Tax competition and tax evasion in a multi-jurisdictional world

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Johannes Voget
Oxford, December 2008

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It was as true as taxes is.
And nothing's truer than them.

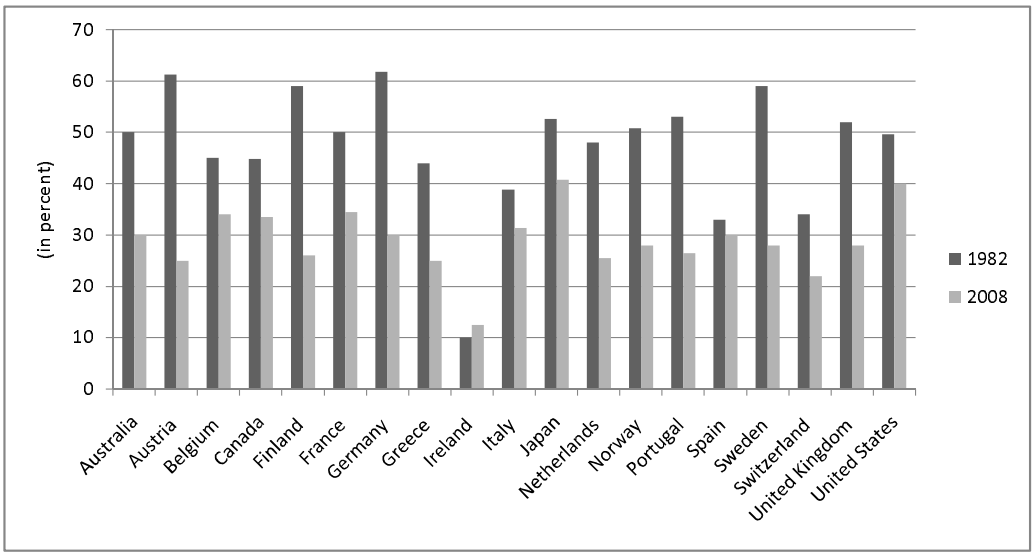
Mr. Barkis in 'David Copperfield' (Charles Dickens)

CHAPTER 1

INTRODUCTION

Corporate income tax rates have fallen tremendously over the last 25 years in virtually all developed countries. Figure 1.1 makes this point, contrasting the corporate income tax rates in 1982 with the tax rates in 2004.

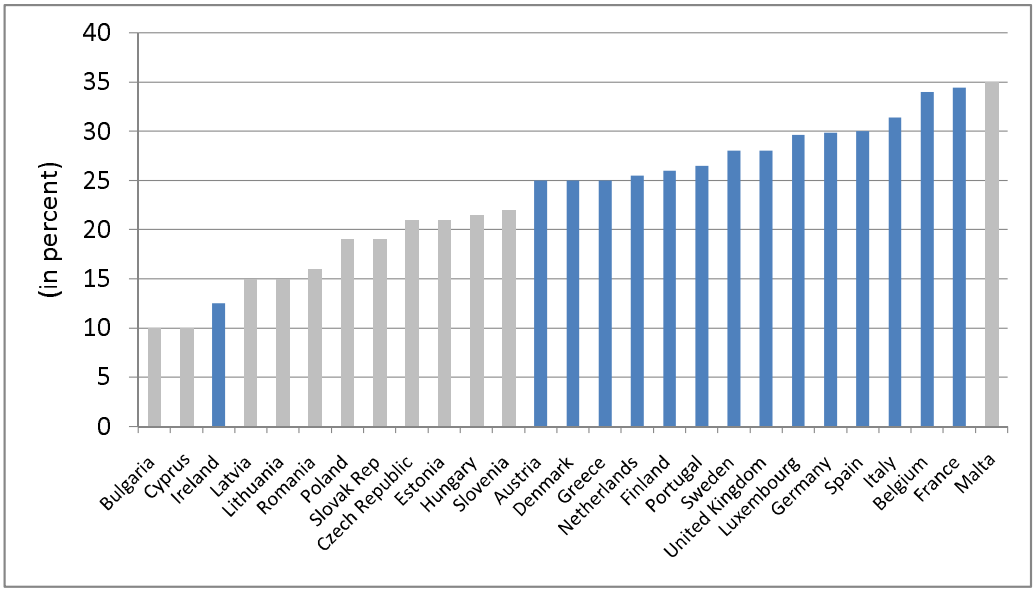
Figure 1.1: Corporate Income Tax Rates, 1982 and 2004



Notes: The figure shows top statutory corporate income tax rates in 1982 and 2008.
Sources: Devereux (2006) and IBFD (2008).

Especially European countries have decreased their corporate tax rates over the last decade. Interestingly, the EU accession countries have consistently lower rates than the established EU members. Figure 1.2 shows the ranking of tax rates within Europe in 2008 (where light grey bars identify accession countries).

Figure 1.2: Ordering of Corporate Income Tax Rates, 2008



Notes: The figure shows top statutory corporate income tax rates in 2008. Source: IBFD (2008).

This may reflect a stronger need of less mature economies to attract foreign capital. The common decrease in corporate income tax rate does not seem to be purely coincidental. Devereux et al. (2008) have recently shown that countries do compete with one another for capital investment. As a response to other countries' moves, governments drive their corporate income tax rates to lower levels. This process has often been coined a "race to the bottom", the possibility of which was first spelled out in the analytical contribution of Zodrow and Mieszkowski (1986). Whether such tax competition is desirable or not ultimately depends on one's view of the nature of government. If one believes government to be a "Leviathan", whose main goal is to collect as much tax revenue from its citizens as possible, then tax competition is desirable as it constrains the beast. If one believes government to be benevolent in nature, then tax competition depresses tax rates to inefficiently low levels, leading to an insufficient supply of public goods.

Whatever view on government one may take, the race to the bottom is a more acute issue today than it was, say, 20 years ago. The best explanation for this phenomenon is the increase in capital mobility which makes investment more sensitive to changes in taxes, in turn intensifying the potential to compete for tax base (i.e., investment) via tax policy. The world has indeed become a much smaller place for capital investment as the following figures show. Trade volume is often used as an indicator of the speed at which the global economy integrates. Between 1999 and 2006 the global international trade volume increased by 63 percent (World Bank, 2007). Compared to the increase in gross capital flows which have tripled in the same period of time (IMF, 2008, Table 1), that is still timid growth.[1] Foreign direct investment (FDI) is of special interest because it can facilitate the transfer of technology, which may boost economic growth. In 2006, FDI inflows worldwide amounted to 1.3 trillion US dollars; the global stock of FDI is about 12 trillion US dollars, equivalent to 25 percent of world gross domestic product (UNCTAD, 2007, Tables B.1 and B.2).

Not surprisingly, many researchers have found FDI to be quite sensitive to corporate income tax rates. De Mooij and Ederveen (2003) find in their comprehensive meta-study a median tax rate elasticity of about -3.3. Hence, a one percentage point reduction in the host country tax rate raises foreign direct investment in that country by 3.3 percent. The large proportion of research about the sensitivity of FDI to taxes led Gordon and Hines (2002) to suggest that research has been "too greatly focused on an earlier question — do tax policies influence FDI? — and not enough on more subtle variants". For instance, many observers associate the term FDI mainly with greenfield investment, having firms in mind that build production facilities from scratch. However, one of the main components of FDI in industrialized countries are cross-border mergers and acquisitions (M&As).[2]

[1] Growth figures by themselves could be misleading. Therefore, this footnote reports trade and capital flows relative to GDP. In 2006, world exports were 27 percent of world GDP, of which the latter summed up to 48.24 trillion US dollars at nominal exchange rates (World Bank, 2007). The capital inflows in the Global Financial Stability Report (IMF, 2008, Table 1) add up to about 14 percent of world GDP, although these figures exclude cross-border flows taking place within the Euro area.

[2] Strictly speaking, cross-border M&As are not a subset of FDI. The value of M&As resulting in an acquisition abroad is counted as outward FDI of the acquiring country to the extent that the acquiring firm finances the transaction in its home financial market. The United Nations Conference on Trade and Development (2000, p. 10) discusses the differences between cross-border M&A and FDI data, and it concludes that the data suggest that M&As have contributed an increasing share of FDI flows to developed and developing countries alike.

By means of cross-border M&As, industries restructure themselves on an international level; new multinationals are formed and expand to new markets by acquiring local companies or other multinationals.[3] Little evidence exists on how corporate taxes affect this process of industrial reorganization and hence the organizational structure of multinationals themselves.[4] Desai and Hines (2002) have examined the role of taxation in 26 cases of so-called inversions of US multinationals in the 1982–2002 period. In these transactions, the international corporate structure is inverted in the sense that the US parent becomes a subsidiary and the earlier foreign subsidiary becomes the parent firm. Chapters 2, 3, and 4 of this dissertation extend this line of research.

The basic insight is that the incentives described by Desai and Hines (2002) apply more generally than just to corporate inversions. The consideration where to best locate a multinational's headquarter should play a role whenever firms from different countries merge. When a cross-border corporate takeover materializes, the organizational structure of the resulting multinational firm can be designed from scratch as the merging corporate entities were previously unrelated. Therefore, cross-border M&As offer a unique opportunity to study the impact of international taxation on the parent-subsidiary structure of multinational firms. The following three chapters consider cross-border M&As involving any two countries among a set of European countries, Japan and the United States in the 1985 – 2004 period. Chapter 2 presents extensive information on all these countries' tax systems and particularly on their taxation of foreign-source dividend income received by resident multinational firms. Chapters 3 and 4 empirically show that the international tax system does indeed systematically affect the organizational structure following international M&As.

For each cross-border takeover, Chapter 3 constructs two rates of international double taxation for the two possible outcomes regarding which of the two affected firms becomes the parent firm (rather than a foreign subsidiary). These double tax rates can be used to calculate international double tax liabilities incurred by the newly created multinational firm in the two possible scenarios as to parent-firm location. It is found that international double tax liabilities in the realized parent-subsidiary scenario are substantially lower than in the counterfactual case where the structure is inverted. Specifically, the

[3] In 2006, there were 6974 reported cross-border M&As valued at 880 billion US dollar (UNCTAD, 2007, Tables B.4 and B.5).

[4] The effect of taxes on the financial structure of multinationals is another issue. See, for example, Huizinga et al. (2008).

international double tax liability is calculated to be 0.62 percent of the combined firm's worldwide pre-tax income in the actual parent-subsidiary outcome, whereas it would be 2.11 percent of worldwide income in the alternative case. Furthermore, the impact of double taxation on the parent-subsidiary decision is estimated by means of a logit binary choice model. The results show that international double taxation has a highly significant impact on the parent-subsidiary structure.

Chapter 4 re-enforces the findings of Chapter 3. Instead of analyzing the direction of individual cross-border M&As, Chapter 4 takes an aggregate perspective. Specifically, it considers how international double taxation affects parent firm location at a bilateral, national level. To this end, a gravity model is used to explain the aggregate number of M&As between two countries. This approach captures that international double taxation may not only affect the direction of M&As but that it may also affect the total number of M&As. The chapter reports a semi-elasticity of the number of M&As generating a parent firm in a country with respect to the double tax rate of -1.7. Based on 2004 M&A data, this suggests that a one percentage point increase in the double tax rate facing US parent firms would decrease international acquisitions by US firms by 1.9 billion US dollars.

Chapters 3 and 4 are in line with evidence from the literature, which shows that countries find it increasingly difficult to tax the return on capital or economic profits at the corporate level as corporations become more mobile and multinational.[5] Taxes can be avoided by relocating activities — really or virtually — to low-tax environments.[6] Barriers to capital flows have decreased significantly over the last decades, especially within the European Union.

So which options does a country have left to finance the provision of public goods and achieve redistributive goals? Countries could give up taxing capital altogether admitting that it is more mobile than labor. In most countries, however, capital is mainly held by the richest 10 percent of the population, whereas the poorest deciles are debtors. Hence, only taxing labor and not capital would go against any redistributive policy. Just as importantly, any economic profits, which are indistinguishable from capital income in standard

[5]The accounting profits in firms' financial reports contain the return to (equity) capital as well as economic profits, which are the profits that remain once all factors of production have been remunerated.

[6]An example for virtual relocation is profit shifting through manipulation of transfer prices. See Bartelsman and Beetsma (2003) and Huizinga and Laeven (2008).

accounting and are hence taxed at the same rate, would go untaxed as well.[7] This is undesirable because taxing economic profits is normally less distortive than other taxes.[8]

Governments could switch from taxing income to taxing consumption. This trend can be observed in several industrialized countries already. Germany, for example, increased its value-added tax (VAT) rate from 16 to 19 percent in 2007 while at the same time reducing wage-related social security contributions. Furthermore, it reduced corporate income tax rates in 2008. Of course, politicians never suggest any link between increasing VAT rates and decreasing corporate income tax rates as it is very unpopular with the electorate. However, it is difficult to design and implement progressive consumption taxes.[9] Thus, redistribution would have to be achieved via government spending and not through taxation. This would increase the total tax revenue that governments have to raise to accomplish the same relative redistributive goal.[10] Furthermore, some harmonization of consumption taxes may be necessary to prevent cross-border shopping (see Nielsen, 2001, or Kanbur and Keen, 1993).

Finally, capital income could be taxed on a residence basis at the individual level instead of taxing it at the corporate level at source. Rather than taxing the entities that employ capital, one could tax the ultimate individual owners of capital. This approach has the appeal that the incidence of capital income taxes is much more transparent than for corporate income taxes. As a matter of fact, most countries have capital income taxes and/or capital gains taxes at the individual level in place. However, the residence principle involves an enforcement problem. A country on its own only has access to information about its residents' capital income at home. In order to tax capital income derived abroad, the home tax authority must rely on its residents' honesty in reporting international capital income or on foreign tax authorities sharing

[7] Easily observable economic profits as, for example, in the oil industry are sometimes taxed at a higher rate than general corporations. Windfall profit taxes may even be imposed with hindsight. Italy just recently introduced a windfall profit tax on oil companies, the United Kingdom imposed windfall profit taxes on oil companies in 1997 (Betts, 2008).

[8] In theory, taxing fixed factors of production, such as land, does not give rise to distortions.

[9] Tait (1989, 1991) argues that consumption taxes are generally regressive and therefore not suitable candidates for redistributive purposes.

[10] For example, if a government can only impose non-discriminatory lump-sum taxes instead of progressive taxes, more tax-revenue would have to be raised to reduce some measure of inequality because the receivers of transfers first have to be compensated for paying the lump-sum tax.

information on capital income. Without information exchange between tax authorities, the likelihood of fraudulent tax declaration is all too evident.

It does not seem to be in a country's self-interest to share information because it deters tax-evading foreign investors that prefer secretive places to locate their capital. The literature has developed theories that explain why two countries may nevertheless exchange information on capital income. In most models, countries interact with each other repeatedly, which facilitates information sharing.[11] In the long run, cooperation yields a higher pay-off than opting for the short-run gains of non-cooperation. The theories are optimistic in the sense that under reasonable circumstances information exchange is feasible.[12] The OECD (1998, 2002) seems to share that point of view as it embraces information exchange as the means to fight international tax evasion and create a 'level playing field' for jurisdictions competing with each other for investment.[13] However, the theories on the adaption and the intensity of information exchange have never been tested.

Therefore, Chapter 5 provides an empirical analysis of information sharing between tax authorities. Employing a unique panel data set on tax information sharing for the Netherlands from 1992 to 2005, I use various econometric models to investigate whether the factors put forward in the literature play a role in determining the intensity of bilateral information sharing.

The econometric evidence on the determinants of information exchange generally supports the existing theory. Countries with high tax rates are more interested in information exchange because their citizens' incentive for tax evasion is stronger. Next, a larger need for public funds fosters information exchange because it shifts the governments' interest from allowing citizens to maximize their private income to protecting the tax base. Countries whose citizens have invested a larger share of their capital abroad are also more prone to share information. The high mobility of their citizens' funds forces them to cooperate with other countries. There is one determinant where empirical evidence and theoretical predictions diverge; non-resident withholding tax rates on capital income do not seem to be related to the degree of information ex-

[11] See, for example, Huizinga and Nielsen (2003) or Bacchetta and Espinosa (2000).

[12] More specifically, information exchange is feasible if the countries' discount rates and preferences for public goods are sufficiently high and the profitability of hosting deposits and country size asymmetries are sufficiently small.

[13] Information exchange does not address the issue of tax avoidance because by definition tax avoiding agents — by contrast to tax evading agents — abide (at least formally) by the existing laws and regulations. Hence, complete transparency across countries would not change the degree of tax avoidance.

change. According to theory, countries should exchange less information if they have high non-resident withholding taxes. Intuitively, withholding taxes raise revenues from foreign investors, which would be deterred by information sharing. The disparity between the existing theory and the empirical evidence can most probably be attributed to the two-country framework on which models of information exchange have been based. With only two countries, a withholding tax can be used to raise revenue and act as a sort of user fee for tax evasion services because citizens from the other country have only one foreign country to deposit their funds in. The two countries are monopolist suppliers of tax-free deposits for the other countries' citizens. The presence of many countries competing for tax evading foreign investors may explain the missing link between withholding taxes and information exchange; low withholding taxes become a necessity to attract any foreign funds.

Chapter 6 addresses the issue of cooperation on information sharing among more than two countries. As mentioned before, predictions based on two-country models may be overly optimistic about the circumstances under which information exchange may develop. In fact, the European Union experienced how difficult it is to enact information sharing among a large group of countries. It took the EU several decades from the first proposal of concerted information exchange to arrive at an effective treaty network on information exchange that includes all European jurisdictions and their overseas dependencies. And still, the existing agreement has only entered into force because some jurisdictions were allowed to opt out of information exchange and resort to a relatively high withholding tax rate that should have the same deterring effect on tax evaders as information exchange. The game-theoretic model in Chapter 6 may explain why the EU Savings Tax Directive has become feasible now although it proved impossible a couple of years ago.

In essence, a country opting not to share any information while other countries do implies free-riding. The profitability of opting out actually increases in the number of countries exchanging information. There are two — conceptually opposite — sets of circumstances that inhibit such free-riding. First, the payoffs of cooperation may be so large that sharing information is even more attractive than being the only free-riding tax haven. Or, alternatively, complete cooperation is enforced by a credible threat of all other countries to the would-be tax haven that one country opting out of information sharing causes all countries to stop exchanging information. In between these two extremes, a range of circumstances exists under which free-riding tax havens and information-sharing countries can coexist. On the one hand, it is more

attractive for a few countries to free-ride than to join the group of cooperating countries. On the other hand, the group of cooperating countries is also better off by sharing information even in the presence of free-riders than if there were no cooperation. Which of these three scenarios prevails depends on parameters such as the degree of capital mobility or the size of banking profits from hosting capital, which is linked to the amount of capital invested. Extremely mobile or immobile capital would provide an environment suitable to complete cooperation as explained in the former two scenarios. Moderate capital mobility would foster a co-existence of tax havens and information sharing countries. Hence, the EU Savings Tax Directive having become feasible can be explained by an increased degree of capital mobility due to the rise of electronic banking, non-cash payment methods, a reduction of cross-border transaction costs and freedom of movement across most European countries.

Explicitly stating the incentives at work helps pointing out the importance of institutional features in the genesis of the EU Savings Tax Directive. The EU initiative on information exchange actually has to rely on an entire network of bilateral and multilateral treaties on information exchange. A "green light provision" in these treaties ensured that all treaties became effective at the same time — or none would have become effective. This provision ensured that the threat of no cooperation whatsoever was credible until all designated participating countries had taken the necessary legal steps. Otherwise, a country might have been tempted to opt out at the last moment as other countries had already entered into information sharing treaties.

Another important feature of the EU initiative is the multilateral approach. According to the model in Chapter 6, the degree of cooperation among countries is not predetermined in many circumstances. Several outcomes are possible. Multilateral negotiations about information exchange ensure a higher degree of cooperation than if countries are left to negotiate bilateral treaties on information exchange. The multilateral approach makes all countries better off.

This Ph.D. dissertation investigates issues related to taxing mobile capital in a multi-jurisdictional world. Chapters 2, 3, and 4 show that the headquarter locations of multinationals and cross-border merger patterns respond to differences between countries' tax regimes in taxing cross-border income. Parent firms tend to be located in the more tax-advantageous environment. The next question is how large the benefits of hosting headquarters are and if countries actually compete with each other for headquarters. As taxing corporate income at source becomes more competitive, resulting in sub-optimal rates,

one alternative is to rely more on capital income taxation on a residence basis. Chapters 5 and 6 explore the incentives to share information between countries which is necessary for residence based taxation.

The issues discussed here will become more acute with progressive economic integration. Some countries have considered fiscal policy an area where national sovereignty should prevail over international coordination efforts to ensure an efficient provision of public goods. Lately, this stance may have lost some support. The United Kingdom — having seen the headquarters of Shire and United Business Media relocate to Ireland in April 2008 — is currently experiencing the constraints that the presence of an attractive next door tax location imposes on the design of its own tax system. At the same time, Summers (2008) encourages the United States "to take the lead in promoting global co-operation in the international tax arena". He observes that globalization has contributed to widening the income gap between rich and poor people. Public opinion therefore fancies protective measures that would try to reverse economic integration. Instead of giving up the gains of free trade or capital mobility, Summers suggests to increase international cooperation in tax and regulatory issues. This would give countries sufficient sovereignty — in the form of progressive income taxation, taxation of capital income, redistribution and setting of labor standards — to allow larger parts of the population to enjoy the gains of globalization.[14] In the end, normative views about the nature of government seem to determine whether people prefer government restraining tax competition or international fiscal cooperation. In the former case, they tend to consider government to be a Leviathan which is only interested in maximizing the benefits for governing politicians and bureaucrats. In the latter case, they tend to consider government to be benevolent.

[14]However, Kapur, Mehta and Subramanian (2008) have responded that they consider Summers' call for more international cooperation and standard setting an example of nationalism. They argue that capital mobility is applauded if it serves US interests but is not welcomed if it is in favor of, for example, developing countries. In their own words: "Having swallowed those bitter pills of intellectual property protection and capital mobility as a necessary price for a better future, developing countries are now told that those medicines cause problems that need more — in this case protectionist — medication."

And it came to pass in those days, that there went out a decree from Caesar Augustus, that all the world should be taxed.

St. Luke ch. 2, v. 1

CHAPTER 2

THE INTERNATIONAL CORPORATE INCOME TAX SYSTEM[1]

This chapter describes how foreign profits of multinationals are taxed conditional on the location of the multinational's parent firm. Knowing how profit repatriations may be subject to double taxation will facilitate reading Chapters 3 and 4. These Chapters describe how the firms' incentive to avoid double taxation causes certain patterns in cross-border M&As; multinationals' parent firms tend to be located in a country with a favorable tax treatment of cross-border income.[2]

2.1 Taxation of Foreign Subsidiaries' Profits

If two firms from different countries merge into a single multinational firm, they have to choose one of the two countries as the country where the parent firm resides. Let this country be denoted by i, whereas the other country is denoted by j. In addition, the multinational has to decide whether to operate

[1] This chapter is based on Huizinga and Voget (2006) and Huizinga and Voget (forthcoming).

[2] The taxation of cross-border corporate income is illustrated by describing the situation in 2004, the last year of the sample. The empirical analysis employs data covering the complete sampling period from 1985 until 2004.

a foreign subsidiary or a branch in country j.[3] Both of these aspects of the multinational's organizational structure potentially have tax consequences. As a main principle, the parent country has the right to tax the multinational's overall income on a worldwide basis. In practice, however, some countries only tax a multinational's domestically generated income on a territorial basis. The selection of the parent country thus affects whether the multinational's income generated outside the parent country is potentially subject to additional taxation by the parent country. The choice between a foreign subsidiary or a foreign branch structure matters as well, as some parent countries tax foreign-source income in the form of dividends received from foreign subsidiaries differently from foreign active business income generated by foreign branches. In practice, most foreign establishments take the form of a subsidiary. Therefore, this section focuses on the international taxation applied to foreign dividend income. In the following section, I discuss how international flows of active business income may be taxed differently.

Income generated in subsidiary country j is first taxed in that country at a corporate tax rate τ_j, leaving a share $1 - \tau_j$ of this income to be reinvested or repatriated to the parent firm in the form of dividends. Table 2.1 provides information on top corporate income tax rates for a sample of European countries, Japan and the United States in 2004. These tax rates include representative subnational state and city taxes.[4] The subsidiary country j, in addition, may apply a non-resident dividend withholding tax to dividends repatriated to country i at a rate ω_{ij}. Information on bilateral dividend withholding taxes for the 30 countries in the sample is provided in Table 2.2. These withholding taxes are zero in case of long-standing EU member states on account of the EU's parent-subsidiary directive, which went into effect on January 1, 1992.[5] Overall, the subsidiary country taxes the multinational's local income to be paid out as dividends at a rate $\tau_j + (1 - \tau_j)\omega_{ij}$.

Parent country i potentially taxes the foreign dividend income at a corporate tax rate τ_i. Let τ_{ij}^{double} be the resulting rate of double taxation defined as the tax rate to be paid by the multinational firm on income from country j in excess of the corporate income tax τ_j in subsidiary country j. This double tax rate depends on whether the multinational firm can defer parent country taxation

[3] A subsidiary is an independent legal entity owned by a parent firm, whereas a branch forms part of the parent firm's entity itself.

[4] Special rates applied to listed firms in Greece until 2000 and to manufacturing firms in Ireland until 2002.

[5] See Council of the European Communities (1990).

until repatriation of profits and on whether, at the time of taxation, the parent country provides any double tax relief from taxes paid in the subsidiary country. In the absence of any deferral and double tax relief, the double tax rate τ_{ij}^{double} equals $\tau_i + (1 - \tau_j)\omega_{ij}$, reflecting both the parent country corporate income tax and the subsidiary country withholding tax.

In practice, most countries provide some form of international double tax relief. Some countries, for example the Netherlands, operate a territorial or source-based tax system, and effectively exempt foreign-source income from taxation. In this instance, the double tax rate τ_{ij}^{double} is given by $(1 - \tau_j)\omega_{ij}$ in the absence of deferral of parent country taxation. Alternatively, the parent country operates a worldwide or residence-based tax system. In this instance, the parent country taxes the worldwide income of its resident multinationals, but it may provide double tax relief in the form of a foreign tax credit for taxes already paid in subsidiary country j. The OECD model tax convention on income and capital, which provides a model framework of recommended practice, gives countries the option between an exemption and a foreign tax credit as the only two ways to relieve double taxation.[6]

The foreign tax credit reduces domestic taxes on foreign source income one-for-one with the taxes already paid abroad. A foreign tax credit can be indirect in the sense that it applies to both the underlying corporate income tax and the dividend withholding tax. Alternatively, the foreign tax is said to be direct and it applies only to the withholding tax. In either case, foreign tax credits in practice are limited to prevent the domestic tax liability on foreign source income from becoming negative. With an indirect foreign tax credit provided, the multinational pays no tax in the parent country on account of the foreign tax credit limitation if $\tau_j + (1 - \tau_j)\omega_{ij} \geq \tau_i$. The double tax rate τ_{ij}^{double} then only reflects the withholding tax in the subsidiary country. Similarly with a direct foreign tax credit provided, the multinational pays no tax in the parent country due to the foreign tax credit limit if $\omega_{ij} \geq \tau_i$. A few countries with worldwide taxation do not provide foreign tax credits, but instead allow foreign taxes to be deducted from the multinational's taxable income. For the various double tax relief conventions, Table 2.3 summarizes analytical expressions for the double tax rate τ_{ij}^{double} that, in the case of a foreign tax credit, depend on whether the foreign tax credit limitation is binding.

Countries tend to vary their method of double tax relief, that is, through an exemption, credit or deduction, based on whether they have concluded

[6] See OECD (2005) for the most recent version of the model tax convention. The convention serves as a model for bilateral double tax treaties.

a tax treaty with the other country.[7] Columns (2) and (3) of Table 2.1 show which double tax relief method countries apply to treaty signatory and non-signatory countries. The exemption method is seen to be the most common method of double tax relief on dividend income from foreign countries with and without a tax treaty, followed by foreign tax credits. Several countries, including Finland and Spain, exempt dividend income from a treaty country, while they apply a foreign tax credit to dividend income from a non-treaty country. In these instances, the existence of a tax treaty makes the method of double tax relief more generous. Among the European countries, most countries have concluded bilateral tax treaties, even if some Eastern European countries are still in the process of completing their treaty networks as seen in Table 2.4, which indicates whether there is a tax treaty in force between any two countries. Based on this information, I can represent the pattern of double tax relief granted bilaterally in Table 2.5.

The sample consists of 30 countries. Thus, for each country I can calculate 29 double tax rates for dividends received (for outward FDI) and dividends paid (for inward FDI) using the statutory information on corporate tax rates, dividend withholding taxes and international double tax relief conventions. These double tax rates per country provide information on whether a country can serve as a tax-advantaged location for parent firms (with low double taxation of dividends received) and a tax-advantaged location for subsidiary firms (with low double taxation of dividends paid out). Table 2.6 ranks the 30 countries on the basis of the average double taxation of dividends received $\overline{\tau}_i^{double}$, while it also provides information on the average double taxation of dividends paid out $\overline{\tau}_j^{double}$. These average double tax rates are equal-weighted across the 29 partner countries.

At the top of Table 2.6, one can see that the Netherlands has an average double tax rate of dividends received of only 1.3 percent. The Netherlands has a territorial tax system so that this 1.3 percent is wholly due to non-resident dividend withholding taxes levied by subsidiary countries. Other countries at the top of the table, in particular Denmark, Finland and Sweden, similarly have a

[7] Note that the method of double tax relief for dividends is not determined by the tax treaty itself, but in the domestic code of the dividend receiving country (although the domestic provisions are frequently conditional on the existence of a double tax treaty). Double tax treaties generally only regulate cross-border cases of juridical double taxation (i.e., taxing the same juridical entity for the same income twice). However, taxing parent companies for dividend income is not a case of juridical double taxation — only a case of economic double taxation (i.e., taxing the same economic activity twice). See Helminen (1999), Couzin (2002), Rohatgi (2002) and Helminen (2005) for more on this subject.

territorial tax system. An interesting case is Ireland that also has a rather low average double tax on incoming dividends despite its system of worldwide taxation with foreign tax credits. Ireland had a low corporate income tax rate of 12.5 percent in 2004, which implies this country de facto exempted most foreign-source income.[8] Japan and the United States also apply worldwide taxation with foreign tax credits, but these countries have relatively high corporate tax rates. This explains these countries' positions at or near the bottom of the table. On tax grounds, Japan and the United States thus are not good residences for the parent companies of multinational firms. From the table, one can see that the average rates of double taxation of incoming and outgoing dividends bear little relationship to each other. To illustrate, Greece and the United States are well placed to host foreign subsidiaries, even if their tax systems do not favor parent location.

Multinationals generally are able to defer parent country taxes in case their foreign-source income is not immediately repatriated.[9] Some countries, however, deny the deferral of parent country taxation under certain conditions, even in the case where foreign-source income is not repatriated. For these countries, the conditions under which deferral is not available are summarized in Table 2.7. As seen in the table, for each country one or more sets of several conditions are listed. Non-deferral applies if all of the conditions in a particular set of conditions are satisfied. In the case of Japan, for instance, a Japanese parent firm with more than a 5 percent ownership of a foreign subsidiary cannot obtain deferral if the foreign tax rate is less than 25 percent and the foreign-source income is mainly passive.

2.2 Taxation of Foreign Branch Profits

Double tax relief conventions applied to foreign branch income are agreed in bilateral tax treaties.[10] Many countries apply the same method of double tax relief in all their tax treaties. The first column in Table 2.8 reports the pre-

[8] See Table 2.1 for corporate income tax rates.

[9] As described by Gordon and Hines (2002), there exist additional methods of tax avoidance such as debt shifting, transfer price manipulation and the relocation of intangible assets. In any case, even relocated profits have to be repatriated to the parent country before being paid out to shareholders, and parent country taxation, if worldwide, will apply eventually. Furthermore, these methods of tax avoidance generally incur some costs, which implies that the burden of international double taxation cannot be fully avoided.

[10] A minority of tax treaties is not bilateral but multilateral such as the consequent Nordic tax treaties between Denmark, Finland, Iceland, Norway and Sweden and also the older tax

ferred method of double tax relief if this method has consistently been chosen in all new tax treaties since the year 2000. In case of inconsistencies across tax treaties, there is no preferred convention provided. The method of double tax relief that is unilaterally applied in the absence of a tax treaty is listed in the second column of Table 2.8. Compared to Table 2.1 regarding the double taxation of dividend income, there are two main differences. First, more countries change their method of double tax relief for foreign branch income if a tax treaty is in place. Second, foreign tax credits rather than exemptions are the favorite method of double tax relief in the case of foreign branch income in the absence of a tax treaty. Only several 'core' European countries (i.e., Austria, Belgium, France, Germany, Hungary, Luxembourg, Netherlands and Switzerland) apply the exemption regime. Other European countries, Japan and the United States prefer tax credits. The method of double tax relief for international branch income on a bilateral basis is provided in Table 2.9.

Analogous to Table 2.6, Table 2.10 ranks countries with respect to average double tax rates on foreign branch income in 2004. Countries exempting active income from foreign source tend to appear at the top of the table, while countries with high corporate income tax rates applying a foreign tax credit system are ranked at the bottom. Some countries, such as Italy and Spain, are ranked much lower in the case of branch income than in the case of dividend income. Both countries regularly exempt foreign-source dividends, whereas they only give foreign tax credits for branch income. Other countries, such as Belgium, France and Germany, advance in the ranking because they fully exempt foreign branch income — in contrast to foreign-source dividends, which are not fully exempted.

The last column in Table 2.10 reports the average double tax rate applied to outgoing branch income in 2004. When comparing the two average double tax rates for incoming and outgoing branch income, one can see again that there is no strong covariation between the two. The case of Japan illustrates this. The country imposes the highest average double taxation on incoming branch income of all countries in the table at 15.8 percent, while the average double taxation of outgoing branch income is among the lowest rates at 0.0 percent in the table.

treaty COMECO between several members of the Warsaw pact from 1977.

2.3 Conclusion

The previous two sections describe that — in the absence of any non-tax factors — multinationals have an incentive to locate their parent firms in countries that impose no or low double taxes on international profits. The pattern of cross-border M&As should reflect such a tax incentive because M&As are one of the means for international industrial reorganization and the formation of multinationals. In the presence of non-tax factors, it is an empirical matter if the tax incentives are still clear and present or if the more critical view of Markusen (1995) applies, that any effect of taxes on FDI will be dominated by other factors. The following two chapters empirically investigate whether or not tax incentives affect the direction and volume of cross-border M&As.

Table 2.1: Tax rates and tax regimes across countries in 2004

Country of residence	Tax rate	Dividend taxation	
		With tax treaty	Without tax treaty
	(1)	(2)	(3)
Austria	34.0	Exemption	Exemption
Belgium	34.0	Exemption[a]	Exemption[a]
Bulgaria	19.5	Credit	Credit[b]
Croatia	20.0	Exemption	Exemption
Czech Republic	28.0	Credit	Deduction
Denmark	30.0	Exemption	Exemption
Estonia	0.0	Credit	Credit
Finland	29.0	Exemption	Credit[b]
France	35.4	Exemption[a]	Exemption[a]
Germany	38.3	Exemption[a]	Exemption[a]
Greece	35.0	Credit	Credit
Hungary	17.7	Exemption	Exemption
Iceland	18.0	Exemption	Exemption
Ireland	12.5	Credit	Credit
Italy	37.3	Exemption[a]	Exemption[a]
Japan	42.0	Credit	Credit
Latvia	15.0	Exemption	Exemption
Lithuania	15.0	Exemption	Exemption
Luxembourg	30.4	Exemption	Exemption
Netherlands	34.5	Exemption	Exemption
Norway	28.0	Exemption	Exemption
Poland	19.0	Credit	Credit
Portugal	27.5	Exemption[c]	Exemption[c]
Romania	25.0	Credit	Credit
Slovak Republic	19.0	Exemption	Exemption
Spain	35.0	Exemption	Credit
Sweden	28.0	Exemption	Exemption
Switzerland	24.0	Exemption	Exemption
United Kingdom	30.0	Credit	Credit
United States	40.0	Credit	Credit
Average	26.7		

Notes: The first column lists top corporate income tax rates including representative state and municipal taxes where applicable with respect to retained earnings. The second column lists the countries' method of tax relief that applies to dividend income in the presence of a tax treaty. The last column provides the same information in the absence of a tax treaty. The parent firm is assumed to hold a majority in the dividend-paying subsidiary so that participation exemptions take effect.

Footnotes: a: Only 95 percent of the dividend is exempted. b: Only withholding taxes are credited but not the underlying corporate income tax. c: Only dividend income from EU sources is exempted. Other dividend income is taxed. Tax credits are provided for withholding taxes.

Table 2.2: Withholding tax rates in 2004

Source country	No treaty	Receiving country																														
		Aus	Bel	Bul	Cro	Cz	Den	Est	Fin	Fra	Ger	Gre	Hun	Icel	Irel	Ita	Jap	Lat	Lith	Lux	Neth	Nor	Pol	Por	Rom	Slvk	Spa	Swe	Swi	UK	USA
Austria	25		0	0	0	10	0	15	0	0	0	0	10	25	0	0	10	25	25	0	0	5	10	0	15	10	0	0	0	0	5
Belgium	25	0		15	5	5	0	15	0	0	0	0	10	5	0	0	5	15	5	0	0	5	5	0	5	15	0	0	10	0	5
Bulgaria	15	0	10		5	10	5	15	0	5	15	10	10	15	5	10	10	15	15	5	5	15	10	10	10	10	5	10	5	10	15
Croatia	15	0	5	5		5	5	5	5	5	15	5	5	15	5	10	15	5	5	15	0	15	5	15	5	5	15	5	5	5	15
Czech Republic	15	10	5	10	5		15	5	5	10	5	15	5	5	5	15	10	5	5	5	0	5	5	15	10	5	5	0	5	5	5
Denmark	28	0	0	5	5	15		5	0	0	0	0	5	0	0	0	0	5	5	0	0	0	5	0	10	15	0	0	0	0	0
Estonia	26	15	15	26	5	15	15		15	5	15	26	15	5	15	5	26	15	15	26	15	0	15	15	26	26	15	15	0	15	0
Finland	29	0	0	10	5	15	0	15		0	0	0	15	0	0	0	10	15	15	0	0	0	15	0	5	15	0	0	5	0	5
France	25	0	0	5	5	10	0	5	0		0	0	5	5	0	0	0	5	5	0	0	0	5	0	10	10	0	0	0	0	5
Germany	21	0	0	15	15	5	0	5	0	0		0	5	5	0	0	15	5	5	0	0	0	5	0	5	5	0	0	0	0	5
Greece	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungary	20	10	10	10	5	5	5	5	5	5	5	10		20	5	10	10	20	20	5	5	10	10	15	5	5	5	0	10	5	5
Iceland	15	15	5	15	15	5	0	5	0	5	5	15	15		5	15	15	5	5	5	0	0	5	10	15	5	5	0	5	5	5
Ireland	20	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Italy	27	0	0	10	10	15	0	5	0	0	0	0	10	27	0		10	27	5	0	0	15	10	0	10	15	0	0	15	0	5
Japan	20	10	10	10	20	10	10	20	10	0	10	20	10	20	10	10		20	20	5	5	5	10	20	10	10	10	5	10	10	10
Latvia	10	10	5	10	5	5	5	5	5	5	5	10	10	5	5	10	10		0	10	5	5	5	10	10	10	10	5	5	5	5
Lithuania	10	10	5	10	5	5	5	0	5	5	5	10	10	5	5	5	10	0		10	5	5	5	10	10	10	5	5	5	5	5
Luxembourg	0[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0
Netherlands	25	0	0	5	0	0	0	5	0	0	0	0	5	0	0	0	5	5	5	0		0	5	0	0	0	0	0	0	0	5
Norway	25	0	0	15	15	5	0	5	0	0	0	0	10	0	0	0	5	5	5	0	0		5	0	10	5	0	0	5	0	15
Poland	19	10	5	10	5	5	0	5	5	5	5	19	10	5	0	10	10	5	5	5	5	5		15	5	5	5	5	5	5	5
Portugal	25	0	0	10	25	15	0	15	0	0	0	0	15	10	0	0	25	10	10	0	0	10	10		10	15	0	0	10	0	5
Romania	15	15	5	10	5	10	10	15	5	10	5	15	5	15	3	10	10	10	10	5	0	10	5	10		10	10	10	10	10	10
Slovak Republic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0
Spain	15	0	0	5	15	5	0	5	0	0	0	0	5	5	0	0	10	15	5	0	0	15	5	0	10	5		0	10	0	10
Sweden	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0
Switzerland	35	0	10	5	5	5	0	5	5	0	0	5	10	5	10	15	10	5	5	0	0	5	5	10	10	5	10	0		5	5
United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
United States	0[b]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Notes: The "No treaty" column provides the withholding tax rates that apply to dividend payments to non-resident corporations in the absence of a tax treaty or any domestic regulation with regard to the EU Parent-Subsidiary Directive. Minimum participation exemptions are taken into account. The remaining part of the table gives the applicable withholding tax rate on a bilateral basis where the source countries are listed on the left and the receiving countries at the top. The table contains data for January 1, 2004. Footnotes: a: The zero withholding tax does not apply to all types of Luxembourg corporations. For some types it is 20 percent if there are no reductions due to tax treaties. b: Withholding tax is not imposed on dividends paid to foreign corporations if the dividends are effectively connected to the conduct of a trade or business in the United States.

Table 2.3: Analytical expressions for the double tax rate τ_{ij}^{double}

Form of double tax relief	Condition	Double tax rate τ_{ij}^{double}
None		$\tau_i + (1-\tau_j)\omega_{ij}$
Indirect foreign tax credit	$\tau_j + (1-\tau_j)\omega_{ij} \geq \tau_i$	$(1-\tau_j)\omega_{ij}$
	$\tau_j + (1-\tau_j)\omega_{ij} < \tau_i$	$\tau_i - \tau_j$
Direct foreign tax credit	$\omega_{ij} \geq \tau_i$	$(1-\tau_j)\omega_{ij}$
	$\omega_{ij} < \tau_i$	$(1-\tau_j)(\tau_i - \omega_{ij})$
Exemption		$(1-\tau_j)\omega_{ij}$
Deduction		$(1-\tau_j)\left[\omega_{ij} + (1-\omega_{ij})\tau_i\right]$

Notes: τ_i is the corporate income tax rate in parent country i; τ_j is the corporate income tax rate in subsidiary country j; and ω_{ij} is the withholding tax rate for dividends repatriated from a subsidiary in country j to a parent firm in country i. In case of a direct foreign tax credit, foreign corporate income taxes are taken to be deductible expenses against taxable corporate income in the parent country.

Table 2.4: Existence of bilateral tax treaties in 2004

Country	Aus	Bel	Bul	Cro	Cz	Den	Est	Fin	Fra	Ger	Gre	Hun	Ice	Ire	Ita	Jap	Lat	Lith	Lux	Neth	Nor	Pol	Por	Rom	Slvk	Spa	Swe	Swi	UK	USA
Austria	-	1971	1983	2000	1978	1970	2001	2000	1993	2000	1970	1975		1987	1981	1963			1992	2001	1995	1974	1970	1976	1978	1995	1991	2000	1993	1996
Belgium	1971	-	1988	2001	1996	1999	1999	1991	1999	2002	1968	1982	2000	1970	1984	1991	1999	1998	1970	2001	1988	2001	1995	1996	1997	2000	1991	1978	1987	1987
Bulgaria	1983	1988	-	1997	1998	1988		1985	1987	1987	1991	1994		2000	1988	1991	2003		1992	1990	1988	1994	1995	1994	1999	1990	1988	1991	1987	
Croatia	2000	2001	1997	-	1999	1981	2002	1986	1974	1987	1996	1996		2002	1982		2000	2000		2000	1983	1994		1996	1996		1980	1999	1981	
Czech Rep	1978	1996	1998	1999	-	1992	1994	1994	1973	1980	1986	1993	2000	1995	1981	1977	2004	1994	1991	1996	1979	1993	1994	1993	2002	1980	1979	1995	1990	1993
Denmark	1970	1999	1988	1981	1992	-	1993	1997	1957	1995	1989	1995	1996	1993	1999	1968	1993	1993	1980	1996	1997	2001	2000	1976	1992	1999	1997	1997	1996	1999
Estonia	2001	1999		2002	1994	1993	-	1993	1997	1996		2002	1994	1997	1997		2002	1993		1997	1993	1994	2003			2003	1993	2002	1994	1998
Finland	2000	1991	1985	1986	1994	1997	1993	-	1970	1979	1980	1978	1996	1992	1981	1992	1993	1993	1990	1995	1997	1994	1970	1998	1999	1990	1997	1991	1996	1989
France	1993	1999	1987	1974	1973	1957	1997	1970	-	2001	1963	1980	1990	1968	1989	1997	1997	1997	1970	1973	1999	1975	1971	1974	1973	1995	1990	1997	1987	1994
Germany	2000	2002	1987	1987	1980	1995	1996	1979	2001	-	1966	1977	1971	1962	1989	1981	1997	1997	1973	2004	1991	2003	1980	2001	1980	1966	1992	2002	1970	1989
Greece	1970	1968	1991	1996	1986	1989		1980	1963	1966	-	1983		2003	1987				1991	1981	1988	1987	1999	1991	1986	2000	1961	1983	1953	1953
Hungary	1975	1982	1994	1996	1993	1995	2002	1978	1980	1977	1983	-		1995	1977	1981	2004	2004	1990	1986	1980	2000	1995	1993	1994	1984	1981	1981	1977	1979
Iceland		2000			2000	1996	1994	1996	1990	1971			-	2003			1994	1998	1999	1997	1996	1998	1999		2002	2002	1996	1988	1991	1975
Ireland	1987	1970	2000	2002	1995	1993	1997	1992	1968	1962	2003	1995	2003	-	1971	1974	1997	1997	1972	1969	2000	1995	1993	1999	1999	1994	1993	1980	1998	1997
Italy	1981	1984	1988	1982	1981	1999	1997	1981	1989	1989	1987	1977		1971	-	1973		1996	1981	1990	1985	1985	1980	1977	1981	1977	1980	1978	1988	1984
Japan	1963	1991	1991		1977	1968		1992	1997	1981		1981		1974	1973	-			1993	1992	1993	1982		1979	1978	1975	2000	1971	1980	1972
Latvia		1999	2003	2000	2004	1993	2002	1993	1997	1997		2004	1994	1997			-	1993		1994	1993	1993	2001	2002	1999	2003	1993	2002	1996	1998
Lithuania		1998		2000	1994	1993	1993	1993	1997	1997		2004	1998	1997	1996		1993	-		1999	1993	1994	2002	2001	2001	2003	1993	2002	2002	1998
Luxembourg	1992	1970	1992		1991	1980		1990	1970	1973	1991	1990	1999	1972	1981	1993			-	1990	1983	1995	1999	1993	1991	1986	1996	1993	1983	1996
Netherlands	2001	2001	1990	2000	1996	1996	1997	1995	1973	2004	1981	1986	1997	1969	1990	1992	1994	1999	1990	-	1990	2002	1999	1998	1996	1971	1991	1966	1989	2004
Norway	1995	1988	1988	1983	1979	1997	1993	1997	1999	1991	1988	1980	1996	2000	1985	1993	1993	1993	1983	1990	-	1977	1970	1980	1979	1999	1997	1987	2000	1980
Poland	1974	2001	1994	1994	1993	2001	1994	1994	1975	2003	1987	2000	1998	1995	1985	1982	1993	1994	1995	2002	1977	-	1995	1994	1994	1979	1975	1991	1976	1974
Portugal	1970	1995	1995		1994	2000	2003	1970	1971	1980	1999	1995	1999	1993	1980		2001	2002	1999	1999	1970	1995	-	1997	2001	1993	2002	1974	1968	1994
Romania	1976	1996	1994	1996	1993	1976		1998	1974	2001	1991	1993		1999	1977	1979	2002	2001	1993	1998	1980	1994	1997	-	1994	1979	1976	1993	1976	1973
Slovak Rep	1978	1997	1999	1996	2002	1992		1999	1973	1980	1986	1994	2002	1999	1981	1978	1999	2001	1991	1996	1979	1994	2001	1994	-	1980	1979	1997	1990	1993
Spain	1995	2000	1990		1980	1999	2003	1990	1995	1966	2000	1984	2002	1994	1977	1975	2003	2003	1986	1971	1999	1979	1993	1979	1980	-	1976	1966	1994	1990
Sweden	1991	1991	1988	1980	1979	1997	1993	1997	1990	1992	1961	1981	1996	1993	1980	2000	1993	1993	1996	1991	1997	1975	2002	1976	1979	1976	-	1992	1983	1994
Switzerland	2000	1978	1991	1999	1995	1997	2002	1991	1997	2002	1983	1981	1988	1980	1978	1971	2002	2002	1993	1966	1987	1991	1974	1993	1997	1966	1992	-	1993	1996
UK	1993	1987	1987	1981	1990	1996	1994	1996	1987	1970	1953	1977	1991	1998	1988	1980	1996	2002	1983	1989	2000	1976	1968	1976	1990	1994	1983	1993	-	2002
USA	1996	1987			1993	1999	1998	1989	1994	1989	1953	1979	1975	1997	1984	1972	1998	1998	1996	2004	1980	1974	1994	1973	1993	1990	1994	1996	2002	-

Notes: The table provides the year in which the most recent tax treaty (or related protocol) between two countries was concluded. If no date is listed, there exists no ratified tax treaty for the respective country-pair as of 2004.

