The central role of Dutch financing companies in tax avoidance strategies

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Abstract

Multinational corporations use various strategies to reduce their total tax burden. Some of these strategies involve the shifting of income among affiliates. This may substantially reduce corporate tax revenues in host countries where the subsidiaries are located as well as in the home country of the ultimate parent company. Previous studies show that affiliate leverage increases with home country tax rate, mainly as a result of internal debt shifting, and suggest that multinationals are able to effectively defer home country residual taxes on foreign dividend income. Research on the use of special tax planning affiliates by multinational corporations has been fairly limited so far.

This thesis investigates how the use of Dutch financing affiliates affects the capital structure of European multinationals. Micro data is obtained from the commercial Reach and Amadeus company databases and the effect of Dutch financing affiliates is analysed using multilevel estimation. It may be first study providing statistical evidence that financing affiliates in third countries, other than standard tax havens, play a central role in the internal capital structure and tax avoidance strategies of multinational corporations.

Significant effects are found for Dutch group financing companies, but not for other types of Dutch financing entities. Group financing companies function as a bank within a large multinational and probably have a central role in the reallocation of income and capital among affiliates. Their use is associated with much higher sensitivity of affiliate leverage to host country tax rates and lower sensitivity to affiliate profitability. The average effect is to reduce affiliate leverage. This combination of results suggests that Dutch group financing companies facilitate internal debt shifting as well as tax deferral. However, the precise roles of different types of financing entities are not yet fully understood.

Contents

1   Introduction

Multinational corporations use various strategies to reduce their total tax burden. Some of these strategies involve the shifting of income among affiliates to a country where lower or no taxes apply. This may substantially reduce corporate tax revenues in host countries where the subsidiaries are located as well as in the home country of the ultimate parent company.

The size of tax avoidance is probably largest in high-income countries because these receive more Foreign Direct Investment (FDI), both in absolute terms and relative to their Gross Domestic Product (GDP) (UNCTAD 2006). However, the effect is also relevant for low- and middle-income countries, because in these countries corporate tax revenues typically account for a much larger share of total tax revenues. The table below shows the proportions for six regions in 1995-1997. A more recent overview is not available.

Table 1: Corporate tax revenues per region in 1995-1997.

Region	Sample size (countries)	Corporate tax (% of GDP)	Total tax (% of GDP)	Corporate tax (% of total tax)
Europe[a]	18	2.9	39.4	7.4
US and Canada	2	3.0	32.6	9.2
Africa	8	2.4	19.8	12.1
Latin America	14	2.3	18.0	12.8
Asia	9	3.0	17.4	17.2
Middle East	7	3.2	18.1	17.7

Source: based on Tanzi and Zee (2000), p. 8, 13.
Notes: [a] all OECD members (as of 1997) excl. Czech Republic, Hungary, and Poland.

Developing countries require considerable financial resources for poverty reduction. Estimates of the additional financing required to achieve the Millennium Development Goals (MDGs) by 2015, such as universal primary education and halving extreme poverty worldwide, range from $40 billion (Devarajan *et al.* 2002) to well over $100 billion (UN Millennium Project 2005) per year. Over the past decades, the focus of increasing development financing has been largely on debt relief and foreign aid, and more recently also on FDI flows. Attention for raising tax revenues from foreign corporations and other domestic government revenues, in contrast, has been relatively limited so far.

This is quite surprising, given that there might be considerable potential for increasing these revenues. A policy paper by Oxfam GB, for example, roughly estimated that the tax revenues lost in developing countries due to corporate tax avoidance and evasion would amount to tens of billions of dollars (Oxfam 2000). The copper mining operations of Exxon (now ExxonMobil) in Chile provide an illustrative example. A large mine was acquired by Exxon for US$ 80 million and reported operating losses for 23 years, accumulating US$ 575 million in tax credits. During this period, however, it transferred large amounts of income to an affiliate on Bermuda through intra-group interest payments. In 2002, Exxon sold the mine to Anglo American for US$ 1.3 billion, which indicates that it was in fact a highly profitable enterprise (Riesco *et al.* 2005). This example demonstrates that large scale tax avoidance by multinationals does indeed occur in practice.

In host countries, tax law can facilitate tax avoidance by foreign owned companies, and insufficient capacity of revenue authorities could play a role as well. However, the opportunities for tax avoidance do not depend on host countries alone. They also depend on the tax regime in the home country of the ultimate parent company and in third countries where other affiliates may be established.

