They do not know even the place where the production activities to develop the software take place. These circumstances are somewhat extreme but they are in a sense typical in the context of e-commerce. Under such circumstances, source-based taxation is infeasible because the tax authorities cannot see where the source is. The issue is, then, if residence-based taxation is possible. In this section, we discuss that even residence-based taxation is almost impossible because of tax competitions between the countries and because of strong pressure from a tax haven.

[11] In this paper, it is assumed that some copyright regulations work so that the customers of the digitized products cannot copy the products they bought for resale.

We still assume that the tax authorities can observe sales amount of software of two firms. Because there are no branches at all, all the income of the firms is taxed by the home countries, and the tax burden of two firms is as indicated as in (14). Compared with a situation in the last section, where source-based taxation was possible, the tax burden of the firms is smaller. Because no taxation on non-resident firms is possible, the incentive for international cooperation in tax administration is limited for both countries, although they might be able to come to some general agreement on, for example, information exchanges.

However, the story does not end here. Note that the firms under discussion are multinationals and do not care about where they are located or to which country they pay their taxes. These firms naturally choose to locate themselves where the tax burden is smaller. For example, if $t_A X_A < t_B X_B$, then, Firm A will stay in Country A and Firm 2 will move from Country B to Country A. In doing so, Firm 2 does not need to physically move to Country A, but just has to claim that all the production activities take place in Country A, and the tax authorities of Country B cannot disprove that claim. When both countries try to maximize tax revenues, they engage in tax competition, not only in tax rates (t_i) but also in tax administration, which affects X_i.[12] Each country tries to set the tax rate at a lower level than the other country and/or each country tries to implement the tax law in a looser way than the other country. In any case, tax revenue goes to zero, making income taxation impossible.

At some point, these countries might recognize that such tax competition is "harmful" for both countries, and might try to curb tax competition. In doing so, it is not sufficient to reach some agreement in taxation rules, such as setting the lowest tax rates, because "the race to the bottom" can emerge also in tax administration. Thus, international cooperation becomes important again to cope with e-commerce issues. If two countries succeed in enhancing the degree of cooperation to such a level as to make the tax environment for multinational firms equal in both countries, in addition to making the tax rates the same, these countries can raise a certain level of revenue from income taxation, although it would seem to be extremely difficult for the tax authorities to strengthen the cooperation to such an extent. The tax authorities also need to agree how to allocate the tax revenue between the counties because they cannot predict the location of the firms beforehand. One idea might be to allocate the revenue according to the sales amount in each country, which makes income taxation somewhat similar to VAT.

The possible outcome explained in the previous paragraph becomes totally improbable as soon as we introduce a third country, which is a tax haven. We define a tax haven by a country that uses every taxation measure to attract multinational firms. The sole objective of the tax haven is to get a fixed amount of commission for registration from multinational firms. We assume that the required commission is just a negligible amount for the multinationals. Then, regardless of the agreement between Countries A and B, the multinational firms can escape from income taxes by claiming that all the production takes place in the tax haven. For example, it is easy for these firms to set up a host computer in the tax haven, to develop the software through that computer even if developers actually live either Country A or B, and to send the software from that computer to customers living in Country A or B.

It would be difficult for Countries A and B to take any anti tax haven measures even if these countries could completely unify their tax systems and tax administration. In that case,

[12] For example, (6) shows that it is possible to reduce X_i by reducing P_{iMAX}.

there remain just two possibilities. One would be to persuade (or threaten) the tax haven to abandon its lax tax policies. In doing that, it is not sufficient to make the tax haven set up a reasonable tax rate. The tax haven might keep the virtual non-tax situation by not enforcing the tax rule. Therefore, it is also necessary for Countries A and B to monitor the tax administration of the tax haven. For example, it is important to secure access to necessary tax information of firms located in the tax haven. Another way is to give up a reasonable level of enforcement in income taxation and to rely on a value added tax (VAT) system, on which we discuss in the next section.

V. *VAT and E-Commerce*

As long as the tax authorities can observe the price and the sales volume of the software,[13] they might be able to apply VAT. The merit of VAT emphasized here is that it usually does not require as much information as income taxes for implementation. (In this paper, we do not touch upon the discussion on the relative desirability of income and consumption as a tax base.)

It is important to recognize that the feasibility of VAT critically depends on whether the tax authorities can impose VAT on the sales to final consumers (B to C transactions). As for business to business (B to B) transactions, imposed VAT is credited against VAT on sales at later stages. Therefore, even if the tax authorities fail to impose VAT on some B to B transactions, the tax credit at later stages is reduced by the same amount, having no effects on the tax revenue. However, if they fail to impose VAT on B to C transactions, they can no longer recover the lost revenue. As long as the sales to final consumers take place within a jurisdiction, VAT can be imposed without any difficulty. A difficult problem arises when cross-border B to C transactions take place.