Table 2.5: Tax regimes for subsidiaries in 2004

Country of residence	Country of source																													
	Aut	Bel	Bul	Cro	Cze	Den	Est	Fin	Fra	Ger	Gre	Hun	Ice	Irel	Ita	Jap	Lat	Lit	Lux	Net	Nor	Pol	Por	Rom	Slk	Spa	Swe	Swi	UK	US
Austria		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Belgium	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Bulgaria	C	C		C	C	C	W	C	C	C	C	C	W	C	C	C	W	W	C	C	C	C	C	C	C	C	C	C	C	W
Croatia	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Czech Republic	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Denmark	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Estonia	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Finland	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
France	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Germany	E	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Greece	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Hungary	E	E	E	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Iceland	E	E	E	E	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Ireland	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Italy	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Japan	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C
Latvia	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E
Lithuania	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E
Luxembourg	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E
Netherlands	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E
Norway	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E
Poland	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C
Portugal	E	E	W	W	E	E	E	E	E	E	E	E	W	E	E	W	E	E	E	E	W	E		W	E	E	E	W	E	W
Romania	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C
Slovak Republic	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		E	E	E	E	E
Spain	E	E	E	C	E	E	C	E	E	E	E	E	E	E	E	E	C	E	E	E	E	E	E	E	E		E	E	E	E
Sweden	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		E	E	E
Switzerland	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		E	E
United Kingdom	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C
United States	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	

Notes: The letters indicate the tax regime that countries of residence in the left column apply to dividend income originating from fully-owned subsidiaries located in the countries listed at the top: E=Exemption regime (at least 95 percent of dividend payment is exempted), C=Indirect credit regime (withholding taxes and underlying corporate income taxes are credited), W=Direct credit regime (only withholding taxes, but not the underlying corporate income tax are credited). Participation exemptions are taken into account in determining the applicable tax regime.

Table 2.6: Country ranking of double tax rates on dividends in 2004

Country	Dividends received			Dividends paid		
	$\bar{\tau}_i^{double}$	Core_i	Wht_i	$\bar{\tau}_j^{double}$	Core_j	Wht_j
	(1)	(2)	(3)	(4)	(5)	(6)
Netherlands	1.3	0.0	1.3	1.3	0.6	0.9
Sweden	1.7	0.0	1.7	1.4	1.4	0.0
Finland	1.8	0.0	1.8	4.4	1.2	3.5
Denmark	2.1	0.0	2.1	2.9	1.1	1.8
Ireland	2.3	0.4	2.3	5.6	5.0	0.6
Luxembourg	2.8	0.0	2.8	1.0	1.0	0.0
Austria	2.9	0.0	2.9	4.1	0.6	3.8
France	3.0	1.3	1.7	2.0	0.5	1.7
Switzerland	3.0	0.0	3.0	5.8	2.8	4.1
Norway	3.3	0.0	3.3	4.1	2.0	2.6
Belgium	3.8	1.3	2.5	3.1	0.6	2.7
Italy	3.8	0.6	3.4	4.2	0.4	4.1
Germany	3.9	1.4	2.5	2.1	0.3	2.0
Spain	4.0	2.4	3.2	3.2	0.5	3.0
Croatia	4.5	0.0	4.5	8.1	4.2	6.1
Poland	4.5	1.2	4.1	6.9	3.2	5.1
Estonia	4.6	0.0	4.6	18.6	10.1	14.7
Lithuania	4.9	0.0	4.9	8.2	4.7	5.3
Hungary	5.2	0.0	5.2	9.1	3.5	6.8
Iceland	5.5	0.0	5.5	8.5	4.7	6.1
Slovak Republic	5.6	0.0	5.6	3.2	3.2	0.0
Latvia	5.9	0.0	5.9	9.0	5.4	5.7
United Kingdom	6.0	5.7	2.4	1.1	1.1	0.0
Romania	6.4	3.3	5.4	7.9	2.6	6.7
Bulgaria	6.9	3.1	5.5	9.1	3.8	7.4
Czech Republic	7.2	4.5	4.6	5.6	1.4	5.0
Portugal	7.8	5.5	4.2	5.7	1.4	4.9
Greece	9.8	9.2	4.4	0.5	0.5	0.0
United States	14.1	13.8	3.8	1.2	1.2	0.0
Japan	16.2	15.8	6.1	6.9	0.7	6.6
Average	5.2	2.3	3.7	5.2	2.3	3.7

Notes: The table is ordered in an ascending manner with respect to the average double tax rate $\bar{\tau}_i^{double}$ in the first column that applies to foreign source dividend income repatriated to the country of residence listed on the left on January 1, 2004. Averages are taken across all potential source countries in the sample. Rates are reported in percentage points. Participation exemptions are taken into account in calculating the tax rates. The second and third columns report two components of the double tax. $Core_i$ is the average double tax rate if withholding taxes are neglected. Wht_i is the average double tax rate if withholding taxes were the only source of double taxation (equivalent to all countries exempting foreign source income from taxation). Note that double tax relief for withholding taxes is generally provided so that $\bar{\tau}_i^{double}$ is generally less than the sum of $Core_i$ and Wht_i. The fourth column reports $\bar{\tau}_j^{double}$, which is the average double tax rate from the point of view of source countries. The countries listed on the left now represent the source country and tax rates apply to dividends *leaving* the country. The last two columns again report the two components of the double tax.

Table 2.7: Conditions for non-deferral in 2004

Home country	Conditions					Non-deferred tax base
	(1) Subsidiary tax rate	(2) Share ownership	(3) Additional condition	(4) Additional condition	(5) Additional condition	
Japan, set 1	$< 25\%$	$> 5\%$	mainly passive income			profit
Japan, set 2	$< 25\%$	$> 5\%$	mainly income OOR			profit
Portugal, set 1		$> 10\%$	$> 25\%$ profit OOR	blacklist		profit
Portugal, set 2	$< 60\%$ of home tax	$> 10\%$	$> 25\%$ profit OOR			profit
Portugal, set 3		$> 10\%$	financial company	blacklist		profit
Portugal, set 4	$< 60\%$ of home tax	$> 10\%$	financial company			profit
Spain, set 1	$< 75\%$ of home tax	$> 50\%$	non-EU subsidiary			max[pass. inc., profit]
Spain, set 2		$> 50\%$	blacklist			min[profit, 15% firm value]
U.K., set 1	$< 75\%$ of home tax	$> 25\%$	not on white list	$< 90\%$ profit distr.	$< 35\%$ publ. listed	pass. inc.
U.K., set 2	$< 75\%$ of home tax	$> 25\%$	$> 10\%$ op. income OOR	$< 90\%$ profit distr.	$< 35\%$ publ. listed	pass. inc.
U.K., set 3		$> 25\%$	blacklist	$< 90\%$ profit distr.	$< 35\%$ publ. listed	pass. inc.
U.S., set 1	$< 90\%$ of home tax	$> 10\%$				pass. inc. and OOR (services)

Notes: Countries with worldwide taxation generally tax foreign-source income upon repatriation. In the absence of repatriation, firms are not able to defer parent country taxation under the conditions listed in the table. Specifically, there is non-deferral of the tax base listed in the last column if all the conditions listed in a particular set for a particular country are satisfied. Column (1) lists conditions relating to the subsidiary's corporate income tax rate. Below a certain threshold, often defined in relation to the parent country's tax rate, the condition is satisfied. Column (2) lists the share that a parent firm must hold in a foreign subsidiary before non-deferral is potentially triggered. Columns (3) to (5) list additional conditions explained in the following. "blacklist": the subsidiary country is on a blacklist defined by the parent country's tax code; "non-EU subsidiary": subsidiary country is not an EU member; "not on white list": subsidiary country is not on a white list defined by the parent country's tax code; "financial company": subsidiary is a financial company; "mainly passive income": subsidiary's income is mainly passive income; "mainly income OOR": subsidary's income is mainly generated out of residence, i.e. in countries other than the subsidiary's country of residence; "$> 25\%$ profit OOR": more than 25% of the subsidiary's profits are generated out of residence; "$> 10\%$ op. income OOR": more than 10% of the subsidiary's operating income is generated out of residence; "$< 90\%$ profit distribution": less than 90% of the subsidiary's profits are distributed to shareholders; "$< 35\%$ publicly listed": less than 35% of the subsidiary's shares are publicly listed. The last column contains the tax base which is subject to parent country taxation in case of non-deferral: "pass. inc.": passive income; "15% firm value": 15 percent of the subsidiary's value; "OOR (services)": income derived from services out of residence, that is, in countries other than the subsidiary's country of residence. For the purpose of constructing deferral dummy variables, conditions relating to type of income and company, profit distribution and public listing are assumed to be satisfied if they cannot be explicitly checked in the data.

Table 2.8: Tax relief regimes applied to foreign branch income in 2004

Country of residence	Branch taxation	
	With recently concluded tax treaty (1)	Unilateral (without tax treaty) (2)
Austria	Exemption	Exemption
Belgium	Exemption	Deduction[a]
Bulgaria		Credit
Croatia		Credit
Czech Republic	Credit	Credit
Denmark	Credit	Credit
Estonia	Credit	Deduction
Finland	Credit	Credit
France	Exemption	Exemption
Germany	Exemption	Credit
Greece	Credit	Credit
Hungary	Exemption	Credit
Iceland		Credit
Ireland	Credit	Deduction
Italy	Credit	Credit
Japan	Credit	Credit
Latvia	Credit	Credit
Lithuania	Credit	Credit
Luxembourg	Exemption	Credit[b]
Netherlands	Exemption	Exemption
Norway		Credit
Poland	Credit	Credit
Portugal	Credit	Credit
Romania	Credit	Credit
Slovak Republic	Credit	No relief
Spain	Credit	Credit
Sweden	Credit	Credit
Switzerland	Exemption	Exemption
United Kingdom	Credit	Credit
United States	Credit	Credit

Notes: The first column presents the method for tax relief that applies to foreign branch income in the presence of a tax treaty. The method of tax relief in the presence of a tax treaty can vary between different bilateral treaties, in which case no unique applicable tax regime can be indicated. The first column indicates the method of tax relief for foreign branch income only if a country has consistently applied the same method in all tax treaties becoming effective in the year 2000 or later. The second column gives the method for tax relief that applies to foreign branch income in the absence of a tax treaty.
Footnotes: a: Belgium only charges 25 percent of the standard tax rate if the deduction regime applies in order to reduce double taxation. b: In case of excess foreign tax credits, Luxembourg allows a deduction of the excess foreign taxes as expenses.

Table 2.9: Tax relief regimes for foreign branches in 2004

Country of residence	Country of source																														
	Aut	Bel	Bul	Cro	Cze	Den	Est	Fin	Fra	Ger	Gre	Hun	Ice	Irel	Ita	Jap	Lat	Lit	Lux	Net	Nor	Pol	Por	Rom	Slk	Spa	Swe	Swi	UK	US
Austria		E	E	E	E	E	E	C	E	E	E	E	E	C	C	C	E	E	E	E	E	E	E	E	E	E	C	E	C	C
Belgium	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Bulgaria	E	E		C	C	E	C	E	E	E	E	E	C	E	E	E	C	C	E	E	E	E	E	E	C	E	E	E	E	C
Croatia	C	E	C		C	E	C	C	E	E	C	C	C	C	E	C	E	E	C	E	E	C	C	C	C	C	E	C	E	C
Czech Republic	E	C	C	C		E	C	C	E	E	E	C	C	C	E	E	C	C	E	E	E	C	C	C	C	E	E	C	E	C
Denmark	E	C	C	C	C		C	C	E	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Estonia	C	C	D	D	C	C		C	C	C	D	D	C	C	C	D	C	E	D	C	C	C	D	D	D	D	C	D	C	C
Finland	C	C	C	C	C	C	C		E	C	C	C	C	C	C	C	C	C	C	C	C	C	E	C	C	E	C	C	C	C
France	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Germany	E	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Greece	E	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Hungary	E	E	E	E	E	E	C	E	E	E	E		C	E	E	E	C	C	E	E	E	E	E	E	E	E	E	E	E	E
Iceland	C	E	C	C	C	E	E	E	E	E	C	C		C	C	C	E	E	E	E	E	C	C	C	C	C	E	E	E	E
Ireland	C	C	C	C	C	C	C	C	C	C	D	C	D		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Italy	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Japan	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C
Latvia	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		E	C	C	C	C	C	C	C	C	C	C	C	C
Lithuania	C	C	C	C	C	C	E	C	C	C	C	C	C	C	C	C	E		C	C	C	C	C	C	C	C	C	C	C	C
Luxembourg	E	E	E	C	E	E	C	E	E	E	E	E	E	E	E	E	C	C		E	E	E	E	E	E	E	E	E	E	E
Netherlands	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E
Norway	C	E	E	E	C	C	C	C	C	E	C	C	C	C	E	C	C	C	C	C		C	E	C	C	C	C	E	E	E
Poland	E	C	E	E	E	C	E	C	E	E	E	E	C	E	E	E	E	E	E	C	E		E	E	E	E	C	E	E	C
Portugal	E	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C
Romania	E	E	E	E	C	C	C	C	C	C	C	C	C	C	C	C	C	C	E	C	C	C	C		E	C	C	C	C	C
Slovak Republic	E	C	C	C	C	E	N	C	E	E	E	C	C	C	E	E	C	C	E	E	E	C	E	C		E	E	C	E	C
Spain	C	C	C	C	E	C	C	E	C	E	C	C	C	C	C	E	C	C	C	E	C	E	C	C	E		C	E	C	C
Sweden	C	C	C	C	C	C	C	C	C	C	E	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C	C
Switzerland	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		E	E
United Kingdom	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C
United States	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	

Notes: The letters indicate the tax regime that countries of residence, listed on the left-hand side, apply in 2004 to foreign source active business income remitted by branches located in the source countries listed at the top. E=Exemption regime, C=Credit regime, D=Deduction regime, N=No relief from double taxation.

Table 2.10: Country ranking of double tax rates on foreign branch income in 2004

Country	Branch income	
	Received $\overline{\tau}_i^{branch}$	Paid $\overline{\tau}_j^{branch}$
Belgium	0.0	0.7
Estonia	0.0	18.9
France	0.0	0.5
Germany	0.0	0.2
Netherlands	0.0	0.6
Poland	0.0	5.3
Switzerland	0.0	3.0
Lithuania	0.1	8.5
Iceland	0.2	6.8
Latvia	0.6	8.5
Hungary	1.0	6.5
Bulgaria	1.1	5.1
Ireland	1.1	10.3
Croatia	1.2	5.2
Slovak Republic	1.2	5.1
Austria	1.3	0.6
Luxembourg	2.2	1.3
Romania	2.7	3.1
Norway	3.8	1.9
Portugal	4.3	2.0
Czech Republic	4.5	1.6
Sweden	4.5	2.1
Finland	5.0	1.6
Denmark	5.7	1.4
United Kingdom	5.7	1.5
Spain	7.3	0.5
Greece	9.2	0.8
Italy	11.3	0.3
United States	13.8	0.1
Japan	15.8	0.0
Average	3.5	3.5

Notes: The first column reports the average double tax rate in percent that applies to income remitted by foreign branches to their parent firm's country of residence listed on the left. Averages are taken across all potential source countries. The table is ordered in an ascending manner with respect to this average double tax rate $\overline{\tau}_i^{branch}$. The second column reports the average double tax rate from the point of view of source countries. The countries listed on the left now represent the source country and the tax rates apply to branch income flows *leaving* the country. The average is then taken across all potential residence countries.

Never marry for money,
but marry where money is.

Proverb from the 19th century

CHAPTER 3

THE DIRECTION OF CROSS-BORDER M&AS AND INTERNATIONAL CORPORATE INCOME TAXATION[1]

A multinational typically has a parent firm in one country and subsidiaries in one or more foreign countries. In this setting, the location of the parent firm generally affects the taxes due in the parent country and all the other countries. As explained in the previous chapter, some parent countries tax the worldwide income of their resident multinationals, whereas other countries exempt the foreign-source income of their multinationals from domestic taxation. A multinational firm with a tax residence in a country that imposes worldwide taxation risks being subject to international double taxation on income generated outside the parent country. Multinationals thus stand to benefit from judiciously choosing the location of the parent firm so as to mitigate any international double taxation.

At the time of a cross-border takeover, the organizational structure of the resulting multinational firm is designed from scratch. Cross-border M&As therefore offer a unique opportunity to study the impact of international taxation on the parent-subsidiary structure of multinational firms. This chapter provides empirical evidence that international tax considerations have materially affected organizational outcomes of cross-border M&As.

The merger of Daimler in Germany with Chrysler in the United States in

[1]This chapter is based on Huizinga and Voget (2006) and Huizinga and Voget (forthcoming).

1998 offers an example where the international tax system appears to have been a key consideration. This merger resulted in a multinational firm with a parent firm (Daimler) located in Germany and a subsidiary (Chrysler) located in the United States. According to testimony given by Daimler-Chrysler's chief tax counsel before the US Ways and Means Committee on June 30, 1999, the exemption from taxation by Germany of dividend income from abroad in contrast to the US system of worldwide taxation was one of the main reasons for locating the parent firm of Daimler-Chrysler in Germany (Bogenschütz and Wright, 2000). Another interesting case is the formal merger of British Shell with Dutch Koninklijke Olie in 2005. Shell and Koninklijke Olie already joined forces in 1903, but had retained separate stock listings and separate tax residences in the United Kingdom and the Netherlands. After the formal merger in 2005 following criticism of its previous corporate structure, the new company became a tax resident of the Netherlands, even though the firm took the legal form of a British public limited company. Based on that decision, the Dutch exemption system applies to the firm's overall income rather than British worldwide taxation.

The empirical work in this chapter is the first to show that the international tax system systematically affects the organizational structure following international M&As. I consider cross-border M&As involving any two countries among a set of European countries, Japan and the United States in the 1985 – 2004 period. For each cross-border takeover, I construct two rates of international double taxation for the two possible outcomes regarding which of the two affected firms becomes the parent firm (rather than a foreign subsidiary). These double tax rates can be used to calculate international double tax liabilities incurred by the newly created multinational firm in the two possible scenarios as to parent firm location.

I find that international double tax liabilities in the realized parent-subsidiary scenario are substantially lower than in the counterfactual case where the structure is inverted. Specifically, the international double tax liability is calculated to be 0.62 percent of the combined firm's worldwide pre-tax income in the actual parent-subsidiary outcome, while it would be 2.11 percent of worldwide income in the alternative case. I proceed to estimate the impact of double taxation on the parent-subsidiary decision using a logit binary choice model. This estimation allows for the inclusion of a range of control variables, such as the relative size of the two merging firms, that affect the selection of the parent firm. International double taxation is found to have a highly significant impact on the parent-subsidiary structure. This result is robust to various

changes in model specification and estimation technique.

The logit estimation results can be used to simulate the impact of a change in the international tax system on the pattern of international parent firm selection. As an interesting possibility, I examine that the United States unilaterally abolishes its system of worldwide corporate income taxation, thereby ceasing to subject the foreign-source income of its multinationals to international double taxation. Such a regime switch, as proposed by the President's Advisory Panel on Federal Tax Reform (2005), is estimated to increase the proportion of cross-border takeovers resulting in a parent firm in the United States from 53.1 percent to 57.6 percent. For 2004 data, this corresponds to a 8.6 billion US dollar increase in the difference between outward and inward takeovers for the United States.[2]

This chapter is organized as follows. Section 3.1 reviews related studies on international taxation and M&As. Section 3.2 discusses the M&A data. Section 3.3 and Section 3.4 introduce the estimation model and present the estimation results, while Section 3.5 simulates the impact of the adoption of the exemption system of international taxation by the US on parent firm selection. Section 3.6 offers a conclusion.

3.1 Related Studies

Two recent studies examine the impact of taxation on a multinational's structure using firm-level data. First, Desai and Hines (2002) examine the role of taxation in 26 cases of so-called inversions of US multinationals in the 1982–2002 period. In these transactions, the international corporate structure is inverted in the sense that the US parent becomes a subsidiary and the earlier foreign subsidiary becomes the parent firm. These inversions serve to eliminate US worldwide income taxation of all previous foreign subsidiaries. In fact, international double taxation is avoided (except for US dividend withholding taxes) if the new parent resides in a country with an exemption system. Desai and Hines (2002) show that inverting firms typically face low foreign tax rates to confirm that inversions yield tax benefits. Despite these tax benefits, corporate inversions, however, are relatively rare due to a certain inertia.

[2] In 2004, US inward and outward M&As were valued at 81.9 and 110.0 US dollars. The value of all M&As involving the US was 191.9 billion US dollars. The change in the US net outflow of M&As is estimated to be 4.5 percent of this or 8.6 billion US dollars. See Table B.4 of United Nations Conference on Trade and Development (2005).

International double taxation potentially has an economically more significant impact on the organizational structures of multinationals created through cross-border M&As as considered in this chapter, as in these instances organizational structures are made from scratch. Second, Devereux and Griffith (1998) examine the impact of taxation on the decisions of US firms whether and how to serve European markets. The US firm can choose to establish production facilities in a European country or it can export to Europe. Taxation is found to affect the choice among European production locations, but not the choice whether to produce in Europe at all. Devereux and Griffith (1998) use data on multinationals headquartered in the US, hence taking a US tax residence as given.

Several studies focus on non-tax determinants of cross-border M&As. Rossi and Volpin (2004), for example, report a governance motive for cross-border takeovers. Firms in countries with strong shareholder protection, in particular, tend to acquire firms in countries with poor shareholder protection. This enables firms in countries with poor shareholder protection to "import" better protection, possibly resulting in a lower cost of capital and higher firm valuation. In line with this, Bris and Cabolis (2008) find that an industry's market value increases when firms in that industry are acquired by foreign firms residing in countries with better shareholder protection and better accounting standards.

3.2 The M&A Data and International Double Taxation

From the Thomson Financial Securities Data Company database, I select all M&As involving any two countries in a sample of European countries, Japan, and the United States during the 1985-2004 period. The cross-border acquiring firm becomes the parent firm of the newly created multinational firm, while the target firm becomes a foreign subsidiary or branch.[3] For tax purposes, the newly created multinational is resident in the acquiring or parent country. The database does not provide information on whether a subsidiary or a branch

[3] I do not have any information on any pre-existing subsidiaries of the two merging firms. This implies that I cannot check whether the parent firm of the newly created multinational firm will be able to engage in worldwide tax averaging. This would potentially reduce the overall tax costs of repatriations. At the same time, I can not analyze how pre-existing subsidiaries are rearranged in the new ownership structure.

is created. As subsidiary structures are more common, I take these to be the benchmark case. In the empirical work, however, I consider the international taxation of branches as a robustness check. The acquiring firm, as reported by Thomson, becomes the immediate owner of the target firm. The database also provides information on the ultimate owner of the newly acquired firm. In some cases, the nationalities of the immediate and ultimate owners differ and the ultimate owner uses a holding company in another country to acquire the target. Corporate structures of this kind may aim to delay or avoid taxation by the ultimate parent country. In a robustness check, I exclude countries where multinationals commonly use organizational structures involving immediate owners in other countries.

Multinational firms are more likely to be concerned about the amounts of international double tax to be paid than about double tax rates per se. Hence, the selection of the parent firm in an international takeover can be expected to reflect the additional tax liability that is incurred one way versus the other. To reflect this, for each takeover I construct a double tax liability rate, denoted θ_{ij}^{double}, defined as the incurred double tax liability as a share of the combined firm's worldwide pre-tax income if firm a (from country i) takes over firm b (in country j) as follows:

$$\theta_{ab}^{double} \equiv \begin{cases} 0 & \text{if} \quad PI_b \leq 0 \\ \tau_{ij}^{double} \times \frac{PI_b}{PI_a + PI_b} & \text{if} \quad PI_b > 0,\ PI_a > 0 \\ \tau_{ij}^{double} & \text{if} \quad PI_b > 0,\ PI_a \leq 0 \end{cases} \tag{3.1}$$

PI_a and PI_b are the pre-tax incomes of the two firms before merging to proxy for expected future incomes, and τ_{ij}^{double} is the statutory double tax rate discussed in the previous chapter.[4] Expression (3.1) reflects that there is no double taxation of the target's income if this income is zero and negative. Furthermore, the expression avoids inflating the tax burden variable θ_{ab}^{double} beyond the statutory double tax rate τ_{ij}^{double} if the acquiring firm's income is negative.[5] Straightforwardly, θ_{ba}^{double} is the corresponding double tax liability rate, if instead firm b takes over firm a.

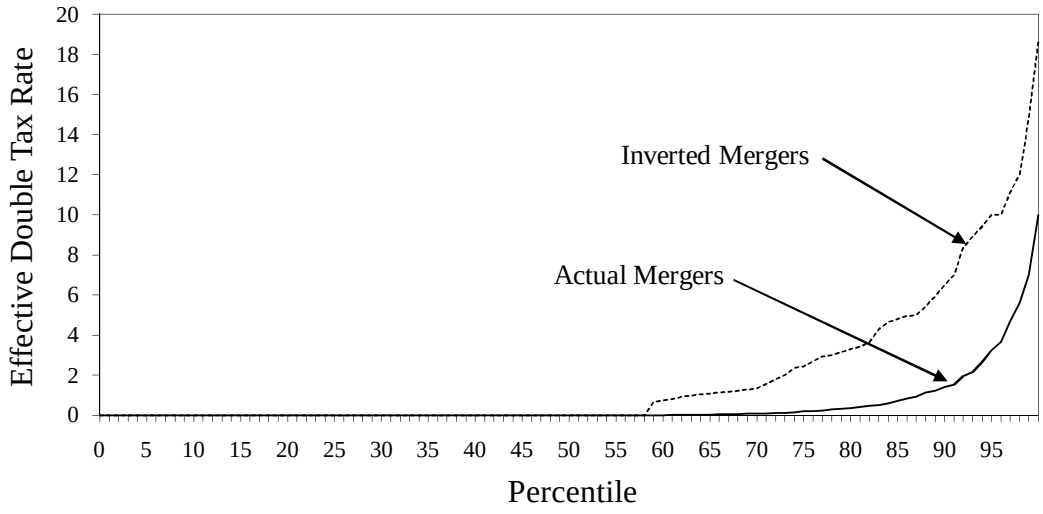
To calculate θ_{ab}^{double}, I need information on the pre-tax incomes of both the acquiring and target firms. For 626 M&As, this information is provided by the

[4] An additional subscript t indicating the year in which an M&A takes place is suppressed. The variation in τ_{ij}^{double} and τ_{ji}^{double} over time due to changes in tax rates and tax regimes between 1985 and 2004 has been taken into account, of course.

[5] If $PI_a < 0$, I assume the parent firm can carry any losses forward or backward so that τ_{ij} is the applicable double tax burden.

Thompson database. To expand the sample, I obtained additional information on pre-tax incomes for some firms from the Compustat Global and Compustat North America databases using CUSIP company identification codes.[6] In this manner, I increased the sample of international M&As for which one can calculate two-way double tax liabilities to 917. For these M&As, I calculate that the average double tax liability according to (1) is 0.62 percent of the merged firm's worldwide pre-tax income. This corresponds to an average annual absolute double tax liability of 4.4 million US dollars per M&A. Interestingly, if the parent-subsidiary structure were inverted, the double tax liability rate would increase to 2.11 percent of worldwide pre-tax income, which corresponds to an absolute annual double tax liability of 15.5 million US dollars. These data suggest that the organizational structure of multinational firms following cross-border M&As is chosen with international double taxation in mind. Additional information on the distribution of actual double tax liability rates and the rates for inverted mergers is provided in Figure 3.1.

Figure 3.1: Distribution of double tax liability rates



Legend: The solid line describes the distribution of double tax liability rates θ^{double} for actual mergers ordered from the lowest to the highest double tax liability rate. The dashed line describes the distribution of double tax liability rates θ^{double} if all mergers were inverted.

The solid and dashed lines in the figure indicate the actual and counterfactual double tax liability rates by percentile, respectively. The figure confirms

[6] CUSIP is the acronym for the Committee on Uniform Security Identification Procedures.

that the mean actual double tax liability rate is lower than the counterfactual, where the parent-subsidiary structure is inverted. At the same time, the actual share of M&As subject to no double taxation is larger than in the inverted case.

In the following sections, I provide empirical evidence on how double taxation affects the direction of cross-border M&As given that the transaction takes place. For this purpose, I estimate a logit binary choice model of selecting the acquiring and target firms.

3.3 Estimating Equation

Following Mitchell and Mulherin (1996), the binary choice model assumes that mergers reflect the synergies from combining two firms and that investors value the individual firms and the merger correctly.[7] Let $V_{ab} = x'_{ab}\beta + \varepsilon_{ab}$ be the value of the merged company if firm a acquires firm b. In this expression, x_{ab} is a vector of independent variables, including the double tax liability θ_{ab}^{double} for the case where firm a acquires firm b, while β is a vector of coefficients and ε_{ab} is an error term with a Weibull distribution. Similarly, let $V_{ba} = x'_{ba}\beta + \varepsilon_{ba}$ be the value of the newly created firm if firm b acquires firm a. The difference in the two firm values, $V_{ab} - V_{ba}$, is given by

$$V_{ab} - V_{ba} = (x_{ab} - x_{ba})'\beta + \varepsilon_{ab} - \varepsilon_{ba} \tag{3.2}$$

where the error term $\varepsilon_{ab} - \varepsilon_{ba}$ follows a logistic distribution as seen in McFadden (1973). If $V_{ab} - V_{ba} > 0$, then firm a will be the acquirer. Hence, the probability of firm a taking over firm b is given by[8]

$$\text{Prob } (V_{ab} - V_{ba} > 0 \mid x_{ab}, x_{ba}) = \frac{\exp x'_{ab}\beta}{\exp x'_{ab}\beta + \exp x'_{ba}\beta} \tag{3.3}$$

The coefficients β can be estimated by way of the following logistic regression model

$$E[y_n|\Delta x_n] = \frac{\exp(\Delta x'_n\beta)}{1 + \exp(\Delta x'_n\beta)} \tag{3.4}$$

[7] Alternatively, the model could also reflect stock market driven acquisitions (Shleifer and Vishny, 2003), where rational managers initiate mergers without real economic long-run gains as a reaction to investors' over- and undervaluation of firms.

[8] The probability is conditional on there being a profitable opportunity for the two firms to merge such that $(V_{ab} \geq V_a + V_b) \quad \vee \quad (V_{ba} \geq V_a + V_b)$, that is, the sum of the parts is worth more than the parts of the sum. I expect this condition to be independent of Prob $(V_{ab} - V_{ba} > 0)$.

where the dependent variable is $y_n \equiv \begin{cases} 1 & \text{if } V_{ab} - V_{ba} > 0 \\ 0 & \text{if } V_{ab} - V_{ba} \leq 0 \end{cases}$,
$\Delta x_n \equiv (x_{ab} - x_{ba})_n$, and n counts the mergers. The n cross-border takeovers are taken to involve a total of m countries.

For exposition, let a be the observed acquirer and b the target. In the vector Δx_n of regressors, I include $m-1$ country dummy variables that capture the propensity of a particular country to be the acquirer country rather than the target country. This country dummy variable for, say, Austria can take on one of three values: (i) it is set to 1 if firm a is Austrian; (ii) it is set to -1 if firm b is Austrian; and (iii) it is set to zero otherwise. In addition to these country fixed effect variables, the vector Δx_n includes the relative double tax burden variable, $\Delta\theta_{ab}^{double} \equiv \theta_{ab}^{double} - \theta_{ba}^{double}$, and several firm-level and country-level controls.

With a and b denoting the acquiring and target firms, it follows that the dependent variable vector y_n just contains 1's and hence displays no variation. A model with a constant dependent variable would, of course, obtain a perfect but trivial fit, if it included a constant among the regressors. The country fixed effect variables, however, are not constants and generally no linear combination of these variables exists that adds up to a constant vector. Thus, the model can be estimated in a non-trival way. Estimation is by maximization of the joint log-likelihood function as follows

$$\log L = \sum_{k=1}^{n} \left[y_k \log \frac{\exp(\Delta x_k' \beta)}{1 + \exp \Delta x_k' \beta)} + (1 - y_k) \log \frac{\exp(-\Delta x_k' \beta)}{1 + \exp(-\Delta x_k' \beta)} \right] \quad (5)$$

With a and b denoting the acquiring and target firms, y_k equals 1 in (5) for all k and the second term within the square brackets vanishes.[9] The convention of letting firm a always be the acquiring firm, however, is arbitrary and this does not affect the estimation results. To see this, let us invert the labeling for exactly one transaction so that for this transaction firm b becomes the acquiring firm and firm a is the target firm. Note that now the dependent variable vector y_n no longer is a unit vector, as it now contains exactly one zero element. It is easily seen that inverting the labeling convention for one deal does not affect the expression for the log-likelihood in (5). Specifically, for this particu-

[9] Note that all regressors in Δx_n have to take on both negative and positive values for different observations k to ensure that the maximum likelihood estimation is well defined. Otherwise, the likelihood would not converge but go to infinity. This implies that each country should have at least one acquiring firm and one target firm in the sample. This condition is satisfied.

lar transaction k now y_k equals zero (so that the second term between square brackets in (5) no longer drops out), while $\Delta x'_k$ becomes the negative value of what it was before (as $x_{ba} - x_{ab} = -(x_{ab} - x_{ba})$). Hence, the log-likelihood expression remains the same, and the estimation yields the same coefficients β. Generally, one can, of course, take firm a to be the target firm in any number of observed M&As without affecting the estimation. I expect the estimation to yield a negative coefficient for the $\Delta\theta_{ab}^{double}$ variable, as double taxation by a country a makes parent firm location in that country less likely.

The relative double tax burden $\Delta\theta_{ab}^{double} = \theta_{ab}^{double} - \theta_{ba}^{double}$ is due immediately, if subsidiary profits are repatriated to the parent country. As mentioned in the previous chapter, parent country taxation can generally be deferred if profits are not repatriated, but there are some exceptions.[10] As reported by Table 2.7 of Chapter 2, deferral is not available under some conditions in Japan, Portugal, Spain, the United Kingdom and the United States. On the basis of this information, I construct bilateral dummy variables D_{ab} and D_{ba} indicating whether parent country a allows deferral of taxation on income from country b, and vice versa.

Frequently, I do not have all information necessary to see whether non-deferral applies in a certain case. For instance, I do not know the mix of active and passive income of the target firm. Thus, I have to make certain assumptions to be able to construct the deferral variables. Specifically, any necessary conditions regarding the type of income, the rate of profit distribution, and the ownership share of the parent that potentially trigger non-deferral are assumed to be met. With these assumptions, Japan, Portugal, Spain, United Kingdom and the United States deny deferral, if the subsidiary-country tax rate is rather low. Next, I construct the variable $\Delta\theta_{ab}^{double,d} = D_{ab}\theta_{ab}^{double} - D_{ba}\theta_{ba}^{double}$ as the part of the double tax liability $\Delta\theta_{ab}^{double}$ that can be deferred. Deferral makes parent country taxes less burdensome and thus I expect the $\Delta\theta_{ab}^{double,d}$ variable to obtain a positive coefficient.

Among the firm-level controls in the set Δx_n, $\Delta Size$ is a measure of the relative size of the two firms involved in the takeover. It is defined as the difference in the two firms' assets divided by the sum of their assets (see Table 3.1 for variable definitions and data sources). I expect this variable to obtain a positive sign, as the larger firm is more likely to take over the smaller one.

[10] Desai and Hines (Figure 2, 2004) show that rates of profit repatriation of US multinationals have declined substantially since 1982, increasing the scope for deferral. For established multinationals, Hines (1994) demonstrates that deferral importantly affects investment and profit shifting incentives.

Next, $\Delta Liquidity$ is the difference in the ratios of liquid assets to total assets. The more liquid firm may find it relatively easy to take over the other firm, as it has relatively little need for costly external funds to finance the acquisition.[11] Next, $\Delta Leverage$ measures the difference in the leverage ratios of the two merging firms. This variable could reflect relative borrowing capacity, for instance on account of different costs of borrowing. Desai and Hines (2002) argue that a low leverage may reflect a high borrowing cost and thus a low borrowing capacity. A positive sign for the $\Delta Leverage$ would suggest that the more highly leveraged firm is more likely to be the acquirer. As an alternative measure of borrowing capacity, I also use $\Delta Fixedassets$, which is the difference in the two firms' ratios of fixed assets to total assets. Fixed assets may easily serve as collateral and hence may signal borrowing capacity (cf. Rajan and Zingales, 1995). An acquiring firm may either wish to borrow against its own fixed assets or against the target's fixed assets, and therefore the expected sign for the $\Delta Fixedassets$ variable is not clear. The variable ΔROA is the difference in the rates of return on assets. More profitable firms are expected to take over less profitable ones.[12] Parent firm location in a country will involve certain headquarter activities that are subject to the parent country corporate tax rate. For this reason, parent firm location in the high-tax country may be less likely. Conversely, parent firm location in the high-tax country may be more likely, if a high taxation regime implies high public spending on, for instance, infrastructure that benefits parent firms. Thus, the difference in the two countries tax rates, represented by the $\Delta Taxrate$ variable, could obtain either sign. Next, I construct the $\Delta Stockmarket$ variable as the difference in the two countries' stock market capitalizations divided by their summed capitalization. The acquiring firm may more easily raise equity capital in its domestic capital market and hence the $\Delta Stockmarket$ variable is expected to obtain a positive sign. As in Di Giovanni (2005), the variable is lagged one period to account for possible endogeneity. Along similar lines, $\Delta Credit$ is the difference in the two countries' domestic credit to the private sector divided by the

[11] The 'pecking order' for financing firms (i.e., preferring internal funds over external funds) is a result of asymmetric information between managers and investors as first comprehensively illustrated by Myers and Majluf (1984). A significant liquidity variable in the context of M&As could imply that the acquiring firm's managers are better informed about target firms than outside investors.

[12] ROA may also serve as a proxy for the book-to-market ratio, which is not available for most firms in the sample. The model for stock market driven acquisitions by Shleifer and Vishny (2003) predicts that acquirers should be more overvalued than their targets. Rau and Vermaelen (1998) have found suggestive evidence that supports this hypothesis.

summed credit provision, all lagged one year. The acquiring firm may more easily borrow in its own country or in the target country, depending on how important bank information about the acquiring firm and the acquired assets are. Thus, the $\Delta Credit$ variable could take on either sign. Further, $\Delta Exch.rate$ is symmetrically calculated as the difference in the annual percentage changes in the bilateral exchange rate lagged by one year. A positive value of $\Delta Exch.rate$ implies past exchange rate appreciation, which is expected to make foreign acquisitions more likely (Blonigen, 1997, and Di Giovanni, 2005). In a robustness check, I further include the $\Delta Pretaxinc$ variable, which is the difference of the pre-tax incomes divided by their sum. This variable thus measures relative size by pre-tax income rather than assets. Again, I expect the larger firm to take over the smaller one. Finally, $\Delta Investment$ is the difference of the two firms' ratios of investment to assets. Firms with high investment rates may have profitable investment opportunities that to some extent are transferrable to target firms, which could explain a positive estimated coefficient. Table 3.2 contains the variables' summary statistics. Note that the included country dummy variables serve to capture country-specific determinants of M&A activity such as the legal and regulatory framework and capital gains taxation. See Rossi and Volpin (2004), Dyck and Zingales (2004), La Porta et al. (2002), Comment and Schwert (1995) and Ayers et al. (2003) for empirical evidence on these determinants of M&As.[13]

3.4 Estimation Results

Table 3.3 presents the results of regressions explaining the direction of M&As. In regression (1), the relative double tax burden variable $\Delta\theta^{double}$ enters with a coefficient of -0.358 that is statistically significant. This suggests that an increase in the double tax burden in one country by one percentage point reduces that country's probability of being the acquiring country by 9.0 percentage points in case of a merger of equals.[14] For comparison, the relative double

[13] Differences in capital gains taxation may also have an influence on the direction and the form of an international M&A. An empirical study by Ayers et al. (2003) suggests that such an effect may exist, as these authors find that domestic shareholder-level capital gains taxes are associated with higher acquisition premiums for taxable acquisitions. I do not explicitly take capital gains taxes into account. There is, however, no bilateral variation in capital gains taxes. Hence, country-specific effects should be sufficient to control for their effect.

[14] The marginal effect of a change in the regressors on the probability that firm a is the acquiring firm is given by the expression

tax burden from the acquirer's perspective is -1.5 percent on average as seen in Table 3.2. International double taxation thus affects M&A outcomes in an economically significant way. Among the controls, the relative size variable enters with a positive and significant coefficient to suggest that the larger firm is more likely to be the acquirer. More liquid assets and a larger leverage appear to make it also more likely that a firm becomes the acquirer firm. The rate of return on assets variable obtains a negative coefficient, but it is statistically insignificant.[15] The relative tax rate obtains a positive coefficient that is statistically insignificant. The relative stock market capitalization and credit provision variables enter with positive and negative coefficients, respectively, that are both insignificant. The exchange rate variable, finally, obtains an unexpected negative, but insignificant, coefficient.

Next, in regression (2) I add the $\Delta\theta^{double,d}$ variable that reflects the part of $\Delta\theta^{double}$ that is potentially deferred. This variable enters with a negative coefficient, but it is statistically insignificant. This could reflect that the value of the deferral option is uncertain to merging firms or that deferral has little value because it may lead to suboptimal reinvestment in the subsidiary country, for instance. Also, the deferral variable may measure the expected availability of deferral imperfectly.

The negative estimated coefficient for the $\Delta\theta^{double}$ variable in regression (1) could merely reflect that firms with relatively high pre-tax incomes are likely to be acquiring firms for reasons other than international double taxation. To exclude this possibility, in regression (3) I include the relative pre-tax income variable as a separate control variable. This relative pre-tax income variable obtains a positive coefficient, but it is insignificant. The relative double tax burden variable now obtains a coefficient of -0.263 that remains statistically significant.

Regression (4) includes the relative investment variable as a control variable. This reduces the sample size from 582 to 346 observations due to missing investment cash flow data. The relative investment variable is estimated with a positive and significant coefficient. This could reflect that firms with high investment levels have profitable investment opportunities that can be trans-

$$\frac{\partial E[y_n|\Delta x_n]}{\partial \Delta x_n} = \Lambda(\Delta x_n'\beta)\left[1 - \Lambda(\Delta x_n'\beta)\right]\beta,$$

where $\Lambda(\cdot)$ indicates the logistic cumulative distribution function. With a merger of equals, $\Delta x_n = 0$ and the marginal effect of x_n on the probability reduces to 0.25β.

[15] The insignificance of an indicator for managerial competence is in line with Franks and Mayer (1996), who also failed to find evidence for M&As being triggered by managerial failure.

ferred to target firms. The relative double tax burden variable obtains a somewhat more negative coefficient of -0.501 that remains statistically significant. In regression (5), I replace the relative leverage variable by the relative fixed assets variable as an index of borrowing capacity. The negative estimated coefficient for the latter variable suggests that firms with relatively large fixed assets make good takeover targets, but the estimate is statistically insignificant.

As a test of robustness, regression (6) applies the probit model rather than the logit model to specification (1). This yields an estimated coefficient for the relative double tax burden variable of -0.186 that is statistically significant. This estimate implies that an increase in the double tax burden of one percentage point in a country reduces the probability of that country being the acquirer by 7.4 percent for the case of a merger of equals.[16] Thus, the calculated marginal affect of a change in double taxation is slightly less than for the logit model.

So far, I have assumed that a merger results in a multinational firm with a foreign subsidiary. Alternatively, the multinational firm could opt for a branch structure. As discussed in Chapter 2, the international taxation of the income of foreign subsidiaries and foreign branches generally differ. As a robustness check, I next construct the relative double tax burden variable $\Delta\theta^{double}$ on the assumption that foreign establishments take the form of branches. The estimated coefficient for the relative double tax variable for the branch case in regression (7) is very similar at -0.355, and it remains statistically significant.