Many tax avoidance constructions involve affiliates in tax havens, such as Bermuda or the British Virgin Islands, where income of foreign owned corporations is taxed at a very low rate or not taxed at all. Some other countries with normal taxes for most business activities also offer very low

rates for specific types of business activities. Examples are Luxembourg, Switzerland, Belgium and until recently the Netherlands, which are competing to attract financing operations. Often tax avoidance constructions involve conduit countries as well, to reduce withholding taxes on intra-group payments or to enable tax deferral. These strategies are explained in more detail in the next section. Note that some ownership structures are also driven by investment protection or other non-fiscal reasons, but probably these constitute a small share of all constructions involving third countries.

It turns out that many conduit constructions involve affiliates in the Netherlands. These affiliates are officially registered by the Dutch Central Bank (DNB) as Special Financial Institutions (SFIs). According to the DNB definition, SFIs are foreign owned and are used at least partly for fiscal reasons. The SFI register is not public. The volume of investments using SFI structures is enormous: 13% of all inward FDI stocks worldwide is held via some 10,000 Dutch SFIs (Weyzig & Van Dijk 2007). This makes the Netherlands the largest conduit country worldwide. This thesis focuses on the role of Dutch SFIs in tax planning constructions and the associated impact on tax revenues in other countries.

The research options are severely constrained by limited data availability. Whereas financing and royalty constructions are both interesting, for example, data on royalty payments is unavailable, even on an aggregated basis. Similarly, it would be interesting to focus on consequences for developing countries, but in practice this is not possible. Even macro data are insufficient in this case, as there are for example no comprehensive statistics on corporate tax revenues in developing countries (Cobham 2007). Finally, aggregate statistics on SFIs are available (Weyzig & Van Dijk 2007), but not sufficiently detailed to estimate effects for individual host countries. The analysis therefore uses micro data from commercial company databases from Bureau van Dijk, notably Amadeus, to investigate how the use of Dutch financing SFIs affects the capital structure of European multinationals.

The outline of the rest of this thesis is as follows. Chapter 2 provides some essential background on corporate taxation in general and the Dutch tax system in particular and chapter 3 reviews previous studies on tax avoidance strategies. Chapter 4 presents the three hypotheses that are being tested and briefly explains multilevel estimation, the main method of analysis used in this thesis. Chapter 5 explains in detail how the data set has been constructed and describes the characteristics of the selected companies. The results of the regressions are described in chapter 6. The last chapter summarises the conclusions of the research and reflects on the findings.

2   Background on tax avoidance constructions

2.1   Company responses to corporate taxation

Corporate tax systems differ per country and therefore companies that conduct business in different countries are faced with different corporate tax systems. This is especially relevant for large multinational corporations that are present in many countries around the world. In general, companies have different ways of responding to these differences. Tax considerations may influence the location of real business operations, such as the location of plants, stores and offices. In some cases, the parent company of a multinational, or subsidiaries with a specific function within the group of companies belonging to the multinational, are also incorporated in special jurisdictions mainly for fiscal reasons. Such establishments may or may not have a real economic presence. Differences among corporate tax systems may also influence the allocation of profit. This is possible because of intra-group transactions, such as intra-group trade, loans, or royalty payments, that allow a considerable degree of freedom in allocating profits among affiliates within a multinational group.

Devereux (2006) proposes a decision tree for multinational corporations to separate the responses into four hierarchical decision making levels. First, a company that wants to sell in a foreign market chooses to produce abroad or to export its products. In case of producing abroad, the second decision is the choice of location. The third level involves choosing the level of investment, conditional on the choice of location. Finally, a company decides on the allocation of profit among affiliates and the parent company and on the level of internal dividend payout, by subsidiaries producing abroad to the parent company.

This decision tree helps to clarify the decision levels covered by an empirical study and the implicit assumptions that are made about decisions at other levels. In addition, it helps to identify the most relevant measure of corporate taxes. At the first and second level, concerning discrete location choices, theory predicts that effective average tax rate is most relevant, because it applies to the total production at a location. At the third and fourth level, the effective marginal tax rate (EMTR) is most relevant, because this is the rate that applies to the marginal return on investments and profit reallocation. In practice, however, most studies find that with regard to the first and second level, both measures of taxation have a significant impact (Devereux 2006).

The main drawback of this decision tree is that it is focussed on production locations only. Thus, it does not separately include decisions about the use of tax planning affiliates, which is the main subject of this thesis. In general, the use of tax planning affiliates can influence decisions at each level. The present study analyses financing constructions involving tax planning affiliates, which are expected to facilitate the shifting of income among affiliates in the form of intra-group interest payments. This corresponds to the fourth level of the decision tree. To what extent the location of affiliates for real business purposes is jointly determined with income shifting is not covered in this study.