In this paper, we assume that VAT is imposed according to the destination principle, which means that the taxation takes place in the jurisdiction of consumers. The origin principle, which means that the taxation takes place in the jurisdiction of producers, is difficult to apply because VAT is not imposed uniformly. In particular, because VAT exempts investment goods, the application of the origin principle would cause price distortions.[14] Thus, although it might be easier to implement the VAT system according to the origin principle, which does not require a border adjustment, it is not generally adopted.[15]

If a producer and a consumer are located in the same jurisdiction, VAT is imposed on the sales of the producer. The tax authorities can collect VAT from the producer and the producer shifts the tax burden to the consumer by increasing the price by the amount of VAT. In other words, there is no need to distinguish the destination principle from the origin principle. Tax collection can be implemented as in the case of the origin principle, but the economic effect is the same as the destination principle. This mechanism does not work when the producer and the consumer are located in different jurisdictions. If the products are tangible goods, VAT can be collected when the goods pass through the customs of an importing country. However, on

[13] However, this condition is not always met for some digitized products.

[14] See Sinn(1990).

[15] We do not discuss issues related to VAT implementation within the European Union in this paper.

line sales of software cannot be identified by the customs and no VAT can be collected under the current system.

We assumed that Firm 1 produces software for business use. If the software is traded only among business and is not directly sold to consumers, VAT can be applied as long as the tax authorities can identify the sales of the final products using the software as inputs. VAT taxation is faced with serious challenges in the case of software for entertainment, produced by Firm 2 and sold directly to final consumers through Internet. If Firm 2 is located in Country B and sells the software to consumers living in Country B, the tax authorities of Country B can impose VAT on the sales of Firm 2. However, when Firm 2 sells the software to consumers living in Country A, it is very difficult for the tax authorities of Country A to impose VAT on the sales. (Note that Country B does not impose VAT on exports of Firm 2 as long as the VAT system follows the destination principle.) The development of e-commerce makes cross-border transactions more efficient and it also makes direct transactions from producers to consumers easier. Although these are important benefits brought about by e-commerce, they also have a side effect of making VAT implementation more difficult. In order to properly impose VAT on Firm 2's sales to consumers in Country A, a close cooperation between the tax authorities of both countries is required. It is also necessary for the tax authorities to do their best to use e-commerce related technologies in order to make the cooperation scheme efficient and effective.

So far, the erosion of the tax base was limited to Firm 2's sales to Country A. However, Firm 2 could move to a tax haven (or to any other country) and sell digitized products to consumers in Country A and B. Then, Firm 2 could escape from all burden of VAT. Alternatively, Firm 2 could set up a branch in Country A by just setting up a "server" in Country A, and sell the software from the parent company in Country B to consumers in Country A and from the branch in Country A to consumers in Country B, thus escaping from VAT altogether. In the age of global e-commerce, not only income taxation but also VAT is becoming more difficult to implement. In order to cope with these difficult situations, it is essential for the tax authorities of the world to strengthen mutual cooperation in tax administration.

VI. *Concluding Remarks*

We have tried to investigate some of the taxation issues related to e-commerce. The development of e-commerce has intensified and accelerated the process of globalization of economic activities, causing serious challenges for the tax authorities whose administrative power is largely restricted within their jurisdictions. It is of course necessary for each country to keep its fiscal sovereignty because it is the people of each country to decide on the necessary public expenditure and to decide how to raise the required revenue. However, although each country should make decisions on tax policies, it is necessary for the tax authorities of the world to keep in close contact to enhance mutual cooperation in administration.

In the context of international taxation, the implications of e-commerce on revenue allocation have attracted a lot of attention. However, another important aspect seems to be that difficulty of implementing source-based taxation could hinder effective tax administration and cooperation among tax authorities. Faced with serious challenges of e-commerce, the tax

authorities of the world should enhance cooperation with a view to preventing harmful tax competition and coping with tax havens, and they should also equip themselves with e-commerce technologies.

Clearly, this paper does no more than scratch the surface of huge problems and many things remain to be done. In addition to the need to investigate more concrete issues from a practical point of view, some theoretical development of the model is necessary. For example, the effects of competition among multinational firms should be examined, particularly in the presence of network externalities. The cost for tax administration and the need to provide public goods should be treated explicitly. The possibility of integrating enforcement of direct and indirect taxes might be worth examining. Also, more investigation on economic analysis of tax administration seems to be needed in the context of international taxation.

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