Two firms engaging in a cross-border merger can opt for a simple parent-subsidiary structure or, instead, for a more complex structure involving a holding company in a third country. The data source provides information on the nationalities of the immediate and ultimate acquirers and thus one can check whether international holding companies are prevalent in the sample. For the 582 transactions in the benchmark regression, there are 12 where these two nationalities differ. These 12 transactions involve 5 countries of ultimate ownership: France, Italy, Luxembourg, the Netherlands and the United Kingdom. In the case of France, 2 out of 36 ultimate owners in France use immediate owners in other countries. For Italy, Luxembourg, the Netherlands and the

[16] Marginal effects in the probit model are given by

$$\frac{\partial E[y_n|\Delta x_n]}{\partial \Delta x_n} = \phi(\Delta x_n'\beta)\beta,$$

where $\phi(\cdot)$ indicates the standard normal density function. With a merger of equals, $\Delta x_n = 0$ and the marginal effect of x_n on the probability reduces to about 0.4β.

United Kingdom, the corresponding figures are 5 out of 28, 1 out of 3, 3 out of 39 and 1 out of 89, respectively. Regression (8) excludes transactions with ultimate owners or targets in France, Italy, Luxembourg or the Netherlands, as ultimate owners in these countries use holding companies in other countries in this sample relatively intensively. The estimated coefficient on the relative double tax burden is similar to previous results at -0.340 and it is statistically significant.

Next, regression (9) applies a conditional logit model to specification (1). Specifically, the estimation is conditioned on information about the proportion of firms that establish a parent firm in one of two countries for any pair of countries.[17] The estimated parameter for the relative double tax parameter is very similar to previous results at -0.322 and is statistically significant.

Finally, I consider the possibility that corporate taxation is endogenous to the direction of M&As. To see how endogeneity may arise, one can interpret international double taxation as a user fee for using a country as the parent country. Such a fee may be justified by, say, a country's superior legal and accounting environment or alternatively the smooth operation of its labor market. An increase in the demand for a country's services as the parent country may endogenously give rise to an increase in the user fee, that is, a higher rate of double taxation applied to resident parent firms. Such a positive response of international double taxation to the location of parent firms in a country could give rise to a positively biased estimated coefficient for the $\Delta\theta^{double}$ variable. To adjust for potential endogeneity, I apply a two-step instrumental variable probit, where $\Delta\theta^{double}$ and $\Delta Taxrate$ are instrumented by their one- and two-year lagged values.[18] The relative tax burden variable now obtains a coefficient of -0.190 as reported in regression (10), which is very similar to the estimate of -0.186 in the probit regression (6). A Wald test of the hypothesis that $\Delta\theta^{double}$ and $\Delta Taxrate$ are exogenous cannot be rejected. A test of the overidentifying restrictions indicates that the hypothesis that the instruments are valid cannot be rejected either. Overall the results in this section show that the direction of international M&As is affected by the prospect of

[17] For mergers between countries i and j (with $i < j$), I define all observations with headquarters locating in country i as "successes" ($y_n = 1$) and all observations with headquarters locating in country j as "failures" ($y_n = 0$). Conditioning the likelihood on the country-pair specific number of successes and failures results in Chamberlain's (1980) fixed-effects logit estimator, which allows for the presence of fixed effects on the level of bilateral country relationships. See also Greene (2008, pp. 800–805) for a good description of the fixed-effects logit estimator.

[18] The chapter's appendix contains further details on the instrumental variable estimation.

international double taxation and that the estimated effect is economically significant. This finding is robust to a variety of changes in the empirical model specification and estimation technique.

3.5 Simulation of International Tax System Change by the United States

The empirical results suggest that countries can attract additional parent companies by lowering international double taxation, either through lower tax rates or more generous double tax relief. For the US case, the President's Advisory Panel on Federal Tax Reform (2005) has recently advocated abolishing the US system of worldwide taxation in favor of an exemption system. The American Jobs Creation Act of 2004 already temporarily allowed US multinationals to repatriate profits subject to a flat tax rate of 5.25 percent from October 2004 until the end of 2005. In response, the foreign subsidiaries of US multinationals increased their repatriations six fold from 34 billion US dollars in 2004 to 217 billion US dollars in 2005.[19] This shows that the current system of worldwide taxation in the United States has a material impact on the behavior of US multinationals. In this section, I present simulations of how an abolition of worldwide taxation by the United States would affect the propensity of newly created multinational companies in this sample to establish a parent firm in the United States. The international tax systems of other countries are assumed to remain unchanged. In the simulations, I use the estimated coefficients of regression (1) in Table 3.3.

Column (1) of Table 3.4 gives the proportion of multinational firms resulting from M&As involving the US that establishes a parent firm in country i. This proportion equals the average predicted probability P_i of parent firm location in country i. Note that 53.1 percent of the deals actually resulted in a parent firm in the United States. Column (2) gives the change in this proportion, or dP_i, that is simulated to occur after the US switches to an exemption system, while column (3) provides the corresponding relative change in the

[19] See Federal Reserve Board of Governors (2006, p. 18). Annual repatriations by US multinationals have never exceeded 50 billion US dollars before 2005. The counterpart to the repatriations from foreign subsidiaries are foreign earnings retained abroad. For the US, quarterly foreign earnings retained abroad have always been positive and since 1996 they have grown from 50 to about 150 billion US dollars before plunging to -62 billion and -81 billion US dollars in the last two quarters of 2005 (see Federal Reserve Board of Governors, 2006, p. 13).

propensity to choose a US parent, or dP_i/P_i. In columns (2) and (3), estimated changes in the probability of establishing a US parent are zero for Belgium, Germany, Italy, Japan, and Spain, as these countries' tax rates are so high in the sample that the US imposes no double tax on foreign-source income from these countries. All other 'partner' countries see their chances of becoming the parent country decrease. For Ireland, the probability of obtaining the parent firm falls rather strongly from 38.2 percent to 3.6 percent. This reflects that US multinationals operating in Ireland are subject to considerable US tax due to the low Irish tax rate of 12.5 percent. The United States itself experiences an increase in the probability of becoming the parent country from 53.1 percent to 57.6 percent.

Columns (4)-(6) provide information about how the US abolition of worldwide taxation affects country i's chances of hosting the parent firm following cross-border deals involving any country (and not just the United States). These columns reflect how deals involving the United States are affected, as before, and also a country's proportion of deals with the United States. The probability of a parent firm in Ireland is now reduced by about 13 percentage points, which reflects that about a third of the deals involving Irish firms are with a US partner. All the same, the redistribution of parent firm activity towards the United States from Ireland and several other countries remains substantial.

3.6 Conclusion

This chapter shows that the international tax system affects the organizational structure of cross-border takeovers. Countries that impose high levels of international double taxation are less likely to attract the parent companies of newly created multinational firms. For a merger of equals, an increase in the effective double tax rate by one percentage point lowers the probability of the burdened firm to be the acquirer by 9.0 percent. This effect is lower when firms differ in size, but the negative effect of double taxation persists even when accounting for size differences.[20] This result implies that, over time, multinationals will assume a corporate structure that minimizes double taxation. Industries are reorganized on an international level through cross-border mergers to achieve production efficiency with respect to increasing market

[20] The smaller marginal effect in case of asymmetric firms is a property of the logit regression (as it is non-linear).

sizes. In every merger, the parent firm tends to reside in the country offering the lower double tax burden.

The organizational structure of multinational firms, of course, has important non-tax as well as tax implications. Specifically, the international organization of the firm implies cross-border relationships of ownership and control that are bound to affect the internal operation of the firm and the dealings of the firm with the affected national economies in the form of employment, for instance. The sensitivity of organizational outcomes of cross-border takeovers to international double taxation suggests that this taxation may carry significant economic costs in distorting international relationships of ownership and control.

One implication is that countries taxing worldwide income tend to lose multinationals' headquarters over time and every relocated headquarter contributes to the erosion of the corporate income tax base. The countries can slow this process by lowering their corporate income tax rate as this reduces the double tax burden with respect to its trading partners. Some countries may even actively cater to multinationals as a location for headquarters by exempting foreign income from taxation and offering a complete set of tax treaties with other countries that offer advantageous dividend withholding tax rates.

Some facts support such a tentative hypothesis: The Netherlands are a well-known location for multinational headquarters and it is striking to find this country ranked with the lowest double tax burden in the ranking of Table 2.6. In contrast, the US and Japan are found at the very bottom of this ranking with relatively high double tax burdens, suggesting that the US and Japan indeed act as Stackelberg leaders in the spirit of the model developed by Gordon (1992): The US and Japan, being large (and traditionally FDI-exporting) countries, apply a foreign tax credit regime and keep corporate taxes relatively high. The other countries act as Stackelberg followers by either keeping the corporate tax level lower than the US or Japan or by exempting foreign source income from taxation, which may eventually attract some multinational headquarters.

The countries applying worldwide taxation may change their policy if the distortions caused by double taxation become too strong. The United Kingdom is about to abandon its traditional foreign tax credit system and exempt dividend income from abroad from taxation.[21] Also, quite recently, the Presi-

[21] Ironically, the looming changes in tax policy prompted two firms, Shire and United Business Media, to relocate their headquarters to Ireland by means of an acquisition in April 2008. These two cases are good examples of how double taxation has an effect on the organizational

dent's Advisory Panel on Federal Tax Reform (2005) has advocated the elimination of worldwide taxation by the US. Simulations presented in this chapter suggest that the impact of such a policy reform on the international patterns of parent country selection could be economically significant. I estimate that the proportion of US-related cross-border takeovers resulting in an American parent company would increase from 53 to 58 percent.

This chapter has mainly focused on the impact of double taxation on the organizational structure of multinationals and the location of headquarters. However, the previous paragraph touches upon another aspect of cross-border mergers and acquisitions: They are also the most substantial contributor to foreign direct investment, especially between developed countries. The next chapter discusses cross-border mergers and acquisitions from that point of view.

structure of multinationals. It seems that the two multinationals did not like the prospect of the United Kingdom taxing their worldwide passive income such as licensing fees on a current basis. The United Kingdom meant to introduce this measure as a supplement to the exemption system in order to reduce the scope for profit shifting.

Table 3.1: Definitions of explanatory variables and data sources

Variable	Description and data source
$\Delta\theta^{double}$	Difference between firms' double tax burden rates in percent after acquiring the other firm. The double tax burden is the additional double tax liability divided by the two firms' combined pre-tax income. The variable is measured in percentage points. Sources for corporate income tax rates: Chennells and Griffith (1997), Eurostat (2004), KPMG International Tax and Legal Center (2003). Sources for tax regimes, tax treaties and withholding taxes: Coopers & Lybrand (1998), IBFD (2005a, 2005b, 2005c, 2005d). Previous issues of these publications were consulted as well. Sources for financial information: Thomson Financial, SDC Database; Compustat Global and Compustat North America.
$\Delta\theta^{double,d}$	The part of $\Delta\theta^{double}$ that can be deferred in case of non-repatriation of subsidiary profits. Sources as for the variable $\Delta\theta^{double}$ above.
$\Delta Size$	Difference in firms' assets divided by the sum of the merging firms' total assets in millions of U.S. dollars. Sources: Thomson Financial, SDC Database; Compustat Global and Compustat North America.
$\Delta Liquidity$	Difference in firms' liquidity ratios (liquid assets/ total assets). Sources: Thomson Financial, SDC Database; Compustat Global and Compustat North America.
$\Delta Leverage$	Difference in firms' leverage ratios (total liabilities/ total assets). Sources: Thomson Financial, SDC Database; Compustat Global and Compustat North America.
$\Delta Fixedassets$	Difference in the firms' ratios of fixed assets over total assets. Sources: Thomson Financial, SDC Database; Compustat Global and Compustat North America.
ΔROA	Difference in firms' profitability (net income / total assets). Sources: Thomson Financial, SDC Database; Compustat Global and Compustat North America.

(continued on the next page)

Table 3.1 (*continued*)

Variable	Description and data source
$\Delta Taxrate$	Difference in corporate income tax rates of the two countries. Sources: Chennells and Griffith (1997), Eurostat (2004), KPMG International Tax and Legal Center (2003).
$\Delta Stockmarket$	Difference in stock market capitalizations of the two countries relative to the sum of the countries' stock market capitalizations lagged by one year. Source: World Development Indicators 2004, World Bank (2004).
$\Delta Credit$	Difference in domestic credit to the private sector of the two countries divided by the summed volume of credit provision lagged by one year. Source: World Development Indicators 2004, World Bank (2004).
$\Delta Exch.rate$	Difference in the two countries' changes (between 1 January and 31 December) of the real bilateral exchange rate in percentage points lagged by one year. An increase in this variable represents an appreciation of firm a's home currency. Source: International Financial Statistics 2007, International Monetary Fund.
$\Delta Pretaxinc$	Difference in firms' pretax incomes divided by the sum of pretax income in millions of US dollars, where non-positive values of pretax income are replaced by 0.001 to avoid low values in the denominator. Sources: Thomson Financial, SDC Database; Compustat Global and Compustat North America.
$\Delta Investment$	Difference in firms' investment activities as measured by the (negative) ratio of net cashflow from investment activities to total assets. A negative cashflow indicates a positive investment activity. Sources: Thomson Financial, SDC Database; Compustat Global and Compustat North America.

Table 3.2: Summary statistics

Variable	Obs	Mean	Std. dev	Min	Max
y	917	1.00	0.00	1.00	1.00
$\Delta\theta^{double}$	917	-1.50	4.65	-30.00	27.50
$\Delta\theta^{double,d}$	582	-0.51	1.65	-16.30	5.80
$\Delta Size$	917	0.70	0.36	-0.99	0.99
$\Delta Liquidity$	582	0.00	0.20	-0.82	1.55
$\Delta Leverage$	582	-0.02	0.51	-5.36	3.18
$\Delta Fixedassets$	394	-0.16	0.19	-0.88	0.66
ΔROA	582	0.08	0.35	-1.18	3.01
$\Delta Taxrate$	582	0.42	10.09	-30.00	30.00
$\Delta Stockmarket$	582	-0.01	0.73	-0.99	0.99
$\Delta Credit$	582	-0.01	0.72	-0.99	0.99
$\Delta Exch.rate$	582	-0.02	0.18	-0.45	0.50
$\Delta Pretaxinc$	582	0.58	0.56	-1.00	1.00
$\Delta Investment$	346	0.05	0.22	-0.80	1.09

Notes: The summary statistics describe the relative values of a variable for firms a and b for the case where the acquiring firm is classified as firm a and the target firm is classified as firm b. This labeling matters for the value of these statistics. For example, the dependent variable y changes from a unit vector to a zero vector and the explanatory variable means switch signs if the labels a and b are switched for all firm pairs. y is a binary variable indicating whether firm a acquires firm b or vice versa. For more variable definitions and data sources, see Table 3.1.

Table 3.3: Estimation results

	(1) Bench-mark	(2) Deferral	(3) Pretax income	(4) Invest-ment	(5) Fixed assets
$\Delta\theta^{double}$	-0.358**	-0.357**	-0.263*	-0.501**	-0.498**
	(0.086)	(0.090)	(0.119)	(0.165)	(0.180)
$\Delta\theta^{double,d}$	–	-0.011	–	–	–
		(0.254)			
$\Delta Size$	5.698**	5.696**	5.453**	7.412**	10.397**
	(0.587)	(0.589)	(0.611)	(1.231)	(1.902)
$\Delta Liquidity$	3.160*	3.154*	2.950*	6.726**	3.252
	(1.253)	(1.259)	(1.276)	(2.414)	(1.752)
$\Delta Leverage$	0.852*	0.850*	0.825	2.168	–
	(0.431)	(0.432)	(0.428)	(1.135)	
$\Delta Fixedassets$	–	–	–	–	-1.335
					(2.524)
ΔROA	-0.360	-0.359	-0.583	-0.449	-0.286
	(0.778)	(0.778)	(0.746)	(1.374)	(1.766)
$\Delta Taxrate$	0.091	0.090	0.069	0.192	0.328**
	(0.056)	(0.056)	(0.060)	(0.108)	(0.118)
$\Delta Stockmarket$	1.420	1.403	0.943	-1.685	4.089
	(2.737)	(2.769)	(2.769)	(5.573)	(5.034)
$\Delta Credit$	-5.243	-5.217	-4.942	-3.041	-12.645*
	(3.143)	(3.205)	(3.169)	(6.191)	(5.807)
$\Delta Exch.rate$	-1.659	-1.650	-1.827	-1.694	-4.694
	(1.328)	(1.346)	(1.337)	(2.162)	(2.534)
$\Delta Pretaxinc$	–	–	0.617	–	–
			(0.555)		
$\Delta Investment$	–	–	–	6.646**	–
				(2.286)	
Observations	582	582	582	346	394
Log-likelihood	-77.4	-77.4	-76.7	-32.6	-28.0

(continued on next page)

Table 3.3 *(continued)*

	(6) Probit	(7) Branch	(8) Holding company	(9) Conditional	(10) IV
$\Delta\theta^{double}$	-0.186**	-0.355**	-0.340**	-0.322**	-0.190**
	(0.044)	(0.088)	(0.088)	(0.099)	(0.047)
$\Delta Size$	2.978**	5.730**	5.399**	5.380**	2.893**
	(0.265)	(0.592)	(0.667)	(0.706)	(0.273)
$\Delta Liquidity$	1.545*	3.189*	2.899*	3.616**	1.510*
	(0.625)	(1.245)	(1.379)	(1.342)	(0.637)
$\Delta Leverage$	0.372	0.877*	0.902*	0.782	0.376
	(0.235)	(0.426)	(0.427)	(0.479)	(0.219)
ΔROA	-0.259	-0.321	-0.268	-0.598	-0.294
	(0.400)	(0.780)	(0.851)	(0.778)	(0.380)
$\Delta Taxrate$	0.046	0.100	0.089	0.220**	0.048
	(0.029)	(0.056)	(0.069)	(0.083)	(0.036)
$\Delta Stockmarket$	0.762	1.167	3.025	-3.448	0.729
	(1.423)	(2.730)	(3.427)	(4.757)	(1.446)
$\Delta Credit$	-2.939	-5.069	-6.221	-29.024**	-2.731
	(1.676)	(3.134)	(3.975)	(8.708)	(1.666)
$\Delta Exch.rate$	-1.138	-1.793	-1.879	-0.324	-0.991
	(0.678)	(1.324)	(1.558)	(1.594)	(0.713)
Wald test:	–	–	–	–	0.79/0.67
Overid test:	–	–	–	–	3.11/0.21
Observations	582	582	417	518	574
Log-likelihood	-78.6	-77.7	-58.0	-46.1	n.a.

Notes: The dependent variable y equals one if firm a acquires firm b and it is zero if firm b acquires firm a. For other variable definitions and data sources, see Table 3.1. All regressions are logit regressions except the probit regression (6) and the two-step instrumental variable probit regression (10). Regression (7) assumes that target firms are integrated as foreign branches instead of as subsidiaries. Regression (8) excludes deals with ultimate acquirers in four countries that use holding companies relatively intensively. Regression (9) is a conditional logit regression. The likelihood is maximized conditional on the number of acquiring and target firms per bilateral relationship. Regression (10) is a two-step instrumental variable probit regression, where the variables $\Delta\theta^{double}$ and $\Delta Taxrate$ are instrumented by their one and two year lagged values. Country fixed effects are not reported. The Wald test of exogeneity has as null hypothesis that the variables $\Delta\theta^{double}$ and $\Delta Taxrate$ are in fact exogenous. With a χ^2 statistic of 0.79 and a p-value of 0.67, this hypothesis cannot be rejected. The test of the overidentifying restrictions has an Amemiya-Lee-Newey minimum χ^2 statistic of 3.11 and a p-value of 0.21. The hypothesis that the instruments are valid cannot be rejected. Standard errors are provided in parentheses. Stars indicate the significance level: $*$: 5%, $**$: 1%.

Table 3.4: Simulation of exemption system in the U.S.

	U.S. related M&As only			All M&As		
	(1)	(2)	(3)	(4)	(5)	(6)
Country	P_i	dP_i	$\frac{dP_i}{P_i}$	P_i	dP_i	$\frac{dP_i}{P_i}$
Austria	–	–	–	44.4	0.00	0.00
Belgium	94.5	0.00	0.00	66.7	0.00	0.00
Denmark	54.0	-10.16	-0.19	57.9	-5.88	-0.10
Finland	72.5	-14.77	-0.20	71.4	-5.63	-0.08
France	48.8	-0.21	0.00	48.7	-0.10	0.00
Germany	46.6	0.00	0.00	51.9	0.00	0.00
Greece	–	–	–	33.3	0.00	0.00
Ireland	38.2	-34.61	-0.91	66.7	-13.19	-0.20
Italy	69.7	0.00	0.00	66.7	0.00	0.00
Japan	51.7	0.00	0.00	50.0	0.00	0.00
Luxembourg	36.4	-1.10	-0.03	60.0	-0.66	-0.01
Netherlands	72.1	-0.48	-0.01	65.5	-0.24	0.00
Norway	32.3	-0.81	-0.03	20.0	-0.27	-0.01
Portugal	–	–	–	50.0	0.00	0.00
Spain	59.0	0.00	0.00	42.9	0.00	0.00
Sweden	58.4	-5.35	-0.09	54.5	-2.43	-0.04
Switzerland	71.9	-5.58	-0.08	71.0	-2.34	-0.03
United Kingdom	35.8	-6.02	-0.17	33.8	-4.35	-0.13
United States	53.1	4.50	0.08	53.1	4.50	0.08
Total	50.0	0.00	0.00	50.0	0.00	-0.01

Notes: This table reports the change in the proportion of acquiring firms per country if the United States switch from applying worldwide taxation to exempting foreign income taxation. P_i is the original proportion of acquiring firms reported in percent and dP_i is the corresponding change in the proportion reported in percent. $\frac{dP_i}{P_i}$ is the implied relative change in the proportion. Marginal effects are calculated using regression (1) in Table 3.3 and taking the observations' explanatory variable values into account. The first three columns relate exclusively to mergers involving the United States, Austria, Greece and Portugal have no values reported because these countries do not have any U.S.-related merger in the sample. The last three columns relate to all mergers in the sample.

3.A Appendix

This appendix discusses the instrumental variable (IV) estimation reported in Table 3.3. Fiscal policy variables change slowly in comparison to firms' decision making in international M&As. Corporate income tax rates are not changed very frequently and the method of relief for double taxation is changed even less frequently. Therefore, we have assumed so far that the double tax variable $\Delta\theta_t^{double}$ is predetermined. Here, we assume to the contrary that this variable is endogenous. An instrumental variable approach is warranted then.

It appears untoward to instrument the complete set of explanatory variables. Instead, we instrument only the tax variable of interest and all explanatory variables that must be endogenous once I assume the tax variable of interest is endogenous. For example, if I assume the double tax variable $\Delta\theta_t^{double}$ to be endogenous, then $\Delta Taxrate_t$ is endogenous as well, because countries tend to affect double tax rates by changing their corporate income tax rates. Lagged values of the endogenous variable provide natural instruments (Greene, 2008, p. 319). One- and two-year lags are chosen to overidentify the model in order to be able to test the exclusion restrictions and orthogonality conditions.

The IV estimator is basically a system of equations regression. For instance, there are three equations implicit in regression (10) of Table 3.3 corresponding to the dependent variable y and the two endogenous explanatory variables $\Delta\theta_t^{double}$ and $\Delta Taxrate_t$. I use Newey's (1987) minimum χ^2 estimator, which is asymptotically efficient relative to many conventional two-stage probit estimators.

The second stage results have already been presented in regression (10) of Table 3.3. The first stage results are now presented in Table 3.5. The instruments seem to be good predictors of the endogenous explanatory variables. Furthermore, the instruments should be orthogonal to the error term in the probit equation and the instruments' exclusion from the probit specification should be valid. The IV estimator is overidentified as there are four orthogonality conditions instead of two, which would just identify the model. This enables testing the validity of the instruments. Under the joint null hypothesis of correct model specification and valid orthogonality conditions, Newey's minimum distance function follows a χ^2 distribution with two degrees of freedom. With a test statistic of 3.11 and a p-value of 0.21, the null hypothesis cannot be rejected.

As a byproduct of Newey's minimum χ^2 estimator, the two-step IV estimator by Rivers and Vuong (1988) is calculated, which allows testing if the

explanatory variables $\Delta\theta_t^{double}$ and $\Delta Taxrate_t$ are indeed endogenous. The fitted errors from the first stage regressions must be included as explanatory variables in the second stage probit regression. Under the null hypothesis of $\Delta\theta_t^{double}$ and $\Delta Taxrate_t$ being exogenous, the coefficients of the fitted errors are zero, which can be evaluated by a Wald test. With a test statistic of 0.79 and a p-value of 0.67, the null hypothesis cannot be rejected. $\Delta\theta_t^{double}$ and $\Delta Taxrate_t$ may very well be exogenous, which is in line with the reasoning at the beginning of this section. Then the standard regression results are more efficient than the IV regression results.

Table 3.5: First stage results for the direction of M&As instrumental variable regression

	(1)	(2)
	$\Delta\theta^{double}$	$\Delta Taxrate$
$\Delta\theta^{double}_{t-1}$	1.292**	0.428*
	(0.044)	(0.181)
$\Delta\theta^{double}_{t-2}$	-0.283**	-0.369*
	(0.044)	(0.182)
$\Delta Size$	-0.027	0.137
	(0.040)	(0.163)
$\Delta Liquidity$	0.116	-0.261
	(0.123)	(0.508)
$\Delta Leverage$	0.000	0.102
	(0.052)	(0.215)
ΔROA	-0.035	0.012
	(0.075)	(0.309)
$\Delta Taxrate_{t-1}$	-0.014	0.714**
	(0.011)	(0.047)
$\Delta Taxrate_{t-2}$	-0.016	0.026
	(0.012)	(0.050)
$\Delta Stockmarket$	-0.003	-1.484
	(0.245)	(1.010)
$\Delta Credit$	0.026	1.608
	(0.281)	(1.158)
$\Delta Exch.rate$	0.020	-0.725
	(0.141)	(0.583)
Observations	574	574
R^2	98.86	94.71

Notes: The table reports first stage OLS regressions which are part of the IV estimation reported in column (10) of Table 3.3. The dependent variable is $\Delta\theta^{double}$ in regression (1) and $\Delta Taxrate$ in regression (2). The variables relate to mergers between a firm a and a firm b. $\Delta\theta^{double}$ is the double tax burden if firm a acquires firm b minus the double tax burden if firm b acquires firm a. $\Delta\theta^{double}_{t-1}$ and $\Delta\theta^{double}_{t-2}$ are the double tax burdens lagged by one and two years. $\Delta Taxrate$ is the difference between corporate income tax rates of firm a's country of origin and firm b's country of origin. $\Delta Taxrate_{t-1}$ and $\Delta Taxrate_{t-2}$ are the difference in tax rates lagged by one and two years. For other variable definitions and data sources, see Table 3.1. Country fixed effects are not reported. Stars indicate the significance level: $*$: 5%, $**$: 1%.

What a neighbour gets is not lost.

Proverb from the 16th century

CHAPTER 4

THE VOLUME OF CROSS-BORDER M&AS AND INTERNATIONAL CORPORATE INCOME TAXATION[1]

The previous chapter has focused on the microeconomic effects of double taxation at the firm level. It shows that double taxation has an effect on the direction of mergers and acquisitions (M&As). This chapter, on the other hand, takes a macroeconomic point of view and analyzes the effect of double taxation on the aggregate number of M&As. The previous chapter focused on the tax effect on the direction of mergers. The different approach of this chapter — replacing individual mergers by aggregate figures as the unit of observation — allows an analysis of the effect of double taxation on the bilateral volume of M&As. Double taxation may affect the number of cross-border M&As in two distinct ways. First, the number of M&As may be relatively low in presence of double taxation, because the additional burden nullifies the gains of a potential acquisition. Second, the number of M&As for a particular bilateral relationship may also be small, because unburdened competitors from countries with low double taxation value potential target firms in the host country more. These latter 'substitution' effects are also captured when examining aggregate figures of M&As.

Analyzing the volume of cross-border mergers and acquisitions also allows drawing conclusions about the distorting effects of double taxation on foreign

[1]This chapter is based on Huizinga and Voget (2006) and Huizinga and Voget (forthcoming).

direct investment (FDI) in general. In fact, cross-border M&As contribute substantially to total FDI figures. In 2006, the ratio of the value of cross-border M&As to worldwide FDI was 72.3 percent (UNCTAD, 2007, Tables B.1 and B.4).[2]

The chapter is organized as follows: Section 4.1 reviews related studies on international taxation, FDI and M&As. Section 4.2 discusses the data. Sections 4.3 and 4.4 introduce the estimation model and present the estimation results, while Section 4.5 simulates the impact of the adoption of the exemption system of international taxation by the United States on cross-border M&As. Finally, Section 4.6 concludes.

4.1 Related Studies

The large overlap between aggregate FDI and cross-border M&As places this chapter in the tradition of a strand of literature that empirically analyzes the effect of taxation on FDI.

Studies on taxation and FDI typically use aggregate national or bilateral FDI data and hence do not distinguish between the part of FDI due to M&As and other components of FDI such as greenfield investment, reinvested earnings, or intra-company loans. Among these studies, Grubert and Mutti (1991), Hines and Rice (1994), and Altshuler et al. (2001) find that a one percentage point increase in the local tax rate reduces the FDI stock between 0.1 and 2.8 percent. Other studies, such as Hartman (1984), Boskin and Gale (1987), Newlon (1987), and Young (1988), use time series data of single countries, yielding estimated tax elasticities of FDI of around -0.6. All these studies focus only on local taxation and ignore international double taxation.

Slemrod (1990) and Hines (1996) recognize the importance of international double taxation for inward U.S. FDI by distinguishing between investments from countries with and without worldwide taxation of corporate income. In the absence of worldwide taxation, the U.S. tax constitutes the overall tax on U.S.-source income. Slemrod (1990) indeed finds some time-series evidence that U.S. taxation more strongly affects investments from countries without

[2]The value of M&As resulting in an acquisition abroad is counted as outward FDI of the acquiring country to the extent that the acquiring firm finances the transaction in its home financial market. The United Nations Conference on Trade and Development (2000, p. 10) discusses the differences between cross-border M&A and FDI data, and it concludes that the data suggest that M&As have contributed an increasing share of FDI flows to developed and developing countries alike.

worldwide taxation. Hines (1996) further investigates how investments by the two groups of countries across U.S. states vary with the state-level corporate income tax rate. Countries with worldwide taxation are shown to invest relatively more in U.S. states with high corporate income tax rates. This reflects that multinationals located in countries with worldwide taxation would be able to obtain off-setting foreign tax credits for U.S. state taxes.

If bilateral investment flows are considered, there are, of course, many non-tax factors that determine observed outcomes. Several previous studies have used the gravity model to explain international investment outcomes. Portes and Rey (2005), for instance, estimate a gravity equation for trade in financial assets, while Wei (2000), Evenett (2003) and Buch et al. (2004) use the gravity model to explain FDI flows. In a recent study, Di Giovanni (2005) applies the gravity model to the volume of cross-border M&As.[3] As already mentioned in Chapter 3, several studies focus on non-tax determinants of cross-border M&As. Rossi and Volpin (2004), for example, report a governance motive for cross-border takeovers. Firms in countries with strong shareholder protection, in particular, tend to acquire firms in countries with poor shareholder protection. This enables firms in countries with poor shareholder protection to 'import' better protection, possibly resulting in a lower cost of capital and higher firm valuation. In line with this, Bris and Cabolis (2008) find that an industry's market value increases when firms in that industry are acquired by foreign firms residing in countries with better shareholder protection and better accounting standards.

4.2 The Data

The sample is similar to the previous chapter. From the Thomson Financial SDC database, I select all M&As involving any two countries in a sample of European countries, Japan and the United States during the 1985-2004 period. The cross-border acquiring firm becomes the parent firm of the newly created multinational firm, while the target firm becomes a foreign subsidiary or branch. For tax purposes, the newly created multinational is resident in the acquiring or parent country. The database does not provide information on whether a subsidiary or a branch is created. As subsidiary structures are more

[3] In the trade literature, the gravity model has been applied for much longer. See Tinbergen (1962) for an early empirical application, and Anderson (1979) for a theoretical justification of the gravity approach in trade.

common, I take these to be the benchmark case. In the empirical work, however, I consider the international taxation of branches as a robustness check. The acquiring firm, as reported by Thomson, becomes the immediate owner of the target firm. The database also provides information on the ultimate owner of the newly acquired firm. In some cases, the nationalities of the immediate and ultimate owners differ and the ultimate owner uses a holding company in another country to acquire the target. Corporate structures of this kind may aim to delay or avoid taxation by the ultimate parent country. In a robustness check, I exclude countries where multinationals commonly use organizational structures involving immediate owners in other countries. Table 4.1 shows the number of acquiring firms and target firms in the sample per country.[4] The table also reports the value of acquired firms and target firms per country (if available). From the table, one can see that Eastern European countries tend to be home to relatively many target firms. Japan and the United States instead are shown to attract relatively many acquiring firms despite these countries' high taxation of incoming dividends as seen in Table 2.6.[5]

4.3 Estimating Equation

I apply the gravity model to estimate the impact of international double taxation on bilateral aggregate numbers of inward and outward M&As. Aggregate numbers of this kind reflect the directions of M&As between any two countries, as considered in the previous chapter, and in addition the total number of M&As between the two countries. In practice, there are no M&As for some country pairs. To reflect this, I will estimate a tobit, censored regression model of the following kind:

$$MA_{\ddot{\imath}jt} = \begin{cases} \exp(MA^*_{\ddot{\imath}jt}) & \text{if} \quad MA^*_{\ddot{\imath}jt} \geq 0 \\ 0 & \text{if} \quad MA^*_{\ddot{\imath}jt} < 0 \end{cases} \tag{4.1}$$

where $MA_{\ddot{\imath}jt}$ is the number of M&As at time t with i and j denoting the acquiring and target countries, and $MA^*_{\ddot{\imath}jt}$ is an index function given by

$$MA^*_{\ddot{\imath}jt} = \beta_0 + \beta' x_{\ddot{\imath}jt} + \epsilon_{\ddot{\imath}jt}. \tag{4.2}$$

In (4.2), $x_{\ddot{\imath}jt}$ is a set of explanatory variables and β_0 and β are parameters to be estimated, and $\epsilon_{\ddot{\imath}jt}$ is a normally distributed error term. The main variable

[4] The data provider claims to register cross-border M&As exhaustively.

[5] The large differences in the ratio of acquiring firms to target firms suggests the presence of country-specific effects.

of interest as part of x_{ijt} is the double tax rate τ_{ijt}^{double} discussed in Chapter 2. Higher double taxation imposed by country i on the foreign source income of local parent firms is expected to lead to fewer M&As where this country is the acquiring country.[6] Next, $D_{ij}\tau_{ijt}^{double}$ is the interaction of a dummy variable D_{ij} signalling deferral of country i's taxation of income from country j and the double tax rate τ_{ijt}^{double}. International double taxation is expected to affect aggregate M&As less negatively, if it can be deferred. I also include the acquiring and target country corporate income tax rates τ_{it} and τ_{jt}. Taxation in both countries may discourage the formation of multinationals operating in the two countries. Among the non-tax controls, I include standard gravity model variables such as the bilateral distance, $Dist_{ij}$, and the two countries' real gross domestic products, GDP_{it} and GDP_{jt}. These variables — as other controls, apart from categorical variables — are in logarithms. Additional explanatory variables are the parent and subsidiary countries' per capita real gross domestic product, denoted $GDPpercap_{it}$ and $GDPpercap_{jt}$. Multinational firms often have parent firms in rich countries, which suggests a positive effect for $GDPpercap_{it}$. At the same time, multinational firms may wish to acquire targets in low-wage countries to have access to cheap labor or in high-wage countries to have access to skilled labor and interesting product markets. Hence, the impact of target country per capita GDP, $GDPpercap_{jt}$, can possibly have either sign.

Next, parent country financial development variables such as stock market valuation over GDP, $(Stocks/GDP)_{it-1}$, and credit provision to the private sector over GDP, $(Credit/GDP)_{it-1}$, are expected to have a positive impact on acquisitions. Following Di Giovanni (2005), I lag these variables for financial depth by one period to avoid endogeneity. The rate of appreciation of country i 's bilateral real exchange rate with respect to country j, $\Delta Exch.rate_{ijt-1}$, is expected to promote acquisitions in country j as this country's assets have become cheaper. The mean statutory tariff rate in the target country, $Tariffs_{jt}$, could equally have a positive impact on acquisitions in that country if multinationals wish to 'jump' a country's tariffs. An index counting the types of capital controls in the target country, $Controls_{jt}$, may negatively impact on acquisitions, as they may prevent foreign investors from acquiring local companies. The variables $Border_{ij}$ and $Language_{ij}$ denote a common border and

[6] As mentioned in Chapter 2, international double taxation also comes in the form of non-resident dividend withholding taxes. Higher non-resident dividend withholding taxes imposed by country j on flows to country i are expected to result in fewer M&As where country i is the acquiring country and country j is the target country.

language and they are both expected to have a positive impact on bilateral acquisitions. The EU_{ijt} variable in turn reflects joint membership of the European Union, and this variable is also expected to foster acquisitions. Next, $Legalquality_{jt}$ measures the quality of the legal structure and the security of property rights in the target country. I expect this variable to have a positive impact on acquisitions in the target country, as it signals some protection from expropriation and other unreasonable treatment. Table 4.2 provides all variable definitions and data sources and Table 4.3 provides the variables' summary statistics. Finally, the regressions contain dummy variables for acquiring and target countries and for time.[7]

4.4 Estimation Results

Table 4.4 reports regressions explaining the logarithm of the bilateral number of M&As, MA_{ijt}, resulting in parent and subsidiary firms in countries i and j, respectively. Regression (1) shows a coefficient of -0.017 for the double tax rate variable τ_{ijt}^{double} that is statistically significant. This estimate suggests that an increase in the double tax rate by 1 percentage point reduces the number of foreign acquisitions by 1.7 percent.[8] The acquiring and target country tax rates, τ_{it} and τ_{jt}, both obtain negative coefficients, but only the latter coefficient is statistically significant. The various control variables enter the regression largely as expected. Distance has a negative impact on the number of cross-border acquisitions. The GDPs of the acquiring and target countries en-

[7] Differences in capital gains taxation may also have an influence on the direction and the form of an international M&A. An empirical study by Ayers et al. (2003) suggests that such an effect may exist, as these authors find that domestic shareholder-level capital gains taxes are associated with higher acquisition premiums for taxable acquisitions. I do not explicitly take capital gains taxes into account. There is, however, no bilateral variation in capital gains taxes. Hence, country-specific effects should be sufficient to control for their effect.

[8] This is less than the 9.0 percent change reported in the previous chapter in Section 3.4, but it should be kept in mind that the 9.0 percent applies for the specific case of a merger of equals. Note that the estimate of 1.7 percent is an upper bound given the tobit specification. More specifically, the marginal effect of a change in the regressor on the frequency of M&As is given by

$$\frac{\partial \ln E[MA_{ijt}|x_{ijt}]}{\partial x_{ijt}} = \beta \times \text{Prob}\left[MA_{ijt}^{*} \geq 0\right].$$

The coefficient vector β gives an upper bound of marginal effects because $0 < \text{Prob}\left[MA_{ijt}^{*} \geq 0\right] < 1$. The marginal effects for country-pairs involving two big countries will approximate this upper bound because the probability of a positive number of acquisitions is close to one.

ter with positive coefficients that are not statistically significant in this regression that includes country dummy variables.[9] Stock market capitalization in the acquiring country has a positive and statistically significant impact on the number of acquisitions, as does the target country's tariff rate. A shared border and a common language equally are positively and significantly related to the number of acquisitions.

Next, in regression (2), I include the double tax rate interacted with a deferral dummy. This variable obtains a positive coefficient, but it is statistically insignificant. This may reflect that the deferral option is not very valuable to merging firms, or alternatively, that the deferral variable measures the expected availability of deferral imprecisely.

In regression (3), I include the legal quality variable.[10] The regression shows that the target country's legal quality is positively and significantly related to the number of acquisitions with no change in the estimated coefficient for the double tax variable. Regression (4) uses a τ_{ijt}^{double} variable constructed on the assumption that the newly created multinationals have an international branch rather than subsidiary structure. The estimated coefficient for the double tax variable is little changed. Regression (5) replaces the number of M&A deals by the value of these deals.[11] The estimated coefficients for the dou-

[9] If the 'import' and 'export' country dummy variables are left out, the GDP variables become highly significant. Therefore, GDP is able to explain a great deal of cross-country variation in the number of M&As, but the covariation over time between GDP and the number of M&As is weaker than the link between GDP and trade, for example. This is probably due to trade exhibiting a relatively stable growth rate as compared to M&As that occur in waves with large declines in between these waves.

[10] The legal quality variable is not part of the benchmark regression because this variable is computed differently before 1995. Furthermore, values between 1985 and 1990, and between 1990 and 1995 have been interpolated.

[11] There is a caveat using the value of M&A values as the dependent variable. Replacing the number of M&As by the value of M&As introduces a sample bias with respect to country coverage. The data provider, Thompson, claims to have an exhaustive list of international M&As. Using the number of M&As thus does not introduce a sample bias. However, the deal values of an M&A are only recorded in about 40 percent of all cases, as the information is often not publicly available. In addition, there is a strong geographical pattern in the missing data. For example, the share of acquiring companies from the United Kingdom would increase from 19.3 percent to 31.6 percent of all acquisitions in the sample. The share of acquiring German firms would decrease from 10.0 percent to 6.2 percent. The same holds for the pattern of target firms: Using the deal values would increase the share of US target firms from 17.2 percent to 25.1 percent of all targets in the sample. The German share would decrease from 12.9 percent to 8.8 percent. Such a structural mismeasurement of the dependent variable by about 50 percent would result in extremely biased estimation results.

ble tax variable is now estimated to be -0.052, which is more negative than in regression (1) to suggest that deals with a larger value are relatively more affected by international double taxation.

Next, I present several regressions that indicate how robust the results are to changes in the estimation approach. First, regression (6) is estimated by ordinary least squares using only uncensored observations with a positive number of M&As. Disregarding censored observations should result in an attenuation of coefficients and indeed the estimated coefficient for the double tax rate variable now is less negative at -0.009, but it remains significant. Second, regression (7) assumes that the dependent variable $y_n \equiv MA_{ijt}$ is Poisson distributed such that $\text{Prob}(Y_n = y_n) = \frac{\exp^{-\lambda_n} \lambda_n^{y_n}}{y_n!}$ for $y_n = 0, 1, 2...$ with $\ln \lambda_n = \beta' x_n$. Again, the estimated coefficient for the double tax variable is negative at -0.018 and statistically significant. Regression (8) generalizes the previous one by assuming that the dependent variable is distributed according to the negative binomial distribution with similar results.[12]

As discussed in Section 3.4 of the previous chapter, there is a possibility that tax policy is endogenous to the international pattern of M&As. In fact, changes in this pattern may well prompt countries to change their tax policies to affect the number of M&As they are involved in as acquiring or target countries. Hence, τ_{ijt}^{double}, τ_{it} and τ_{jt} are potentially endogenous to the number of observed M&As. To adjust for this, I instrument these variables by their one- and two-year lagged values in a two-step instrumental variable tobit regression.[13] Standard errors are adjusted for variation from the first-step regression. The double tax variable remains statistically significant and obtains a coefficient of -0.018 in regression (9). A Wald test of the hypothesis that τ_{ijt}^{double}, τ_{it}, and τ_{jt} are exogenous cannot be rejected. Similarly, a test of the hypothesis that the instruments are valid cannot be rejected. Overall, this section's results show that international double taxation has a significant impact on parent firm location at the aggregate, national level. These results are robust to various changes in model specification and estimation technique.

[12] One restrictive consequence of a Poisson distribution is the equality of the distribution's mean to its variance. The negative binomial distribution relaxes this restriction such that $\text{Prob}(Y_n = y_n) = \frac{\exp^{-\lambda_n} \lambda_n^{y_n}}{y_n!}$ for $y_n = 0, 1, 2...$ with $\ln \lambda_n = \beta' x_n + \ln u_n$. The last term $\ln u_n$ represents additional sources of variance such as unobservable or omitted variables and is distributed according to $u_n \sim \text{Gamma}(1/\alpha, \alpha)$ where α is estimated jointly with the coefficients β.

[13] For further details on the instrumental variable estimation, see the Appendix 4.A.

4.5 Simulation of a US Policy Switch to Exempting Foreign Income

Similar to the previous chapter, I simulate how an abolition of worldwide taxation by the United States would affect the the pattern of cross-border M&As. The international tax systems of other countries are assumed to remain unchanged. In the simulations, I use the estimated coefficients of regression (1) in Table 4.4. On average, US firms acquired 549.7 foreign targets per year between 2000 and 2002. The switch in US international taxation would increase this number by 57.6, which is a 10.5 percent increase. Table 4.5 reports the US acquisitions and the simulated increase in US acquisitions per target country. Percentage changes are also reported. For a particular host country, the increase in target firms depends on the size of double taxation that is eliminated by the change in US tax policy. The lower the host country's corporate income tax rate, the more double taxation is eliminated. Specifically, the number of target firms in the United Kingdom (acquired by US firms) would increase by 19.0 percent. For some smaller countries (with very low corporate income tax rates and hence a high double tax burden to be eliminated), the increase in target firms is even larger: The number of Irish target firms would increase by 39.0 percent and the number of Estonian target firms would nearly double.

The effect of the U.S. abolishing worldwide taxation on the direction of cross-border M&As has already been simulated in the previous chapter. In the following, the two simulations are reconciled. This chapter and the previous chapter have approached the same subject — double taxation of international profit flows and its effect on cross-border merger and acquisitions — from a different point of view. The present chapter has taken a macroeconomic view by analyzing aggregate patterns of cross-border mergers and acquisition. The previous chapter has taken a microeconomic point of view by analyzing the impact of double taxation on the firm level.

The macroeconomic estimates allow statements about the changes in the number of acquirers A_j and the number of targets T_j in country j. The microeconomic approach takes the occurrence of a merger as given, so it can make no statement on the total number of firms involved in cross-border mergers $F_j \equiv A_j + T_j$, but it estimates the probability P_j that a firm from country j involved in a merger is the acquiring party. The two different approaches are linked by the following identities:

$$A_j = P_j \cdot F_j \tag{4.3}$$

$$T_j = (1 - P_j) \cdot F_j \tag{4.4}$$

From these expressions it follows that

$$\frac{dA_j}{A_j} = \frac{dP_j}{P_j} + \frac{dF_j}{F_j} \tag{4.5}$$

$$\frac{dT_j}{T_j} = -\frac{dP_j}{1 - P_j} + \frac{dF_j}{F_j} \tag{4.6}$$

By substitution, one finds

$$\frac{dA_j}{A_j} - \frac{dT_j}{T_j} = \frac{dP_j}{P_j} + \frac{dP_j}{1 - P_j} \tag{4.7}$$

The last expression allows a reconciliation of the macroeconomic and microeconomic simulation by substituting per country the results from Table 4.5 on the left-hand side of (4.7) and the results from Table 3.4 on the right-hand side of (4.7).[14] The correlation between the left-hand side values derived in this chapter and the right-hand side values derived in the previous chapter is 0.90. The scatterplot in Figure 4.1 illustrates this correlation. The two simulations arrive at similar results.