Income shifting, resulting in other levels of affiliate profits than would have been the case if the enterprise did not belong to a multinational, can take various forms. Sometimes income is shifted to tax haven affiliates, but this is not necessarily the case. In principle, tax savings can be achieved by shifting income between affiliates in any two countries with a different effective marginal tax rate. The main forms of income shifting are the following:

- overpricing of exports from a low tax to a high tax country;
- underpricing of exports from a high tax to a low tax country;
- above normal royalty payments from a high tax to a low tax country, potentially involving the ownership of patents, trademarks, and other intangible property by affiliates in countries where (royalty) income is low-taxed;

- above normal interest payments from a high tax to a low tax country, often through the substitution of equity investment by intra-group borrowings, and potentially involving group financing companies located in countries where (intra-group interest) income is low-taxed.

These income shifting strategies are legally allowed as long as tax authorities do not regard the prices for intra-group transactions, of which the fair market value is often hard to determine, unacceptably high or low. Above normal royalty and interest payments are similar to transfer pricing in some aspects, but there are important differences too. In contrast to traded inputs, royalties or interest may be subject to withholding taxes. These are taxes levied on certain types of international payments. The standard rates are determined by the host country, but in tax treaties the rates of withholding tax are often reduced on a bilateral basis. Furthermore, income shifting via transfer pricing requires intra-firm trade of real (tangible) goods with an affiliate in a low tax country, whereas royalties require the location of intangible property or in a low tax country only. Debt shifting often involves intra-group loans, but in its broadest sense, it may include the substitution of equity capital by external debt as well, a strategy that is also available to domestic companies.

A low foreign tax rate, compared to the country where the parent is located, may induce another type of tax planning well. It provides an incentive for multinationals based in a country with a tax credit system for foreign income, such as the UK or US, to achieve tax deferral by investing via an intermediate holding established in a country with an exemption system.[1] This could shield repatriated dividends from home country residual tax. In general, the residual tax is equal to the difference of the tax that would have been paid in the home country on the underlying profits out of which a dividend is paid and the tax that has actually been paid in the host country. Tax deferral means that such a tax does not arise as long as the profits are not repatriated to the parent in the form of dividends. In principle, the income distributed to the intermediate holding can be reinvested in other foreign affiliates or lent to any group affiliate to the parent without residual tax being levied.

Multi-layered holding structures may serve to achieve both tax deferral and lower withholding taxes on dividends. For this purpose, an intermediary holding is usually located in a country with a high number of tax treaties to reduce or eliminate withholding taxes between the source and the intermediate country and, if dividend income is repatriated further upwards, between the intermediate and the home or other destination country. A multinational may use similar conduit structures for royalties and interest payments. In that case, in principle the conduit affiliate does not have to be an intermediary holding, although in practice the two sometimes coincide.

2.2   The Dutch tax system

Dutch affiliates are widely used in tax avoidance strategies. The attractiveness of the Netherlands results from several factors (Weyzig & Van Dijk 2007):

- a participation exemption, which exempts dividends and capital gains arising from foreign subsidiaries from corporate income tax in the Netherlands;
- a large tax treaty network that substantially reduces withholding taxes on dividend, interest and royalty payments between treaty countries and the Netherlands;
- the possibility to conclude advance tax rulings with the Dutch tax authorities that provide certainty in advance to multinationals on how the income of their Dutch subsidiaries will be taxed in case of complex international transactions;

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[1] For a more elaborate explanation of credit and exemption systems, see e.g. Desai, Foley and Hines (2003).

- a special regime for group financing companies, which offers very low tax rates on interest received from loans to subsidiaries, while interest payments can be deducted at the normal tax rate abroad;
- zero withholding taxes on outgoing interest and royalties;
- general factors, such as legal security and political and economic stability.

This makes the Netherlands especially attractive for all types of conduit structures and for deferral and financing arrangements (Mintz 2004). The normal corporate tax rate in the Netherlands is not very low, at least not when compared to low-tax EU countries such as Ireland and Cyprus. Therefore Dutch affiliates are not widely used in transfer pricing arrangements (Muller *et al.* 2004). This study focuses on financing activities and financing conduits.

Special note should be made of the Dutch regime on Group Financing Activities (GFA)[2]. The GFA regime offers an effective tax rate of 6-10% on the balance of interest received minus interest paid on loans to and from foreign affiliates. The lowest effective tax rate, equal to one fifth of the normal statutory tax rate (STR), applies to interest income that is later reinvested in subsidiaries as equity capital. In 2003, the GFA regime was found to be in breach of the EU competition law and was discontinued. Companies can no longer apply for the regime, but it will remain in force until 2011 for companies that were already using the arrangement. These are less than a hundred companies, probably most of them very large multinationals. For most companies using the regime, possibly accounting for over three quarters of the associated financial flows, it will end in 2007 or 2008 already (Weyzig & Van Dijk 2007).

2.3   Special Financial Institutions (SFIs)

DNB maintains a special register for what it refers to as Special Financial Institutions (SFIs)[3]. SFIs are defined as:

> *"Netherlands-based companies or institutions whose shares are held directly or indirectly by non-residents, which specialise in raising funds outside the Netherlands and on-lending or investing them outside the Netherlands. The funds raised by these institutions are onlent or invested almost entirely within the group of which they form part. These institutions are based in the Netherlands partly for fiscal reasons, enjoying tax advantages either in the Netherlands, or in the country where the parent company is established."* (DNB 2003)

According to DNB, about 75% of SFIs are managed by trust offices (DNB 2007) and may not have a real economic substance. In conformance with their purpose, DNB identifies the following three types of SFIs (DNB 2004).

- **Financing companies:** companies whose purpose is to take up and on-lend funds obtained from international capital markets, from the parent company, or from financing affiliates in tax havens. Some financing companies issue bonds or stocks and provide the funds to affiliates outside the Netherlands that belong to the same multinational group of companies. Some financing companies can also be regarded as the internal bank of a multinational.

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[2] In Dutch: *Concernfinancieringsactiviteiten (CFA).*
[3] In Dutch: *Bijzondere Financiële Instellingen (BFIs).*

- **(Sub-) Holding companies:** companies that manage participations outside the Netherlands, distribute dividend gained from the participations to the parent company and perform acquisitions on behalf of the parent company.
- **Royalty and film right companies:** companies that exploit licences, patents and film rights for their parent companies.

Only the first type is analysed here. However, apart from the three main types, SFIs may also perform a combination of the activities mentioned above. As was mentioned in the introduction, the SFI register is not public and it is not possible to determine with certainty whether a company is an SFI and if so, of what type. Although no public data are available on the transactions associated with each type, it is known that financing companies account for the largest magnitude of cross-border transactions, followed by holding companies (DNB 2004). Royalty and film right companies constitute only a limited number of SFIs with a small share in the total volume of transactions.

SFIs account for the large majority of Dutch FDI stocks and flows and are not included in regular statistics. Since 2003, however, the Dutch balance of payments and international investment positions including SFIs are published separately. For an analysis of SFI operations on the basis of DNB statistics, see Weyzig & Van Dijk 2007. At present, there exist just over 10,000 SFIs and 13% of all inward FDI stocks worldwide are held via these special companies. As such, they play a major role in international tax avoidance constructions.

2.4   Types of financing constructions

For the purpose of this research, three main types of financing SFIs will be distinguished. The types are associated with different constructions to avoid corporate and withholding taxes. The first type is a financing conduit or interest conduit. A conduit is narrowly defined here as a special entity whose single or main purpose is to route financial flows of a particular type through a third country in order to reduce or avoid withholding taxes. In addition, the financial income received and paid onwards should be of the same type. A financing conduit, then, is a company that obtains loans from affiliated companies and onlends them to other affiliates. Some constructions with Dutch financing conduits may involve financing companies in standard tax havens as well. It has been estimated that entities in Caribbean tax havens, probably financing companies of large multinationals, have invested some € 50 billion in affiliates all over the world via intra-group loans to Dutch SFIs (Weyzig & Van Dijk 2007). Obviously, such constructions may have large consequences for the internal capital structure of multinationals.

The second type are fund raising vehicles. Similar to financing conduits, these raise funds and lend them back to the parent or onwards to other affiliates. The difference with a financing conduit if that the capital is not raised from other group companies, but from external parties in international capital markets, for example by issuing bonds. In terms of liabilities and income flows, this is a main activity of Dutch SFIs (Weyzig & Van Dijk 2007). On the basis of the data used in this study, financing conduits and fund raising vehicles cannot be properly distinguished, because internal and external loans are not included as separate items.

The third type are group financing companies. These have a central banking function within a multinational. It is expected that they pool different types of income received from affiliates, such as dividends and interest payments, and reinvest this within the group. These investments are partly in the form of loans, but could also include equity investments. In order to obtain maximum benefits under the Dutch GFA regime, a group financing company should itself be mainly financed with equity capital to maximise its net intra-group interest income. Therefore it is assumed that group financing companies usually have a low leverage.

The effects associated with group financing companies on the one hand and financing conduits and fund raising vehicles on the other may be different and will be analysed separately.

3 Literature review

3.1 Overview

Research on the use of special tax planning affiliates by multinational corporations has been fairly limited so far. Studies focussing on affiliates in standard tax havens, such as Bermuda or the Cayman Islands, are an important exception. However, the precise activities of these affiliates usually remain a black box because financial data for these companies are not available.