4.6 Conclusion

This chapter shows that the international tax system affects the pattern of cross-border M&As. Specifically, firms from countries that impose high levels of international double taxation engage less in acquisitions abroad. An increase in double taxation by one percentage point decreases the frequency of cross-border mergers and acquisitions by 1.7 percent. International double taxation comes in the form of non-resident dividend withholding taxes and parent-country corporate income taxation of repatriated dividends. With respect to dividend withholding taxes, the results imply that a host country can encourage acquisitions from another country by lowering withholding taxes vis-à-vis that country. This will be reflected in increased FDI inflows as cross-border M&As are a main contributor to FDI. This chapter's results allow to quantify the FDI-promoting aspects of double tax treaties. A typical double tax treaty reduces withholding taxes by 15 percentage points from the rate

[14] If the US exempts dividend repatriations from taxation, the term dT_j/T_j is non-negative for all countries as reported in Table 4.5. The term dA_j/A_j is positive for the US and zero for all other countries as reported in the notes to Table 4.5.

that would apply in the absence of a treaty. Assuming both signatory countries to have a corporate income tax rate of 33.3 percent and to exempt foreign source dividends from taxation or provide indirect tax credits, it follows that such a decrease in withholding taxes on dividends increases the number of cross-border mergers and acquisitions between these two countries by 17 percent.[15]

With respect to double taxation in the form of parent-country corporate income taxation of repatriated dividends, the results imply that multinationals subject to double taxation are relatively less represented especially in those host countries where they are at a comparative disadvantage compared to multinationals whose home countries do not impose double taxes. This is especially an issue in host countries with low corporate income tax rates due to the nature of foreign tax credits.[16] Hence, this chapter generalizes Hines' 1996 findings in an international context.[17] Furthermore, it quantifies how the difference in host and home country tax levels affect investment via double taxation.

To summarize, the sensitivity of organizational outcomes of cross-border takeovers to international double taxation suggests that this taxation may carry significant economic costs in distorting international relationships of ownership and control. For that reason, the causes of double taxation should be eliminated. Non-resident dividend withholding taxes, in fact, are already quite low for most countries in my sample due to the EU Parent-Subsidiary Directive. This directive, adopted in 1990, eliminates the taxation of intra-EU, intra-company dividend flows. Parent-country corporate taxation of foreign-source income, however, is still substantial in the EU and elsewhere. As already men-

[15] Table 2.3 implies that τ_{ijt}^{double} increases by 10 when corporate tax rates of 33.3 percent are assumed and when the two countries either exempt dividend repatriations from taxation or provide indirect tax credits. The 17 percent increase is, as mentioned before, an upper limit because it is based on coefficient estimates from tobit regressions.

[16] As an example: if the United Kingdom decreases its tax rate from 30 percent to 29 percent, this generally has a positive effect on the number of foreign firms that acquire British firms. For firms from the United States, however, this positive effect is nullified by the accompanying increase in double taxation because the decrease in the United Kingdom tax results in lower foreign tax credits. Consequently, US acquirers are relatively less represented than acquirers from other countries.

[17] Hines (1996) wrote that "the ability to apply foreign tax credits against home-country tax liabilities reduces an investor's incentive to avoid high-tax foreign locations". In light of this chapter, one is tempted to transform this line as follows: "The inability to fully exploit low host country tax rates due to double taxation restricts investors subject to worldwide taxation to high-tax foreign locations."

tioned in Chapter 3, this may change as well in the near future. The United Kingdom is about to abandon its traditional foreign tax credit system and exempt dividend income from abroad from taxation. And in the United States, the President's Advisory Panel on Federal Tax Reform (2005) has advocated the elimination of worldwide taxation by the US.

The findings in the last three chapters raise quite a few further questions. The residence of multinationals is sensitive to double taxation, but what is the exact value of having a multinational's headquarter in the country? Of course, for countries with worldwide taxation their presence increases the tax base, but are there any positive spill-over effects? After all, a headquarter employs high-skilled labor. Research and development often takes place close to the headquarter's location. Maybe there even exists a home bias in multinationals' investment decisions. The choice of taxation regime for foreign income is decisive for the eventual size of double tax burdens. Do countries make their choice in a strategic manner or is it a result of tradition and history? How does the choice of taxation regime interact with the level of the tax rate? Large foreign-tax-credit countries in general have lower corporate income tax rates than large countries that exempt foreign income from taxation. Is that pure coincidence or is this difference caused by the countries' desire to keep double taxation at a minimum? The limitation of double taxes would reduce incentives to relocate headquarters and also support the activities of a country's multinationals abroad where they have to compete with other multinationals whose foreign income is exempt from taxation. Does it amplify the degree of tax competition if foreign-tax-credit countries have such an additional incentive to reduce corporate income taxes? These questions are left for future research.

Table 4.1: Outgoing versus incoming acquisitions

Country	Number of acquiring firms	Number of target firms	Value of acquisitions (millions of US dollars)	Value of target firms (millions of US dollars)
	(1)	(2)	(3)	(4)
Austria	624	552	10,947	19,399
Belgium	940	995	63,923	62,269
Bulgaria	0	67	0	2,857
Croatia	6	39	120	1,538
Czech Republic	18	438	86	11,046
Denmark	852	761	25,097	27,646
Estonia	23	117	89	454
Finland	787	717	51,614	33,970
France	2,720	3,563	378,284	200,067
Germany	3361	4,372	381502	453,361
Greece	114	48	7,451	3,377
Hungary	46	428	888	7,069
Iceland	36	11	1,861	369
Ireland	792	409	28,207	22,084
Italy	882	1,610	70,579	83,971
Japan	1,073	398	82,879	41,202
Latvia	7	52	6	395
Lithuania	10	88	1	1,246
Luxembourg	205	127	20,105	19,759
Netherlands	2,173	1,728	203,345	172,100
Norway	554	639	19,455	34,786
Poland	27	570	403	13,831
Portugal	95	298	1,998	9,535
Romania	6	101	6	1,946
Slovak Republic	7	88	25	2,851
Spain	430	1,531	34,698	63,276
Sweden	1,682	1,299	96,144	128,616
Switzerland	1,310	1,105	173,394	57,662
United Kingdom	6,479	5,429	978,858	583,042
United States	8,142	5,821	535,888	1108,131
Total	33,401	33,401	3167,853	3167,853

Notes: This table lists the number of acquiring firms (column 1) and the number of target firms (column 2) per country. Column 3 lists the deal value of foreign acquisitions and column 4 lists the deal value of acquisitions by foreign firms in millions of US dollars. The sample includes all M&As between listed countries recorded in the Thomson database from 1985 through 2004.

Table 4.2: Variable definitions and data sources

Variable	Description and data source
MA_{ijt}	Frequency of cross-border mergers and acquisitions in the year t, in which the acquiring firm is located in country i and the target firm is located in country j. A transaction is included if the bidding firm acquires a controlling stake in the target firm. Source: Thomson Financial, SDC Database.
τ_{ijt}^{double}	Double tax rate for dividend income repatriated from country j to country i in year t. This rate includes the burden of withholding taxes. Sources as for the variable $\Delta\theta^{double}$ above.
D_{ij}	Dummy variable indicating potential deferral granted by acquiring country i of taxes on subsidiary's profits in country j. Data are for 2004. Sources as for the variable $\Delta\theta^{double}$ above.
τ_{it}	Corporate income tax rate (in percent) in the acquiring country i. Sources as for the variable $\Delta\theta^{double}$ above.
τ_{jt}	Corporate income tax rate (in percent) in the target country j. Sources as for the variable $\Delta\theta^{double}$ above.
$Distance_{ij}$	Distance in miles between the capital of acquiring firms' country i and the capital of target firms' country j (logarithm). Source: Rose (2000).
GDP_{it}	Gross domestic product of the acquiring country in constant 1995 U.S. dollars (logarithm). Source: World Development Indicators 2004, World Bank (2004).
GDP_{jt}	Gross domestic product of the target country in constant 1995 U.S. dollars (logarithm). Source: World Development Indicators 2004, World Bank (2004).
$GDPpercap_{it}$	Real income per capita of the acquiring country (logarithm). Source: World Development Indicators 2004, World Bank (2004).
$GDPpercap_{jt}$	Real income per capita of the target country (logarithm). Source: World Development Indicators 2004, World Bank (2004).

(continued on the next page)

Table 4.2 (*continued*)

Variable	Description and data source
$(Stocks/GDP)_{it-1}$	Ratio of stock market capitalization to GDP of the acquiring country (logarithm). Source: World Development Indicators 2004, World Bank (2004).
$(Credit/GDP)_{it-1}$	Ratio of domestic credit to the private sector to GDP of the acquiring country (logarithm). Source: World Development Indicators 2004, World Bank (2004).
$\Delta Exch.rate_{ijt-1}$	Change in the logarithm of the real bilateral exchange rate between countries i and j between the end of year $t-1$ and $t-2$. An increase in this variable represents an appreciation of country i's currency. Source: International Financial Statistics 2007, IMF (2007).
$Tariffs_{jt}$	Mean statutory tariff rate of target country (logarithm). Source: Gwartney and Lawson (2005).
$Controls_{jt}$	Index of the number of capital controls in the target country based on 13 types of capital controls reported by the IMF. The original index is inverted such that a higher index corresponds to more capital controls. Source: Gwartney and Lawson (2005).
$Border_{ij}$	Dummy variable indicating whether acquiring country i and target country j have a common land border. Source: Rose (2000).
$Language_{ij}$	Dummy variable indicating whether acquiring country i and target country j share a common language. Source: Rose (2000).
EU_{ijt}	Dummy variable indicating whether acquiring country i and target country j were both members of the European Union in year t. Source: Rose (2000).
$Legalquality_{jt}$	Indicator for the quality of legal structure and the security of property rights in the target country. The definition of the variable was broadened in 1995. Values between 1985 and 1990, and between 1990 and 1995 have been interpolated. Source: Gwartney and Lawson (2005).

Table 4.3: Summary statistics

Variable	Obs	Mean	Std. dev	Min	Max
MA_{ijt}	8042	3.51	13.14	0.00	364.00
τ_{ijt}^{double}	8042	5.35	6.29	0.00	42.00
$D_{ij}\,\tau_{ijt}^{double}$	8042	4.98	6.12	0.00	40.40
τ_{it}	8042	35.38	9.36	0.00	61.80
τ_{jt}	8042	35.70	8.87	0.00	65.00
$Distance_{ij}$	8042	6.93	0.91	4.37	8.82
GDP_{it}	8042	12.25	1.88	8.45	16.03
GDP_{jt}	8042	12.18	1.92	8.31	16.03
$GDPpercap_{it}$	8042	9.73	0.94	7.29	10.99
$GDPpercap_{jt}$	8042	9.73	0.97	7.24	10.99
$(Stocks/GDP)_{it-1}$	8042	-1.08	1.19	-6.43	1.70
$(Credit/GDP)_{it-1}$	8042	-0.40	0.73	-2.64	0.71
$\Delta Exch.rate_{ijt-1}$	8042	0.00	0.16	-1.45	1.45
$Tariffs_{jt}$	8042	1.58	0.79	-4.09	3.10
$Controls_{jt}$	8042	3.08	2.49	0.00	10.00
$Border_{ij}$	8042	0.10	0.30	0.00	1.00
$Language_{ij}$	8042	0.05	0.22	0.00	1.00
EU_{ijt}	8042	0.28	0.45	0.00	1.00
$Legalquality_{jt}$	8042	7.86	1.19	4.50	9.60

Notes: For variable definitions and data sources, see Table 4.2.

Table 4.4: Estimation results

	(1) Bench-mark	(2) Deferral	(3) Legal quality	(4) Branches
τ_{ijt}^{double}	-0.017**	-0.024**	-0.017**	-0.018**
	(0.004)	(0.006)	(0.004)	(0.004)
$D_{ij}\tau_{ijt}^{double}$	–	0.008	–	–
		(0.006)		
τ_{it}	-0.003	-0.003	-0.003	0.001
	(0.003)	(0.003)	(0.003)	(0.003)
τ_{jt}	-0.019**	-0.019**	-0.018**	-0.019**
	(0.003)	(0.003)	(0.003)	(0.003)
$Distance_{ij}$	-0.967**	-0.964**	-0.970**	-0.955**
	(0.037)	(0.037)	(0.037)	(0.036)
GDP_{it}	0.553	0.732	0.564	0.553
	(0.957)	(0.966)	(0.957)	(0.920)
GDP_{jt}	1.394	1.370	1.142	0.801
	(0.874)	(0.873)	(0.880)	(0.857)
$GDPpercap_{it}$	1.236	1.043	1.205	1.236
	(1.084)	(1.092)	(1.083)	(1.037)
$GDPpercap_{jt}$	-1.209	-1.170	-0.916	-0.595
	(0.935)	(0.935)	(0.943)	(0.915)
$(Stocks/GDP)_{it-1}$	0.239**	0.236**	0.240**	0.236**
	(0.040)	(0.040)	(0.040)	(0.039)
$(Credit/GDP)_{it-1}$	0.151*	0.153*	0.151*	0.163**
	(0.061)	(0.061)	(0.061)	(0.061)
$\Delta Exch.rate_{ijt-1}$	0.131	0.136	0.134	0.152
	(0.094)	(0.094)	(0.094)	(0.090)
$Tariffs_{jt}$	0.197**	0.193**	0.209**	0.179**
	(0.059)	(0.059)	(0.059)	(0.058)
$Controls_{jt}$	-0.010	-0.010	-0.010	-0.004
	(0.012)	(0.012)	(0.012)	(0.011)
$Border_{ij}$	0.154**	0.159**	0.151**	0.176**
	(0.055)	(0.055)	(0.055)	(0.054)
$Language_{ij}$	0.230**	0.231**	0.230**	0.246**
	(0.053)	(0.053)	(0.053)	(0.052)
EU_{ijt}	-0.049	-0.038	-0.056	0.007
	(0.047)	(0.047)	(0.047)	(0.045)
$Legalquality_{jt}$	–	–	0.102*	–
			(0.045)	
Observations	8042	8042	8042	8845
Log-likelihood	-5110.6	-5109.6	-5108.0	-5411.7

(continued on next page)

Table 4.4 *(continued)*

	(5) Deal values	(6) OLS	(7) Poisson	(8) Negative binomial	(9) IV
τ_{ijt}^{double}	-0.052**	-0.009*	-0.018**	-0.025**	-0.018**
	(0.016)	(0.004)	(0.005)	(0.005)	(0.004)
τ_{it}	0.002	-0.001	-0.009*	-0.005	-0.006
	(0.014)	(0.003)	(0.004)	(0.004)	(0.005)
τ_{jt}	-0.074**	-0.011**	-0.017**	-0.025**	-0.023**
	(0.013)	(0.003)	(0.004)	(0.004)	(0.005)
$Distance_{ij}$	-2.647**	-0.718**	-0.881**	-1.181**	-0.942**
	(0.153)	(0.038)	(0.052)	(0.048)	(0.038)
GDP_{it}	1.932	1.440	2.143*	1.365	1.034
	(3.950)	(1.069)	(0.937)	(1.066)	(1.014)
GDP_{jt}	8.365*	2.299*	0.379	1.821	2.714**
	(3.659)	(1.011)	(1.145)	(1.032)	(0.952)
$GDPpercap_{it}$	2.502	-0.530	0.067	0.798	0.649
	(4.546)	(1.204)	(1.075)	(1.226)	(1.165)
$GDPpercap_{jt}$	-8.493*	-2.618*	0.557	-1.341	-2.981**
	(3.983)	(1.070)	(1.267)	(1.125)	(1.042)
$(Stocks/GDP)_{it-1}$	0.639**	0.243**	0.664**	0.454**	0.282**
	(0.174)	(0.046)	(0.074)	(0.055)	(0.043)
$(Credit/GDP)_{it-1}$	0.338	0.102	0.230*	0.208**	0.162*
	(0.269)	(0.062)	(0.091)	(0.081)	(0.063)
$\Delta Exch.rate_{ijt-1}$	0.375	0.104	0.114	0.160	0.082
	(0.385)	(0.109)	(0.139)	(0.118)	(0.155)
$Tariffs_{jt}$	0.639*	0.129*	0.173	0.223**	0.141*
	(0.259)	(0.062)	(0.088)	(0.080)	(0.063)
$Controls_{jt}$	-0.089	0.010	0.001	-0.014	-0.008
	(0.050)	(0.011)	(0.013)	(0.013)	(0.012)
$Border_{ij}$	0.157	0.104	0.147*	0.139*	0.180**
	(0.236)	(0.055)	(0.058)	(0.061)	(0.057)
$Language_{ij}$	0.289	0.255**	0.612**	0.271**	0.213**
	(0.218)	(0.057)	(0.048)	(0.054)	(0.053)
EU_{ijt}	-0.175	-0.096*	-0.106	-0.122*	-0.059
	(0.198)	(0.049)	(0.060)	(0.053)	(0.048)
Wald test:					0.53/0.91
Overid. test:					6.08/0.11
Observations	6873	3339	8042	8042	7100
Log-likelihood/R^2	-6253.9	0.656	-11691.8	-9969.3	n.a.

Notes: Unless indicated otherwise, these are tobit regressions and the dependent variable is the logarithm of the frequency of M&As in year t, in which the acquiring firm is located in country i and the target firm in country j. Zero observation are taken into account as censored observations. Regression (4) assumes that target firms are integrated as foreign branches. Regression (5) uses the logarithm of the deal values of M&As as dependent

(continued on next page)

(notes continued)
variable. Regression (6) is an ordinary least squares regression using the uncensored observations (i.e., those with a positive number of M&As). Regression (7) is a Poisson regression using the number of M&As as dependent variable. Regression (8) is a negative binomial regression using the number of M&As as dependent variable. Regression (9) is a two-step instrumental variable tobit regression, where τ_{ijt}^{double}, τ_{it} and τ_{jt} are instrumented by their one- and two-year lagged values. Country and time fixed effects are not reported. The Wald test of exogeneity has as null hypothesis that the variables τ_{ijt}^{double}, τ_{it} and τ_{jt} are exogenous. With a χ^2 statistic of 0.53 and a p-value of 0.91, this hypothesis cannot be rejected. The test of the overidentifying restrictions has an Amemiya-Lee-Newey minimum χ^2 statistic of 6.08 and a p-value of 0.11. The hypothesis that the instruments are valid cannot be rejected. Standard errors are provided in parentheses. Stars indicate the significance level: $*$: 5%, $**$: 1%. For detailed variable definitions and data sources, see Table 4.2.

Table 4.5: Simulation of exemption system in the United States

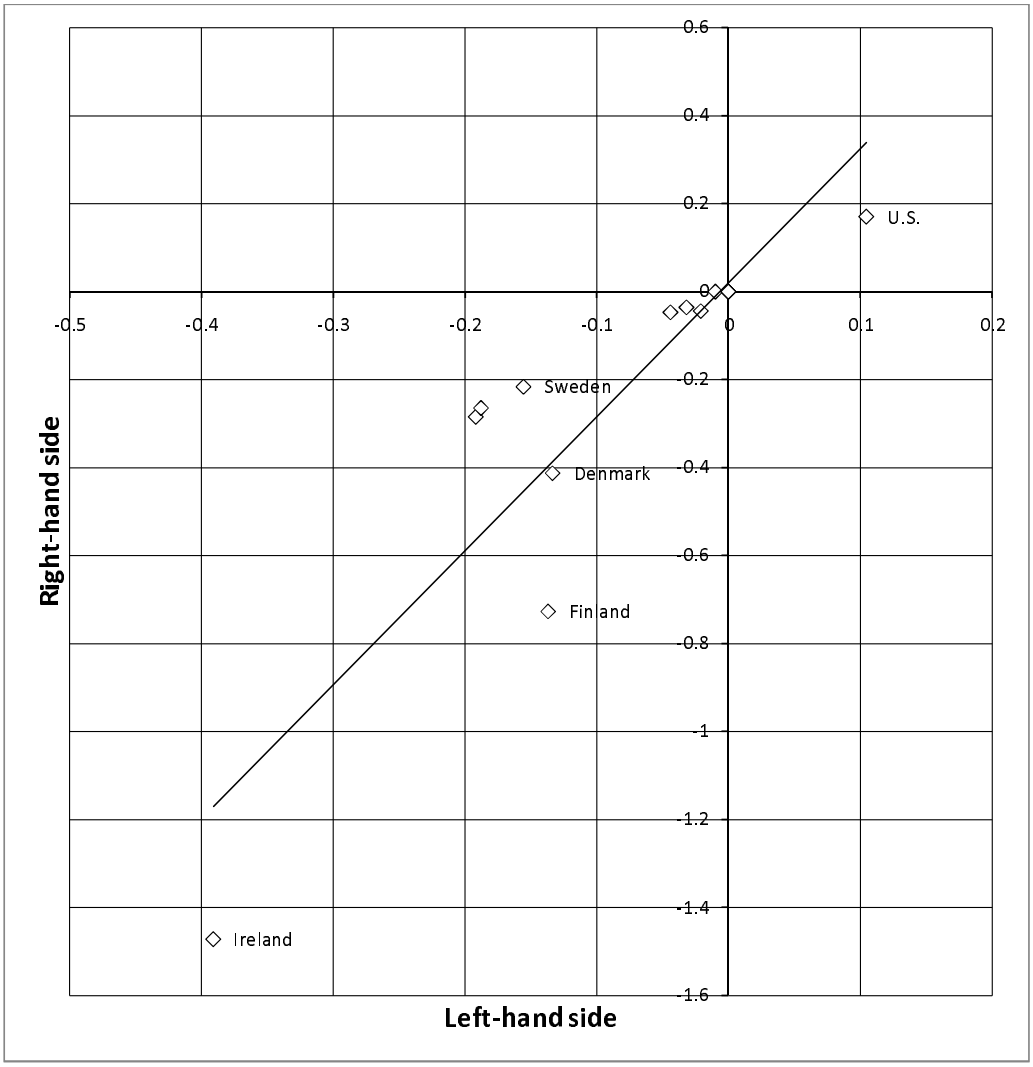
Country	T_j	dT_j	$\frac{dT_j}{T_j}$
Austria	5.0	0.2	0.05
Belgium	16.7	0.0	0.00
Bulgaria	1.0	0.0	0.00
Croatia	0.3	0.0	0.00
Czech Republic	8.3	0.8	0.10
Denmark	11.0	1.5	0.13
Estonia	1.0	1.0	0.99
Finland	5.7	0.8	0.14
France	56.3	0.6	0.01
Germany	74.7	0.0	0.00
Greece	0.3	0.0	0.00
Hungary	3.7	1.2	0.33
Iceland	0.7	0.2	0.24
Ireland	13.0	5.1	0.39
Italy	24.3	0.0	0.00
Japan	27.0	0.0	0.00
Latvia	0.0	0.0	na[a]
Lithuania	1.7	0.5	0.27
Luxembourg	1.0	0.0	0.04
Netherlands	24.7	0.8	0.03
Norway	9.0	0.2	0.02
Poland	10.0	1.4	0.14
Portugal	2.0	0.1	0.05
Romania	2.7	0.1	0.03
Slovak Republic	1.0	0.1	0.14
Spain	16.0	0.0	0.00
Sweden	21.0	3.3	0.16
Switzerland	15.0	2.9	0.19
United Kingdom	196.7	36.9	0.19
United States	na[b]	na[b]	na[b]

Notes: The table reports the change in target firms per country if the United States switch from applying worldwide taxation to exempting foreign income taxation. T_j is the average number of target firms acquired by US firms between 2000 and 2002 and dT_j is the predicted average increase in target firms acquired by US firms. dT_j/T_j is the implied relative change in target firms. Predictions are calculated using regression (1) in Table 4.4 and taking the observations' explanatory variable values into account.

a: US firms did not acquire any Latvian firm from 2000 to 2002, so the growth rate is not defined.

b: The number of US target firms is not affected. However, the average number of acquiring US firms is $A_{US} = 549.7$, the average predicted increase in acquiring US firms is $dA_{US} = 57.6$ and the relative change in acquiring US firms is $dA_{US}/A_{US} = 0.105$.

Figure 4.1: Comparing simulations of the United States exempting dividend repatriations from taxation



This scatter plot illustrates the similarity between the simulations in Sections 3.5 and 4.5. Every scatter represents one country. The horizontal axis measures the left-hand term of expression (4.7) for a given country, which is derived in Section 4.5 and reported in Table 4.5. The vertical axis measures the right-hand term of expression (4.7) for a given country, which is derived in Section 3.5 and reported in Table 3.4. The correlation coefficient of the left- and right-hand side is 0.90.

4.A Appendix

This appendix discusses the instrumental (IV) estimation reported in Table 4.4 in detail. Tax policy is a slow process in comparison to firms' decision making in international mergers and acquisitions. Corporate income tax levels are not changed very frequently and the method of relief for double taxation is changed even less frequently. Therefore, we have assumed so far that the double tax variable τ_{ijt}^{double}, is predetermined. Here, I assume to the contrary that this variable is endogenous, which requires an instrumental variable approach.

It appears untoward to instrument the complete set of explanatory variables. Instead, I instrument only the tax variable of interest and all explanatory variables that must be endogenous once I assume the tax variable of interest is endogenous. More specifically, if I assume the double tax variable τ_{ijt}^{double}, to be endogenous, then τ_{it} and τ_{jt} are most probably endogenous as well, because countries tend to affect double tax rates by changing their corporate income tax rates. As before, one- and two-year lagged values are chosen as instruments for the endogenous variables to be able to test the exclusion restrictions and orthogonality conditions.

The IV estimator is basically a system of equations regression. For instance, there are four equations implicit in regression (9) of Table 4.4 corresponding to the dependent variable MA_{ijt} and the three endogenous explanatory variables τ_{ijt}^{double}, τ_{it} and τ_{jt}. The system of equations is estimated using Newey's (1987) minimum χ^2 estimator which is asymptotically efficient relative to many conventional two-stage tobit estimators.

The second stage results have already been reported in regression (9) of Table 4.4. The first stage results are reported in Table 4.6. The chosen instruments predict the endogenous explanatory variables well. The IV estimator is overidentified as there are six orthogonality conditions instead of the minimum three, which are necessary to identify the model. Under the joint null hypothesis of correct model specification and valid orthogonality conditions, Newey's minimum distance function follows a χ^2 distribution with three degrees of freedom. With a test statistic of 6.08 and a p-value of 0.11, the null hypothesis cannot be rejected. Under the null hypothesis of τ_{ijt}^{double}, τ_{it} and τ_{jt} being exogenous, the first stage regression fitted errors have no effect in the second stage tobit regression. With a Wald test statistic of 0.53 and a p-value of 0.91, τ_{ijt}^{double}, τ_{it} and τ_{jt} are probably exogenous and the standard regression results should be preferred.

Table 4.6: First stage results for instrumental variable regression

	(1)	(2)	(3)
	τ_{ijt}^{double}	τ_{it}	τ_{jt}
τ_{ijt-1}^{double}	0.827**	0.086**	-0.018
	(0.012)	(0.016)	(0.016)
τ_{ijt-2}^{double}	0.023*	-0.100**	0.006
	(0.011)	(0.015)	(0.016)
τ_{it-1}	-0.033**	0.690**	0.003
	(0.009)	(0.011)	(0.012)
τ_{it-2}	-0.024**	-0.034**	-0.001
	(0.008)	(0.011)	(0.011)
τ_{jt-1}	0.048**	0.017	0.717**
	(0.009)	(0.013)	(0.013)
τ_{jt-2}	-0.001	-0.020	-0.022
	(0.009)	(0.012)	(0.012)
$Distance_{ij}$	0.094	0.036	0.015
	(0.078)	(0.104)	(0.106)
GDP_{it}	14.542**	11.962**	2.177
	(1.927)	(2.552)	(2.616)
GDP_{jt}	1.133	2.044	2.179
	(1.839)	(2.436)	(2.497)
$GDPpercap_{it}$	-16.922**	-15.673**	-2.603
	(2.132)	(2.823)	(2.894)
$GDPpercap_{jt}$	-0.675	-2.044	-6.954*
	(2.036)	(2.697)	(2.764)
$(Stocks/GDP)_{it-1}$	-0.001	-0.821**	0.055
	(0.069)	(0.091)	(0.093)
$(Credit/GDP)_{it-1}$	0.383**	0.836**	-0.182
	(0.132)	(0.174)	(0.179)
$\Delta Exch.rate_{ijt-1}$	0.994**	3.041**	-2.426**
	(0.300)	(0.397)	(0.407)
$Tariffs_{jt}$	-0.377**	-0.028	-0.047
	(0.113)	(0.150)	(0.154)
$Controls_{jt}$	-0.038	0.004	0.241**
	(0.026)	(0.034)	(0.035)
$Border_{ij}$	0.054	-0.033	-0.080
	(0.129)	(0.170)	(0.175)
$Language_{ij}$	0.266*	0.049	0.045
	(0.132)	(0.174)	(0.179)
EU_{ijt}	-0.738**	0.221	0.220
	(0.097)	(0.128)	(0.131)
Observations	7100	7100	7100
R^2	88.03	91.18	89.47

(Notes on next page)

Notes on Table 4.6: The table reports first stage OLS regressions which are part of the IV estimation reported in column (9) of Table 4.4. The dependent variable is τ_{ijt}^{double} in regression (1), τ_{it} in regression (2) and τ_{jt} in regression (3). τ_{ijt}^{double} is the double tax rate that applies to dividend income repatriated from the target firms' country j to acquiror firms' country i in the year t. τ_{it} and τ_{jt} are the corporate income tax rates in country i and country j in year t. τ_{ijt-1}^{double} and τ_{ijt-2}^{double} are the double tax rates lagged by one and two years. τ_{it-1}, τ_{it-2}, τ_{jt-1} and τ_{jt-2} are corporate income tax rates in country i and country j lagged by one and two years. $Distance_{ij}$ is the logarithm of the distance between country i's capital and country j's capital in miles. GDP_{it} and GDP_{jt} are the logarithms of country i's and country j's GDP in year t. $GDPpercap_{it}$ and $GDPpercap_{jt}$ are the logarithms of the per capita income of countries i and j in year t. $(Stocks/GDP)_{it-1}$ is the logarithm of country i's stock market capitalization relative to its GDP in year $t-1$. $(Credit/GDP)_{it-1}$ is the logarithm of country i's domestic credit provided to the private sector relative to its GDP in year $t-1$. $\Delta Exch.rate_{ijt-1}$ is the change in the logarithm of the real bilateral exchange rate between countries i and j between year $t-1$ and year $t-2$. $Tariffs_{jt}$ is the logarithm of the average tariff on goods imported to country j in year t. $Controls_{jt}$ is an index of the number of capital controls in country j in year t. $Border_{ij}$ indicates whether countries i and j share a common land border. $Language_{ij}$ indicates whether countries i and j share a common language. EU_{ijt} indicates whether countries i and j were both members of the European Union in year t. Country and time fixed effects are not reported. Stars indicate the significance level: $*$: 5%, $**$: 1%. For detailed definitions and data sources, see Table 4.2.

I only ask for information.

Miss Rosa Dartle in 'David Copperfield' (Charles Dickens)

CHAPTER 5

THE DETERMINANTS OF CROSS-BORDER TAX INFORMATION SHARING[1]

The increased mobility of capital flows, facilitated by technological developments and the lifting of capital controls in the 1980s, has affected countries' ability to effectively tax cross-border capital flows. Because of the ready access to foreign financial markets — often located in offshore financial centers levying no or low tax rates — taxpayers can easily conceal their capital income and asset ownership. Tax authorities of the country of residence of investors are faced with an increasing number of taxpayers disappearing from their 'tax radar screen'. Although it is difficult to quantify the overall size of the revenue loss, it is generally considered to be sizable. These developments have raised calls for stepped-up international cooperation between national tax authorities in the form of tax information sharing.

The need for taxpayer-specific information arises from the pervasive use of the residence principle in the taxation of cross-border (capital) income.[2] Under the residence principle, income tax is ultimately payable to the country in which a taxpayer (natural person or company) resides, possibly with some

[1] This chapter is based on Ligthart and Voget (2008).

[2] The residence principle—which provides the welfare case for information sharing—is underpinned by the Diamond and Mirrlees (1971b) theorem on the desirability of production efficiency. Keen and Wildasin (2004), however, show that the conditions for the Diamond-Mirrlees theorem are far from trivial in an international setting. Besides the requirement that pure profits are fully taxed, countries need to have access to lump-sum taxes.

credit or deduction for taxes paid in the country of source (i.e., in which the income is generated). To enforce the residence principle, tax authorities of countries must have information on their residents' income (and potentially assets) abroad. Many countries require taxpayers to disclose (through a system of self-assessment) details of such income to the tax authorities of their country of residence, but the likelihood of fraudulent (or no) declaration is all too evident. To address international tax evasion, residence countries need to have access to information in the country of source.

Tax information sharing between national tax authorities lies at the heart of important recent policy initiatives. In 1998, the OECD launched the 'Harmful Tax Practices' project (cf. OECD, 1998), which considers the lack of effective information sharing as one of the key criteria identifying harmful tax practices.[3] In addition, as of July 1, 2005, 22 EU member states automatically exchange information on individuals' interest income between each other.[4] Little is known about countries' actual experiences in terms of the size and nature of information flows and even less is known about the effectiveness of information sharing. This is no doubt a reflection of the considerable degree of confidentiality with which the data are treated by tax authorities. Indeed, by not revealing these data, tax authorities create a healthy uncertainty amongst taxpayers. To my knowledge, there are no formal empirical studies on the determinants of information sharing.[5] This study tries to fill that void. I empirically investigate whether the determinants put forward in the theoretical literature play a role in determining the intensity of bilateral information sharing 'on request' related to a particular taxpayer.[6] To this end, I employ a unique panel data set (covering 81 countries during 1992–2005) on tax information requested by the Dutch tax authorities. To deal with zero-valued bilateral information flows, I use various econometric models (i.e., , negative binomial, and Heckman selection).

[3]Countries featuring harmful tax practices were put on a blacklist. The original (June 2000) list featured 37 countries. As of August 2007, only three countries remain on the OECD blacklist: Andorra, Liechtenstein, and Monaco.

[4]As of January 1, 2007, this also includes Bulgaria and Romania. Three member states (i.e., Austria, Belgium, and Luxembourg) operate a non-resident withholding tax on interest income.

[5]Huizinga and Nicodème (2004) study employs a dummy variable indicating whether countries have entered into an automatic information sharing agreement. No significant effect of information sharing on depositing patterns is found, however.

[6]Information on request is defined as information that is provided in response to a well-founded request by the requesting tax authorities. This implies that 'fishing trips' are prevented.

Not much is known about countries' incentives to exchange tax information, except for a few theoretical contributions focusing on information sharing for income tax purposes.[7] The key theoretical challenge is to understand why countries would be willing to engage in information sharing. By providing tax information, source countries become less attractive places to tax-evading foreign investors. Furthermore, the tax authorities of source countries also bear the direct administrative costs of information provision. Bacchetta and Espinosa (2000) and Huizinga and Nielsen (2003) argue that bilateral cooperation in information sharing may be sustained if the choice of tax rates is viewed as an infinitely repeated game rather than a one-off matter. Each country must then weigh the temporary gain from not providing information (by attracting tax evading investors), one the one hand, against the cost of non-cooperative behavior by the other country (generally, more aggressive tax competition or absence of information provision or both) forever after. Bacchetta and Espinosa (2000) and Huizinga and Nielsen (2003) formally derive the attractions of defecting, which provides a list of potential determinants of tax information sharing.

This chapter provides empirical tests of the predictions regarding the determinants of information exchange from this literature. The determinants suggested by the theoretical literature are mostly confirmed with one exception. A country's willingness to engage in information sharing increases in the marginal cost of public funds, in the share of a country's interest-bearing deposits held abroad and in the domestic income tax rate. However, there is no support that the size of withholding tax on non-residents' saving income has any effect on the propensity to exchange information. The potential revenue from hosting foreign investors' funds does not seem to inhibit information exchange.[8] A corollary result is that information sharing is characterized by a considerable degree of reciprocity. Last, the chapter investigates which institutional arrangements countries choose to facilitate or to inhibit information exchange. The EU Mutual Assistance Treaty seems to result in more informa-

[7] Central contributions are those by Bacchetta and Espinosa (1995, 2000), Eggert and Kolmar (2002, 2004), Huizinga and Nielsen (2003), and Keen and Ligthart (2006a, 2007) . See Keen and Ligthart (2006b) for a survey of the theoretical literature and an overview of the institutional arrangements underpinning information sharing.

[8] Furthermore, there is weak support for the hypothesized negative effect on information sharing of a country's ability to monitor its taxpayers' investment activities. The bank reporting dummy is significant at the 5 percent level, whereas the bank secrecy dummy and auditing variable are insignificant.

tion exchange than bilateral tax treaties with information exchange clauses.[9] Relationships characterized by tax treaties without an information exchange clause exhibit very low levels of information sharing — even much less than relationships without a tax treaty at all.

The chapter is organized as follows. Section 5.1 discusses a simple model from which various hypotheses are derived. Section 5.2 analyzes the tax information sharing data and discusses the sample used in the regression analysis. Section 5.3 sets out the empirical methodology. Section 5.4 presents the empirical results. Finally, Section 5.5 offers a conclusion.

5.1 Tax Information Sharing

The section first deals with the economics of tax information sharing before it turns to institutional and legal issues. This yields a number of hypotheses, which are tested empirically in Sections 5.3–5.4.

5.1.1 Why Information Sharing?

Under what circumstances does self-interest drive source countries to voluntarily supply tax information to the countries of residence of savers? Common sense suggests that source countries that provide tax information become less attractive places to tax-evading foreign investors (because the source country helps the residence country to enforce its income taxes). In addition, source countries bear the administrative costs of information gathering, which is more of a burden the less developed is the country's tax administration and banking system. Information sharing is a kind of barter trade. The information receiving (or residence) country obtains a gift (i.e., additional public revenue) from the information providing (or source) country. The amount of additional tax revenue collected is typically private information to the residence country.[10] It is presumed that in a decentralized Nash equilibrium of a static tax setting game tax information is under-supplied or even not supplied at all.

[9] The impact of the EU Mutual Assistance Treaty cannot easily be distinguished from the effect of other institutional features that apply to EU membership.

[10] Sometimes tax authorities inform each other on the additional tax revenue collected as a result of tax information with a view to further strengthen the bilateral relationship between them.

Some countries may be willing to provide information, even if it is apparently against their own interests, because they believe this is an aspect of good behavior toward countries they have economic or political ties with. Not surprisingly, this is more the exception than the rule. More persuasive arguments are rooted in self-interested behavior of national governments. In this context, the literature has put forward various reasons why countries may be interested in exchanging information.[11] The first reason is related to beneficial strategic effects as set out in Bacchetta and Espinosa's (1995) two-stage game. Prior to their choice of tax rates, countries commit to tax information sharing, reflecting the long-term nature of information exchange treaties.[12] If countries cannot discriminate between residents and non-residents in tax setting, then a country may benefit unilaterally by providing some information in the first stage because it induces the foreign partner country to set a higher tax rate in the second stage. Indeed, tax evasion by residents of the partner country becomes less attractive, so that it can afford to set a higher tax rate. Of course, there is also a negative effect because information provision makes the information supplying country less attractive to foreign investors. But the strategic effect can dominate this adverse effect, which explains why countries may choose to provide partial information in equilibrium. A crucial assumption of the analysis is that there are only two large countries. Otherwise, the strategic effect breaks down, due to countries' free-riding on others providing information.

Another explanation for information sharing is related to governments interacting with each other over time. Even if governments have to decide simultaneously on the amount of information to provide to the other country, some form of bilateral cooperation may be sustained if the game is infinitely repeated (as is analyzed in Section 5 of Bacchetta and Espinosa (2000) and Huizinga and Nielsen (2003)).[13] Countries then perform a dynamic cost-benefit analysis in deciding whether or not to add an information sharing

[11] I will not discuss the papers by Keen and Ligthart (2006a, 2007), who stress the incentive effects of revenue transfers. If the residence country transfers a share of the revenue it collects as a result of the information passed to it by the source country, the latter may be more willing to cooperate on information sharing. Because this proposal has not been implemented in practice yet, I will not further discuss it.

[12] Tax information exchange agreements usually take the form of an additional clause in a bilateral income tax treaty (e.g., Article 26 of the OECD (2005) Model Convention on Income and Capital). Consequently, these agreements change less frequently than tax rates.

[13] In such a world, the Folk theorem applies, which says that many outcomes (including that of the one-shot game) can be sustained (cf. Abreu, 1988).

clause to a bilateral tax treaty. Each country weighs the one-off benefits from failing to provide information (i.e., attracting tax evading investors) against the discounted cost of having to deal with non-cooperative behavior by the partner country (i.e., more aggressive tax competition and/or no provision of information) forever after. If the short-run benefits dominate the long-term costs, then the sustainable level of information provision is zero or very low and vice versa.

Repeated interaction is not necessary for information exchange if the countries can commit themselves to information sharing. In Bacchetta and Espinosa, (2000, Section 4), countries can credibly agree on a level of information sharing because they effectively lack the possibility to take advantage of the other country by deviating from the agreed upon policy. The lacking benefit of defection is due to the assumption that deviating behavior is detected — and hence can be retaliated — by the other country before private investors take notice of the change in information exchange policy. The authors show that a Pareto improvement is always possible by exchanging at least some information, although the amount of information that a country provides in equilibrium may differ from the amount of information it receives. Any information clause that improves the non-cooperative situation will be added to a double tax treaty. At which 'price' a country is willing to provide information depends more or less on the same set of factors found in the repeated game mentioned above. The relevant factors are discussed below.

5.1.2 A Simple Analytical Framework

This section derives a number of testable hypotheses based on the work of Bacchetta and Espinosa (2000) and Huizinga and Nielsen (2003).[14] Consider a world consisting of two (potentially asymmetric) countries. Each country features a continuum of households that live for one period. Upon death households are being replaced by a new generation, implying a constant population size. Each individual is endowed with one unit of savings, a proportion of which can be invested abroad (denoted by F). Investment abroad involves

[14] I draw on a simplified version of Bacchetta and Espinosa's (2000) model, in which I assume that households receive a 100 percent tax credit for taxes paid abroad. Note that the framework of Huizinga and Nielsen (2003) is very similar. It differs with respect to the modeling of the banking sector, which is not included in Bacchetta and Espinosa (2000), and in the form of the transaction cost function. Transaction costs are linear in distance in Huizinga and Nielsen (2003), whereas they are a convex function of cross-border investment in Bacchetta and Espinosa (2000).

convex transaction costs $\sigma(F)$, whereas investment at home does not involve any transaction costs.[15] In both countries there is a constant-returns-to-scale technology yielding a constant rate of interest (r). The domestic tax authority can perfectly monitor all domestic investments, but can only monitor a (fixed) fraction of the foreign (portfolio) investments made by its own residents. The degree of non-monitored investments is denoted by $0 \leq k \leq 1$ for the home country, where I assume that k is constant. Similarly, for the foreign country I define $0 \leq k^* \leq 1$, where asterisks denote foreign variables. Individuals investing abroad are assumed not to report their foreign income to the tax authorities of their country of residence. Without assistance from the source country, the residence country has a hard time identifying those of its own residents who have saved abroad. However, the tax authorities of the source country can transmit a proportion (ξ and ξ^* for the home and foreign country, respectively) of information on tax evaders' income to their country of residence. For an individual investor, the probability $(1-k)$ of being monitored by the home country and the probability ξ^* of being reported by the foreign country are independent. It is assumed that information transmission is costless.

Domestic investment is subject to the domestic income tax (τ for the home country and τ^* for the foreign country). Non-monitored foreign investment income pays the non-resident withholding tax only. Non-resident withholding taxes in the home (foreign) country are denoted by t_N (t_N^*). In accordance with the residence principle, monitored foreign investment income is taxed in the residence country at the domestic income tax rate minus a hundred percent tax credit for non-resident withholding tax paid abroad. No penalty on tax evasion applies, but this can be easily taken into account.

Households maximize a well-behaved utility function, which depends on private consumption and a public good, subject to their budget constraint. Because the government decides on public consumption, utility maximization of individuals amounts to the maximization of consumption with respect to foreign investment. The household's optimal amount of cross-border investments is determined by a comparison between the transaction costs incurred in depositing funds abroad (i.e., $\sigma'(F)$) and the taxes saved in doing so (i.e., $r(\tau - t_N^*)k(1-\xi^*)$). More formally, a home investor balances foreign and do-

[15] These transaction costs are *net* costs because there also exist non-tax related benefits of investment abroad (e.g., diversification benefits or agglomeration externalities). At low levels of F, costs may be negative. For example, $\sigma(F) \equiv \frac{1}{2\chi_1}F^2 - \chi_0 F$, where $\chi_0 > 0$, $\chi_1 > 0$, and $\chi_0 < (1/2)\chi_1$.

mestic investment such that the net marginal return on foreign investment (left hand side) equals the net marginal return on domestic investment (right hand side):

$$r(1-\tau) + r(\tau - t_N^*)k(1-\xi^*) - \sigma'(F) = r(1-\tau) \tag{5.1}$$

The foreign investors' first order condition is similar:

$$r(1-\tau^*) + r(\tau^* - t_N)k^*(1-\xi) - \sigma'(F) = r(1-\tau^*) \tag{5.2}$$

An interior solution applies if $\tau - t_N^* > 0$ and $\tau^* - t_N > 0$. Equations (5.1)–(5.2) then yield the optimal cross-border investment by the home country ($\hat{F}$) and by the foreign country ($\hat{F}^*$). Note that optimal tax rates are set in a previous stage of the game in such a way that it pays to households to evade domestic income taxes, implying that $\hat{F}, \hat{F}^* > 0$. Because a higher degree of information provision makes investment abroad less attractive, $\frac{\partial \hat{F}^*}{\partial \xi}$ and $\frac{\partial \hat{F}}{\partial \xi^*}$ are negative.

Following Bacchetta and Espinosa (2000), a second-best world is considered in which each government finances its public spending entirely by distortionary taxes on interest income (i.e., $G = \tau r(1-F) + t_N r F^* + [1-k(1-\xi^*)](\tau - t_N^*)rF$ for the home country). Consequently, the marginal cost of public funds (η) exceeds unity. Governments maximize welfare, which is the discounted utility of present and future generations, by choosing their income tax rate, non-resident withholding tax rate, and degree of information sharing. I consider the special case in which countries have set their non-resident withholding taxes cooperatively, implying that a double tax relief treaty is optimal for both countries. Subsequently, the two governments play a Nash game in income tax rates, taking into account the tax effect on households' savings allocations. After governments have set their taxes, private investors decide how much to invest abroad.