The main related areas of research are the effects of tax incentives on transactions between (US-based) parent companies and their foreign subsidiaries and the use of ownership chains. Other studies investigate differences in profitability among affiliates in different countries, which are partly due to fiscal reasons, profit shifting in general, or specific strategies such as manipulation of transfer prices, debt shifting or intra-group payments for the use of intangible property. However, all these areas of research have in common that they rarely pay attention to the role of special conduit entities or group financing companies in third countries. Data limitations may have been one reason, but probably the central role of such affiliates has also been simply overlooked. More recently, researchers have started to explore the internal financing structures of multinationals in more detail, often using micro data from the Deutsche Bundesbank, Amadeus, or similar sources and some have paid attention to the role of financing affiliates as well. However, it seems that these studies have not yet produced statistical evidence that special tax planning entities, other than intermediate holding companies or affiliates in standard tax havens, play a role in tax avoidance constructions.

The literature review below is divided into three sections. First, studies that focus on chains of ownership will be reviewed. These confirm the central role of the Netherlands as a conduit country and are helpful to put capital structures within multinationals in a broader context. Second, previous studies on debt shifting and internal capital structure are discussed. These resemble most to the analysis in this thesis and occasionally include variables on financing affiliates as well. Third, a few studies on alternative forms of income shifting are reviewed. The implications of each set of studies for the design of the present research are summarised at the end of each section.

3.2 Chains of ownership

3.2.1 Overview

Desai, Foley and Hines (2003) analyse the impact of taxation on both FDI volume and income shifting using firm level data of US-based multinationals. They focus on the behaviour of US-based multinationals that own affiliates through intermediate holdings in such countries. As examples of chains of ownership, the authors describe a 'triangular strategy', in which an affiliate invests its retained earnings in another existing affiliate, and a 'multiple tiers strategy', in which the retained earnings of one affiliate are used as equity investment into a another new affiliate (Desai *et al.* 2003). It may however be expected that multinationals use more complex and flexible strategies involving many affiliates, as described in the previous section, and the income may never be repatriated to the final parent (Van Dijk *et al.* 2006).

The study uses US Bureau of Economic Analysis (BEA) survey firm-level data from 1982 to 1997. The survey data were most detailed in the benchmark years 1982, 1989, and 1994. In these years the threshold for data collection was affiliate sales, assets, or net income of at least US\$ 3 million. The survey collects detailed data on the operations, financial accounts, and intra-firm transactions of foreign affiliates owned for at least 10% by US-based multinationals. Participation in the survey is compulsory and the BEA believes that coverage is almost complete (Desai *et al.* 2003). There are reasons to doubt this, though. In benchmark years, the survey included

approximately 15,000 affiliates. However, this number seems implausibly low. This would be equivalent to each company included the S&P 500 having just 30 affiliates worldwide that are owned for at least 10% and meeting the threshold assets or sales level of US$ 3 million, for example.

With the exception of the UK, intermediate holdings appear to be concentrated in countries with an exemption system and in tax havens. 21.4% of all indirectly owned affiliates worldwide are held through the Netherlands, the leading intermediary country. The UK is second with a share of 17.5%. After that there is a considerable gap before the countries ranking third and fourth, Germany and France, with shares of 9.2% and 6.5% respectively (Desai *et al.* 2003). This confirms the central role of The Netherlands in holding conduit and deferral constructions. Such constructions may be combined with financing activities.

Weichenrieder (2006) analyses chains of ownership of German multinationals, using data that has been specially constructed by the Deutsche Bundesbank. It contains selected information from the balance sheet of all foreign affiliates of German multinationals with total assets of at least € 3 million (as of 2002). For German ultimate parents, chains of ownership are not a standard construction, because in 2001, 70% of foreign affiliates were directly owned. In addition, subsidiaries more often held via an intermediate owner in the same host country than via an intermediate owner in a third country (Weichenrieder 2006).

An analysis of the most important intermediate holding countries, based on a sample of over 3,000 indirectly owned affiliates, ranks the Netherlands as the first country in terms of affiliates owned, with a share of approximately 22%. Switzerland is second with 20%. In terms of investment value, Netherlands ranks second after the US. Dutch and Swiss intermediary holdings are used for investments worldwide, not just in Europe. Since the entry into force of the EU Parent Subsidiary Directive in 1990, which eliminates dividend withholding taxes between a subsidiaries and parent companies within the EU, the Netherlands has substantially increased its share mainly at the expense of Switzerland. Again, this confirms the central position of the Netherlands as a holding conduit.

The author also explores whether indirect ownership structures are related to financing structures. No evidence is found that the use of dividend conduit entities is associated with higher affiliate leverage. It is concluded that the research approach may not work, though, because group financing companies need not necessarily coincide with holding structures (Weichenrieder 2006). The former are more likely to be located in pure tax havens like Bermuda or Jersey. In addition, even if a majority does coincide, it should be realised that group financing companies may be used by large multinationals only. Pure dividend conduit structures are more common and are likely to dominate the regression results, even if some are combined with group financing structures.

3.2.2 Implications for this research

The two studies discussed above suggest that financing companies in the Netherlands are likely to have an intermediate holding function as well. The reverse, however, is not true: it is likely that there exist many intermediate holdings in the Netherlands without financing activities. As financing activities in the Netherlands are likely to be combined with holding activities, a cautious approach is required when trying to select Dutch SFIs with intra-group financing as their main activity.

3.3   Debt shifting and internal capital structure

3.3.1 Study of European affiliates using Amadeus data

Huizinga, Laeven and Nicodème (2007) analyse capital structure and international debt shifting within European multinationals using Amadeus data. Of all literature reviewed, their study is closest

to this thesis. The major difference is that Huizinga *et al.* did not investigate the use of special financing affiliates. Instead, they focussed on debt shifting among European affiliates, including to or from the parent company. The study covers all 33 European countries included in Amadeus for the period 1994-2003. The sample consists of approximately 13,300 subsidiaries, including intermediate companies that have subsidiaries themselves, and 5,800 direct parent companies. The number of subsidiaries is relatively low compared to the approximately 9,800 subsidiaries in Amadeus that are identified for 87 ultimate parents in the data set for this thesis.

The ratio of affiliate liabilities to total assets is the main dependent variable in the analysis. The sample average is 0.62. An adjusted measure of leverage is calculated too, excluding cash and amounts payable, with an average of 0.49. These ratios are the same for unconsolidated direct parent companies and subsidiaries. Country specific averages of parent and subsidiary leverage range from 0.22 to 0.60 for EU countries. These differences are relatively large.

The main explanatory variable in the analysis is the 'tax incentive to shift debt'. This is the is difference between host country statutory tax rate (STR) and the average STR of all European affiliates and the parent of the same multinational, weighted by total assets, and taking into account interest withholding taxes and other aspects of the international tax system. Furthermore, the effective marginal tax rate (EMTR) on profits used in the analysis includes not only host country STR but also dividend withholding taxes and any residual taxes that may apply in the home country. This approach is much more sophisticated than in any of the other studies below.

Three affiliate characteristics are included as control variables. The coefficient for log of affiliate sales, one of the controls, is approximately 0.02 in most regressions. The coefficient for tangibility, the ratio of tangible fixed assets to total assets, takes on values from -0.13 to -0.08, but its sign switches when adjusted leverage is used as the dependent variable instead of the liabilities to total assets ratio. The ratio of earnings before interest, taxes, depreciation and amortisation (EBITDA) to total assets is used as a measure of profitability and the its coefficient estimates are between -0.13 and -0.08. The authors suggest that higher profitability may reduce leverage if affiliates use retained earnings to finance new investments or pay off existing debt.

Without the tax incentive to shift debt, a one percentage point increase in EMTR is associated with a 0.26 percentage point increase in liabilities to total assets. However, the tax incentive to shift debt has a significant positive effect on leverage as well and reduces the influence of the EMTR. Thus, the overall tax system faced by a multinational matters for the capital structure of individual subsidiaries (Huizinga *et al.* 2007). The effect that is found is not very large, though. Everything else equal, an increase of this incentive by two standard deviations is associated with a ratio of affiliate liabilities to total assets of just one percentage point higher. This is not entirely surprising, because the incentive reflects European tax systems only and it might be expected that multinationals shift debt among affiliates at a global level. In particular, constructions may involve affiliates in tax havens that are not covered by Amadeus. It is also not clear whether the calculation of the incentive covers all European subsidiaries of large multinationals.

For manufacturing companies, the effect of the tax shifting incentive is about twice as large and the EMTR effect is smaller. The authors note that manufacturing firms are relatively transparent and infer that it may be relatively easy for them to borrow in one country against assets located in another country (Huizinga *et al.* 2007). This would be strange, though, as the debts of an individual affiliate within a multinational group could always be guaranteed by the parent or by a group financing company. It seems more plausible that due to their relative transparency, manufacturing companies find it more difficult to shift income in other ways, for example by manipulating transfer prices or using intra-group royalty payments.