I analyze countries' incentives to cooperate on tax information sharing. To simplify the analysis, the effect of information sharing on the sustainability of the double tax relief treaty is ignored. Furthermore, governments cannot enjoy one-off gains from deviating from information sharing because it is assumed that the private sector cannot react immediately to a change in ξ (ξ^*) before the foreign (home) government does. Consequently, the countries' discount rates do not play a role. If one country does not transmit information, it is 'punished' by the other country that abstains from information provision as well. In this context, the following condition applies (see equation (13) of

Bacchetta and Espinosa, 2000):

$$\Omega \equiv t_N \frac{\partial \hat{F}^*}{\partial \xi} - [\tau - (1 - k(1 - \xi^*))(\tau - t_N^*)] \frac{\partial \hat{F}}{\partial \xi^*} + \left(\frac{\eta - 1}{\eta} \right) k(\tau - t_N^*)\hat{F} > 0 \quad (5.3)$$

where Ω indicates the home country's willingness to exchange information. The first term of (5.3) represents the costs of information provision to the home country, whereas the second and third terms denote the benefits of receiving information. Factors that increase Ω make the home country more willing to exchange information. This yields a set of economic and institutional determinants for the empirical analysis, which I will discuss in turn.

5.1.3 Determinants

Countries with a high income tax rate on residents are more likely to provide information than countries with a low income tax rate (Hypothesis 1), which is also derived by Huizinga and Nielsen (2003). A high tax rate increases the second term of (5.3) (because $\frac{\partial \hat{F}^*}{\partial \xi^*} < 0$), thereby increasing Ω:

Hypothesis 1 *A country is more likely to cooperate on information sharing if the resident income tax rate is high, that is* $\partial\Omega/\partial\tau > 0$.

A large non-resident withholding tax rate makes the first term of (5.3) more negative (because $\frac{\partial \hat{F}^*}{\partial \xi} < 0$), reducing a country's incentive to share information (Hypothesis 2).

Hypothesis 2 *A country is more likely to cooperate on information sharing if its domestic non-resident withholding tax rate is low, that is,* $\partial\Omega/\partial t_N < 0$.

The intuition for Hypotheses 1–2 is as follows. The additional revenue a country gets from the foreign savings of its own residents (which are brought into tax due to tax information sharing) exceeds the loss of revenue from non-resident savings (which will be relocated to 'information free' places).

The third term of equation (5.3) demonstrates that countries with a sizable public sector—which thus feature a large marginal cost of public funds, η—are more likely to engage in information sharing (Hypothesis 3). Intuitively, these countries derive a larger gain from the additional resources brought into tax, owing to the received tax information.

Hypothesis 3 *Countries that value public goods more than private goods (and thus feature a high marginal cost of public funds) are more eager to engage in information sharing, that is,* $\partial\Omega/\partial\eta > 0$.

Bacchetta and Espinosa (1995, 2000) reason that countries with a large share of investment abroad (yielding a large third term in (5.3)) are more eager to share information than countries where a lot of foreign capital is deposited (Hypothesis 3). This argument is closely linked to Tanzi and Zee's (2001) observation that countries being net exporters of capital would place a higher value on tax information received than countries that are *net* importers of capital.[16]

Hypothesis 4 *Countries that have a large share of financial assets abroad are more eager to share information than countries where a lot of foreign capital is deposited, that is,* $\partial\Omega/\partial\hat{F} > 0$.

Institutional factors such as the degree to which a country's tax authority monitors its taxpayers abroad play a role too. The lower the degree to which a country can monitor its residents' foreign investments—and thus the higher the percentage of non-complying taxpayers it is faced with—the more eager it is to exchange tax information. More formally, the second and third terms of (5.3) are positive, where $\partial\hat{F}/\partial\xi^* < 0$, $\partial(\partial\hat{F}/\partial\xi^*)/\partial k < 0$, and $\partial\hat{F}/\partial k > 0$. Intuitively, there is less need for information sharing if a country can obtain most information by its own means.

Hypothesis 5 *Countries that are better able to monitor their residents' financial transactions (i.e., implying a smaller k) provide less tax information, that is,* $\partial\Omega/\partial k > 0$.

5.1.4 Information Sharing Instruments

Most countries have laws protecting the confidentiality of information that tax authorities have gathered about a particular taxpayer. As a result, tax authorities of a country cannot provide taxpayer-specific information to a tax authority of another country without a legal instrument permitting such disclosure. Traditionally, information exchange has been carried out under bilateral double income tax relief treaties (typically based on the OECD (2005) Model Convention on Income and Capital) and various multilateral mutual

[16] Bacchetta and Espinosa (2000) also argue that countries featuring capital inflows that are less sensitive to information sharing than their capital outflows (which is typically the case for large countries) are more willing to exchange information (because the greater will then be the advantages to the small country of not providing information). More formally, $|\frac{\partial F^*}{\partial \xi}|$ is small compared with $|\frac{\partial F}{\partial \xi^*}|$ in equation (5.3).

assistance treaties.[17] Given that many countries have an extensive network of bilateral tax treaties, the country coverage of these treaties is generally wider than the typical multilateral treaty. The most well-known multilateral treaties are the following two.[18] All 27 EU countries participate in the EU Mutual Assistance Directive (which applies to direct and indirect taxes). The EU Mutual Assistance directive was concluded in 1977 and amended in 2004 to better facilitate information sharing for direct taxes. A much smaller treaty is the OECD/Council of Europe Convention on Mutual Administrative Assistance in Tax Matters, in which 11 countries participate.[19] Under all those treaties, countries are expected to rely on their domestic sources before making a specific request to a treaty partner. The request has to be precise (i.e., details about the taxpayer in question, the fiscal year, the transaction(s) under scrutiny, and the relevance of the information being sought). All of these requirements are designed to prevent countries from overburdening each other with requests and to ensure that taxpayer information is disclosed only when necessary.

Having enacted one of the legal instruments mentioned above does not necessarily imply that national tax authorities can fully share tax information. The information sharing clause in most bilateral tax treaties incorporates a provision relieving tax authorities from providing information that is not obtainable under their normal administrative procedures. Consequently, obligatory exchanges are typically reduced to the 'least common denominator.' Furthermore, some countries have imposed an article in their double tax treaties that limits information sharing (e.g., to criminal tax matters only) or precludes information sharing. Finally, some countries can only exchange information related to criminal tax matters under the principle of 'double incrimination,' whereas no obstacles exist for civil tax matters.[20]

[17] Alternative legal instruments exist, however. Mutual legal assistance treaties or provisions in domestic laws may permit information sharing for criminal tax matters. Criminal tax matters refer to tax investigations involving intentional conduct of a taxpayer that is subject to criminal prosecution in the country of residence of the offender. Civil tax matters are those subject to non-criminal penalties. See Keen and Ligthart (2006b, p. 83).

[18] Since July 1, 2005, the Netherlands also automatically exchanges information on interest income with EU member states and associated territories under the EU Savings Tax Directive.

[19] Besides the Netherlands, the following 10 countries participate in this convention: Azerbaijan, Belgium, Denmark, Finland, France, Iceland, Norway, Poland, Sweden, and the United States.

[20] The principle of double incrimination implies that a country is unable to share information unless the offense would also be a tax crime if committed in its own jurisdiction.

5.2 Data Description

The data set pertains to tax information sharing by the Dutch tax authorities with tax authorities of foreign countries for income tax purposes. The exchanged information typically includes the following items: banking records (i.e., interest income earned, account number, and contact information of paying agent), fiscal residence of an individual, and expenses recorded on a tax return. The data points refer to the annual number of completed cases of information sharing on request for the period 1992–2005. On average, it takes 3–6 months to settle a case. In the early 1990s, this amounted to an average of 9 months when secure/encrypted e-mail exchanges were not that common yet. The non-response to information requests is generally very small,[21] because of reciprocity in information sharing (see Section 5.4.3). Requesting tax authorities can 'punish' non-complying partners by not reciprocating future information requests by the latter, making non-compliance costly. Furthermore, it is quite likely that the Dutch tax authority is only requesting information from countries that are known to be complying.

Table 5.1 shows the average number of exchanges by partner country during the sample period. All countries are included that have at least provided/received information once, yielding a total of 50 countries. The countries are ranked by the average size of the information flow. On the information import side, 19 countries exchange 95 percent of the information and only seven countries do about 80 percent of the exchanges. On the information export side, 30 countries exchange 95 percent of the data. The average aggregate number of exchanges on the information import side is much larger than on the export side. Furthermore, information received on request is more concentrated than information provided on request (the coefficient of variation is 2.10 and 2.23, respectively). Information sharing has gained prominence over the years. On average, 23 countries supply information to the Netherlands during the sample period; the number of countries grows from 13 in 1992 to 41 in 2005. On the information receipt side, one can see a similar pattern. Note that the average number of exchanges is extremely small compared to the number of Dutch income tax payers (8.86 million in 2004) and completed audits in the Netherlands (66,428 in total in 2004).

Information flows can be decomposed into three types: (i) automatic;[22] (ii) on

[21] This is based on anecdotal evidence obtained from conversations with experts at the Ministry of Finance. Exact figures are not available.

[22] Automatic information sharing implies that the authorities of the source country period-

request; and (iii) spontaneous. On average, automatically received information amounts to 85.4 percent, spontaneously received information is 14.3 percent, and requested information amounts to 0.3 percent of the total information received by the Netherlands. A similar pattern can be seen on the information supply side. The dependent variable in the econometric analysis is the number of cases per year for which a country's tax authority has provided information to the Dutch tax authority on request.[23] I expect information sharing on request (as compared to the other forms) to yield the strongest relationship between information flows and the hypothesized determinants of information sharing. The number of automatic information exchanges per year itself does not contain any information because it is the outcome of an automated process. Hence, the only meaningful information is, when and if automatic exchange is initiated. Spontaneous information sharing is very much a by-product of auditing activities of the foreign partner country. The pattern of spontaneously provided information exhibits a lot of noise with the amount of information often varying from zero to large numbers back to zero again within one or two years. In addition, it is very much concentrated among a small group of OECD countries.

One could include all countries of the world in the sample, but that would result in a large share of zero observations in the sample. Instead, the sample for the benchmark regression consists of 81 countries that are mentioned in the OECD (2006b) report on *Tax Co-operation: Towards a Level Playing Field* (which I will refer to as the 'OECD information list,' see Table 5.2).[24] This set contains more or less all countries in which a tax-evading investor may consider putting his or her funds. It comprises all industrialized countries as well as the larger developing countries. More relevant, it also encompasses smaller jurisdictions and associated territories that are known to be tax havens; 32 of them featured on the initial (June 2000) blacklist of the OECD. Countries on this list typically provide less tax information, which is confirmed by a correlation coefficient of -0.33 between the logarithm of information sharing and a

ically pass on (in bulk) to the residence country all tax-relevant information they have agreed to exchange without need for a specific request.

[23] I do not analyze Dutch tax information provided on request to partner countries because the explanatory variables for the Dutch do not vary across partner countries, so there is no variation to exploit.

[24] The left panel of Table 5.1 reports 12 countries (i.e., Brazil, Dominican Republic, Estonia, Indonesia, Israel, Latvia, Lithuania, Romania, Slovenia, Sri Lanka, Suriname, and Thailand) with which the Netherlands has exchanged information, but which are not part of the OECD information sharing list and thus do not feature in the benchmark data set.

dummy representing whether a country is on the OECD blacklist. The Netherlands has double taxation relief treaties with 77 countries (as of January 2005) of which 36 treaties are with countries in the sample (Table 5.2).

Ranking the countries in the benchmark data set by size shows that countries large in terms of economic size (as measured by the logarithm of real GDP) provide more information (also measured in logarithms, see Section 5.3) to the Netherlands than economically small countries. The partial correlation coefficient amounts to 0.490 [$p = 0.000$]. It appears also that there is a negative correlation between the logarithm of distance and the logarithm of information provision by partner countries (i.e., the partial correlation coefficient is -0.598 [$p = 0.000$]).[25] Indeed, 17 of 19 countries that cover 95 percent of the imported information by the Netherlands are EU countries. On the information export side, only 8 of 30 countries are EU members, however.

5.3 Empirical Methodology

This section studies single-stage procedures (like and negative binomial models) and a sample selection model based on a two-stage procedure.

5.3.1 Single-Stage Procedures

From the data discussion, it appears that large countries send more information on tax cases to the Netherlands than small ones. Furthermore, countries that are situated close by send more tax information than distant ones. Therefore, I use the partner country's real Gross Domestic Product (GDP)—which serves as a proxy for its economic size—and distance between the partner country and the Netherlands as basic control variables. This approach bears resemblance to the popular gravity model, which is used to explain bilateral trade flows between countries (cf. Tinbergen, 1962; and Anderson, 1979).[26] To explain any additional heterogeneity beyond the basic gravity pattern, I include additional control variables—related to the geographic and cultural

[25] These figures do not change much if only those countries of the benchmark regression (see column (2) of Table 5.4 below) are considered. The correlation coefficients amount to 0.407 and -0.658, respectively.

[26] I employ a modified version of the basic gravity model, given that I use bilateral information flows for the Netherlands only. Real GDP for the Netherlands is, therefore, not included in the gravity equation. It features as a constant in a cross-sectional analysis and becomes part of the time-specific effect in a panel data analysis.

characteristics of countries—and the variables of interest that should play a role according to theory (see Section 5.1).

For a considerable number of observations in the sample, the Netherlands does not receive any information from the partner country in a given year. The benchmark data set contains 60.6 percent zero-valued information flows.[27] To reflect this, I estimate a , censored regression model of the following kind:

$$y_{it} = \begin{cases} e^{y^*_{it}} & \text{if} \quad y^*_{it} \geq 0 \\ 0 & \text{if} \quad y^*_{it} < 0 \end{cases}, \tag{5.4}$$

where y_{it} is the information received from country $i = 1, ..., N$ in year $t = 1, ...T$ and y^*_{it} denotes an index function (representing the latent variable):

$$y^*_{it} = \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln Dist_i + \phi' x_{it} + \psi' q_{it} + \delta' d_t + \varepsilon_{it}, \tag{5.5}$$

where $Dist_i$ represents country i's distance to the Netherlands, the vector x_{it} denotes the explanatory variables of interest (which are measured in logarithms, except for tax rates and dummy variables), the vector q_{it} represents additional control variables (also measured in logarithms, except for the dummies related to country characteristics), d_t captures time-specific fixed effects (i.e., 13 annual dummies to account for the overall increase in information sharing), and ε_{it} is a normally distributed error term. The β's, ϕ's, ψ's, and $\delta's$ are parameters to be estimated.

The following variables of interest are generally present in all specifications (the expected sign of the parameter to be estimated and the hypothesis to be tested are between brackets): (i) the resident income tax rate ($\phi_1 > 0$, Hypothesis 1); (ii) the non-resident withholding tax rate ($\phi_2 < 0$, Hypothesis 2); (iii) the expenditure-to-GDP ratio as a proxy for the marginal cost of public funds ($\phi_3 > 0$, Hypothesis 3); (iv) the share of savings deposits held abroad in total deposits of a country ($\phi_4 > 0$, Hypothesis 4);[28] and (v) the degree of taxpayer monitoring by the domestic tax authorities ($\phi_5 < 0$, Hypothesis 5). Tax authorities' monitoring ability is proxied in three ways (of which

[27] The most extensive sample—including also many developing countries, yielding a total of 124 countries—gives rise to 81 percent zero observations. Silva and Tenreyro (2006) find 48 percent of zero observations in their analysis of bilateral goods trade, which is typical for gravity studies.

[28] I do not think there is much concern with simultaneity. Huizinga and Nicodème (2004) could not find any evidence that information sharing negatively affects savings deposits. Note also that there are no multi-collinearity issues since the correlation coefficient between the domestic tax rate and the logarithm of the deposit ratio is only 0.11.

the first two proxies increase monitoring ability, whereas the third proxy reduces it). The first proxy is the tax authorities' auditing intensity, that is, the conducted number of audits per taxpayer during a year. The second proxy is a bank reporting dummy, which indicates whether information on interest income is automatically reported by domestic financial institutions to the domestic tax authorities. Third, a bank secrecy dummy is included, which indicates whether the privacy of bank information is protected (by statutory provisions) to unauthorized disclosure to ordinary third parties. Note that bank secrecy rules are less restrictive if it concerns information requested by tax or judicial authorities. Most countries in the sample give access (on request) to bank information for criminal tax matters. Only three countries (i.e., Guatemala, Nauru, and Panama) do not grant access for this purpose.

The additional control variables pertain to various geographic and cultural characteristics of the partner countries. I include dummy variables for countries that are landlocked or islands. In addition, I include the logarithm of a country's surface area to capture its physical size. In addition to being a control variable, country size may also have a bearing on information sharing. An informal analysis by Ligthart (2007) shows that small countries are likely to exchange less information than large countries. Finally, I incorporate a common language dummy variable for countries that have Dutch as an official language, which captures cultural ties between countries. As Tanzi and Zee (2001) emphasize in their informal analysis, language hurdles may also frustrate tax information sharing. See Table 5.3 for the descriptive statistics and the Appendix, Section 5.A, for a list of data sources.

Exploiting the time dimension meaningfully would require a sufficient share of countries changing their basic stance on information exchange. That has probably not happened in the last two decades. Most of the exploitable information is therefore in the cross-sectional variation between countries. Running cross-sectional regressions for every year would be one way to use this variation. Instead of using a cross-section approach, I choose the more succinct and efficient way of pooling the observations and adjusting the standard errors (via clustering by country) such that they are robust to correlation across time. That approach also yields unbiased estimates in the presence of unobservable country-specific random effects. Because of the 'incidental parameter problem,' fixed-effect regressions are a problematic option if the panel's time dimension is not sufficiently large.[29] Furthermore, a considerable num-

[29] If the number of time periods is fixed and the number of cross-sectional units goes to infinity, the coefficients of the dummy variables in the least-squares dummy variable approach are

ber of countries does not send information to the Netherlands at all during the sample period. These countries would drop completely from the sample in a fixed effects estimation, implying that any information on why these countries do not exchange information would be lost.

Strictly speaking, the number of cases for which information is exchanged represents count data, so that a Poisson regression model or a negative binomial regression model may be good alternatives. In both cases, the regression model is then

$$\ln \lambda_{it}(GDP, Dist, x, q, d) = \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln Dist_i + \phi' x_{it} + \psi' q_{it} + \delta' d_t \quad (5.6)$$

where λ_{it} is the conditional expected number of information transmissions from country i to the Netherlands in year t. Based on the corresponding probability distributions, the parameters β, ϕ, ψ, and δ are estimated by maximum likelihood.[30] The generalizations of the negative binomial model with respect to the Poisson model are twofold. First, the conditional variance of the dependent variable does not have to equal its conditional mean. Second, unobservable random effects are allowed.

5.3.2 Sample Selection Model

The models above implicitly assume that the ultimate control about the number of information exchanges rests with the supplying country, even if an information sharing agreement has been concluded. Existing information shar-

not consistent since the number of these parameters increases as the number of cross-sectional units increases. See Greene (2004a) and Greene (2004b) for a recent in-depth discussion of the incidental parameter problem in the context of regressions.

[30] The corresponding Poisson probability distribution is

$$\text{Prob}(Y_{it} = y_{it}) = \frac{{\lambda_{it}}^{y_{it}} e^{-\lambda_{it}}}{y_{it}!}, \quad y_{it} = 0, 1, 2, \ldots,$$

where y_{it} counts the number of cases for which information is sent by country i to the Netherlands in year t, $y_{it}! = y_{it} \times (y_{it} - 1) \times \ldots \times 2 \times 1$, and Y_{it} is a Poisson random variable. The Poisson random variable satisfies $E(Y|x_{it}) = \lambda$ and $V(Y|x_{it}) = \lambda$, where V denotes the conditional variance. The corresponding negative binomial probability distribution is

$$\text{Prob}(Y_{it} = y_{it}) = \frac{\Gamma(\nu + y_{it})}{\Gamma(1 + y_{it})\Gamma(\nu)} \left(\frac{\nu}{\nu + \lambda_{it}}\right)^{\nu} \left(\frac{\lambda_{it}}{\nu + \lambda_{it}}\right)^{y_{it}}, \quad y_{it} = 0, 1, 2, \ldots,$$

where $\Gamma(\cdot)$ is the gamma distribution, $\nu \equiv 1/\alpha$, and α is a dispersion parameter (which is simultaneously determined with the other coefficients through maximum likelihood estimation). As α increases, the variance of the negative binomial distribution also increases.

ing agreements do not provide for passing on the ordinary costs of information provision to the requesting country. At a price of zero, the demand for information should always surmount information supply. Then the number of information exchanges genuinely reflects a country's incentive to supply information. If the previous assumptions appear too strong, then Heckman's (1979) selection model—a generalization of the model—allows for the representation of a two-dimensional decision process. First, the partner country decides whether or not to provide information to the Dutch tax authority (i.e., the *extensive* margin). Second, the Dutch tax authority decides how much information to request from the partner country (i.e., the *intensive* margin). However, the second dimension is only observable if the partner country decides to provide information.

More formally, the extensive margin can be represented by the selection equation:

$$z_{it} = \begin{cases} 1 & \text{if} \quad z_{it}^* \geq 0 \\ 0 & \text{if} \quad z_{it}^* < 0 \end{cases}, \tag{5.7}$$

where z_{it}^* is a latent, unobservable decision variable:

$$z_{it}^* = \gamma_0 + \gamma_1 \ln GDP_{it} + \gamma_2 \ln Dist_i + \zeta' w_{it} + \chi' q_{it} + \omega' d_t + u_{it}, \tag{5.8}$$

and the outcome equation is:

$$y_{it} = \begin{cases} e^{y_{it}^*} & \text{if} \quad z_{it} = 1 \\ 0 & \text{if} \quad z_{it} = 0 \end{cases}, \tag{5.9}$$

where γ, ζ, χ, and ω are parameters to be estimated, w_{it} is the vector of variables of interest, and the latent variable y_{it}^* is defined as:

$$y_{it}^* = \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln Dist_i + \psi' q_{it} + \delta' d_t + \varepsilon_{it}, \tag{5.10}$$

where $\varepsilon_{it} \sim N(0, \sigma_\varepsilon^2)$ (with variance σ_ε^2), $u_{it} \sim N(0,1)$ (with variance σ_u^2, which is normalized to unity), and $\rho_{\varepsilon u}$ is the correlation between the error terms u_{it} and ε_{it}.[31] The focus is on a country's incentive to share information, so it is the selection equation that features the full set of explanatory variables as used in the regressions. The outcome equation only encompasses basic gravity and control variables because data with cross-sectional variation for the Netherlands is not available. Hence, the variation in Dutch information demand

[31] The size of the coefficients in the outcome and selection equation cannot be readily compared. Heckman's model reduces to a model if all explanatory variables in the selection and outcome equation are the same, $\rho_{u\varepsilon} = 1$, and $\gamma = \beta/\sigma_\varepsilon$, and $\chi = \psi/\sigma_\varepsilon$.

across countries cannot be captured in more depth. Evidently, the number of variables in the selection equation exceeds that in the outcome equation, so the selection and outcome equation are fully identified. I estimate the equations by full maximum likelihood allowing for clustering of error terms at the country level.

5.4 Estimation Results

This section presents econometric results for both single-stage and two-stage procedures and performs a sensitivity analysis. In addition, it studies reciprocity in information sharing and analyzes the role of legal instruments in facilitating information sharing.

5.4.1 Single-Stage Procedures

The Benchmark

Table 5.4 reports regression results explaining the flow of information from foreign tax authorities to the Dutch tax authorities in the period 1992–2005. The benchmark regression (1) shows a coefficient of 0.0259 for the domestic income tax variable, which is significant at the one percent level. In line with Hypothesis 1, this suggests that an increase in the foreign country's tax rate on its residents' interest income by one percentage point increases the amount of information sent abroad by 2.6 percent.[32] A country's non-resident withholding tax rate does not have a significant effect on the information flow. Hypothesis 2 is thus not supported. The expenditure-to-GDP ratio features a coefficient of 1.45, which is significant at the one percent level. Hence, a one percent increase in a country's government expenditure-to-GDP ratio increases the amount of information sent abroad by 1.45 percent, which sup-

[32]The marginal effect of a change in the regressor of interest on the information sent to the Netherlands is given by:

$$\frac{\partial \ln E[y_{it}|x_{it}]}{\partial x_{it}} = \phi \times \text{Prob}\,[y^*_{it} \geq 0],$$

where E denotes an expectations operator. The coefficient vector ϕ gives an upper bound on the marginal effects because $0 < \text{Prob}\,[y^*_{it} \geq 0] < 1$. The marginal effect for a large, close by situated, country approximates this upper bound. Indeed, the probability of this country sending some information to the Netherlands is close to one. The coefficient $100 \times \phi$ is the semi-elasticity of $\ln E[y_{it}|x_{it}]$ with respect to x_{it}. If I replace x_{it} by $\ln x_{it}$ in the equation, $100 \times \phi$ denotes an elasticity.

ports Hypothesis 3 as the expenditure-to-GDP ratio serves as a proxy for the marginal cost of public funds. The ratio of deposits owned abroad to domestic deposits has a significant coefficient of 0.37. Hence, a one percent increase in this ratio increases the information sent to other countries' tax authorities by 0.37 percent, lending support to Hypothesis 4.

The various control variables enter the regression as expected; GDP features a positive coefficient and distance a negative coefficient, showing a gravity pattern. The absolute size of the distance elasticity and GDP-elasticity is somewhat larger than usually found in gravity models of bilateral goods trade (cf. Silva and Tenreyro, 2006). A common language seems to facilitate information exchange as the significantly positive coefficient shows. Other geographic variables like a country's surface area, or whether a country is an island or is landlocked do not seem to play a role.

For many countries, especially the smaller ones, there are no data on savings deposits held abroad. Furthermore, data on the variable are available from 1995 onwards only. Therefore, regression (2) excludes the variable 'foreign deposit ratio,' which increases the sample size by about 40 percent. Estimation results are very similar, despite the different sample size and the omitted variable. Regressions (3)–(5) include different variables as proxy for the degree to which a tax authority of a country monitors its citizens' capital movements/tax affairs in order to test Hypothesis 5. The sample sizes are generally smaller than for the benchmark regression because the proxy variables are available for some countries only. Regression (3) includes the auditing intensity variable, which turns out to be insignificant. Alternatively, using the number of audit staff per taxpayer (not reported in the table) does not yield a significant effect either.[33] Regression (4) incorporates a dummy variable capturing whether there is mandatory (automatic) reporting by domestic financial institutions to the country's tax authority. The coefficient has the predicted negative sign, but it is only significant at the 10 percent level. Regression (5) includes a dummy variable indicating whether the confidentiality between the bank and its customer is reinforced by statutory provisions.[34] The bank secrecy variable has the wrong sign, but is insignificant. In summary, only the results from regression (4) show weak support for Hypothesis 5, whereas the other two regressions do not support the hypothesis.

[33]The organization of the anti-fraud unit (i.e., whether it is part of the tax administration) is likely to play a role too, but data on this variable are hard to come by.

[34]In total, there are 59 bank secrecy countries in the sample, including the 'usual suspects,' such as Austria, Luxembourg, and Switzerland.

I have tested the assumption of normally distributed error terms with the conditional moment test by Pagan and Vella (1989). The test results show that for all model specifications the null hypothesis of normality cannot be rejected at the 5 percent level of significance.[35] Following Wooldridge (2002), I also the test the appropriateness of the specification by comparing the scaled coefficient estimates (i.e., β/σ_ε) to the coefficient estimates of a similar (unreported) Probit regression, in which the binary dependent variable is given by observations being censored (zero) or uncensored (one). There are no sign changes in the coefficients and the magnitude of the estimates is sufficiently similar. Hence, the model seems to be appropriate.

Robustness Analysis

To limit the number of censored observations (with no information exchange at all), I restricted the sample in the previous regressions to the 81 countries on the OECD information list. Instead, regression (6) of Table 5.5 tests the robustness of the results with respect to sample selection by including all countries and/or jurisdictions in the world for which the relevant tax rate data are available. As a result, the share of censored observations rises from 60.6 percent to 81 percent. Generally, the results are the same as for the benchmark regression. One difference is the positively significant island dummy variable, which is not in line with received wisdom on the tax havens status of small island economies. This can be explained by the disproportionate presence of big island economies, such as, Australia, New Zealand, and United Kingdom. Regression (7) focuses the sample on those countries that have exchanged information with the Netherlands at least once. As compared with the benchmark, the coefficient on the foreign deposit ratio is larger, whereas the expenditure-to-GDP ratio has a smaller coefficient.

I also analyze the sensitivity of the benchmark regression to different econometric modeling approaches. The previous regressions are robust with respect to country-specific random effects. Nevertheless, regression (8) explicitly accounts for random effects because this renders more efficient parameter estimates if random effects are indeed present. The signs of the estimated coefficients are the same as in the benchmark regression, although the size of the slope coefficients decreases a bit. Instead of a model, I can employ a Poisson model or (a more general) negative binomial regression model. The likeli-

[35] Because the sample size is not large enough to rely on critical values of the asymptotic χ^2 distribution, I derive critical values of the test using a parametric bootstrapping procedure.

hood ratio test (i.e., $\chi^2(1) = 1509.41$ with $p = 0.0000$) indicates that the mean-variance equality is always violated in the Poisson model. I find a dispersion parameter α of 0.76, so that there is substantial overdispersion (while noting that for $\alpha = 0$ the negative binomial model has the same distribution as the Poisson model, see footnote 30). Consequently, in regression (9) I estimate a negative binomial model, which yields coefficients of the variables of interest that are again very similar to the benchmark regression. The same variables are statistically significant. Regression (10) includes the bank reporting variable, which is insignificant, however.

5.4.2 Sample Selection Model

Regression (11a-b) in Table 5.6 reports the estimation results for the sample selection model. The set of significant variables in the selection equation is similar to that in the benchmark case (see column (1) of Table 5.5). The domestic income tax rate, the height of the marginal cost of public funds, and the foreign deposit ratio are significant and all have the expected sign. One difference is that a country's surface area is now significant at the 5 percent level in the selection equation. Small countries are thus less likely to supply information, which is in line with formal analysis of Keen and Ligthart (2006a) and the informal analysis of Ligthart (2007).

Comparing the selection and outcome equations in the Heckman specification shows that the set of significant control variables changes slightly. A common language does not seem to play a role in determining the intensity of information sharing, but is important in selecting a country into information sharing. In addition, the Dutch tax authority appears to demand less information from landlocked countries as indicated by the negative landlocked dummy (which is significant at the 10 percent level only). Note that a country's surface area is significantly positive in the selection equation, but is significantly negative in the outcome equation. Apparently, the Dutch tax authority requests more information from small non-landlocked economies.

To analyze the robustness of the results, the estimates in regressions (12a-b) are based on a broad sample of countries (including many countries that are not on the OECD information list). The estimates are similar to before, except for the island dummy now being significant and the common language dummy variable being insignificant. Regressions (13a-b) add the bank reporting dummy to the selection equation of the broad sample. Because the bank reporting dummy is observed for 38 countries only, the sample size drops

substantially. The bank reporting is significant and has the expected negative sign.

5.4.3 Reciprocity

Informal studies consider information sharing as a 'matter of reciprocity' (as opposed to 'free lunch' information provision or 'issue linkage,' in which case a country provides information in return for a concession in some other area of public policy). Reciprocity could be viewed as mechanism to share the administrative (including auditing) costs of information sharing between countries (cf. Keen and Ligthart, 2006b, p. 84). Indeed, information supplying countries do not receive any (monetary) compensation for the ordinary costs of information provision. Information requests, however, often involve some additional research for the requested country. Reciprocity is expected to be less than perfect. A lack of reciprocity may reflect a legal obstacle, the absence of taxable activities, or a country's reluctance to cooperate.

To capture reciprocity, the amount of information that the Dutch tax authorities have provided to other countries is added as an explanatory variable.[36] This allows determining whether there is reciprocity above and beyond the information flows associated with the previously identified determinants. The information variable is likely to be endogenous as there is a reciprocal effect that works in both directions. Therefore, I apply an instrumental variables (IV) model. I instrument the information received from the Dutch tax authorities by its own two- and three-year lagged values and the other explanatory variables.[37] The estimation results are derived using Newey's (1987) minimum χ^2 estimator which is asymptotically efficient relative to many conventional two-stage estimators.

The results, reported as regression (14) in Table 5.7, show that Dutch information provision is significant at the one percent level, suggesting that reciprocity plays an important role. A one percent increase in the amount of tax information that the Dutch tax authorities provide to foreign tax authorities, increases the amount of information received by the Dutch tax authorities by 0.67 percent. A Wald test of exogeneity reveals that an IV estimation approach

[36] The new variable is defined as the logarithm of the amount of Dutch information provision to other countries plus one.

[37] Using longer or shorter lags as instruments produces very similar results, but the sample size will decrease with longer lags because information provision is only available up to three years before the sampling period.

is indeed required. The hypothesis that contemporaneous Dutch information provision is exogenous is rejected at the 1 percent level.[38] The IV estimator is overidentified as there are two instruments, one more than necessary to identify the model. Under the joint null hypothesis of a correct model specification and valid orthogonality conditions, the objective function of Newey's (1987) minimum χ^2 estimator follows a χ^2 distribution with one degree of freedom (cf. Lee, 1992). With a test statistic of 0.011 and a p-value of 0.92, the null hypothesis cannot be rejected. The instruments seem to be valid. Instead of a two-step estimator, one could also employ a full maximum likelihood approach, which also allows to take clustering into account. The corresponding coefficients reported in regression (15) are very similar to the two-step estimates.

5.4.4 The Role of Tax Treaties

Instead of the number of information exchanges, one could have used the existence of information sharing clauses in tax treaties as a dependent variable. However, information sharing clauses are an imperfect proxy for the amount of information sharing effectively taking place because other institutional features play an important role. The degree to which a government limits domestic reporting requirements can severely constrain the usefulness of information exchange agreements. Another constraining factor is the size of resources deployed to government departments that control reporting obligations or that are ultimately responsible for the information exchange taking place.[39] In fact, an information sharing agreement is not even a necessary legal

[38] See Wooldridge (2002, pp. 472-478) for further details on the Wald test of exogeneity.

[39] For example, the National Audit Office (2007) reports that in the UK overseas territories, "at least in the smaller financial centres, the number of reports is so low as to indicate that some financial institutions either do not know or monitor their customers sufficiently or are unaware of their obligations to report". The National Audit Office (2007) goes on to report that "in Bermuda, very few of the 313 reports received in 2006 had been investigated to the extent of their potential for prosecution. In Anguilla, the Financial Intelligence Unit has no permanent full-time staff. Investigation work, and developing local officers to investigate financial crime there, fell to a contracted UK Detective Inspector, who also acquired criminal investigation and management responsibilities and was supported by one part-time local detective constable. There was a backlog of some 20 cases and the Inspector estimated that the staffing requirement to match the workload as three full time investigators and an administrator." The report eventually summarizes: "Where significant numbers of suspicious activity reports are generated, an increasing burden falls on law enforcement agencies to assess the substance of the reports, investigate those found to have substance and to support subse-

instrument as some countries allow for information sharing in their domestic laws even in the absence of international treaties.

Nevertheless, the existence of certain treaty arrangements can be usefully employed as regressors. As they are a proxy for the dependent variable itself, it cannot explain a country's incentive for information exchange. Explaining the intensity of information exchange by the existence of an information sharing clause would be tautological. Instead, the coefficients of these variables indicate which legal framework countries choose to initiate effective exchange of information. To this end, various treaty dummy variables are added to a parsimonious specification including only the gravity variables GDP and distance. The results reported in Table 5.8 show that double tax treaties are strongly correlated with information sharing, suggesting that they are an important vehicle for exchanging tax information. The absence of an information sharing clause in a tax treaty is a clear sign of a country not being interested in information sharing. Limited information sharing clauses are insignificant. Joint membership of the OECD/Council of Europe mutual assistance treaty is not correlated with more information sharing. The EU Mutual Assistance directive, however, has a significant positive effect on information sharing; its estimated coefficient is larger than that of bilateral double tax treaties. Apparently, the EU Mutual Assistance directive is a more convenient vehicle for sharing tax information.[40]

5.4.5 Discussion

The regression analysis found support for Hypotheses 1, 3, and 4 put forward in the theoretical literature. I could not find convincing evidence for Hypothesis 5, which says that countries provide less information if they can better monitor their residents' investments abroad. This can potentially be explained by either of three factors: (i) the proxy variables describing the tax authority's ability to monitor residents' cross-border investments were inappropriate; (ii) countries are generally unable to monitor their residents' affairs to such a degree that they may rely less on cooperation with other countries; and (iii) the variable is simply not a determinant of tax information sharing.

quent prosecutions. This burden has outstripped the capacity of law enforcement agencies in most Territories. Only the Cayman Islands has so far achieved successful prosecutions of local participants for offshore money laundering offences."

[40]The EU Mutual Assistance directive dummy variable is very similar to an EU membership dummy variable, so the two institutions cannot be disentangled.

Hypothesis 2 on the effect of the withholding tax on non-residents could also not be supported, casting doubt on the way that withholding taxes are perceived in the theoretical framework. According to the hypothesis, countries may not engage in tax information exchange because the consequent decrease in inbound foreign investment results in a decrease of tax revenue from withholding taxes. Some countries may indeed extract some rents from foreign investors via withholding taxes. Most tax havens, however, seem to set withholding taxes (and sometimes even corporate income tax rates) to zero to lure foreign investors. Rent extraction is then left to the local financial institutions and legal services industry or to government via non-tax instruments (e.g., license fees). The insignificance of withholding taxes signals the limitations of previous attempts to model information exchange, which only take interactions between two countries into account. In such a framework, the domestic tax-evading investor is faced with a foreign monopoly supplier of 'information free' savings income. Accordingly, rent extraction via the imposition of withholding taxes is easy, implying that the county will have less of an incentive to participate in information sharing agreements. In a world of many tax havens competing for tax-evading investors, this relationship may even be the exact opposite; those countries that resist information sharing also feature extremely competitive non-resident withholding tax rates because both features make the country more attractive to foreign tax-evading investors.

5.5 Conclusions

This chapter analyzes empirically the determinants of tax information sharing between national tax authorities. More specifically, I study information on tax cases that the Dutch tax authority has received 'on request' from various foreign tax authorities. In addition, I study whether tax information sharing is based on reciprocity and investigate which legal framework countries use in exchanging information. The sample covers 81 countries and jurisdictions for the period 1992–2005.

Information sharing features a basic gravity pattern. Above and beyond this pattern, the regression analysis finds support for four of five hypotheses put forward in the analytical literature. The height of the domestic income tax rate, the size of the marginal cost of public funds, and the share of a country's share of deposits held abroad make a country more willing to engage in information sharing. Only weak support can be found for the hypothesized negative effect

of a country's ability to monitor its taxpayers' investment activities abroad. The bank reporting dummy is significant at the 5 percent level, whereas the bank secrecy dummy and auditing variable are insignificant.

Bilateral double tax treaties and the EU Mutual Assistance treaty are used as legal instruments to facilitate tax information sharing, where the latter is more productive in terms of facilitating information sharing. The absence of an information sharing clause in a double tax treaty indicates that a country is not interested in information sharing. Such negative effect is absent for clauses in tax treaties that limit information sharing. Finally, there is a substantial degree of reciprocity in information sharing. A one percent increase in the amount of tax information that the Dutch tax authorities provide to foreign tax authorities, raises the amount of information received by the Dutch tax authorities by 0.67 percent.

The econometric analysis shows that non-resident withholding taxes do not negatively affect the amount of information that is provided to the Dutch tax authorities. An important policy implication of this analysis is, therefore, that information sharing and non-resident withholding taxes are complementary instruments in tax authorities' fight against international tax evasion. Efforts to strengthen information sharing relationships should be devoted to those countries that substantially discriminate between residents and non-residents in taxing capital income. In view of the ever expanding cross-border capital flows, tax authorities are expected to rely more heavily on tax information sharing in the future. Information sharing may be facilitated further if more (focused) multilateral legal instruments were developed. The EU Savings Tax Directive is an important step in this direction.

As the empirical analysis of information exchange in this chapter suggests that the main shortcoming of existing models of information exchange is the limitation to only two countries, the following chapter develops a framework of information exchange that allows for a multi-jurisdictional world.

5.A Data Appendix

Information received on request Cases of information provision for income tax purposes from country *i* to the Dutch tax authorities in year *t*. *Source*: Dutch Ministry of Finance.

Domestic income tax rate (in percent) Country *i*'s tax on residents on interest from savings deposits in year *t*. The top rate applies if the tax is progressive. Wealth taxes are included by calculating an equivalent tax on interest income assuming an interest rate of 4 percent. Representative taxes levied at lower levels of government are taken into account as determined by the OECD data source. For non-OECD countries with sub-national taxes, the location of the capital determines the representative sub-national government tax. *Sources*: For single-level income tax regimes, statutory personal income tax rates are from the OECD tax database (Tables I.5–I.7), available at http://www.oecd.org/ctp/taxdatabase, the World Bank's *World Development Indicators* available at http://econ.worldbank.org, the *World Tax Database* of the Office of Tax Policy Research, available at http://www.bus.umich.edu/otpr/otpr/introduction.htm, and from data provided on request from Huizinga and Nicodème (2004). In case of dual income tax systems and wealth taxes, statutory tax rates are taken from Huizinga and Nicodème (2004) and following sources of the International Bureau of Fiscal Documentation (IBFD): *Global Tax Surveys*, *Europe: Individual Taxation*, *Europe: Private Investment Income*, *European Tax Surveys*, *Central/Eastern Europe: Taxation and Investment*, *Africa: Taxation and Investment*, *Middle East: Taxation and Investment*, *Canada: Taxation and Investment*, *Caribbean: Taxation and Investment*, *Latin America: Taxation and Investment*, *Latin American Tax Surveys*, *Asia-Pacific: Taxation and Investment* and the Tax News Service, which are available at http://www.ibfd.org/portal

Non-resident withholding tax rate (in percent) Country *i*'s withholding tax on (Dutch) non-residents' interest from savings deposits in year *t*. *Sources*: Huizinga and Nicodème (2004) and following sources of the International Bureau of Fiscal Documentation (IBFD): *Global Tax Surveys*, *Europe: Individual Taxation*, *Europe: Private Investment Income*, *European Tax Surveys*, *Central/Eastern Europe: Taxation and Investment*, *Africa: Taxation and Investment*, *Middle East: Taxation and Investment*, *Canada: Taxation and Investment*, *Caribbean: Taxation and Investment*, *Latin America: Taxation and Investment*, *Latin American Tax Surveys*, *Asia-Pacific: Taxation and Investment*, and the Tax News Service, which are available at http://www.ibfd.org. The IBFD tax treaty database, also available at http://www.ibfd.org, allows taking treaty withholding tax rates into account that potentially undercut a country's general level of withholding tax rates.

Expenditure-to-GDP ratio Logarithm of country *i*'s ratio of government expenditures over gross domestic product (in current prices) in year *t*. *Sources*: The International Monetary Fund's *International Financial Statistics*, available at http://www.imf.org/external/data.htm. Alternatively, if a country's time series is missing in the previous source: the World Bank's *World Development Indicators*, available at http://econ.worldbank.org.

Foreign deposit ratio Logarithm of the ratio of deposits abroad owned by country *i*'s non-banking sector (in local currency) over the sum of time and demand deposits in country *i* in year *t* (in local currency). *Sources*: Deposits abroad are taken from the Bank of International Settlement's *Locational Banking Statistics*, available at http://www.bis.org/statistics/bankstats.htm, where US dollars have been converted to local currency using the exchange rates from the World Bank's *World Development Indicators*, available at http://econ.worldbank.org. Time and demand deposits are taken from the International Monetary Fund's *International Financial Statistics*, available at http://www.imf.org/external/data.htm.

Auditing intensity Logarithm of the ratio of the number of audits conducted in 2004 to the number of registered taxpayers in 2004. It is assumed that the ratio remains constant over time. *Source*: The number of audits is obtained from Table 27 of OECD (2006b) and the number of registered taxpayers follows from Table 30 of OECD (2006b).

Bank reporting dummy A one indicates that there is mandatory (automatic) reporting by domestic financial institutions to the domestic tax administration. *Source*: Table 12 of OECD (2006b).

Bank secrecy dummy A one indicates that country *i* features bank secrecy reinforced by statute. A zero indicates the contrary. *Source*: Column 3 of Table B1 of OECD (2006a).

Gross domestic product Logarithm of country *i*'s gross domestic product in year *t* in millions of US dollar (in constant prices, base year 2000). *Source*: The World Bank's *World Development Indicators*, available at http://econ.worldbank.org

Distance Logarithm of the distance between the Dutch capital Amsterdam and country *i*'s capital in kilometers. *Sources*: *Centre d'Etudes Prospectives et d'Informations Internationale* (CEPII) data set, available at http://www.cepii.fr/anglaisgraph/bdd/distances.htm and own calculations based on location data from the Central Intelligence Agency (CIA) factbook 2007, available at https://www.cia.gov/library/publications

Surface area Logarithm of country *i*'s surface area in square kilometers. *Sources*: CEPII data set, available at http://www.cepii.fr/anglaisgraph/bdd/distances.htm and the CIA factbook 2007 available at https://www.cia.gov/library/publications

Landlocked dummy A one indicates that country *i* has no coastline. A zero indicates the contrary. *Sources*: CEPII data set, available at http://www.cepii.fr/anglaisgraph/bdd/distances.htm and the CIA factbook 2007, available at https://www.cia.gov/library/publications

Island dummy A one indicates that country *i* is an island. A zero indicates the contrary. *Source*: The CIA factbook 2007, available at https://www.cia.gov/library/publications

Common language dummy A one indicates that country *i* has Dutch as an official language, whereas a zero indicates otherwise. *Sources*: CEPII data set, available at http://www.cepii.fr/anglaisgraph/bdd/distances.htm and the CIA factbook 2007, available at https://www.cia.gov/library/publications

Information sent on request Logarithm of the amount of Dutch information provision for income tax purposes in year *t* to country *i* plus one. *Source*: Dutch tax authority.