An 'intermediate dummy' is included to analyse whether intermediate holdings differ from other affiliates. The intermediate companies have a lower ratio of liabilities to total assets, are much more responsive to the EMTR, and less responsive to the tax incentive to shift debt (Huizinga *et al.*

2007). A possible explanation for these last two differences is that some intermediary holdings are themselves used as vehicles to shift debt.

When the effect of the tax incentive to shift debt is decomposed into debt shifting to the direct parent and to other countries, the coefficient for other countries is several times higher. Moreover, when decomposing the EMTR variable, the partial effect of residual of taxes in the home country on debt shifting is not significant. It is also shown that the withholding tax components of the EMTR and the debt shifting incentive are not significant. The authors conclude that multinationals are able to achieve tax deferral using for example a triangular strategy, and more specifically, that withholding taxes *'can be avoided by triangular arbitrage involving a conduit company in a tax haven'* (Huizinga *et al.* 2007). This thesis will show that Dutch group financing companies play an important role in such constructions.

3.3.2   Other studies

Mintz and Weichenrieder (2005) analyse the capital structure of foreign affiliates of German multinational corporations using micro data from the Deutsch Bundesbank. They analyse the effect of tax rates on different types of debt and claim to be the first to distinguish fully and partly owned affiliates in such a study.

The sample consists of manufacturing affiliates (including mining and utilities) in 68 countries. It covers the period 1996 to 2000 and includes on average about 7,770 affiliates per year. Capital structures of affiliates are almost constant over time and very similar for directly and indirectly owned affiliates. The only difference is that directly held affiliates often have internal debts to German affiliates but not to foreign affiliates, whereas for indirectly held affiliates this is exactly the other way around (Mintz & Weichenrieder 2005). This suggests that holding and financing operations are usually combined, either in Germany or abroad. In principle, it makes sense for a multinational to locate holding and financing operations in the same country, because that allows to pool dividend and intra-group interest income, which may create more flexibility in internal financing transactions.

Affiliate leverage is regressed on STR, squared STR, and a set of local capital market controls to test the hypothesis that leverage increases with host country STR. The results support this hypothesis and the significantly negative squared term indicates a non-linear relationship. When the leverage of fully and partly owned affiliates is analysed separately, the expected effect shows up for fully owned affiliates only. For this group, at sample means, a one percentage point increase in STR is associated with a 0.56 percentage point increase in the total debts to total assets ratio.

Next, debt is decomposed into external debt and internal loans from German and foreign affiliates. No significant effect of STR on external debt is found. A one percentage point increase in STR is associated with an increase in loans from German affiliates equal to 0.41% of total assets for directly owned and 0.25% for indirectly owned affiliates. Loans from foreign affiliates are responsive to the host country tax rate only in the case of indirectly owned affiliates, and this effect is linear rather than quadratic. The authors conclude that host country STR has a significant and substantial effect on affiliate leverage and that this effect comes almost entirely from intra-group borrowing (Mintz & Weichenrieder 2005). This contrasts with other studies (Altshuler & Grubert 2002; Desai *et al.* 2004; World Bank 2004). However, the data sources on US-based multinationals used in those studies contain data on internal debt to the US parent only and do not cover internal debt to other affiliates, such as foreign financing companies. The conclusion of Mintz and Weichenrieder (2005) is therefore more informative.

It is interesting that the effect is quadratic for loans from the parent or other German affiliates and linear for loans from foreign affiliates. There might be a simple explanation. The median foreign STR faced by affiliates in the sample was approximately 35% so in most

observations the foreign tax rate was lower than the German tax rate during 1996-2002. The negative quadratic terms therefore implies that as the difference between the German and foreign STR increases, internal borrowings to Germany decrease more than proportionally. Affiliates outside Germany that provide internal loans, by contrast, are likely to be located in countries with a lower effective marginal tax rate. Therefore the difference between the tax rate faced by the financing affiliate and the affiliate under consideration could be either positive or negative and non-linear effects are no longer adequately captured. Even though not significant, it is noteworthy that the sign of the quadratic term is actually reversed, suggesting that the effect may still be more than proportional but in the majority of observations the foreign financing affiliate faced the lowest tax rate of the two.

Jog and Tang (2001) analyse the effect of major tax reforms in the US and Canada in the mid-1980s on the debt structure of companies in Canada. During this period, the combined federal and state corporate tax rate in the US fell from 51% to 39%, while the Canadian tax rate fell approximately 7 percentage points, reversing Canada's relative position from a low tax to a high tax country (Jog & Tang 2001). These reforms are used as a natural experiment to analyse the effect of STR differences on debt shifting.