OECD/Council of Europe treaty dummy A one indicates that country *i* participates in the mutual treaty and a zero otherwise. *Source:* http://www.oecd.org

EU Mutual Assistance treaty dummy A one indicates that country *i* participates in the mutual assistance treaty and a zero otherwise. *Source:* http://ec.europa.eu/taxation_customs/taxation/tax_cooperation/mutual_assistance/direct_tax_directive/index_en.htm_customs

Double tax treaty dummy A one indicates that country *i* has a bilateral tax treaty with the Netherlands and a zero otherwise. *Source:* Tax treaties data base of the IBFD, available at http://www.ibfd.org

Double tax treaty with limited information sharing dummy A one indicates that country *i* has a bilateral tax treaty with the Netherlands that limits information sharing and a zero otherwise. *Source:* Tax treaties data base of the IBFD, available at http://www.ibfd.org

Double tax treaty without information sharing dummy A one indicates that country *i* has a bilateral tax treaty with the Netherlands that does not allow for information sharing and a zero otherwise. *Source:* Tax treaties data base of the IBFD, available at http://www.ibfd.org

Table 5.1: Average Information Sharing on Request, 1992–2005

Received			Provided		
Country	Mean	Percent	Country	Mean	Percent
Total	862.8	100.0	Total	569.2	100.0
Germany	180.9	21.0	Belgium	122.6	21.5
Belgium	165.8	19.2	Germany	108.9	19.1
United Kingdom	123.4	14.3	France	64.9	11.4
Spain	80.6	9.3	United Kingdom	41.1	7.2
France	59.6	6.9	Italy	38.5	6.8
Italy	49.9	5.8	Russia Federation	21.2	3.7
Luxembourg	45.5	5.3	Spain	20.6	3.6
Portugal	24.5	2.8	Lithuania	11.8	2.1
Denmark	15.6	1.8	Denmark	11.2	2.0
Ireland	15.3	1.8	Sweden	10.9	1.9
Sweden	12.8	1.5	United States	10.6	1.9
Austria	8.5	1.0	Poland	10.1	1.8
United States	7.8	0.9	Portugal	6.7	1.2
Netherlands Antilles	6.9	0.8	Greece	6.1	1.1
Estonia	5.0	0.6	Suriname	6.0	1.1
Greece	4.8	0.6	Netherlands Antilles	5.5	1.0
Poland	4.5	0.5	Ukraine	4.9	0.9
Finland	3.9	0.4	Republic of Korea	4.2	0.7
Czech Republic	3.8	0.4	Austria	3.6	0.6
Turkey	3.8	0.4	Latvia	3.6	0.6
Cyprus	3.0	0.3	Indonesia	3.3	0.6
Hungary	2.8	0.3	Canada	3.3	0.6
Suriname	2.8	0.3	Finland	3.1	0.5
Canada	2.4	0.3	Czech Republic	2.9	0.5
Malta	1.7	0.2	Luxembourg	2.9	0.5
Lithuania	1.5	0.2	Ireland	2.7	0.5
Latvia	1.4	0.2	Estonia	2.4	0.4
Aruba	1.3	0.2	Hungary	2.4	0.4
Slovak Republic	1.3	0.1	Norway	2.4	0.4
Norway	1.2	0.1	Slovakia	2.3	0.4
New Zealand	1.2	0.1	Australia	2.2	0.4
Romania	1.2	0.1	Croatia	2.0	0.4
Argentina	1.0	0.1	Kazakhstan	2.0	0.4
Australia	1.0	0.1	Kuwait	2.0	0.4
Belize	1.0	0.1	Mexico	2.0	0.4
Brazil	1.0	0.1	Japan	1.8	0.3
Cayman Islands	1.0	0.1	Argentina	1.5	0.3
Dominican Republic	1.0	0.1	Bulgaria	1.5	0.3
Guatemala	1.0	0.1	New Zealand	1.5	0.3
Indonesia	1.0	0.1	Belarus	1.3	0.2
Israel	1.0	0.1	Israel	1.3	0.2
Japan	1.0	0.1	India	1.2	0.2
Mexico	1.0	0.1	Turkey	1.2	0.2
Russian Federation	1.0	0.1	Brazil	1.0	0.2
Singapore	1.0	0.1	Iceland	1.0	0.2
Slovenia	1.0	0.1	Malta	1.0	0.2
South Africa	1.0	0.1	Pakistan	1.0	0.2
Sri Lanka	1.0	0.1	Romania	1.0	0.2
Switzerland	1.0	0.1	Singapore	1.0	0.2
Thailand	1.0	0.1	South Africa	1.0	0.2

Notes: Only those countries are listed for which there has been at least one exchange during the sample period.

Table 5.2: Countries in the Sample

Country/Territory	OECD member	OECD black-list	Tax treaty	Country/Territory	OECD member	OECD black-list	Tax treaty
Andorra	0	1	0	Liechtenstein	0	1	0
Anguilla	0	1	0	Luxembourg	1	0	1
Antigua and Barbuda	0	1	0	Macao, China	0	0	0
Argentina	0	0	1	Malta	0	0	1
Aruba	0	1	*	Malaysia	0	0	0
Australia	1	0	1	Marshall Islands	0	1	0
Austria	1	0	1	Mauritius	0	0	0
The Bahamas	0	1	0	Mexico	1	0	1
Bahrain	0	1	0	Monaco	0	1	0
Barbados	0	1	0	Montserrat	0	1	0
Belgium	1	0	1	Nauru	0	1	0
Belize	0	1	0	Netherlands Antilles	0	1	*
Bermuda	0	0	0	New Zealand	1	0	1
British Virgin Islands	0	1	0	Niue	0	1	0
Brunei	0	0	0	Norway	1	0	1
Canada	1	0	1	Panama	0	1	0
Cayman Islands	0	0	0	Philippines	0	0	1
China	0	0	1	Poland	1	0	1
Cook Islands	0	1	0	Portugal	1	0	1
Costa Rica	0	0	0	Russian Federation	0	0	1
Cyprus	0	0	1	St Kitts & Nevis	0	1	0
Czech Republic	1	0	1	St Lucia	0	1	0
Denmark	1	0	1	St Vincent & Grenadines	0	1	0
Dominica	0	1	0	Samoa	0	1	0
Finland	1	0	1	San Marino	0	0	0
France	1	0	1	Seychelles	0	1	0
Germany	1	0	1	Singapore	0	0	1
Gibraltar	0	1	0	Slovak Republic	1	0	1
Greece	1	0	1	South Africa	0	0	1
Grenada	0	1	0	Spain	1	0	1
Guatemala	0	0	0	Sweden	1	0	1
Guernsey	0	1	0	Switzerland	1	0	0
Hong Kong SAR	0	0	0	Turkey	1	0	0
Hungary	1	0	1	Turks and Caicos Islands	0	1	0
Iceland	1	0	1	United Arab Emirates	0	0	0
Ireland	1	0	1	United Kingdom	1	0	1
Isle of Man	0	1	0	United States	1	0	1
Italy	1	0	1	US Virgin Islands	0	1	0
Japan	1	0	1	Uruguay	0	0	0
Jersey	0	1	0	Vanuatu	0	1	0
Korea	1	0	1				
				Total	29	32	36

Sources: Keen and Ligthart (2006b) and IBFD's tax treaties data base. Notes: The sample of 81 countries is based on OECD (2006a). The identifier is one if the country is included in the chosen sub-sample. The June 2000 version of the OECD's blacklist is employed. The double tax treaty status of a country is measured as of 2005. Asterisks denote that the jurisdiction is part of the Kingdom of the Netherlands (and thus the treaty of the Kingdom of the Netherlands applies).

Table 5.3: Descriptive Statistics

	Observations	Mean	Standard deviation	Min	Max
Information received on request	543	15.91	52.34	0	428
Domestic tax rate (in percent)	543	20.84	18.00	0	65
Non-resident withholding tax rate (in percent)	543	4.48	6.70	0	25
Expenditure-to-GDP ratio (in percent)	543	-1.39	0.41	-2.43	-0.70
Foreign deposit ratio (in percent)	543	-1.50	2.09	-5.71	5.59
Auditing intensity	331	-4.74	1.55	-7.13	-1.14
Bank reporting	375	0.80	0.40	0	1
Bank secrecy	543	0.76	0.43	0	1
GDP (in millions and constant prices)	543	11.14	2.32	5.50	16.23
Distance (in kilometers)	543	8.09	1.18	5.15	9.85
Surface area (in square kilometers)	543	11.21	3.08	3.22	16.65
Landlocked	543	0.12	0.32	0	1
Island	543	0.30	0.46	0	1
Common language	543	0.03	0.17	0	1
Information sent	543	0.90	1.36	0	5.90
OECD/Council of Europe treaty	1036	0.08	0.27	0	1
EU Mutual Assistance Directive	1036	0.19	0.39	0	1
Bilateral double tax treaty	1036	0.50	0.50	0	1
Treaty with limited information sharing	1036	0.03	0.16	0	1
Treaty without information sharing	1036	0.02	0.14	0	1

Notes: The sample consists of 81 counties and jurisdictions that feature on the OECD information sharing list. See the Appendix 5.A for variable definitions and data sources.

Table 5.4: Tax Information Sharing: Tobit Regression Results

Independent variables	(1)	(2)	(3)	(4)	(5)
Domestic income tax rate	0.0259***	0.0368***	0.0257**	0.0288***	0.0257***
	(0.0069)	(0.0099)	(0.0078)	(0.0064)	(0.0067)
Non-resident withholding tax rate	-0.0001	-0.0046	0.0185	-0.0053	0.0002
	(0.0180)	(0.0302)	(0.0148)	(0.0207)	(0.0192)
Expenditure-to-GDP ratio	1.4486***	1.4611***	0.6300*	1.7480***	1.3801***
	(0.5430)	(0.5088)	(0.3899)	(0.6046)	(0.5175)
Foreign deposit ratio	0.3677***	–	0.3950***	0.3637***	0.3610***
	(0.0684)		(0.0649)	(0.0689)	(0.0699)
Auditing intensity	–	–	0.0614	–	–
			(0.0806)		
Bank reporting dummy	–	–	–	-0.6302*	–
				(0.3268)	
Bank secrecy dummy	–	–	–	–	-0.2886
					(0.2986)
GDP	0.4944***	0.4861***	0.5836***	0.4825***	0.4711***
	(0.0988)	(0.1183)	(0.1277)	(0.1029)	(0.0986)
Distance	-0.9619***	-0.9852***	-1.0990***	-0.8533***	-0.9612***
	(0.1476)	(0.1616)	(0.1634)	(0.1801)	(0.1438)
Surface area	0.0696	0.0004	0.0342	0.0836	0.0481
	(0.0691)	(0.0802)	(0.0647)	(0.0704)	(0.0688)
Landlocked dummy	-0.4508	-0.6894	-0.0726	-0.5458	-0.5166
	(0.3737)	(0.4789)	(0.3482)	(0.3694)	(0.3561)
Island dummy	0.3451	0.0257	0.5620**	0.5258	0.1717
	(0.3582)	(0.3709)	(0.2779)	(0.3791)	(0.3254)
Common language dummy	1.3985***	2.4525***	0.8062	1.5357***	1.1980***
	(0.4314)	(0.6736)	(0.6343)	(0.5457)	(0.4120)
Constant	3.3305**	3.7190**	3.1036**	3.3252**	4.0349**
	(1.4415)	(1.8328)	(1.4159)	(1.4514)	(1.5838)
Observations	543	887	331	375	543
Censored observations	329	598	136	167	329
Clusters	52	67	31	35	52
McFadden pseudo R^2	0.471	0.426	0.433	0.422	0.473
Log-likelihood	-389.96	-605.40	-321.84	-361.70	-388.33
χ^2 statistic for normality test	6.283	2.699	12.734	4.062	6.492
5% critical value, bootstrapped	19.92	13.06	16.84	19.48	21.80

Notes: These are tobit regressions and the dependent variable is the logarithm of tax information received on request by the Dutch tax authorities from country i in year t. Zero observations are taken into account as censored observations. Year effects are not reported. Standard errors, robust to error clustering on a country level, are provided in parentheses. ***, **, * denote significance at the 1, 5, and 10 percent level, respectively. For variable definitions and data sources, see the Appendix 5.A. The conditional moment test Pagan and Vella (1989) is applied to test the assumption of normally distributed error terms. The sample size is not large enough to rely on critical values of the asymptotic χ^2 distribution. Instead, critical values are derived using a parametric bootstrapping procedure.

Table 5.5: Results of Robustness Analysis: Single-Stage Procedures

Independent variables	Pooled Tobit			Random Effects Tobit	Negative Binomial	
	Benchmark	Broad sample	Sharing at least once		No bank reporting	Bank reporting
	(1)	(6)	(7)	(8)	(9)	(10)
Domestic income tax rate	0.0259***	0.0193***	0.0229***	0.0154**	0.0353***	0.0339***
	(0.0069)	(0.0062)	(0.0070)	(0.0061)	(0.0074)	(0.0079)
Non-resident withholding tax rate	-0.0001	-0.0046	0.0162	-0.0218	-0.0068	-0.0069
	(0.0180)	(0.0183)	(0.0172)	(0.0207)	(0.0266)	(0.0286)
Expenditure-to-GDP ratio	1.4486***	1.1642**	1.1715**	1.1998***	1.3845***	1.3437***
	(0.5430)	(0.5525)	(0.5607)	(0.2831)	(0.7026)	(0.7691)
Foreign deposit ratio	0.3677***	0.3822***	0.3939***	0.2912***	0.3730***	0.3767***
	(0.0684)	(0.0642)	(0.0649)	(0.0356)	(0.0738)	(0.0727)
Bank reporting dummy	–	–	–	–	–	-0.3038
						(0.3296)
Real GDP	0.4944***	0.6700***	0.5276***	0.4505***	0.4946***	0.4763***
	(0.0988)	(0.0874)	(0.0972)	(0.0975)	(0.1157)	(0.1259)
Distance	-0.9619***	-0.9765***	-0.9934***	-0.9077***	-1.3102***	-1.2070***
	(0.1476)	(0.1357)	(0.1422)	(0.1503)	(0.1538)	(0.1942)
Surface area	0.0696	-0.0109	0.0723	0.0436	0.1274	0.1084
	(0.0691)	(0.0716)	(0.0804)	(0.0789)	(0.0909)	(0.0945)
Landlocked dummy	-0.4508	-0.1737	-0.2489	-0.6716	-0.4908	-0.6194
	(0.3737)	(0.3544)	(0.3539)	(0.4235)	(0.4179)	(0.4156)
Island dummy	0.3451	0.7292**	0.6477**	0.0600	0.5020	0.5154
	(0.3582)	(0.3382)	(0.3350)	(0.3820)	(0.3447)	(0.3571)
Common language dummy	1.3985***	1.4423***	1.4544***	1.3129**	0.9760**	0.8473
	(0.4314)	(0.3964)	(0.4309)	(0.6517)	(0.4176)	(0.6103)
Constant	3.3305**	1.8035	2.6652**	3.9084***	5.1572***	5.1326**
	(1.4415)	(1.2260)	(1.2740)	(1.4850)	(1.4862)	(1.4678)
Observations	543	1,258	642	543	543	375
Censored observations	329	1019	403	329	–	–
Clusters	52	124	60	52	52	35
McFadden pseudo R^2	0.471	0.486	0.412	–	–	–
Log-likelihood	-389.96	-518.63	-484.57	-334.55	-865.77	-840.55
χ^2 stat. (normality test)	6.2986	5.2978	2.1712	–	–	–

Notes: Unless indicated otherwise, these are tobit regressions and the dependent variable is the logarithm of tax information received on request by the Dutch tax authorities from country i in year t. Zero observations are taken into account as censored observations. Regression (8) is a random-effects tobit regression. Regressions (9) and (10) are negative binomial regressions using the frequency of tax information received on request as dependent variable. Year dummy variables are not reported. Standard errors, robust to correlation of errors across time, are provided in parentheses. ***, **, * denote significance at the 1, 5, and 10 percent level, respectively. For variable definitions and data sources, see the Appendix 5.A.

Table 5.6: Heckman's Selection Model

Independent variables	OECD Information sample		Broad sample		Bank reporting	
	Selection	Outcome	Selection	Outcome	Selection	Outcome
	(11a)	(11b)	(12a)	(12b)	(13a)	(13b)
Domestic income tax rate	0.0146**	–	0.0106**	–	0.0122*	–
	(0.0065)		(0.0052)		(0.0067)	
Foreign withholding tax rate	-0.0062	–	-0.0070	–	-0.0163	–
	(0.0160)		(0.0151)		(0.0212)	
Expenditure-to-GDP ratio	1.9596***	–	1.1242**	–	2.5693***	–
	(0.5716)		(0.5265)		(0.6649)	
Foreign deposit ratio	0.3629***	–	0.2683***	–	0.4614***	–
	(0.0786)		(0.0577)		(0.0966)	
Bank reporting dummy	–	–	–	–	-0.6980*	–
					(0.4128)	
Gross Domestic Product	0.3383**	0.5940**	0.4384***	0.4448	0.3982**	0.6092***
	(0.1538)	(0.2767)	(0.1056)	(0.4148)	(0.1931)	(0.2355)
Distance	-0.3744**	-0.5814**	-0.4519***	-0.5567*	-0.2579	-0.5630**
	(0.1874)	(0.2528)	(0.1609)	(0.3388)	(0.1663)	(0.2296)
Surface area	0.1440**	-0.3179**	0.0263	-0.2107	0.1903***	-0.3213**
	(0.0590)	(0.1430)	(0.0482)	(0.1829)	(0.0717)	(0.1417)
Landlocked dummy	0.1405	-0.7145*	0.1842	-0.6709*	0.3425	-0.6359
	(0.3589)	(0.4091)	(0.2582)	(0.3927)	(0.3356)	(0.4085)
Island dummy	0.1571	0.0170	0.5272**	0.0392	0.4570	0.1903
	(0.3078)	(0.3156)	(0.2482)	(0.3434)	(0.3415)	(0.3172)
Common language dummy	1.1428***	0.4125	1.1003	0.5257	4.1872***	0.8100*
	(0.9505)	(0.5002)	(1.1043)	(0.5070)	(1.4354)	(0.4602)
Constant	-0.1024	3.9156**	-0.6007	4.1547**	-0.7521	3.6750**
	(1.4587)	(1.7943)	(1.1520)	(1.7597)	(1.3194)	(1.8516)
$\rho_{\varepsilon u}$	-0.6008		-0.6444		-0.6808	
	(0.4631)		(0.5191)		(0.2882)	
σ_{ε}	1.1449		1.1781		1.1616	
	(0.1713)		(0.2438)		(0.1490)	
Observations	543		1269		408	
Censored observations	329		1,030		198	
Clusters	52		125		38	
Log-likelihood	-479.11		-645.27		-452.71	
Wald test ($H_0 : \rho_{\varepsilon u} = 0$)	0.92		0.74		2.39	
Prob $> \chi^2$	[0.3379]		[0.3884]		[0.1220]	

Notes: These are Heckman selection regressions. The binary dependent variable in the selection equation describes whether or not information is provided by country i to the Dutch tax authorities in year t. The endogenous variable in the outcome equation represents Dutch demand for tax information, which is measured by the logarithm of the number of requests made by the Dutch tax authorities if information sharing occurred. Year dummy variables are not reported. Standard errors, robust to correlation of errors across time, are provided in parentheses. ***, **, * denote significance at the 1, 5, and 10 percent level, respectively. The values in square brackets are p-values. For variable definitions and data sources, see the Appendix 5.A.

Table 5.7: Tobit Regression Results: Reciprocity in Information Sharing

Independent variables	Two-step IV	Full max. likelihood
	(14)	(15)
Domestic income tax rate	0.0204***	0.0204***
	(0.0035)	(0.0063)
Non-resident withholding tax rate	0.0140	0.0140
	(0.0107)	(0.0156)
Expenditure-to-GDP ratio	0.9629***	0.9629**
	(0.1848)	(0.4260)
Foreign deposit ratio	0.2794***	0.2794***
	(0.0298)	(0.0611)
Information sent to partner	0.6728***	0.6728***
	(0.1013)	(0.1654)
Real GDP	0.2374***	0.2374**
	(0.0603)	(0.0950)
Distance	-0.5466***	-0.5466***
	(0.0960)	(0.2025)
Surface area	0.0351	0.0351
	(0.0443)	(0.0603)
Landlocked dummy	0.2560	0.2560
	(0.2135)	(0.3351)
Island dummy	0.4142**	0.4142
	(0.1861)	(0.3720)
Common language dummy	0.4065	0.4065
	(0.3198)	(0.3263)
Constant	2.0769***	2.0769
	(0.7162)	(1.4316)
Observations	543	543
Censored observations	329	329
Wald test of exogeneity	9.08***	9.71***
Prob $> \chi^2$	[0.0026]	[0.0018]
Amemiya-Lee-Newey test	0.011	–
Prob $> \chi^2$	[0.9183]	

Notes: These are IV tobit regressions and the dependent variable is the logarithm of tax information received on request by the Dutch tax authorities from country i in year t. Zero observations are taken into account as censored observations. Regression (14) is a two-step estimator and regression (15) is a full maximum likelihood estimator. The variable 'Information sent' is instrumented by its own 2- and 3-year lagged values. Year dummy variables are not reported. Standard errors are provided in parentheses. The standard errors of the full maximum likelihood regression are robust to correlation of error terms across time. ***, **, * denote significance at the 1, 5, and 10 percent level, respectively. The values in square brackets are p-values. For variable definitions and data sources, see the Appendix 5.A.

Table 5.8: Tobit Regression Results: Tax Treaties

Independent variables	(16)
OECD/Council of Europe mutual assistance treaty	-0.2646
	(0.4843)
EU Mutual Assistance directive	2.2759***
	(0.4677)
Bilateral double tax treaty	1.6657**
	(0.8273)
Double tax treaty with limited information sharing	0.1969
	(0.6116)
Double tax treaty without information sharing	-2.4904***
	(0.5680)
Real GDP (in logarithms)	0.2503
	(0.1647)
Distance (in logarithms)	-0.5309**
	(0.2144)
Constant	-0.1623
	(1.8078)
Observations	1036
Censored observations	744
McFadden pseudo R^2	0.412
Log-likelihood	-706.18

Notes: This is a tobit regressions and the dependent variable is the logarithm of tax information received on request by the Dutch tax authorities from country i in year t. Zero observations are taken into account as censored observations.Year effects are not reported. Standard errors, robust to correlation of errors across time, are provided in parentheses. ***, **, * denote significance at the 1, 5, and 10 percent level, respectively. For variable definitions and data sources, see the Appendix 5.A.

More light!

Last words of J. W. von Goethe

CHAPTER 6

COOPERATION ON INFORMATION EXCHANGE AND ITS EFFECT ON THE PRESENCE OF TAX HAVENS

From an efficiency and equity perspective, it is desirable that countries are able to tax capital income on a residence basis. With respect to efficiency, the Diamond-Mirrlees theorem (1971a, 1971b) states that production efficiency requires residence-based capital income taxation because source-based capital taxation at different tax rates distorts production decisions.[1] With respect to equity, an equitable financing of public goods requires that governments can tax their residents' capital income, especially if capital is distributed very asymmetrically among citizens.[2] However, a country on its own only has access to information about its residents' capital income at home. For taxing capital income derived abroad, the home tax authority must rely on its residents' honesty in reporting worldwide capital income or on foreign authorities that share information on capital income.

This chapter analyzes under what circumstances countries exchange infor-

[1] However, Keen and Wildasin (2004) show that it may be efficient to deviate from the principle of residence-based taxation if countries cannot transfer tax revenues and have insufficient tools to replicate a transfer of tax revenues. The assumptions of the Diamond-Mirrlees theorem are also not satisfied if pure profits cannot be fully taxed.

[2] Furthermore, residence taxation avoids the fierce tax competition for capital that may develop under source-based taxation. See Zodrow and Mieszkowski (1986). Instead of taxing income, countries could resort to taxing consumption, but it is difficult to impose a progressive taxation system via consumption taxes.

mation on non-residents' capital income in a multi-jurisdictional world. A game-theoretic model is developed for a multi-jurisdictional world in which each country decides on its bilateral information exchange policy in a two-stage process. Using the concept of cartel stability (see D'Aspremont and Gabszewicz, 1986), the countries are enabled to commit themselves to cooperation if they choose to do so. In the first stage, countries decide simultaneously if they want to cooperate or not. Having observed the outcome of the first stage, all countries simultaneously set their their bilateral information sharing policy, where the countries that previously chose to cooperate act as one single player whose actions are determined by a bargaining process within the set of cooperating countries. After all countries have set their information exchange policies, households decide whether they want to deposit their funds at home or abroad (to evade domestic taxes). Conclusions on the feasibility of information exchange agreements are eventually drawn from the set of subgame perfect Nash equilibria.

The analysis shows first that the conventional current institutional framework of concluding information exchange agreements mainly on a bilateral basis can trap countries in a Pareto-inferior equilibrium without information exchange.[3] Multilateral approaches are necessary to achieve Pareto-optimal outcomes.

Second, the relationship between the degree of information exchange and parameters like bank profitability or capital mobility is — in contrast to previous work — U-shaped. In fact, an increase in bank profitability or capital mobility can enforce full information exchange although a similar increase at a lower level of bank profitability has the contrary effect of deteriorating the degree of information exchange and contributing to the emergence of tax havens.

Third, the model distinguishes between two motivations for engaging in information exchange. On the one hand, countries can be intrinsically motivated to exchange information because the value of the information received from partner countries outweighs the value of becoming a tax haven. On the other hand, countries may only continue sharing information because they know that their partner countries would not tolerate the existence of another tax haven triggering a complete break-down in information exchange. These motivations require different policy responses. In the latter scenario the degree of mutual control and transparency must be higher with respect to adhering

[3] Chapter 5 discusses the institutional framework of information exchange agreements in depth.

to an agreed information sharing policy.

Fourth, the model determines endogenously the fraction of countries becoming tax havens. The number of countries in the world is in itself an important determinant, which cannot be determined in a two-country framework. In particular, the model can also explain why identical countries may choose different information exchange policies. Hence, the coexistence of information exchanging countries next to tax havens that resist to share any information can be explained even without differences in country characteristics.

The chapter is organized as follows. Section 6.1 reviews related studies on information sharing between countries. Section 6.2 develops a model for information exchange between many countries. Section 6.4 contains a comparative statics analysis of the potential equilibria. The model is then applied to explaining the genesis and certain features of the EU Savings Tax Directive in Section 6.5. Finally, Section 6.6 concludes.

6.1 Related Literature

In a setting of two large countries, Bacchetta and Espinosa (1995) identify a strategic revenue effect that gives countries an incentive to exchange information. The foreign country takes into account that the home country reacts to (partial) information sharing by setting higher capital income taxes. The foreign country seems to lose utility from the deterrence of evading capital due to the (partial) information exchange, but that is more than compensated for by a larger inflow of capital due to the higher income capital taxation in the home country.

This strategic effect ceases to exist in a small open economy setting, as numerous foreign countries would benefit if one of them increases the degree of information sharing. In order to explain information sharing in a small country setting, Bacchetta and Espinosa (2000) apply an infinitely repeated game. Both countries could attain a short-run advantage by defecting from the information exchange policy agreed upon with the other country and hence attracting a large amount of tax evading capital. However, a potentially defecting country fears the retaliatory measures of the other country in the long run as it looses its reputation as a trustworthy partner. If both countries are sufficiently far-sighted/patient, this fear of non-cooperation in the future enables them to exchange information as if they could credibly commit themselves to a policy of information exchange.

Huizinga and Nielsen (2003) extend this approach by allowing countries to choose between withholding taxes and information exchange as policies to (partially) prevent international tax evasion. In both regimes, full cooperation is possible if countries are sufficiently patient. In comparison to information sharing, applying non-resident withholding taxes allows relatively more cooperation between impatient countries. If countries are patient, however, fully cooperative behavior is more easily sustained under information sharing. If allowed to choose, small countries opt for withholding taxes because they generate some additional tax revenue, whereas large countries opt for information exchange because the withdrawal from information sharing is a more powerful threat to keep small countries cooperating than a withdrawal from setting withholding taxes cooperatively. Keen and Ligthart (2006a) extend this model by allowing for tax revenue sharing between source and residence country. They show that revenue sharing has no effect on the size of withholding taxes, so they are comparable to lump-sum transfers from the source country to the residence country. However, revenue sharing does increase the degree of information exchange between source and residence country because the revenue sharing aligns the objectives of source and residence countries. This difference enables them to show that every revenue sharing regime with withholding taxes is dominated by some regime with information exchange and an appropriate revenue sharing parameter.

The conventional two-country framework has the drawback that the model's results have to be projected on a multi-jurisdictional reality to be able to draw conclusions. This raises several problems. For example, in two-country models, both countries have a monopoly on offering possibilities for tax evasion to the other country's citizens. In a universe with only two countries there is no competition for tax evading capital. At least three questions cannot be answered in such a framework: First, does the number of countries itself have an effect on the degree of information exchange? Second, does it make a difference if countries negotiate with each other bilaterally or multilaterally on information exchange agreements? Third, what factors can explain the coexistence of similar country pairs, one characterized by complete information sharing, the other without any information exchange?

The logic of the infinite game is also quite problematic in the context of capital income taxation. The barrier to more intensive information exchange is created by the fear that the other country may suddenly defect from the agreed upon information exchange policy. For one period, the defecting country can benefit from information provided by the other country as well as attract a

large inflow of tax evading capital. How should the defecting country hide its intentions from the other country and at the same time inform a large mass of atomistic investors that it has stalled information sharing? (Is the length of the period of surprise sufficient to extract any considerable benefit?) Tax havens do not lack the credibility to commit to information exchange agreements, they simply abstain from concluding an agreement in the first place. This behavior is extremely difficult to model in a two-country universe because two countries may easily identify Pareto improvements if they can commit to a course of action.[4] To solve these conceptual problems, the model described below in Section 6.2 will allow for more than two countries.[5]

Before describing the model in detail, it is worthwhile to discuss the differences with a model by Slemrod and Wilson (2006), which also discusses the effect of tax havens' presence in a multi-country world, albeit not in the context of information exchange. They develop a general equilibrium model to show that the existence of tax havens reinforces the detrimental effect of tax competition and that even a partial elimination of tax havens would be beneficial. Countries cannot interact strategically to coordinate their actions to reduce the number of tax havens.[6] The model described below relies on a partial equilibrium model that takes Slemrod and Wilson's (2006) results as a starting point: the detrimental effects of tax evasion on efficiency are taken as given, as the revenue loss resulting from tax competition is taken to be welfare reducing. That approach allows focusing on the strategic interaction between countries, which may decide to cooperate to reduce the degree of tax evasion and the number of tax havens. Another important difference is, of course, that Slemrod and Wilson (2006) analyze territorial capital income taxation at the firm level. This makes information exchange between countries immaterial. In their model, tax enforcement, although costly, is under the total control of firms' host countries. The model described here analyzes residence-based capital income taxation at the individual level. Home countries can fully tax

[4]See Section 4 of Bacchetta and Espinosa (2000): if countries cannot defect on information exchange agreements, then there always exists some information exchange agreement that makes both countries better off. The authors argue that rights and obligations of information exchange clauses in conventional tax treaties are traditionally stated in a symmetric manner with respect to the participating countries. This prohibits a widespread use of information exchange agreements, especially between asymmetric countries. Chapter 5 discusses the institutional framework of information exchange in more depth.

[5]Huizinga and Nielsen (2003) allow for a myopic third country, but that does not resolve the previously mentioned problems.

[6]In fact, Slemrod and Wilson (2006) conclude their article by stating: "A task for future research would be to explore ways to coordinate further reductions in tax havens."

capital deposited at home, but they must rely completely on information exchange with foreign countries for taxing capital deposited abroad.Information transmission is assumed to be costless.

6.2 The Model

Consider a set $M = \{1, \ldots, m\}$ of $m \geq 3$ countries. In each country there are H households that own funds of unit size that they wish to deposit at either domestic or foreign banks. Depositors receive the same pre-tax interest rate at domestic and foreign banks.[7] Specifically, the deposit interest rate equals $r - \delta$, where r is an (exogenous) return on bank assets, and δ is the fixed interest spread or profit rate per unit of deposits. As all banks pay the same deposit rate, the deposit location will be determined by tax and non-tax costs, if any. Starting with the non-tax costs, I assume that depositing at a domestic bank is costless, whereas the costs of depositing at a foreign bank vary across households and across countries. For any household from country j the cost for depositing in country i is given by the random vector X_j of order $m \times 1$. The elements x_{ij} are exponentially distributed with an average cost of β, except for the household's home country $i = j$ for which depositing costs are zero ($x_{jj} = 0$). Otherwise, depositing costs are i.i.d. (identically and independently distributed) across households and across countries. These heterogeneous costs may reflect differences in travel or communication costs. Alternatively, they may represent heterogeneous expectations of how likely a country is to retain its role as tax haven for private investors in the future.[8]

The taxation of interest income generally also varies with the bank's location. In any country, domestic deposits are assumed to be subject to a specific tax t. Countries can report interest income accruing to non-residents to the respective foreign tax authority. The reporting country i controls the flow of information, and hence the probability $p_{ij} \in [0, 1]$ that deposits by residents from country j are indeed reported. If reported, cross-border deposits are subject to a domestic tax equal to $t(1 + f)$ where $f \geq 0$ is a fine rate. The expected tax imposed on cross-border deposits now equals $\tau_{ij} = p_{ij}t(1 + f) \geq 0$. The residence-based tax t is taken to be exogenous, as it might be determined by the need to tax other income (such as labor income) in a comprehensive in-

[7] Different pre-tax interest rates are not considered because banks can redistribute the deposited funds internationally such that pre-tax returns on capital are equalized.

[8] Strictly speaking one should also index depositing costs per household, but that would only cloud notation.

come tax system. Likewise, the fine rate f is taken to be exogenous, as it would be determined by the severity of tax evasion relative to other forms of crime. As p_{ij} therefore is more readily adjusted than t or f, the effective cross-border tax τ_{ij} is de facto chosen by the reporting country i. Information transmission is assumed to be costless.

A household from country j prefers to deposit at home if

$$r - \delta - t \geq r - \delta - \tau_{ij} - x_{ij} \qquad \forall i \in M \setminus \{j\} \tag{6.1}$$

Otherwise, the household deposits in country i^* for which the sum of transaction costs plus effective taxes due to information exchange are smallest, such that $\tau_{i^*j} + x_{i^*j} = \min_i[\tau_{ij} + x_{ij}]$ holds, where $i \in M \setminus \{j\}$.

Hence, average private net-of-all-cost income I_i in country i is given by

$$\begin{aligned} E[I_i] &= \text{Prob}\left\{ t \leq \min_{k \neq i}[x_{ki} + \tau_{ki}]] \right\} (r - \delta - t) \\ &\quad + \text{Prob}\left\{ t > \min_{k \neq i}[x_{ki} + \tau_{ki}] \right\} (r - \delta - \min_{k \neq i}[x_{ki} + \tau_{ki}]) \quad i, j, k \in M \end{aligned} \tag{6.2}$$

The index k represents all countries to which a tax evading depositor from country i could send funds (hence, potential tax havens). The first term represents country i's share of households for which it would not pay off to engage in tax evasion. The transaction costs together with taxation due to information exchange are too high for all potential tax havens, so they deposit their funds at home, in country i. These households earn the net interest $r - \delta$ on which they pay domestic taxes t. The second term represents country i's share of households for which it pays off to engage in tax evasion. They deposit their funds in the tax haven that incurs the lowest transaction costs such that they earn a net interest of $r - \delta$, but they incur transaction costs and face taxation due to information exchange of $\min_{k \neq i}[x_{ki} + \tau_{ki}]$. Of course, the most favorable tax haven may differ across households because transaction costs differ across households.

Banks in country i receive deposits from residents and non-residents, yielding average bank profits (normalized by the number of households H)

$$\begin{aligned} E[P_i] &= \delta \, \text{Prob}\left\{ \min_{j \neq i}[x_{ji} + \tau_{ji}] \geq t \right\} \\ &\quad + \delta \sum_{j \neq i} \left(\text{Prob}\left\{ x_{ij} + \tau_{ij} = \min_{k \neq j}[x_{kj} + \tau_{kj}] \;\middle|\; \min_{k \neq j}[x_{kj} + \tau_{kj}] < t \right\} \times \right. \\ &\quad \left. \text{Prob}\left\{ \min_{k \neq j}[x_{kj} + \tau_{kj}] < t \right\} \right) \qquad i, j, k \in M \end{aligned} \tag{6.3}$$

The index j represents all countries to which a tax evading depositor from country i could deposit and — vice versa — from which country i could attract funds from tax evading households. The index k, which includes country i, represents the countries that are competing for tax evading funds from country j. The first term represents bank profits from country i's share of households for which it would not pay off to engage in tax evasion. They deposit their funds with banks at home on which the banks earn a profit rate of δ. The second term represents profits from the share of households from all other countries, which deposit their funds in country i because transaction costs and information exchange policies are such that tax evasion pays off for these households and country i indeed turns out to be the most favorable destination country.

Country i's average tax revenue (normalized by the number of households H) is given by

$$\begin{aligned} E[T_i] \;=\; & t\,\text{Prob}\left\{\min_{j\neq i}[x_{ji}+\tau_{ji}] \geq t\right\} \\ & +\sum_{j\neq i}\tau_{ji}\Bigg(\text{Prob}\left\{x_{ji}+\tau_{ji}=\min_{k\neq i}[x_{ki}+\tau_{ki}] \mid \min_{k\neq i}[x_{ki}+\tau_{ki}] < t\right\}\times \\ & \text{Prob}\left\{\min_{k\neq i}[x_{ki}+\tau_{ki}] < t\right\}\Bigg) \qquad i,j,k \in M \end{aligned} \tag{6.4}$$

The indices j and k represent all countries to which a depositor from country i could evade and — vice versa — from which country i could attract funds of tax evading households. The first term represents domestic tax revenue from country i's share of households for which it would not pay off to engage in tax evasion. They deposit their funds at home and pay the domestic tax t. The second term represents country i's tax revenue due to information exchange with other countries such that the share of households that choose country j as their favorite investment location pays an effective tax of τ_{ji}. Appendix 6.A.1 substitutes the probability expressions in the above three equations taking into account that transaction costs x_{ij} are exponentially distributed.

Each government is interested in maximizing the average social surplus, S_i, consisting of average household private income, average bank profits per household, and average tax revenue per household as follows

$$S_i = E[I_i] + E[P_i] + \rho E[T_i] \tag{6.5}$$

where $\rho \geq 1$ is the marginal cost of public funds from an alternative source of government revenue. Due to the law of large numbers, the expected values

will be very close to the actual observed averages if the number of households is sufficiently large. Hence, a government's attitude to risk does not play a role.

6.3 Solving the Model

6.3.1 Information Exchange without the Ability to Commit

This section considers the situation in which countries cannot commit to a particular information exchange policy in contrast to the next section, in which countries can commit to cooperate. Countries set their information exchange policy simultaneously and non-cooperatively. Country i specifically sets its information exchange policy with respect to country j in form of the non-negative strategic variable τ_{ij}, which determines the effective tax that tax evaders from country j to country i have to pay at home due to information exchange. Every country has control over $m-1$ strategic variables and takes the information exchange policy of other countries as given. Country i's payoff is given by equation (6.5), which is a function of the strategic variables. The game is not repeated in order to avoid introducing the assumption that private investors can react more quickly to changes in a country's information exchange policy than other governments.[9]

As the following proposition shows, no country has an incentive to exchange information. The proof is in Appendix 6.A.2.

Proposition 6.1 *If there exist bank profits $\delta > 0$, then the unique Nash equilibrium of a one-shot non-cooperative game exhibits no information exchange, that is, $\tau_{ij} = 0$ for all $i \neq j$ and $i, j \in M$.*

The intuition of the proposition is straightforward and similar to the two-country case as discussed in Huizinga and Nielsen (2003). There is no direct reward for exchanging information. A higher degree of information exchange only deters potential depositors that generate bank profits. Without the possibility to commit to mutual information exchange, countries cannot reward

[9] As Bacchetta and Espinosa (2000) put it: "Since information goes from government to government, it seems reasonable to assume that the foreign private sector cannot react before the foreign government to a change in λ" (where λ stands for information sharing).

each other for information exchange.[10] In fact, with more countries competing for tax evading funds, the negative incentive for providing information has become even worse. Not only may depositors decide to deposit at home and pay domestic taxes, but with many countries to choose from, they may switch to another tax haven to deposit their funds. This makes deposits more elastic to information exchange than in the two-country case, where one country is the tax haven monopolist for tax evaders from the other country.

6.3.2 Information Exchange with Possibility to Commit to Cooperation: The Second Stage of the Game

In this section, the degree of information sharing is determined in a two-stage game. In the first stage, countries choose simultaneously whether or not they wish to cooperate.[11] After observing the outcome of the first stage, all countries simultaneously set their degree of information sharing, where the cooperating countries act as one player that maximizes the sum of the coalition members' payoffs.[12] Last, households decide whether they want to pay domestic taxes and deposit their funds at home or try to evade domestic taxes and deposit their funds abroad. In the latter case they also choose their favorite country, which is characterized by the lowest possible combination of transaction costs and taxation due to information exchange. This completely determines each country's payoff.

[10] Huizinga and Nielsen (2003) use a repeated game setting in which countries use punishment strategies to induce more cooperative behavior. However, such an approach requires the assumption that private investors react immediately to a change in the information exchange policy of the foreign government, whereas governments can only react with a lag of one period.

[11] The possibility of more than one cooperating coalition is not allowed for. Furthermore, free entry and exit from the coalition is implicitly assumed (as any country can decide to join or not to join the coalition in the first stage). Introducing the possibility of several coalitions or the possibility to bar entry to the coalition would not affect the results. Proposition 6.5 (on p. 132) will show that larger coalitions weakly dominate smaller coalitions in terms of the coalition members' payoffs. So there would be no interest in barring entry of new members. Furthermore, competing coalitions of equal or smaller size would have an incentive to either join the largest coalition or to effectively dissolve the coalition, thereby behaving just like non-cooperating countries.

[12] One could equivalently assume that the countries that choose to cooperate in the first stage act as one single player whose actions are determined by a bargaining process within the set of cooperating countries. Since countries are symmetric, all bargaining processes that satisfy certain basic axioms arrive at the same outcome.

The game is solved by backwards induction. In the second stage, all singleton countries and the cooperating countries determine the degree of information exchange τ_{ij}, $i \neq j$, i and $j \in M$, given that n countries choose not to cooperate and $c = m - n$ countries choose to cooperate in the first stage. (The n non-cooperating countries form the set of non-cooperating countries N, whereas the c cooperating countries form the set of cooperating countries C.) The optimal second-stage strategy of non-cooperating countries is equivalent to the situation in the previous section in which commitment is not possible at all. They do not provide any information irrespective of other countries' first-stage decisions.

Proposition 6.2 *If there exist bank profits $\delta > 0$, then the strictly dominant strategy of non-cooperating countries in the second stage of the game is not to provide any information to other countries, $\tau_{ij} = 0$ for all $i \neq j$, $j \in M$, $i \in N$.*

Proof: The same proof as for Proposition 6.1 in Appendix 6.A.2, but only applied to all $i \in N$. □

The following proposition shows that also cooperating countries do not provide information in the second stage to countries that have not joined the coalition. The proof is in Appendix 6.A.3.

Proposition 6.3 *If there exist bank profits $\delta > 0$, then the strictly dominant strategy of cooperating countries in the second stage is not to provide any information to countries that are not part of the coalition, such that $\tau_{ij} = 0$ for all $i \neq j$, $j \in N$, $i \in C$.*

It follows that information exchange can only take place within the group of countries that have decided to cooperate. Suppose that the group of cooperating countries could share information at a pre-emptive level such that $\tau_{ij} = t$ for all countries $i \neq j$ and $i, j \in C$ that have chosen to cooperate in the first stage. In that case, households from a cooperating country can only evade taxes by holding their deposits in a non-cooperating country. Cross-border tax evasion within the group of cooperating countries would be eradicated. Alternatively, the group of cooperating countries could also decide that it is better not to share information such that $\tau_{ij} = 0$ for all countries $i \neq j$ and $i, j \in C$. Then there is no information exchange between any pair of countries and the outcome would be equivalent to the situation described in Section 6.3.1 where countries are not able to commit themselves.

The cooperating countries take the following factors into account when deciding to exchange information or not. On the one hand, cooperating countries have an incentive to share information because it reduces the number of tax havens available to their citizens. The share of households for which tax evasion is not an attractive option increases. These households do not want to incur the transaction costs of depositing their funds abroad anymore, deposit their funds at home, thereby increasing domestic tax revenue. On the other hand, some households may simply switch to their second-best choice of tax haven if their first-best location concludes an information exchange treaty. That share of households does not contribute to an increase in domestic tax revenue. Instead, these households only suffer higher transaction costs as their most favorable tax haven is taken away, which has a negative effect on a country's payoff function. Another negative effect of exchanging information within the coalition is the loss of bank profits. Households that have evaded taxes by depositing funds with a coalition member may shift their funds to alternative locations outside the coalition, driving out bank profits from within the coalition to non-cooperating countries.

After the first stage of the game, the number of cooperating countries c and the number of non-cooperating countries $n = m - c$ is fixed. Furthermore, $\tau_{ij} = 0$ for any country pair such that i or $j \in N$ because not providing any information to country j is country i's strictly dominant strategy. Hence, the decision whether or not to exchange information, can be written as a function of the number of non-cooperating countries n. If the coalition decides to fully share information then the corresponding social surplus is given by $S_i^{C*}(n)$ for cooperating countries and by $S_i^{N*}(n)$ for non-cooperating countries. The social surplus S^o if the coalition decides not to exchange information is equal for all countries, whether cooperating or not. The three functions are specified in Appendix 6.A.4. A coalition of size $c = m - n$ decides to exchange information if $S^{C*}(n) - S^o > 0$. The non-cooperating countries then receive a payoff $S^{N*}(n)$.

The following two propositions further characterize the behavior of the cooperating countries in the second stage of the game. The propositions' proofs are in Appendices 6.A.5 and 6.A.6.

Proposition 6.4 *If all countries decide to cooperate at the first stage, they will always decide to exchange information at the second stage.*

Proposition 6.5 *If a coalition of c countries decides to exchange information, then also a coalition of size $c + 1$ exchanges information. In fact, once a coalition of size*

c^* decides to exchange information, the gains from exchanging information, as measured by $S^{C*}(n) - S^o$, keeps increasing in the number of cooperating countries; the increments become larger for every additional member.

6.3.3 The First Stage of the Game

In the first stage of the game, a coalition of size $c = M - n$ is said to be internally stable if none of the cooperating countries wants to defect from the coalition and externally stable if none of the non-cooperating countries wants to join the coalition:

$$R^C(n) - Q^N(n+1) > 0 \tag{6.6}$$

$$Q^N(n) - R^C(n-1) \geq 0 \tag{6.7}$$

where $Q^N(n)$ represents the payoff for not cooperating and $R^C(n)$ represents the payoff for cooperation if n countries are outside the coalition and $c = M - n$ countries are in the coalition. The payoff for cooperating countries is $R^C(n) = \max[S^{C*}(n), S^o]$. The coalition will fully exchange information with a payoff of $S^{C*}(n)$ if that is better than not exchanging any information with a payoff of S^o. The non-cooperating countries' payoff depends on the coalition's strategy in the second stage. The payoff is $Q^N(n) = S^{N*}$ if there is full information exchange within the coalition, that is, if $S^{C*}(n) > S^o$. Otherwise, if $S^{C*}(n) \leq S^o$, then the payoff is $Q^N(n) = S^o$.

Conditions (6.6) and (6.7) identify the set of sub-game perfect Nash equilibria as the functions $Q^N(n)$ and $R^N(n)$ take the optimal coalition behavior in the second stage of the game into account. The inequalities in conditions (6.6) and (6.7) ensure that, for $Q^N(n+1) = R^C(n)$, countries within the coalition have an incentive to leave because they could attain the same payoff without cooperation. This reflects infinitesimal transaction costs of being a coalition member.[13] As a result, coalitions are only formed if they exchange information in the second stage of the game.

For an equilibrium with a grand coalition (i.e., $n = 0$), internal stability is sufficient. For an equilibrium with no cooperation (i.e., $n = M - 1$), external stability is sufficient. For all intermediate equilibria, both stability conditions have to be satisfied.

One can now determine all equilibria for a given set of parameters by backward induction. First, it is determined for all potential coalition sizes $c = m -$

[13]Higher transaction costs could also be specified. This would make equilibria with coalitions less likely. Otherwise, results would remain unaffected.

n if information is shared or not by analyzing the function $g(n) \equiv S^{C*}(n) - S^o$. That determines the payoffs $R^C(n)$ and $Q^N(n)$ for all $n \in \{0, ..., m-1\}$. In a second step, one determines for which n the conditions (6.6) and (6.7) are satisfied. This procedure identifies all existing equilibria. The two steps of equilibrium identification are now explained in more detail.

First, the function $g(n) = S^C(n) - S^o$, determines, if members of a coalition exchange information in the presence of n outsiders, which are defined as tax havens. Figure 6.1 illustrates a typical shape for the function $g(n)$. By Proposition 6.4, the function must be positive for $n = 0$. By the proof of Proposition 6.5, it is convex and downward sloping for any $g(n) > 0$. If $g(n)$ has a zero point at n^*, it separates the domain of $g(n)$ in two relevant regions. Information exchanging coalitions may be feasible if there are less than n^* outsiders. This corresponds to the positive values of $g(n)$ to the left of n^*. An information exchanging coalition is impossible if there are more than n^* outsiders as represented by the negative values of $g(n)$ to the right of n^*. Hence, n^* defines a necessary threshold size for stable coalitions because coalition members have an incentive to leave a coalition that does not exchange information. The analysis further below will consider how the threshold size n^* changes with respect to changes in parameter values.

The validity of conditions (6.6) and (6.7) for different values of n is most easily analyzed graphically by plotting the function $g(n)$ and another function: $f(n) \equiv S^{C*}(n) - S^{N*}(n+1)$. This latter function determines whether or not a country has an incentive to leave an information exchanging coalition to become the $(n+1)$th tax haven under the assumption that the coalition keeps exchanging information even if one country defects. Equivalently, $f(n)$ shows if there is an incentive for the $(n+1)$th tax haven to join an information exchanging coalition. These incentives are exactly the opposite of each other.[14] With the help of the functions $g(n)$ and $f(n)$ one can distinguish between two different sorts of equilibria.

[14]For example, if $f(n) \leq 0$, then any member of an information exchanging coalition of size $c = m - n$ has an incentive to leave the coalition if it could be ensured that the coalition of size $c - 1$ would still be exchanging information. Similarly, if $f(n) \leq 0$, there is no incentive for non-cooperating countries to join an information exchanging coalition of size $c - 1$ to become the cth member. On the other hand, if $f(n) > 0$, then no member of an information exchanging coalition of size $c = m - n$ has an incentive to leave the coalition. Similarly, if $f(n) > 0$, there is an incentive for non-cooperating countries to join an information exchanging coalition of size $c - 1$ to become the cth member.

The first set of equilibria have coalitions of size $c = M - n$ for which:

$$f(n-1) \leq 0 \tag{6.8}$$

$$f(n) > 0 \tag{6.9}$$

Condition $f(n) > 0$ ensures internal stability. First, $f(n) > 0$ guarantees by definition that coalition members have no incentive to leave the coalition even if the coalition without them continued to share information. That also implies that coalition members have no incentive to leave the coalition if that makes the coalition abandon information exchange. Because of $S^{N*}(n) \geq S^o$ for all $n \in \{0, \ldots, m-1\}$, it follows that $g(n) \geq f(n) > 0$. And $g(n) > 0$ not only shows that the coalition of size $c = m - n$ is exchanging information, but it also means that coalition members have no incentive to leave the coalition if that leads to a total breakdown of information exchange. Hence, $f(n) > 0$ is sufficient for internal stability.

Similarly, $f(n-1) \leq 0$ ensures by definition that no outsider would like to join an information exchanging coalition. Hence, $f(n-1) \leq 0$ and $f(n) > 0$ together are sufficient conditions for external stability because $f(n) > 0$ ensures that a coalition of size $c = m - n$ and (by Proposition 6.5) also a coalition of size $c + 1 = m - (n-1)$ are both information sharing. For $0 < n < M - 1$, this is called an intrinsic intermediate coalition equilibrium. Special cases are the intrinsic grand coalition, for which $n = 0$ and only condition (6.9) has to be satisfied for stability, and no coalition, for which $n = m - 1$ and only condition (6.8) has to be satisfied for stability.

The second set of equilibria have coalitions of size $c = M - n$ for which

$$f(n-1) \leq 0 \tag{6.10}$$

$$g(n) > 0 \tag{6.11}$$

$$g(n+1) \leq 0 \tag{6.12}$$

where $g(n) > 0$ ensures that the coalition is sharing information in the presence of n tax havens. Because of $g(n+1) \leq 0$ there would be no information exchange anymore if the coalition lost one member. Hence, condition $g(n) > 0$ and condition $g(n+1) \leq 0$ together are sufficient for internal stability because every coalition member realizes that leaving the coalition results in a complete breakdown of information exchange which makes everyone worse off, coalition members as well as tax havens.[15] Similarly, $f(n-1) \leq 0$ ensures by

[15] From $S^{N*}(n) \geq S^o$ for all $n \in \{0, \ldots, m-1\}$ and $g(n) > 0$ it follows that everyone would be worse off without information exchange.

definition that no outsider would like to join an information exchanging coalition. Hence, $f(n-1) \leq 0$ and $g(n) > 0$ together are sufficient conditions for external stability because $g(n) > 0$ ensures that a coalition of size $c = m - n$ and (by proposition 6.5) also a coalition of size $c + 1 = m - (n - 1)$ are both information sharing.

For $0 < n < M - 1$, this is called a forced intermediate coalition equilibrium. A corner solution is the forced grand coalition, for which $n = 0$, and conditions (6.11) and (6.12) are sufficient for stability.

The difference between the 'intrinsic' first set of equilibria and the 'forced' second set of equilibria is the mechanism by which a coalition is internally stable. The attribute 'forced' indicates that the threat of a complete breakdown in information sharing keeps coalition members from leaving the coalition. (As opposed to an 'intrinsic' desire to be a coalition member, which is a prerequisite for internal stability if the coalition's threat of abandoning information exchange in case of defections is not credible.)

Proposition 6.6 *There always exists at least one equilibrium.*

Proof: Case 1: $f(m-2) \leq 0$, which satisfies condition (6.8). Hence, a no-coalition equilibrium exists. Case 2: $f(0) > 0$, which satisfies condition (6.9). Hence, an intrinsic grand coalition equilibrium exists. Case 3: $f(m-2) > 0$ and $f(0) \leq 0$. Then there must exist at least one $n \in \{1, \ldots, m-2\}$ such that $f(n) > 0$ and $f(n-1) \leq 0$ and these are the conditions (6.8) and (6.9). Hence, an intrinsic intermediate coalition equilibrium exists. Together, these cases cover all possible situations. □

6.4 Description of Equilibria

This section will answer the questions posed in the Introduction. Will there be information exchange? How many countries will take part in an information sharing agreement? Are there several equilibria? How are the answers to these questions affected by parameter changes? What are the policy implications? These questions are answered by illustrating numerically all possible combinations of equilibria.

The parameter values for the benchmark case are the same as in Huizinga and Nielsen (2003): average transaction costs are $\beta = 0.04$, the domestic tax rate is $t = 0.03$, bank profits are $\delta = 0.005$, and the marginal value of tax revenues is $\rho = 1.4$. The number of countries m is initially assumed to be 7.

The graphs of $g(n)$ and $f(n)$ in Figure 6.1 show that there exist two equilibria. (i) an intrinsic grand coalition (due to $f(0) > 0$); and (ii) no cooperation at all (due to $f(5) \leq 0$). What about intermediate equilibria? Coalitions confronted with 2 or more tax havens would not exchange any information (due to $g(n) \leq 0$). These coalitions cannot be part of an equilibrium because they are not internally stable. A coalition of 6 countries that is only confronted with 1 tax haven does exchange information (due to $g(1) > 0$). It is not externally stable, however, because the tax haven would like to join the information exchanging coalition (due to $f(0) > 0$).

The intrinsic grand coalition is clearly a Pareto improvement with respect to no cooperation at all. It is hence quite important to have an institutional set-up that facilitates the grand coalition equilibrium. Bargaining over information exchange clauses in the framework of sequential bilateral tax treaties (as it has been the most common practice over the last century) is destined to trap countries in the inferior equilibrium. A multilateral approach to information exchange agreements, or at least the use of green light provisions enables countries to coordinate the superior equilibrium. (A green light provision ensures that a framework of treaties does not enter into force before the last involved country has enacted the treaties in its domestic law.) Departing from a situation without any information exchange no pair of countries has an incentive to sign a bilateral information exchange agreement. Figure 6.1 illustrates this fact as $g(5) \leq 0$.

As bank profitability increases from $\delta = 0.005$ to $\delta = 0.01$ it becomes more attractive to become a tax haven. The dashed and solid lines in Figure 6.2 show that the grand coalition has become impossible (due to $f(0) \leq 0$). The two equilibria are a forced intermediate coalition (due to $f(0) \leq 0$, $g(1) > 0$ and $g(2) \leq 0$) and no cooperation at all (due to $f(5) \leq 0$). Again, the former equilibrium is Pareto superior to the latter equilibrium.[16]

As bank profitability increases further to $\delta = 0.02$, no coalition is willing to bear the presence of tax havens anymore. The foregone bank profits would hurt the information sharing countries so much that they would prefer no cooperation to any intermediate coalition. The lines in Figure 6.3 show two equilibria. (i) a forced grand coalition (due to $g(0) > 0$ and $g(1) \leq 0$); (ii) and no cooperation at all (due to due to $f(5) \leq 0$). Of course, the former equilibrium

[16]Strictly speaking there are 8 equilibria: one equilibrium with no cooperation and 7 equilibria with six information sharing countries and one tax haven. Every equilibrium of the latter sort features another country as the tax haven. Due to all countries being symmetric, these 7 equilibria are equivalent.

is Pareto superior to the latter and a coordination mechanism that ensures the outcome of a grand coalition is very desirable. Further increasing bank profitability would not lead to qualitatively different outcomes. On the other hand, by decreasing bank profitability to zero, the function $f(n)$ converges to the function $g(n)$ and the result is qualitatively similar to the benchmark situation depicted in Figure 6.1.

Increasing the total number of countries m has effects very similar to increasing bank profitability δ. The situation for $m = 7$ countries has already been summarized in Figure 6.1, which shows two equilibria: (i) an intrinsic grand coalition and (ii) no cooperation at all. Increasing the number of countries to $m = 10$ makes it more attractive to become a non-cooperating tax haven because the the potential gain from attracting tax-evading bank depositors increases as the tax haven is now smaller relative to the rest of the world. Figure 6.4 shows two equilibria in this situation: a forced intermediary coalition (due to $f(0) \leq 0, g(1) > 0$ and $g(2) \leq 0$) and no cooperation at all (due to $f(9) \leq 0$). Increasing the number of countries further to $m = 13$ causes the presence of tax havens to become unbearable to any information sharing coalition. Figure 6.5 shows two equilibria: a forced grand coalition (due to $g(0) > 0$ and $g(1) \leq 0$) and no cooperation at all (due to $f(11) \leq 0$). Further increasing the number of countries M does not render any qualitatively different results. However, decreasing the number of countries to $m = 4$ leads to a qualitatively different situation. Figure 6.6 shows that the intrinsic grand coalition has become the unique equilibrium (due to $f(0) > 0$). If the number of countries is sufficiently small, it is not necessary to coordinate a superior equilibrium outcome as there is only one. Departing from a situation without any information exchange, two countries would have an incentive to sign a bilateral information exchange agreement even if no other bilateral agreement were to follow. Figure 6.6 illustrates that $f(2) = g(2) > 0$.

The equilibrium pattern across the two-dimensional parameter space, that is, the number of countries and bank profitability is summarized more generally in Table 6.1. The prototypical combinations of equilibria are indicated by the following abbreviations: IG, which indicates the co-existence of an intrinsic grand coalition and a no cooperation equilibrium as represented by Figure 6.1. FI, indicating a forced intermediate coalition and an equilibrium without any information sharing as represented by Figures 6.2 and 6.4. FG stands for the equilibrium combination of a forced grand coalition and no information sharing at all as represented by Figures 6.3 and 6.5. AG stands for a unique intrinsic grand coalition as represented by Figure 6.6.

The effects of increased capital mobility (reflected in a decreasing β) are comparable to the effects of increased banking profitability. Table 6.2 summarizes the equilibrium pattern across the number of countries and capital mobility ($m \times \beta$). In the row representing $m = 10$ countries, one can observe that for very immobile capital ($\beta = 0.16$), the grand coalition is the unique equilibrium. Avoiding citizens' costly tax evading activities is of such a value that all countries will join an information exchanging coalition without any coordination effort. (See Figure 6.6 for a representative illustration of incentives.) As capital mobility increases to $\beta = 0.08$, the grand coalition is not the unique equilibrium anymore. Avoiding transaction costs has become less attractive compared to retaining a country's status of potential tax haven, so no cooperation at all has become a second equilibrium next to the intrinsic grand coalition. (See Figure 6.1 for a comparable structure of incentives.) As capital mobility increases to the benchmark value of $\beta = 0.04$, some countries will find it attractive to exploit the increased mobility of bank deposits and will act as tax havens. The two equilibria in this situation are a forced intermediary coalition and no information sharing. In case of a further increase of capital mobility ($\beta = 0.02$), the presence of tax havens becomes unbearable to any intermediary information exchanging coalition. Either there will be no information exchange at all, or there will be full information exchange in a forced grand coalition. From Table 6.2 it emerges that this is a general pattern across any potential number of countries m. For relatively immobile capital (high values of β), tax havens can exist next to an intermediary information sharing coalition. This equilibrium becomes infeasible as capital mobility increases because the loss in depositors — and thus tax base — becomes intolerable to an intermediary information exchanging coalition.

Table 6.3 summarizes the equilibrium pattern across the number of countries and the domestic capital income tax rate ($m \times t$). For $m = 10$ countries and high domestic tax rates $t = 0.12$ (and all other parameters at benchmark values), there exists an intrinsic grand coalition equilibrium because the size of countries' tax revenues in the absence of tax evasion makes it attractive to stay in an information exchanging grand coalition. However, no cooperation at all is also an equilibrium because households have a strong incentive to evade domestic taxation and hence there is considerable scope to attract foreign deposits. In this equilibrium, no country would like to scare potential depositors away by engaging into an information exchange agreement. As the size of domestic taxes decreases to $t = 0.06$, the size of tax revenues is not sufficient anymore to give an intrinsic motivation for countries to stay with the grand

information exchanging coalition. Becoming a tax haven has become more attractive, but it is the threat of a total breakdown of information sharing that keeps the grand coalition a viable equilibrium. An intermediary information exchanging coalition would not tolerate the presence of tax havens. The coalition would stop sharing information altogether. Interestingly, an intermediary information exchanging coalition does tolerate the existence of a limited number of tax havens if the domestic tax rate decreases further to the benchmark value $t = 0.03$. The decreased incentive to evade taxes also limits the loss of deposits to the tax havens such that information sharing within the coalition can be upheld. In contrast to Tables 6.1 and 6.2, the forced intermediary (FI) coalition equilibrium pattern is not 'in between' the forced grand (FG) coalition pattern and the intrinsic grand (IG) coalition pattern, but an intermediary coalition is the outcome in the limit as domestic tax rates become smaller. In fact, as domestic tax rates decrease further to $t = 0.001$, there is a new equilibrium not encountered before; the (unique) intrinsic intermediary coalition (AI): $f(n) > 0$ and $f(n-1) \leq 0$ are both satisfied. No tax haven would like to join the coalition and no country would like to leave the intermediary information exchanging coalition. Table 6.3 shows that this equilibrium is especially relevant if the number of countries is not too large.[17] Figure 6.7 illustrates the structure of incentives for $m = 7$ countries and $t = 0.001$ by plotting the functions $f(n)$ and $g(n)$.

6.5 Application to the EU Savings Tax Directive

On July 1, 2005 the EU Savings Tax Directive (and associated treaties) entered into force. The genesis and the provisions of this agreement leave no doubt that it represents a forced equilibrium (in the terms of the model developed above). A clear sign is the use of a 'green light provision'. The EU Savings Tax Directive was supposed to enter into force on January 1, 2005 provided that 5 non-EU member countries and 10 dependent/associated territories apply from the same date measures equivalent to the ones determined in the Directive. This mechanism ensured that no country could defect at the last minute on previous promises without triggering the credible threat that there would be no automatic information exchange or withholding taxes at all. In fact, 'green light' could not be given prior to January 1, 2005, so the entry into force

[17] One should keep in mind, that changes in other parameter values may extend the relevance of this equilibrium to larger values of m as well.

had to be deferred to July 1, 2005. Another sign of the forced nature is the behavior of several parties during the negotiations: The European Commission proposed the precursor of the Directive in 1998, upon which Austria, Luxembourg and the UK required that the cooperation of all relevant third countries should be a precondition for the European solution. Later, in June 2000, all EU member countries agreed on a system of automatic information exchange except for Austria and Luxembourg. These two countries objected declaring that they would only adjust bank secrecy laws if relevant third countries such as Liechtenstein, Monaco, San Marino and Switzerland did the same. Eventually, Belgium joined this point of view. In the following negotiations with third countries, Switzerland proposed an alternative to information exchange. It would apply a withholding tax on non-residents' interest income of up to 35% if Austria, Belgium and Luxembourg did the same.[18] The recurring conditionality on the behavior of other countries shows that all parties wanted to make sure that all relevant countries are effectively included under the eventual agreement. Last, it took seven years from the first proposal in 1998 until 2005 to enact the Savings Tax Directive. Some countries deliberately procrastinated to test if some version of the Savings Tax Directive would go through without having to participate. If previous failed initiatives for coordination of capital income taxation in 1967 and in 1989 are taken into account, then it took 38 years to arrive at cooperation in this policy area.[19]

Has anything happened in the meantime that enabled the successful conclusion of the EU Savings Tax Directive? Several potential explanations are

[18]The withholding tax will initially be lower. See Keen and Ligthart (2006b).

[19]The initiative in 1967 was meant to reduce the extent of tax evasion as well as double taxation of capital income. The European Commission (1967) discussed two proposals: Either abolish all withholding tax rates and exchange information on capital income or introduce a harmonized withholding tax rate on capital income. The former option was seen as impractical because it collided with the principle of bank secrecy and because it may have caused massive capital flight to non-member countries. The latter option was never agreed upon because Belgium, France and Italy called for more than the proposed 10% withholding tax to combat tax evasion whereas Luxembourg and the Netherlands called for less than 10% to facilitate free movement of capital (Genschel, 2002, p. 138, and Holzinger, 2005). In 1989, the European Commission (1989) still disqualified the idea of information exchange because of its infeasibility and proposed a minimum withholding tax rate of 15%. The member countries could not agree: France and Italy still desired a higher rate, whereas Denmark and the Netherlands preferred an information exchange system. Luxembourg and the United Kingdom rejected both ideas because they wanted to protect their banking sectors. After Germany's bad experience with a national withholding tax on savings income which resulted in massive capital flight, the initiative had become politically infeasible (Genschel, 2002, p. 147, and Holzinger, 2005).

cited. First, the terrorist attack on the World Trade Center in 2001 has created a wider support for the OECD initiatives in the area of financial transparency, bank secrecy and information exchange (CEPS, 2001).[20] This awareness might have helped the European Commission to hammer out an agreement. Second, issue-linkage has been widely used in the history of EU negotiations to reach agreements in areas very sensitive to national vetoes. The Savings Tax Directive may have a negative effect on Switzerland, but at the same time Switzerland concluded bilateral treaties with the EU that made the EU Parent-Subsidariy Directive and the EU Merger Directive applicable to Switzerland. That makes Switzerland much more attractive for locating multinationals' headquarters and, indeed, over the last two years many European headquarters have flocked to Zurich. Naturally, official sources always denied a connection between the negotiations of the different agreements. Third, it should be taken into account that the Savings Tax Directive relates only to fixed income assets. Such a limited agreement may be more easily concluded than an agreement that relates to all asset classes either because the definition of fixed income assets has gaps or because it may not be a binding constraint for tax evading investors if their optimal portfolio can still be achieved without investing any tax evading funds in fixed income assets (Keen and Ligthart, 2006b).

The model developed in the previous section offers an alternative explanation. The transaction costs for moving funds from one EU country to another have decreased tremendously over the last decades. Most capital controls have ceased to exist. Border controls have been abolished for the member states of the Schengen agreement. Costs for physical transportation have decreased while the introduction of the Internet has lowered the costs for virtual transactions. The introduction of a common currency in 1999 has eliminated the currency risk between the 15 Euro members. Since 2001, banks must charge the same fees for cross-border transactions as for domestic transactions. In 2008, the introduction of the Single Euro Payments Area (covering the European Economic Area and Switzerland) has further eradicated any remaining discrimination between national and intra-European cross border payments in the Euro currency. The strong increase in capital mobility (in the

[20] More specifically, the OECD launched an initiative against harmful tax practices in 1998, the OECD Global Forum on Taxation was established in 2001 to foster dialogue between OECD countries and tax havens, a model agreement on exchange of information on tax matters was developed by the OECD Global Forum Working Group on Effective Exchange of Information and released in April 2002, the Convention on Mutual Administrative Assistance in Tax Matters was opened for signature in 1988 and entered into force in 1995.

terms of the model a lower β) has made the existence of tax havens unbearable to an intermediate information exchanging coalition. Either all countries started cooperating in taxing capital income or the further financial integration would have been at risk. Such a scenario would take place in a world with 10 countries if β would decrease from 0.04 to 0.02 (see Table 6.2). With $\beta = 0.04$, 9 information sharing countries could bear the presence of a tax haven. With $\beta = 0.02$, the presence of the tax haven becomes intolerable. Either all countries are included in an information exchange agreement or cooperation breaks down completely.

The Nordic Convention on Mutual Administrative Assistance in Tax Matters from 1989 (effective from 1991) is another, very early example of a multilateral information exchange agreement, which may have been caused by low barriers to capital flows between Nordic countries relative to the rest of the world. The Nordic countries are very close in terms of language and history; Finland was part of Sweden until 1809, Norway and Sweden were united under one king until 1905 and all Nordic countries have minority groups deriving or claiming heritage of a population residing within another Nordic state. Furthermore, the Nordic passport union came into effect in 1958 allowing citizens of the Nordic countries to cross approved border districts without carrying their passport or having their passport checked. The increased mobility of factors of production may have required a multilateral agreement in order to make further economic integration of these countries acceptable to all parties.

6.6 Conclusion

The previous analysis derives several important results. First, there is a need for coordinating information exchange agreements beyond the traditional bilateral level in order to attain equilibria that are Pareto-efficient. Otherwise, countries may be trapped in an equilibrium without any information exchange even if all countries were intrinsically motivated to contribute to a world with full information exchange. There exists a first mover disadvantage of acting cooperatively which must be overcome through the use of multilateral agreements and green light provisions in treaties.

Second, the analysis shows that information sharing may be driven by very different motivations. On the one hand, countries may have an intrinsic motivation to be part of an information exchanging coalition because its payoff is higher than if it became a tax haven next to an information exchanging

coalition. On the other hand, countries may only stay with an information exchanging coalition because they know that defection would trigger a complete breakdown of information exchange. This eventual situation makes the option to defect unattractive. Although these equilibria may look very similar in terms of actual information exchange taking place, they require a very different institutional framework. If coalition countries are intrinsically motivated, they will automatically take care of keeping the information exchanging coalition effective. However, if countries have an incentive to defect from an information exchanging coalition, given the remaining countries keep cooperating, then a lot of effort will have to be invested in keeping information sharing effective. Individual countries will try to find loopholes in the information exchange agreement in order to remain attractive to tax-evading foreign depositors and at the same will time pretend to fully cooperate to keep the information exchanging coalition intact. Other countries may respond by pulling out of the information sharing coalition arguing that full information sharing within the coalition is not effective. This kind of incentives requires a constant renegotiation of the terms of information exchange to keep up with legal, financial, and technological developments to shift tax evading deposits from one country to another. Otherwise, there may be a shift to an equilibrium without any information exchange.

Third, it emerges that the number of players is in itself a very important parameter determining the feasibility of information exchange. A two-country analysis will never be able to explore this dimension of information exchange. Even with symmetric countries, it depends on the number of countries which outcome (i.e., tax havens or full information exchange) prevails and which motivation keeps information sharing countries cooperating. Furthermore, the model shows that identical countries may choose different information exchange policies. Hence, the coexistence of information exchanging countries and tax havens that resist to share any information is explainable even without differences in country characteristics.

Fourth, the relationship between parameters and the feasibility of information sharing is non-monotonic. In fact, successive increases in bank profitability (or alternatively capital mobility or the number of countries) may first cause a breakdown of full information exchange and the emergence of tax havens. However, further increases then contribute to the disappearance of tax havens and reestablishment of full information sharing (although the motivation to stay within the information sharing coalition has changed with respect to the initial situation as discussed above). It is noteworthy, that the

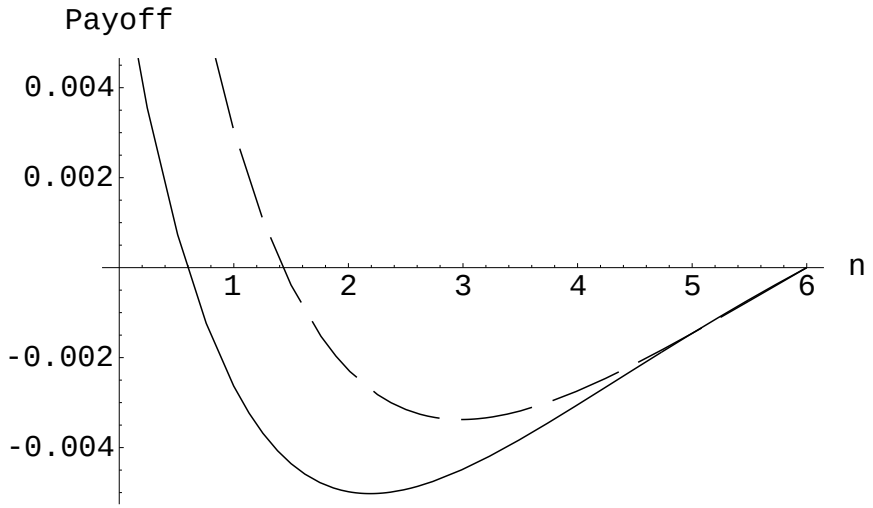
model allows a seamless analysis of the transition from a world with imperfectly mobile capital to a world with perfectly mobile capital (as β converges to zero). Previous research used to introduce auxiliary assumptions that excluded perfectly mobile capital.

Fifth, countries' discount rates and infinitely repeated games are not required in order to explain information sharing between countries. Due to the folk theorem (cf.Abreu, 1988), repeated games can explain an extremely wide range of possible behavior. Determining a country's discount rate is an intricate task in itself. Modeling information exchange as a repetitive game must assume that it is possible for countries to credibly inform atomistic investors about an imminent defection and still surprise the other country with its action. The present approach does not exhibit these drawbacks. It allows for an endogenous choice of countries to credibly commit to cooperation or to refrain from cooperation.

There are two caveats in interpreting the results. They apply to a world with symmetric countries and a homogeneous capital mobility index β. Asymmetries in country size or in transaction costs have been left out intentionally because it would cloud analyzing the ramifications of other parameters. However, introducing the strong asymmetries (especially in country size) present in reality will strongly affect the occurrence of different equilibrium patterns. For example, the coexistence of intermediary information sharing coalitions (having large country members) and small tax havens will be feasible for a much larger range of parameter values than for symmetric countries.[21] Future work along the lines of the model presented here — which takes size asymmetries into account — is definitely warranted.

[21] (Slight) asymmetry in country size is in fact the most likely candidate for resolving the indeterminacy problem of which country gets the (attractive) role of tax haven and which countries are members of a forced intermediary information sharing coalition. This determinacy problem cannot be resolved within a model assuming perfectly symmetric countries.

Figure 6.1: Benchmark: 7 Countries



Notes: The dashed line shows the incentive for a coalition of $c = m - n$ countries to exchange information with each other: $g(n) \equiv S^{C*}(n) - S^{o}$, where $n \in \{0, \ldots, m-1\}$ indicates the number of non-cooperating countries. A positive value indicates an incentive to exchange information. The solid line shows the incentive for a member of an information sharing coalition of size $c = m - n$ to defect if the defection does not cause the coalition to stop information sharing: $f(n) \equiv S^{C*}(n) - S^{N*}(n+1)$. A negative value indicates an incentive to defect. At the same time, the solid line also reflects the incentive of a tax haven to join an information sharing coalition of size $c = m - n$ to become its $c+1$th member: $S^{C*}(n-1) - S^{N*}(n)$. A positive value indicates an incentive to join.

Figure 6.2: Increased Bank Profitability: $\delta = 0.01$

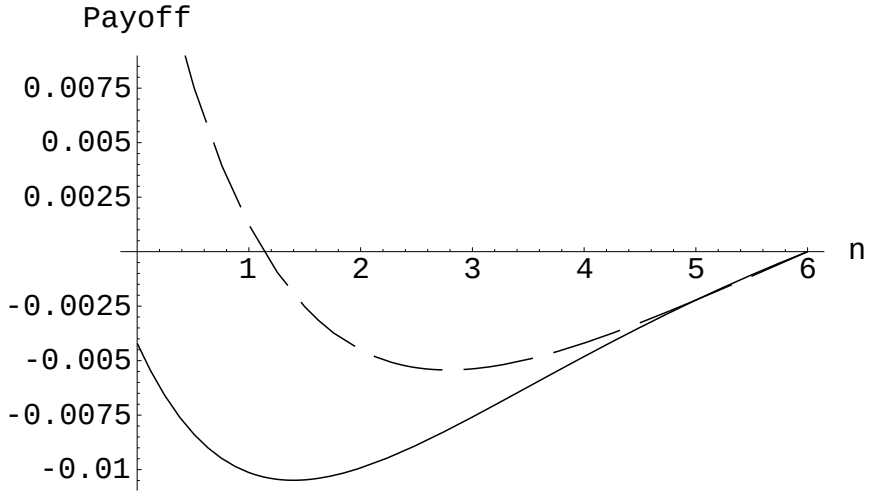
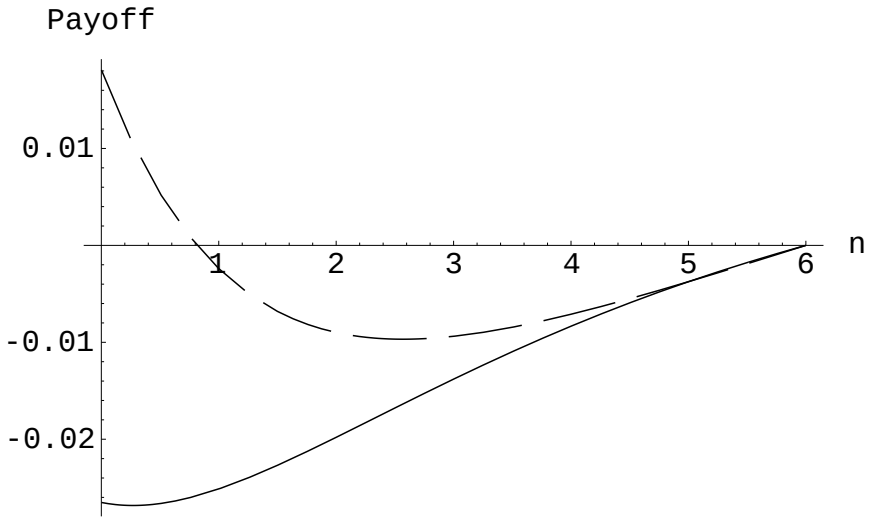


Figure 6.3: Increased Bank Profitability: $\delta = 0.02$



Notes: The dashed line shows the incentive for a coalition of $c = m - n$ countries to exchange information with each other: $g(n) \equiv S^{C*}(n) - S^{o}$, where $n \in \{0, \ldots, m-1\}$ indicates the number of non-cooperating countries. A positive value indicates an incentive to exchange information. The solid line shows the incentive for a member of an information sharing coalition of size $c = m - n$ to defect if the defection does not cause the coalition to stop information sharing: $f(n) \equiv S^{C*}(n) - S^{N*}(n+1)$. A negative value indicates an incentive to defect. At the same time, the solid line also reflects the incentive of a tax haven to join an information sharing coalition of size $c = m - n$ to become its $c+1$th member: $S^{C*}(n-1) - S^{N*}(n)$. A positive value indicates an incentive to join.

Figure 6.4: Benchmark with 10 Countries

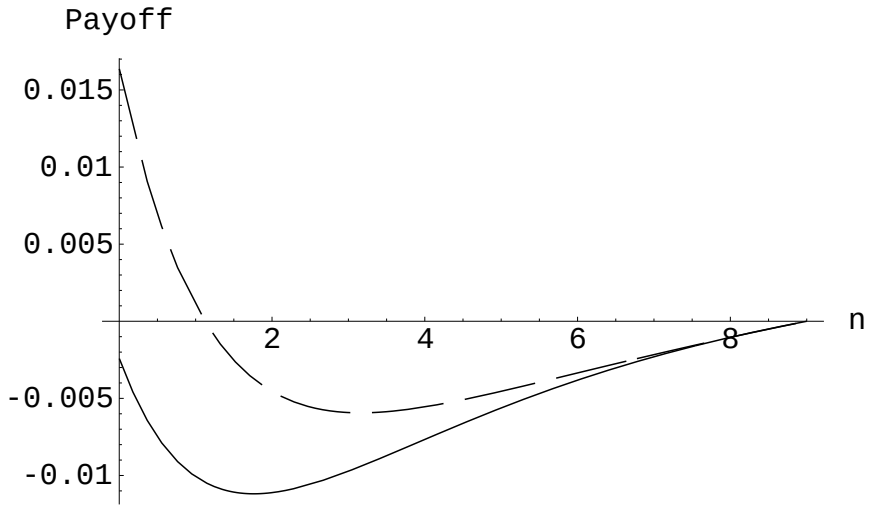
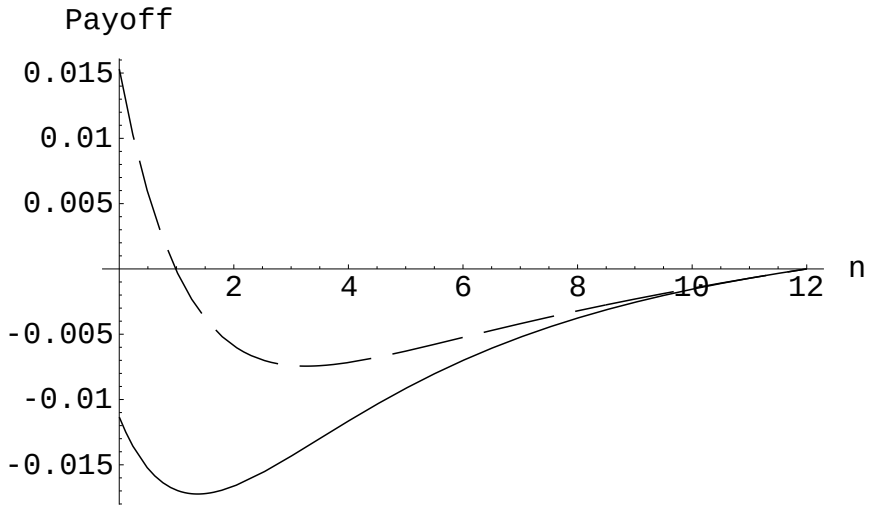


Figure 6.5: Benchmark with 13 Countries



Notes: The dashed line shows the incentive for a coalition of $c = m - n$ countries to exchange information with each other: $g(n) \equiv S^{C*}(n) - S^{o}$, where $n \in \{0, \ldots, m-1\}$ indicates the number of non-cooperating countries. A positive value indicates an incentive to exchange information. The solid line shows the incentive for a member of an information sharing coalition of size $c = m - n$ to defect if the defection does not cause the coalition to stop information sharing: $f(n) \equiv S^{C*}(n) - S^{N*}(n+1)$. A negative value indicates an incentive to defect. At the same time, the solid line also reflects the incentive of a tax haven to join an information sharing coalition of size $c = m - n$ to become its $c+1$th member: $S^{C*}(n-1) - S^{N*}(n)$. A positive value indicates an incentive to join.

Figure 6.6: Benchmark with 4 Countries

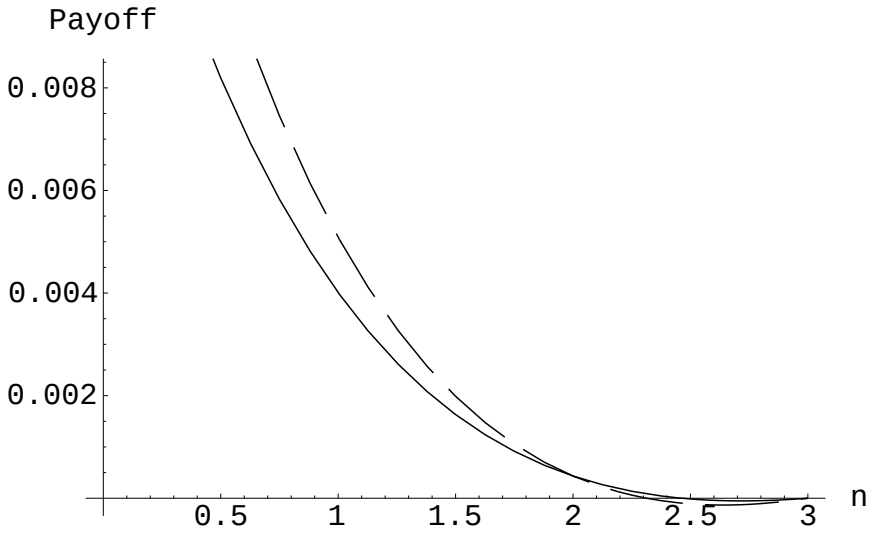
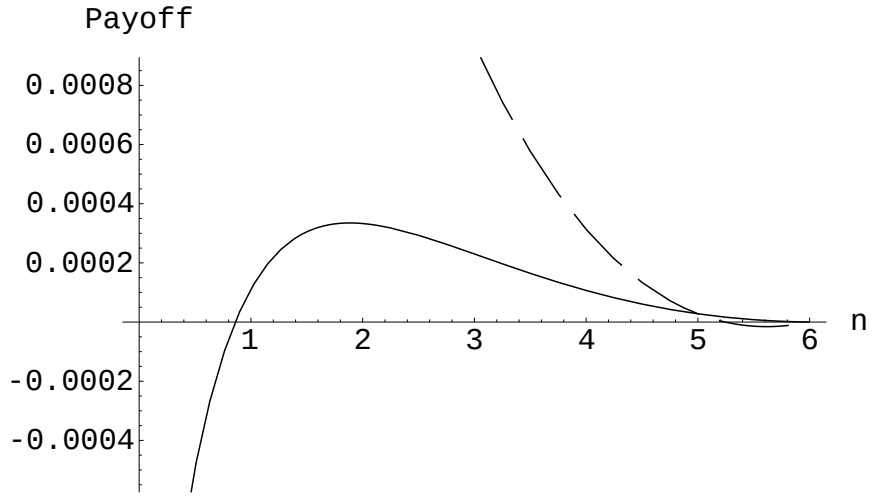


Figure 6.7: Intrinsic Intermediate Coalition



Notes: The dashed line shows the incentive for a coalition of $c = m - n$ countries to exchange information with each other: $g(n) \equiv S^{C*}(n) - S^{o}$, where $n \in \{0, \ldots, m-1\}$ indicates the number of non-cooperating countries. A positive value indicates an incentive to exchange information. The solid line shows the incentive for a member of an information sharing coalition of size $c = m - n$ to defect if the defection does not cause the coalition to stop information sharing: $f(n) \equiv S^{C*}(n) - S^{N*}(n+1)$. A negative value indicates an incentive to defect. At the same time, the solid line also reflects the incentive of a tax haven to join an information sharing coalition of size $c = m - n$ to become its $c+1$th member: $S^{C*}(n-1) - S^{N*}(n)$. A positive value indicates an incentive to join.

Table 6.1: Equilibria over the Parameter Space $m \times \delta$

Number of Countries	Bank Profitability (δ)								
	0.001	0.002	0.005	0.01	0.02	0.025	0.03	0.036	0.04
2	AG	AG	AG	AG	AG	AG	AG	AG	AG
3	AG	AG	AG	AG	AG	AG	AG	**IG**	FG
4	AG	AG	AG	**IG**	**IG**	*FI*	FG	FG	FG
5	**IG**	**IG**	**IG**	**IG**	*FI*	FG	FG	FG	FG
6	**IG**	**IG**	**IG**	**IG**	FG	FG	FG	FG	FG
7	**IG**	**IG**	**IG**	*FI*	FG	FG	FG	FG	FG
8	**IG**	**IG**	**IG**	*FI*	FG	FG	FG	FG	FG
9	**IG**	**IG**	**IG**	FG	FG	FG	FG	FG	FG
10	**IG**	**IG**	*FI*	FG	FG	FG	FG	FG	FG
11	**IG**	**IG**	*FI*	FG	FG	FG	FG	FG	FG
12	**IG**	**IG**	*FI*	FG	FG	FG	FG	FG	FG
13	**IG**	**IG**	FG	FG	FG	FG	FG	FG	FG
14	**IG**	**IG**	FG	FG	FG	FG	FG	FG	FG
15	**IG**	**IG**	FG	FG	FG	FG	FG	FG	FG
16	**IG**	**IG**	FG	FG	FG	FG	FG	FG	FG
17	**IG**	**IG**	FG	FG	FG	FG	FG	FG	FG
18	**IG**	**IG**	FG	FG	FG	FG	FG	FG	FG
19	**IG**	**IG**	FG	FG	FG	FG	FG	FG	FG
20	**IG**	**IG**	FG	FG	FG	FG	FG	FG	FG
21	**IG**	*FI*	FG	FG	FG	FG	FG	FG	FG
22	**IG**	FG	FG	FG	FG	FG	FG	FG	FG
23	**IG**	FG	FG	FG	FG	FG	FG	FG	FG
24	**IG**	FG	FG	FG	FG	FG	FG	FG	FG
25	**IG**	FG	FG	FG	FG	FG	FG	FG	FG
26	**IG**	FG	FG	FG	FG	FG	FG	FG	FG
27	**IG**	FG	FG	FG	FG	FG	FG	FG	FG
28	FG	FG	FG	FG	FG	FG	FG	FG	FG
29	FG	FG	FG	FG	FG	FG	FG	FG	FG
30	FG	FG	FG	FG	FG	FG	FG	FG	FG

Notes: IG indicates the co-existence of an intrinsic grand coalition and a non-cooperative equilibrium as represented by Figure 6.1. FI indicates a forced intermediate coalition and an equilibrium without any information sharing as represented by Figures 6.2 and 6.4. FG stands for the equilibrium combination of a forced grand coalition and no information sharing at all as represented by Figures 6.3 and 6.5. AG stands for a unique intrinsic grand coalition as represented by Figure 6.6. Bold and italic typeface are used to facilitate recognizing patterns across the parameter space.

Table 6.2: Equilibria over the Parameter Space $m \times \beta$

Number of Countries	Capital Mobility (β)							
	0.001	0.01	0.02	0.03	0.04	0.06	0.08	0.16
2	AG	AG	AG	AG	AG	AG	AG	AG
3	**IG**	**IG**	**IG**	AG	AG	AG	AG	AG
4	**IG**	**IG**	**IG**	**IG**	AG	AG	AG	AG
5	FG	**IG**	**IG**	**IG**	**IG**	AG	AG	AG
6	FG	FG	**IG**	**IG**	**IG**	**IG**	AG	AG
7	FG	FG	FG	**IG**	**IG**	**IG**	**IG**	AG
8	FG	FG	FG	FG	**IG**	**IG**	**IG**	AG
9	FG	FG	FG	FG	**IG**	**IG**	**IG**	AG
10	FG	FG	FG	FG	*FI*	**IG**	**IG**	AG
11	FG	FG	FG	FG	*FI*	**IG**	**IG**	AG
12	FG	FG	FG	FG	*FI*	**IG**	**IG**	**IG**
13	FG	FG	FG	FG	FG	*FI*	**IG**	**IG**
14	FG	FG	FG	FG	FG	*FI*	**IG**	**IG**
15	FG	FG	FG	FG	FG	*FI*	**IG**	**IG**
16	FG	FG	FG	FG	FG	*FI*	*FI*	**IG**
17	FG	FG	FG	FG	FG	*FI*	*FI*	**IG**
18	FG	FG	FG	FG	FG	*FI*	*FI*	**IG**
19	FG	FG	FG	FG	FG	*FI*	*FI*	**IG**
20	FG	FG	FG	FG	FG	*FI*	*FI*	**IG**
21	FG	FG	FG	FG	FG	*FI*	*FI*	**IG**
22	FG	FG	FG	FG	FG	*FI*	*FI*	**IG**
23	FG	FG	FG	FG	FG	*FI*	*FI*	**IG**
24	FG	FG	FG	FG	FG	*FI*	*FI*	**IG**
25	FG	FG	FG	FG	FG	*FI*	*FI*	**IG**
26	FG	FG	FG	FG	FG	*FI*	*FI*	**IG**
27	FG	FG	FG	FG	FG	*FI*	*FI*	*FI*
28	FG	FG	FG	FG	FG	*FI*	*FI*	*FI*
29	FG	FG	FG	FG	FG	*FI*	*FI*	*FI*
30	FG	FG	FG	FG	FG	*FI*	*FI*	*FI*

Notes: IG indicates the co-existence of an intrinsic grand coalition and a non-cooperative equilibrium as represented by Figure 6.1. FI indicates a forced intermediate coalition and an equilibrium without any information sharing as represented by Figures 6.2 and 6.4. FG stands for the equilibrium combination of a forced grand coalition and no information sharing at all as represented by Figures 6.3 and 6.5. AG stands for a unique intrinsic grand coalition as represented by Figure 6.6. Bold and italic typeface are used to facilitate recognizing patterns across the parameter space.

Table 6.3: Equilibria over the Parameter Space $m \times t$

Number of Countries	Domestic Tax on Capital Income (t)									
	0.001	0.005	0.01	0.02	0.03	0.04	0.06	0.08	0.12	0.24
2	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG
3	**AI**	**AI**	AG	AG	AG	AG	AG	**IG**	**IG**	**IG**
4	**AI**	**AI**	**AI**	AG	AG	**IG**	**IG**	**IG**	**IG**	**IG**
5	**AI**	**AI**	**AI**	AG	**IG**	**IG**	**IG**	**IG**	**IG**	**IG**
6	**AI**	**AI**	**AI**	**IG**	**IG**	**IG**	**IG**	**IG**	**IG**	**IG**
7	**AI**	**AI**	**AI**	**IG**	**IG**	**IG**	**IG**	**IG**	**IG**	**IG**
8	**AI**	**AI**	*FI*	**IG**	**IG**	**IG**	**IG**	**IG**	**IG**	**IG**
9	**AI**	**AI**	*FI*	**IG**	**IG**	**IG**	**IG**	**IG**	**IG**	**IG**
10	**AI**	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	**IG**	**IG**
11	**AI**	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	**IG**	**IG**
12	**AI**	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	**IG**
13	**AI**	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	**IG**
14	**AI**	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	**IG**
15	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	**IG**
16	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	**IG**
17	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	**IG**
18	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	**IG**
19	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	**IG**
20	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	**IG**
21	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	**IG**
22	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	FG
23	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	FG
24	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	FG
25	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	FG
26	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	FG
27	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	FG
28	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	FG
29	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	FG
30	*FI*	*FI*	*FI*	*FI*	FG	FG	FG	FG	FG	FG

Notes: AI indicates the intrinsic intermediary coalition. IG indicates the co-existence of an intrinsic grand coalition and a non-cooperative equilibrium as represented by Figure 6.1. FI indicates a forced intermediate coalition and an equilibrium without any information sharing as represented by Figures 6.2 and 6.4. FG stands for the equilibrium combination of a forced grand coalition and no information sharing at all as represented by Figures 6.3 and 6.5. AG stands for a unique intrinsic grand coalition as represented by Figure 6.6. Bold and italic typeface are used to facilitate recognizing patterns across the parameter space.

6.A Appendix

6.A.1 Unconditional Payoff Functions

The transaction costs for a household from country j depositing with a bank in the foreign country i are distributed exponentially with a cumulative distribution function $\text{Prob}\{x_{ij} < x\} = 1 - e^{-x/\beta}$ and a probability density function $f(x) = (1/\beta)e{-}x/\beta$. Accordingly, the minimum total cost for depositing abroad, $\theta_j \equiv \min_{k\neq j}[\tau_{kj} + x_{kj}]$, has the cumulative distribution function

$$\text{Prob}\{\theta_j < x\} = 1 - \Pi_{k\neq j}\left(\min[1, e^{-(x-\tau_{kj})/\beta}]\right) \tag{6.13}$$

The corresponding probability density function is

$$f(x) = \left(\frac{1}{\beta}\sum_{k\neq j}\Lambda_{kj}(x)\right)\Pi_{k\neq j}\left(\min[1, e^{-(x-\tau_{kj})/\beta}]\right) \tag{6.14}$$

where $\Lambda_{kj}(x) = 1$ if $x \geq \tau_{kj}$ and $\Lambda_{kj}(x) = 0$ if $x < \tau_{kj}$. Furthermore, the chance that country i^* is the most favorite depositing country, conditional on θ_j is:

$$\text{Prob}\{\tau_{i^*j} + x_{i^*j} = \theta_j \,|\, \theta_j = x \text{ and } \theta_j < t\} = \frac{\Lambda_{i^*j}(x)}{\max[1, \Sigma_{k\neq j}\Lambda_{kj}(x)]} \tag{6.15}$$

It is worthwhile to spell out this conditional probability. Given the minimum total cost for depositing abroad θ_j, there is an equal chance of being the favorite depositing country for all countries (indexed by k) that exhibit a restrictive information exchange policy with respect to country j such that $\tau_{kj} \leq \theta_j$. Countries with a higher intensity of information exchange, such that $\tau_{kj} > \theta_j$, have of course no chance of being the favorite depositing country. The equal probability to locate deposits in a certain country conditional on θ_j facilitates integration across all potential values of θ_j.

The above expressions will now be used in deriving the following equations: average private net-of-all-cost income, average bank profits per household, and average tax revenue per household.

Average private net-of-all-cost income I_i in country i is given by

$$\begin{aligned} E[I_i] \;=\; & \text{Prob}\left\{t \leq \min_{k\neq i}[x_{ki} + \tau_{ki}]\right\}(r - \delta - t) \\ & + \text{Prob}\left\{t > \min_{k\neq i}[x_{ki} + \tau_{ki}]\right\}(r - \delta - \min_{k\neq i}[x_{ki} + \tau_{ki}]) \quad i, k \in M \end{aligned} \tag{6.16}$$

This can be rewritten more succinctly as

$$E[I_i] = r - \delta - E\left[\min[t, \min_{k\neq i}[x_{ki} + \tau_{ki}]]\right] \qquad i, k \in M \tag{6.17}$$

Irrespective of the location of a household's deposits, it will earn a return of r, of which the bank will cut out a profit rate of δ. The last term is a household's average cost of taxation and transaction costs associated with tax evasion. Depending on the random vector of transaction costs, there is either a most favorite foreign country with sufficiently low transaction costs and information exchange policy, or the deposits are kept in the home country and the domestic tax t applies. Using the property[22] that for any nonnegative random variable X, $E[X] = \int_0^\infty \text{Prob}\{X > x\}\, dx$, equation (6.17) transforms into

$$E[I_i] = r - \delta - \int_0^\infty \text{Prob}\left\{\min[t, \min_{k\neq i}[x_{ki} + \tau_{ki}]] > y\right\} \text{d}y \qquad i,k \in M \tag{6.18}$$

which is equivalent to

$$E[I_i] = r - \delta - \int_0^t \prod_{k\neq i} \min[1, e^{-(y-\tau_{ki})/\beta}] \text{d}y - \int_t^\infty 0\, \text{d}y \qquad i,k \in M \tag{6.19}$$

For example, if $i = 3$ and $\tau_{1i} \leq \tau_{2i} \leq t \leq \tau_{ki}$ for all $k > 3$, then I_i can be written as

$$E[I_i] = r - \delta - \int_0^{\tau_{1i}} 1\, \text{d}y - \int_{\tau_{1i}}^{\tau_{2i}} e^{-\frac{y-\tau_{1i}}{\beta}} \text{d}y - \int_{\tau_{2i}}^{t} e^{-\frac{y-\tau_{1i}}{\beta} - \frac{y-\tau_{2i}}{\beta}} \text{d}y \tag{6.20}$$

Banks in country i receive deposits from residents and non-residents, yielding average bank profits

$$E[P_i] = \delta\, \text{Prob}\{\theta_i > t\} + \delta \sum_{j\neq i} \text{Prob}\left\{x_{ij} + \tau_{ij} = \theta_j < t\right\} \qquad j \in M \setminus \{i\} \tag{6.21}$$

$$\begin{aligned} \Leftrightarrow E[P_i] &= \delta\, \text{Prob}\left\{\min_{j\neq i}[x_{ji} + \tau_{ji}] \geq t\right\} \\ &\quad + \delta \sum_{j\neq i} \left(\text{Prob}\left\{x_{ij} + \tau_{ij} = \min_{k\neq j}[x_{kj} + \tau_{kj}] \mid \min_{k\neq j}[x_{kj} + \tau_{kj}] < t\right\}\right. \\ &\quad \left. \text{Prob}\left\{\min_{k\neq j}[x_{kj} + \tau_{kj}] < t\right\}\right) \quad i,j,k \in M \end{aligned} \tag{6.22}$$

[22] When X has density f, then

$$E[X] = \int_0^\infty y f(y) dy = \int_0^\infty \int_0^y f(y)\, dx\, dy = \int_0^\infty \int_x^\infty f(y)\, dy\, dx = \int_0^\infty \text{Prob}\{X > x\} dx$$

.

Using the probability density function of the minimum term, this is rewritten as

$$\begin{aligned} E[P_i] &= \delta \int_t^{\infty} \frac{\sum_{j\neq i} \Lambda_{ji}(y)}{\beta} \prod_{j\neq i} \min[1, e^{-(y-\tau_{ji})/\beta}] \mathrm{d}y \\ &\quad +\delta \sum_{j\neq i} \int_0^t \Bigg(\text{Prob}\left\{ x_{ij} + \tau_{ij} = \min_{k\neq j}[x_{kj} + \tau_{kj}] \mid \min_{k\neq j}[x_{kj} + \tau_{kj}] = y \right\} \\ &\quad \frac{\sum_{k\neq j} \Lambda_k(y)}{\beta} \prod_{k\neq j} \min[1, e^{-(y-\tau_{kj})/\beta}] \Bigg) \mathrm{d}y \quad i, j, k \in M \end{aligned} \tag{6.23}$$

where Λ_{ji} is an indicator function such that $\Lambda_{ji}(y) = 0$ if $y < \tau_{ji}$ and $\Lambda_{ji}(y) = 1$ if $y \geq \tau_{ji}$. Solving the first integral and eliminating the probability term in the second integral then gives

$$\begin{aligned} E[P_i] &= \delta \prod_{j\neq i} \min[1, e^{-(t-\tau_{ji})/\beta}] \mathrm{d}y \\ &\quad +\delta \sum_{j\neq i} \int_0^t \Bigg(\frac{\Lambda_{ij}(x)}{\max[1, \Sigma_{k\neq j} \Lambda_{kj}(x)]} \\ &\quad \frac{\sum_{k\neq j} \Lambda_{kj}(y)}{\beta} \prod_{k\neq j} \min[1, e^{-(y-\tau_{kj})/\beta}] \Bigg) \mathrm{d}y \quad i, j, k \in M \end{aligned} \tag{6.24}$$

where Λ_{ij} and Λ_{kj} are indicator functions such that $\Lambda_{ij}(y) = 0$ if $y < \tau_{ij}$ and $\Lambda_{ij}(y) = 1$ if $y \geq \tau_{ij}$, and $\Lambda_{kj}(y) = 0$ if $y < \tau_{kj}$ and $\Lambda_{kj}(y) = 1$ if $y \geq \tau_{kj}$. This can be further simplified to:

$$\begin{aligned} E[P_i] &= \delta \prod_{j\neq i} \min[1, e^{-(t-\tau_{ji})/\beta}] \mathrm{d}y \\ &\quad +\delta \sum_{j\neq i} \int_{\tau_{ij}}^t \frac{1}{\beta} \prod_{k\neq j} \min[1, e^{-(y-\tau_{kj})/\beta}] \mathrm{d}y \quad i, j, k \in M \end{aligned} \tag{6.25}$$

Country i's average tax revenue per household is given by

$$E[T_i] = t\,\text{Prob}(\theta_i > t) + \sum_{j\neq i} \tau_{ji} \text{Prob}(x_{ji} + \tau_{ji} = \theta_i < t) \qquad i, j \in M \tag{6.26}$$

$$\begin{aligned} \Leftrightarrow E[T_i] &= t\,\text{Prob}\left\{ \min_{j\neq i}[x_{ji} + \tau_{ji}] \geq t \right\} \\ &\quad + \sum_{j\neq i} \tau_{ji} \Bigg(\text{Prob}\left\{ x_{ji} + \tau_{ji} = \min_{k\neq i}[x_{ki} + \tau_{ki}] \mid \min_{k\neq i}[x_{ki} + \tau_{ki}] < t \right\} \\ &\quad \text{Prob}\left\{ \min_{k\neq i}[x_{ki} + \tau_{ki}] < t \right\} \Bigg) \quad i, j, k \in M \end{aligned} \tag{6.27}$$

Using the probability density function of the second probability in the integral, this is rewritten as

$$\begin{aligned} E[T_i] &= t\int_t^{\infty}\frac{\sum_{j\neq i}\Lambda_{ji}(y)}{\beta}\prod_{j\neq i}\min[1,e^{-(y-\tau_{ji})/\beta}]\mathrm{d}y \\ &\quad+\sum_{j\neq i}\tau_{ji}\int_0^t\Bigg(\text{Prob}\left\{x_{ji}+\tau_{ji}=\min_{k\neq i}[x_{ki}+\tau_{ki}]\mid \min_{k\neq i}[x_{ki}+\tau_{ki}]=y\right\} \\ &\quad\frac{\sum_{k\neq i}\Lambda_{ki}(y)}{\beta}\prod_{k\neq i}\min[1,e^{-(y-\tau_{ki})/\beta}]\Bigg)\mathrm{d}y \quad i,j,k\in M \end{aligned} \tag{6.28}$$

where Λ_{ki} is an indicator function such that $\Lambda_{ki}(y)=0$ if $y<\tau_{ki}$ and $\Lambda_{ki}(y)=1$ if $y\geq\tau_{ki}$. Solving the first integral and substituting the probability term in the second integral then gives

$$\begin{aligned} E[T_i] &= t\prod_{j\neq i}\min[1,e^{-(t-\tau_{ji})/\beta}]\mathrm{d}y \\ &\quad+\sum_{j\neq i}\tau_{ji}\int_0^t\Bigg(\frac{\Lambda_{ji}(x)}{\max[1,\Sigma_{k\neq i}\Lambda_{ki}(x)]} \\ &\quad\frac{\sum_{k\neq i}\Lambda_{ki}(y)}{\beta}\prod_{k\neq i}\min[1,e^{-(y-\tau_{ki})/\beta}]\Bigg)\mathrm{d}y \quad i,j,k\in M \end{aligned} \tag{6.29}$$

which further simplifies to

$$\begin{aligned} E[T_i] &= t\prod_{j\neq i}\min[1,e^{-(t-\tau_{ji})/\beta}]\mathrm{d}y \\ &\quad+\sum_{j\neq i}\tau_{ji}\int_{\tau_{ji}}^t\frac{1}{\beta}\prod_{k\neq i}\min[1,e^{-(y-\tau_{ki})/\beta}]\mathrm{d}y \quad i,j,k\in M \end{aligned} \tag{6.30}$$

Each government is interested in maximizing the average social surplus, S_i, consisting of average household private income, average bank profits per household, and average tax revenue per household as follows

$$S_i\equiv E[I_i]+E[P_i]+\rho E[T_i] \tag{6.31}$$

where $\rho\geq 1$ is the marginal cost of public funds from an alternative source of government revenue. Due to the law of large numbers, the expected values will be very close to the actual observed averages if the number of households is sufficiently large. Hence, a government's attitude to risk does not play a role.

6.A.2 Proof of Proposition 6.1

For every country $i\in M$, having no information exchange at all — such that $\tau_{ij}=0$ for all $j\neq i$ and $j\in M$ — is the strictly dominant strategy over all

other strategies with $\tau_{ij} \geq 0$ for all $j \neq i$ and $\tau_{ij} > 0$ for at least one $j \in M$. Let τ_i be the vector of order $m-1$ containing the different variables τ_{ij}. Let the vector τ_K of order $(m-1)^2$ indicate the information exchange policy of the remaining countries. It consists of the $(m-1)^2$ variables $\tau_{kj} \geq 0$, for all $k, j \in M$ and $k \neq j$ and $k \neq i$. For the proof it is sufficient to show that for all $i \in M$:

$$S_i(\tau_i = 0, \tau_K) > S_i(\tau_i \neq 0, \tau_K) \tag{6.32}$$

$$\Leftrightarrow \quad P_i(\tau_i = 0, \tau_K) > P_i(\tau_i \neq 0, \tau_K) \tag{6.33}$$

$$\Leftrightarrow \quad \delta \textstyle\sum_{j\neq i} \{ \int_0^t \frac{1}{\beta} e^{-\frac{y-0}{\beta}} (\prod_{k\neq i,j} \min\left[1, e^{-\frac{y-\tau_{kj}}{\beta}}\right]) \mathrm{d}y\}$$

$$> \delta \textstyle\sum_{j\neq i} \{ \int_{\tau_{ij}}^t \frac{1}{\beta} e^{-\frac{y-\tau_{ij}}{\beta}} (\prod_{k\neq i,j} \min\left[1, e^{-\frac{y-\tau_{kj}}{\beta}}\right]) \mathrm{d}y\} \tag{6.34}$$

$$\Leftrightarrow \quad \delta \textstyle\sum_{j\neq i} \{ \int_{\tau_{ij}}^{t+\tau_{ij}} \frac{1}{\beta} e^{-\frac{y-\tau_{ij}}{\beta}} (\prod_{k\neq i,j} \min\left[1, e^{-\frac{y-\tau_{kj}-\tau_{ij}}{\beta}}\right]) \mathrm{d}y\}$$

$$> \delta \textstyle\sum_{j\neq i} \{ \int_{\tau_{ij}}^t \frac{1}{\beta} e^{-\frac{y-\tau_{ij}}{\beta}} (\prod_{k\neq i,j} \min\left[1, e^{-\frac{y-\tau_{kj}}{\beta}}\right]) \mathrm{d}y\} \tag{6.35}$$

And the last inequality holds because the integrands on the left-hand side of the inequality are larger or equal to the respective integrands on the right-hand side because $\min[1, e^{-\frac{y-\tau_{kj}-\tau_{ij}}{\beta}}] \geq \min[1, e^{-\frac{y-\tau_{kj}}{\beta}}]$. Furthermore, all integrands are strictly larger than zero and the integrals on the left-hand side have a larger upper limit $t + \tau_{ij}$ than the right-hand side integrals for at least one $j \in M$. This shows that the left-hand side is strictly larger than the right-hand side. □

6.A.3 Proof of Proposition 6.3

The coalition maximizes the aggregate social surplus of members $S_K = \sum_{k\epsilon C} S_k$. Consider $\frac{\partial S_K}{\partial \tau_{ij}}$, where $i \in C$ and $j \in N$. If $\tau_{ij} > t$, then $\frac{\partial S_K}{\partial \tau_{ij}} = 0$. If $\tau_{ij} < t$, then the relevant part of S_K — a summand in the equation describing bank profits — whose derivative with respect to τ_{ij} is not equal to zero, can be written as:

$$\begin{aligned} P_K^j = \quad & \delta \sum_{k\epsilon C_{high}} \int_{\tau_{kj}}^{t} \frac{1}{\beta} \prod_{l\epsilon M\setminus\{j\}} \min[1, e^{-\frac{y-\tau_{lj}}{\beta}}] \mathrm{d}y \\ & + \delta \sum_{k\epsilon C_{low}} \int_{\tau_{kj}}^{\tau_{ij}} \frac{1}{\beta} \prod_{l\epsilon M\setminus\{j\}} \min[1, e^{-\frac{y-\tau_{lj}}{\beta}}] \mathrm{d}y \\ & + \delta \sum_{k\epsilon C_{low}} \int_{\tau_{ij}}^{t} \frac{1}{\beta} \prod_{l\epsilon M\setminus\{j\}} \min[1, e^{-\frac{y-\tau_{lj}}{\beta}}] \mathrm{d}y \end{aligned} \tag{6.36}$$

where C_{high} is the set of countries such that $k \in C$ and $\tau_{kj} > \tau_{ij}$ and $t \geq \tau_{kj}$. The set C_{low} is the set of countries such that $k \in C$ and $\tau_{kj} \leq \tau_{ij}$. The latter

set is never empty, because it always contains at least country i. Taking the derivative (using Leibniz's rule) gives:

$$\begin{aligned}\frac{\partial S_K}{\partial \tau_{ij}} &= \delta\frac{1}{\beta}\sum_{k\epsilon C_{high}}\int_{\tau_{kj}}^{t}\frac{1}{\beta}\prod_{l\epsilon M\setminus\{j\}}\min[1,e^{-\frac{y-\tau_{lj}}{\beta}}]\mathrm{d}y \\ &+\delta\sum_{k\epsilon C_{low}\setminus\{i\}}\frac{1}{\beta}\prod_{l\epsilon M\setminus\{j\}}\min[1,e^{-\frac{\tau_{ij}-\tau_{lj}}{\beta}}]-\delta\sum_{k\epsilon C_{low}}\frac{1}{\beta}\prod_{l\epsilon M\setminus\{j\}}\min[1,e^{-\frac{\tau_{ij}-\tau_{lj}}{\beta}}] \\ &+\delta\frac{1}{\beta}\sum_{k\epsilon C_{low}}\int_{\tau_{ij}}^{t}\frac{1}{\beta}\prod_{l\epsilon M\setminus\{j\}}\min[1,e^{-\frac{y-\tau_{lj}}{\beta}}]\mathrm{d}y \qquad (6.37)\end{aligned}$$

The summands in the first and the last row can be collected in one integral and the summands in the middle row cancel each other out such that the derivative can be written as

$$\begin{aligned}\frac{\partial S_K}{\partial \tau_{ij}} &= \delta\frac{1}{\beta}\int_{\tau_{ij}}^{t}\frac{\sum_{k\epsilon C}\Lambda_{kj}(\tau_{kj},y)}{\beta}\prod_{l\epsilon M\setminus\{j\}}\min[1,e^{-\frac{y-\tau_{lj}}{\beta}}]\mathrm{d}y \\ &-\delta\frac{1}{\beta}\prod_{l\epsilon M\setminus\{j\}}\min[1,e^{-\frac{\tau_{ij}-\tau_{lj}}{\beta}}] \qquad (6.38)\end{aligned}$$

where Λ is an indicator function such that $\Lambda_{kj}(\tau_{kj},y)=0$ if $y<\tau_{kj}$ and $\Lambda_{kj}(\tau_{kj},y)=1$ if $y\geq\tau_{kj}$. The second term contains $\mathrm{Prob}\{\min_{l\neq j}[x_{lj}+\tau_{lj}>\tau_{ij}]\}=\prod_{l\neq j}\min[1,e^{-\frac{\tau_{ij}-\tau_{lj}}{\beta}}]$, which is the probability that the minimum cost of tax evasion for a household from country j is larger than τ_{ij}. This probability can be transformed into an integral such that the derivative can be written as

$$\begin{aligned}\frac{\partial S_K}{\partial \tau_{ij}} &= \delta\frac{1}{\beta}\int_{\tau_{ij}}^{t}\frac{\sum_{k\epsilon C}\Lambda_{kj}(\tau_{kj},y)}{\beta}\prod_{l\epsilon M\setminus\{j\}}\min[1,e^{-\frac{y-\tau_{lj}}{\beta}}]\mathrm{d}y \\ &-\delta\frac{1}{\beta}\int_{\tau_{ij}}^{\infty}\frac{\sum_{l\epsilon M\setminus\{j\}}\Lambda_{lj}(\tau_{lj},y)}{\beta}\prod_{l\epsilon M\setminus\{j\}}\min[1,e^{-\frac{y-\tau_{lj}}{\beta}}]\mathrm{d}y \qquad (6.39) \\ &< 0\end{aligned}$$

The derivative is strictly smaller than zero because the integrand of the second term is at least as large as the integrand of the first term over the whole integration domain, reflecting $\sum_{l\epsilon M\setminus\{j\}}\Lambda_{lj}(\tau_{lj},y)\geq\sum_{k\epsilon C}\Lambda_{kj}(\tau_{kj},y)$. Furthermore, the integrands are strictly larger than zero and the second integral has no upper limit on its domain as the first term has. Hence, $\frac{\partial S_K}{\partial \tau_{ij}}<0$ for $\tau_{ij}<t$. For $\tau_{ij}>t$, the derivative is zero. For $\tau_{ij}=t$, S_K is not differentiable. (As τ_{ij} converges to t from below, the first derivative is strictly negative and does

not converge to zero.) S_K is a continuous function, so the information on the derivative is sufficient to conclude that $S_K(\tau_{ij} = 0) > S_K(\tau_{ij} > 0)$. Hence, $\tau_{ij} = 0$ is a strictly dominant strategy. □

6.A.4 Payoffs as a Function of First-Stage Results

If there is information exchange between the coalition countries, but not between any other pair of countries, then private net-of-all-cost income for a coalition member $i \in C$ as a function of the number of non-cooperating countries n is derived from equation (6.19) in Appendix 6.A.1 by substituting $\tau_{ij} = 0$ for all $\{i, j\}$ such that i or $j \in N$ and substituting $\tau_{ij} = t$ for all $\{i, j\}$ such that i and $j \in C$:

$$I_i^{C*}(n) = \begin{cases} r - \delta - \frac{\beta}{n}\left(1 - e^{-n\frac{t}{\beta}}\right) & \text{if } n > 0 \\ r - \delta - t & \text{if } n = 0 \end{cases} \tag{6.40}$$

Similarly, a coalition member's bank profit is derived from equation (6.25) in Appendix 6.A.1 as

$$P_i^{C*}(n) = \delta \left[e^{-n\frac{t}{\beta}} + \frac{n}{m-1}\left(1 - e^{-(m-1)\frac{t}{\beta}}\right)\right] \tag{6.41}$$

And a coalition member's tax revenue is derived from equation (6.30) in Appendix 6.A.1 as

$$T_i^{C*}(n) = te^{-n\frac{t}{\beta}} \tag{6.42}$$

A coalition member's total payoff is then

$$S_i^{C*}(n) = I_i^{C*}(n) + P_i^{C*}(n) + \rho T_i^{C*}(n) \tag{6.43}$$

which can be rewritten as

$$S^{C*}(n) = \begin{cases} r - \delta - \frac{\beta}{n} + \left(\delta + \rho t + \frac{\beta}{n}\right)e^{-nt/\beta} + \delta\frac{n}{m-1}\left(1 - e^{-(m-1)t/\beta}\right) & \text{if } n > 0 \\ r - \delta - t + (\delta + \rho t)\, e^{-nt/\beta} + \delta\frac{n}{m-1}\left(1 - e^{-(m-1)t/\beta}\right) & \text{if } n = 0 \end{cases} \tag{6.44}$$

The function is twice continuously differentiable for all $n \in [0, m-1]$.

The respective payoff functions can also be stated for the countries $i \in N$ that have chosen not to cooperate in the first stage. Their payoffs are

$$I_i^{N*}(n) = r - \delta - \frac{\beta}{m-1}\left(1 - e^{-(m-1)\frac{t}{\beta}}\right) \tag{6.45}$$

$$P_i^{N*}(n) = \delta \left[e^{-(m-1)\frac{t}{\beta}} + \frac{c}{n}\left(1 - e^{-n\frac{t}{\beta}}\right) + \frac{n-1}{m-1}\left(1 - e^{-(m-1)\frac{t}{\beta}}\right)\right] \tag{6.46}$$

$$T_i^{N*}(n) = te^{-(m-1)\frac{t}{\beta}} \tag{6.47}$$

Their total payoff is given by

$$S_i^{N*}(n) = I_i^N(n) + P_i^N(n) + \rho T_i^N(n) \tag{6.48}$$

which can be rewritten as

$$\begin{aligned} S^{N*}(n) &= r - \delta - \frac{\beta}{m-1} + \left(\delta\frac{m-n}{n} + \rho t + \frac{\beta}{m-1}\right) e^{-(m-1)t/\beta} \\ &\quad + \delta\frac{m-n}{n}\left(1 - e^{-nt/\beta}\right) + \delta\frac{n-1}{m-1} \end{aligned} \tag{6.49}$$

The function is twice continuously differentiable for all $n \in [0, m-1]$. The values in the domain $n \in (m-1, m)$ are not of any interest because $S^{N*}(m-1) = S^{N*}(m)$ always holds. The second-stage equilibrium is the same if no country or only one country decides to cooperate in the first stage. In either case, there is no meaningful coalition that could exchange information.

If there is no information exchange between the coalition countries, then the payoff for all countries — cooperating or not — is found by substituting $\tau_{ij} = 0$ for all $\{ij\}$ in equations (6.19), (6.25), and (6.30) in Appendix 6.A.1. Then private net-of-all-cost income, bank profits, and tax revenues are

$$I^o = r - \delta - \frac{\beta}{m-1}\left(1 - e^{-(m-1)\frac{t}{\beta}}\right) \tag{6.50}$$

$$P^o = \delta\left[e^{-(m-1)\frac{t}{\beta}} + \left(1 - e^{-(m-1)\frac{t}{\beta}}\right)\right] \tag{6.51}$$

$$T^o = te^{-(m-1)\frac{t}{\beta}} \tag{6.52}$$

Social surplus is then:

$$\begin{aligned} S^o &= I^o + P^o + \rho T^o \\ &= r - \frac{\beta}{m-1} + \left(\rho t + \frac{\beta}{m-1}\right) e^{-(m-1)\frac{t}{\beta}} \end{aligned} \tag{6.53}$$

6.A.5 Proof of Proposition 6.4

The proposition is true if it can be proven that $S^{C*}(0) - S^o > 0$ for all possible parameter values $\delta \geq 0$, $\rho \geq 1$, $t > 0$, $\beta > 0$ and $m \geq 3$.

Proof: For all $x \neq 0$, it holds that $e^x - 1 > x$. Due to $t > 0$ and $m - 1 > 0$, this is equivalent to:

$$e^{(m-1)\frac{t}{\beta}} - 1 > (m-1)\frac{t}{\beta} \quad (6.54)$$

$$\Leftrightarrow \quad -(m-1)\frac{t}{\beta}e^{-(m-1)\frac{t}{\beta}} + \left(1 - e^{-(m-1)\frac{t}{\beta}}\right) > 0 \quad (6.55)$$

$$\Leftrightarrow \quad \left(t + \frac{\beta}{m-1}\right)\left(1 - e^{-(m-1)\frac{t}{\beta}}\right) > t \quad (6.56)$$

As $\rho \geq 1$, one can deduce :

$$\left(\rho t + \frac{\beta}{m-1}\right)\left(1 - e^{-(m-1)\frac{t}{\beta}}\right) - t > 0 \quad (6.57)$$

$$\Leftrightarrow \quad S^{C*}(0) - S^o > 0 \quad (6.58)$$

□

6.A.6 Proof of Proposition 6.5

A coalition of size $c = m - n$ decides to exchange information if $S^{C*}(n) - S^o > 0$. The specific form of this decision function is

$$S^{C*}(n) - S^o = \left(\delta + \rho t + \frac{\beta}{n}\right)e^{-n\frac{t}{\beta}} + \frac{\delta n + \beta}{m-1}\left(1 - e^{-(m-1)\frac{t}{\beta}}\right) - \delta - \frac{\beta}{n} - \rho t e^{-(m-1)\frac{t}{\beta}} \quad (6.59)$$

Proposition 6.4 has already proven that $S^{C*}(0) - S^o > 0$. Furthermore, $S^{C*}(m-1) - S^o = 0$ because one 'cooperating' country exchanging information exclusively with itself and $m - 1$ non-cooperating countries that do not exchange any information are equivalent to the situation, in which a coalition — irrespective of its size — decides against information exchange. In both cases there is no information exchange between any pair of countries. The first, second, and third derivatives of $S^{C*}(n) - S^o$ are

$$\frac{\partial S^{C*}(n)}{\partial n} = -\frac{t}{\beta}\left(\delta + \rho t + \frac{\beta}{n}\right)e^{-n\frac{t}{\beta}} + \beta\frac{1}{n^2}\left(1 - e^{-n\frac{t}{\beta}}\right) + \frac{\delta}{m-1}\left(1 - e^{-(m-1)\frac{t}{\beta}}\right) \quad (6.60)$$

$$\frac{\partial^2 S^{C*}(n)}{\partial n^2} = \left(\frac{t}{\beta}\right)^2\left(\delta + \rho t + \frac{\beta}{n}\right)e^{-n\frac{t}{\beta}} + 2\beta\frac{t}{\beta}\frac{1}{n^2}e^{-n\frac{t}{\beta}} - 2\beta\frac{1}{n^3}\left(1 - e^{-n\frac{t}{\beta}}\right) \quad (6.61)$$

$$\frac{\partial^3 S^{C*}(n)}{\partial n^3} = -\left(\frac{t}{\beta}\right)^3\left(\delta + \rho t + \frac{\beta}{n}\right)e^{-n\frac{t}{\beta}} - 3\beta\left(\frac{t}{\beta}\right)^2\frac{1}{n^2}e^{-n\frac{t}{\beta}} - 6\beta\frac{t}{\beta}\frac{1}{n^3}e^{-n\frac{t}{\beta}} + 6\beta\frac{1}{n^4}\left(1 - e^{-n\frac{t}{\beta}}\right) \quad (6.62)$$

Following conditions have to be proven: $S^{C*}(n-1) > S^{C*}(n)$ and $S^{C*}(n-1) - S^{C*}(n) > S^{C*}(n) - S^{C*}(n+1)$ if $S^{C*}(n) > 0$.

Proof: For the grand coalition $S^{C*}(0) - S^o > 0$, whereas without any cooperation $S^{C*}(m-1) - S^o = 0$. It will be proven that there is no interior maximum for the function $S^{C*}(n) - S^o$ and at most one interior minimum. If there is no minimum then the function $S^{C*}(n) - S^o$ is strictly decreasing and strictly convex (which would prove the proposition). If there is a minimum at some point n^{min}, then $S^{C*}(n^{min}) - S^o < 0$ and the function $S^{C*}(n) - S^o$ is strictly decreasing and strictly convex for all $n \in [0, n^{min}]$. Furthermore, $S^{C*}(n) - S^o \leq 0$ for all $n \in [n^{min}, m-1]$ (which again proves the proposition).

First, it is shown that there is no interior maximum:

$$\lim_{n\to 0} \frac{\partial^2 S^{C*}(n)}{\partial n^2} = \lim_{n\to 0} \left[\left(\frac{t}{\beta}\right)^2 \left(\delta + \rho t + \frac{\beta}{n}\right) e^{-n\frac{t}{\beta}} + 2\beta \frac{t}{\beta}\frac{1}{n^2} e^{-n\frac{t}{\beta}} - 2\beta \frac{1}{n^3}\left(1 - e^{-n\frac{t}{\beta}}\right) \right] \tag{6.63}$$

$$= \lim_{n\to 0} \left[\left(\frac{t}{\beta}\right)^2 (\delta + \rho t) e^{-n\frac{t}{\beta}} - 2\beta \frac{1}{n^3} + \left(\frac{\beta}{n} + 2\beta \frac{t}{\beta}\frac{1}{n^2} + 2\beta \frac{1}{n^3}\right) e^{-n\frac{t}{\beta}} \right] \tag{6.64}$$

$$= \left(\frac{t}{\beta}\right)^2 (\delta + \rho t) + \lim_{n\to 0} \left[-2\beta \frac{1}{n^3} + \left(\frac{\beta}{n} + 2\beta \frac{t}{\beta}\frac{1}{n^2} + 2\beta \frac{1}{n^3}\right) \left(\sum_{k=0}^{\infty} \frac{(-n(t/\beta))^k}{k!} \right) \right] \tag{6.65}$$

$$= (t/\beta)^2 (\delta + \rho t - \frac{1}{3} t) > 0 \tag{6.66}$$

Furthermore, $\frac{\partial^2 S^{C*}(n)}{\partial n^2} \leq 0 \Rightarrow \frac{\partial^3 S^{C*}(n)}{\partial n^3} > 0$ for all n such that $n(t/b) + t/(\delta + \rho t) < 3$ because

$$\frac{\partial^2 S^{C*}(n)}{\partial n^2} \leq 0 \tag{6.67}$$

$$\Rightarrow 2\beta \frac{1}{n^3}\left(1 - e^{-n\frac{t}{\beta}}\right) \geq \left(\frac{t}{\beta}\right)^2 \left(\delta + \rho t + \frac{\beta}{n}\right) e^{-n\frac{t}{\beta}} + 2\beta \frac{t}{\beta}\frac{1}{n^2} e^{-n\frac{t}{\beta}} \tag{6.68}$$

$$\Leftrightarrow 6\beta \frac{1}{n^4}\left(1 - e^{-n\frac{t}{\beta}}\right) \geq \frac{1}{n} 3 \left(\frac{t}{\beta}\right)^2 \left(\delta + \rho t + \frac{\beta}{n}\right) e^{-n\frac{t}{\beta}} + 6\beta \frac{t}{\beta}\frac{1}{n^3} e^{-n\frac{t}{\beta}} \tag{6.69}$$

$$> \left(\frac{t}{\beta}\right)^3 \left(\delta + \rho t + \frac{\beta}{n}\right) e^{-n\frac{t}{\beta}} + 3\beta \left(\frac{t}{\beta}\right)^2 \frac{1}{n^2} e^{-n\frac{t}{\beta}} + 6\beta \frac{t}{\beta}\frac{1}{n^3} e^{-n\frac{t}{\beta}} \tag{6.70}$$

$$\Rightarrow \frac{\partial^3 S^{C*}(n)}{\partial n^3} > 0 \tag{6.71}$$

Suppose $\frac{\partial^2 S^{C*}(n)}{\partial n^2} \leq 0$ for any $\hat{n}$ such that $n(t/b) + t/(\delta + \rho t) < 3$, then by the continuity of the second and third derivative $\frac{\partial^2 S^{C*}(n)}{\partial n^2} < 0$ for all $n < \hat{n}$ which contradicts $\lim_{n\to 0} \frac{\partial^2 S^{C*}(n)}{\partial n^2} > 0$. Hence, $\frac{\partial^2 S^{C*}(n)}{\partial n^2} > 0$ for all n such that $n(t/b) + t/(\delta + \rho t) < 3$ and there can be no interior maximum on that domain.

Similarly, $\frac{\partial S^{C*}(n)}{\partial n} \leq 0 \Rightarrow \frac{\partial^2 S^{C*}(n)}{\partial n^2} > 0$ for all n such that $2 < n(t/b) + t/(\delta + \rho t)$ because

$$\frac{\partial S^{C*}(n)}{\partial n} \leq 0 \tag{6.72}$$

$$\Rightarrow \beta \frac{1}{n^2}\left(1 - e^{-n\frac{t}{\beta}}\right) \leq \frac{t}{\beta}\left(\delta + \rho t + \frac{\beta}{n}\right)e^{-n\frac{t}{\beta}} \tag{6.73}$$

$$\Leftrightarrow 2\beta \frac{1}{n^3}\left(1 - e^{-n\frac{t}{\beta}}\right) \leq 2\frac{1}{n}\frac{t}{\beta}\left(\delta + \rho t + \frac{\beta}{n}\right)e^{-n\frac{t}{\beta}} \tag{6.74}$$

$$< \left(\frac{t}{\beta}\right)^2\left(\delta + \rho t + \frac{\beta}{n}\right)e^{-n\frac{t}{\beta}} + 2\beta\frac{t}{\beta}\frac{1}{n^2}e^{-n\frac{t}{\beta}} \tag{6.75}$$

$$\Rightarrow \frac{\partial^2 S^{C*}(n)}{\partial n^2} > 0 \tag{6.76}$$

This proves that there can be no interior maximum for all n such that $2 < n(t/b) + t/(\delta + \rho t)$. In conjunction with the fact that there is no interior maximum for all n such that $n(t/b) + t/(\delta + \rho t) < 3$, this excludes the existence of any interior maximum for all $n \in (0, m-1)$. If this is the case, then there exists at most one interior minimum.

If an interior minimum does not exist, then $S^{C*}(n) - S^o$ must monotonically decrease over the whole domain of $n \in [0, m-1]$ (as $S^{C*}(0) > S^o$). In fact, the second derivative is strictly positive on the domain n such that $n(t/b) + t/(\delta + \rho t) < 3$ and on the domain n such that $2 < n(t/b) + t/(\delta + \rho t)$, $\frac{\partial S^{C*}(n)}{\partial n} \leq 0$ implies $\frac{\partial^2 S^{C*}(n)}{\partial n^2} > 0$. Therefore, the second derivative is strictly positive on the whole domain. The function $S^{C*}(n) - S^o$ is strictly convex.

If an interior minimum at n_{min} does exist, then $S^{C*}(n) - S^o < 0$ for all $n \in [n_{min}, m-1)$ and $S^{C*}(n) - S^o$ must decrease monotonically for all $n \in [0, n_{min}]$. In fact, $\frac{\partial^2 S^{C*}(n)}{\partial n^2} > 0$ for all $n \in [0, n_{min}]$ because the second derivative is strictly positive on the domain n such that $n(t/b) + t/(\delta + \rho t) < 3$ and on the domain n such that $2 < n(t/b) + t/(\delta + \rho t)$, $\frac{\partial S^{C*}(n)}{\partial n} \leq 0$ implies $\frac{\partial^2 S^{C*}(n)}{\partial n^2} > 0$. □

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SAMENVATTING (SUMMARY IN DUTCH)

Dit proefschrift, met als titel *Belastingconcurrentie en belastingontduiking in een gedecentraliseerde wereld*, onderzoekt hoe de structuur van multinationale bedrijven door het belastingbeleid van landen wordt vormgegeven. Tevens verkent deze dissertatie hoe de overheid belasting op kapitaalinkomsten van individuen zou kunnen heffen in een globaliserende wereld waarbij het voor individuen eenvoudiger wordt hun rente-inkomsten buiten het gezichtsveld van hun eigen belastingdienst te houden.

Diverse studies hebben aangetoond dat buitenlandse directe investeringen door lage belastingtarieven worden aangetrokken. Het is gebruikelijk om belasting op deze investeringen te heffen via het bronlandbeginsel, dat kapitaalinkomen belast in het land waar dat wordt gegenereerd. In een dergelijk systeem zullen afzonderlijke landen met elkaar concurreren ten aanzien van de belastingtarieven; zij zullen elkaar onderbieden in een *race to the bottom* om buitenlandse ondernemingen aan te trekken en te behouden. Dit proefschrift bouwt voort op deze inzichten en toont empirisch aan dat ook de organisatiestructuur van multinationale ondernemingen door de internationale belastingwetgeving wordt beïnvloed. Bij grensoverschrijdende fusies en overnames is het fiscaal aantrekkelijk om het hoofdkantoor in het land te vestigen dat een laag belastingtarief heft op in het buitenland gerealiseerde bedrijfswinsten. Dit blijkt uit een econometrische analyse van de drijfveren van grensoverschrijdende fusies en overnames gebruikmakend van data op bedrijfsniveau. Ditzelfde verschijnsel kan ook vanuit een macro-economisch perspectief worden bestudeerd door gebruik te maken van een empirisch zwaartekrachtmodel gebaseerd op data voor het totale aantal grensoverschrijdende

fusies en overnames per landenpaar. De analyse toont aan dat een lager binnenlands tarief van de winstbelasting resulteert in een groter aantal overnames door buitenlandse bedrijven. Deze bedrijven zijn uiteraard alleen afkomstig uit die landen die dit lagere belastingtarief op hun beurt niet neutraliseren door een hoger tarief te heffen over de uit het buitenland gerepatrieerde winsten. Ondernemingen met een hoofdkantoor in een land zonder dubbele belasting op internationale winsten genieten dus een voordeel bij het overnemen van (delen van) andere ondernemingen.

Vervolgens rijst de vraag hoe een overheid de voorziening van collectieve goederen en diensten alsmede de doelstelling van inkomensherverdeling nog kan realiseren als multinationale ondernemingen — vanwege de mogelijkheid om economische activiteiten reëel of virtueel tussen landen heen en weer te schuiven — niet direct belast kunnen worden. Hogere belastingtarieven op het arbeidsinkomen of op de particuliere consumptie zijn in principe mogelijk, maar pakken ongetwijfeld electoraal slecht uit. Een hoger tarief van de consumptiebelasting maakt de inkomensverdeling van een land waarschijnlijk veel minder gelijk. De Organisatie voor Economische Samenwerking en Ontwikkeling (OESO) pleit er dan ook voor om belasting op het kapitaalinkomen van huishoudens te heffen op basis van het woonlandbeginsel, waarbij een ingezetene wordt belast op zijn wereldwijde inkomen in het thuisland. Dit systeem zou de maatschappelijke welvaart kunnen verhogen in vergelijking met een systeem gebaseerd op het bronlandbeginsel, aangezien individuen minder geneigd zijn vanwege fiscale redenen van domicilie te veranderen dan ondernemingen (waardoor de belasting minder verstorend zal zijn).

Er doet zich evenwel een praktisch probleem voor bij het naleven van het woonlandbeginsel. Zoals het recente schandaal rondom belastingontduiking in Liechtenstein duidelijk heeft gemaakt, ondervinden belastingautoriteiten grote problemen om belastinginformatie te vergaren over het buitenlands vermogen van ingezetenen. Uiteindelijk heeft de binnenlandse belastingautoriteit alleen soevereiniteit ten aanzien van belastingheffing en informatieverwerving binnen de eigen landsgrenzen. Hierdoor hebben individuele belastingplichtigen echter weinig tot geen prikkels om rente-inkomsten uit het buitenland te rapporteren. Dit probleem zou kunnen worden opgelost door uitwisseling van belastinginformatie tussen nationale belastingautoriteiten. Indien een belastingverdrag wordt afgesloten, is dit kosteloos mogelijk. Onder welke omstandigheden zullen landen bereid zijn informatie uit te wisselen? In theorie is vrijwillige uitwisseling van informatie tussen twee landen mogelijk als de nationale overheid relatief veel waarde toekent aan belastinginkomsten, in-

gezetenen veel financieel kapitaal in het buitenland aanhouden ten opzichte van hun binnenlandse beleggingen en het binnenlandse marginale tarief van de inkomstenbelasting hoog genoeg is om een prikkel tot belastingontduiking te vormen. Aan de hand van een empirische analyse voor Nederland (uitgaande van informatie ontvangen van partnerlanden) wordt aangetoond dat de genoemde factoren ook in de praktijk een rol spelen. Op één punt falen de geponeerde hypothesen echter. Een land zou minder belang bij informatie-uitwisseling hebben als een binnenlandse bronbelasting wordt geheven op het kapitaalinkomen van niet-ingezetenen. Informatieverschaffing zal namelijk belastingontduikende buitenlandse spaarders afschrikken, hetgeen een negatief effect heeft op de opbrengsten van de bronbelasting geheven op renteinkomsten van deze groep. Waarschijnlijk kan het uitblijven van empirisch bewijs voor de bovenstaande hypothese worden verklaard doordat theoretische modellen uitgaan van een hypothetische wereld met slechts twee landen. Ingezetenen die de belasting willen ontduiken hebben in dat geval maar één keuze om hun kapitaal buiten het gezichtsveld van hun eigen belastingdienst te houden. Een land kan dan een bronbelasting heffen op buitenlands kapitaal zoals een monopolist prijzen zet.

De bestaande theorie schiet dus tekort betreffende het modeleren van de strategische interactie tussen belastingautoriteiten. Daarom wordt in dit proefschrift, als laatste stap, een analytisch model ontwikkeld waarin meerdere landen op het gebied van de informatie-uitwisseling interageren. Uit het model blijkt dat de maatschappelijk optimale uitkomsten alleen door een multilaterale aanpak kunnen worden gerealiseerd. Bilaterale belastingverdragen zijn echter de usance op het gebied van informatie-uitwisseling, terwijl een multilaterale aanpak gebruikelijk is bij internationale handels- en milieuverdragen. Verder toont het model aan dat factoren, zoals een grotere kapitaalmobiliteit, die conform de intuïtie nadelig voor de uitwisseling van informatie zou moeten zijn, juist een samenwerking tussen alle landen in de hand kan werken.