The data set for this study was specially constructed by Revenue Canada. The authors use a sample of 388 non-financial Canadian or US-controlled companies. Affiliate leverage is regressed on Canadian STR interacted with group dummies, US STR or the difference between Canadian and US STR, and some control variables. The analysis shows that domestic companies are more responsive to the Canadian tax rate. A one percent point increase in the Canadian STR is associated with a 0.53 percentage point increase in the ratio of debts to total assets for domestic companies, but only 0.07 for multinational companies. The difference in tax rates induces an additional debt shifting effect for multinationals. A one percent point increase in STR difference is associated with a 0.35 percentage point increase in leverage (Jog & Tang 2001). The results suggest that such differences are the main motivation behind debt shifting by multinationals. However, it should be noted that the regressions do not include limited control variables for affiliate characteristics. The estimates may therefore not be very reliable.

Desai, Foley and Hines (2004) analyse debt shifting using BEA survey data for the benchmark years 1982, 1989 and 1994. In the last year, the survey covers almost 2,400 US-based parent companies and 18,000 affiliates worldwide. The BEA data allows to distinguish debt from parent and non-parent sources. The vast majority of debt comes from non-parent sources.

The main dependent variable in this study is again the ratio of liabilities to total assets. A one percent point increase in STR is found to increase this ratio by 0.24 to 0.32 percentage points. When leverage is calculated excluding accounts payable, the STR coefficient falls to 0.13-0.16. The effect is smaller for debt from the ultimate parent than for other debt, but as average debts from the parent are much lower, the elasticity of parent borrowing to host country STR is greater than that of external borrowing. This is consistent with the fine-tuning of intra-group transactions to avoid taxes. The analysis also shows that debt from the parent and from other sources are almost perfect substitutes (Desai *et al.* 2004). Interestingly, the effect of tangibility of affiliate assets, one of the control variables, is negative with liabilities to total assets as the dependent variable and positive when accounts payable are excluded, just as in Huizinga *et al.* 2007.

As part of a broader study on profit shifting, Weichenrieder (2007) investigates the use of profit shifting vehicles in third countries to reduce the tax of US subsidiaries of German multinationals. It is one of the few studies that explores the role of special tax planning entities. The study uses Deutsche Bundesbank data for the period 1996-2003 and the sample consists of 5,780 observations of 1,464 subsidiaries in the US.

Affiliate profitability is regressed on the lowest STR applying to any affiliate in the multinational group worldwide, on the average STR faced by the multinational weighted by affiliate assets, and on a dummy for presence in one of the main recipient countries of German FDI offering

special tax benefits targeted at multinationals. In contrast to Huizinga *et al.* (2007), average STR is calculated for all affiliates worldwide. The countries selected for the special tax regimes dummy are the Netherlands, Belgium, Ireland, Luxembourg and Switzerland. None of the explanatory variables is insignificant, though. The study does therefore not provide evidence of the use of profit shifting vehicles in third countries (Weichenrieder 2007). A likely explanation is that the chosen variables do not distinguish between normal affiliates, with substantial real business operations, and special tax planning affiliates, which was also the case in Mintz and Weichenrieder (2005).

3.3.3   Implications for this research

All studies above provide evidence of debt shifting and show that a higher host country STR is on average associated with higher affiliate leverage. This effect comes almost entirely from intra-group borrowing and therefore reflects arbitration among affiliates in countries with different effective marginal tax rates. Moreover, there are indications that special financing companies or conduits in third countries are being used to facilitate intra-group debt shifting. Attempts to isolate the effect of special financing affiliates in third countries have so far been unsuccessful, though.

3.4   Alternative forms of income shifting

3.4.1   Overview

Grubert (1998) analyses the effect of both host country STR and withholding taxes on alternative ways of income repatriation by US-based multinational corporations (Grubert 1998). The study starts from the 'true' or undistorted pre-tax income of a foreign subsidiary, before royalties and interest to related parties, unrelated interest, and other forms of income shifting (Grubert 1998). The focus of the article is on the division of this income over royalties and interest to foreign affiliates, dividends, and retained earnings. For each of these four components, a marginal tax price is constructed, which depends on the parent's foreign tax credit position. In general, it is attractive for a multinational to disguise profit repatriations, which would otherwise take the form of dividends, as royalties or interest payments (Grubert 1998).

The study uses data for 1990 from the US Internal Revenue Service (IRS). The sample consists of the 3,467 largest majority-owned foreign affiliates, in terms of assets, of US-based manufacturing multinationals. Intra-group interest covers payments to the US parent and to those foreign affiliates that are subject to anti-abuse rules. These rules aim to prevent tax avoidance and apply mainly to affiliates in low tax jurisdictions. Interest payments to such affiliates are much higher than to the parent (Grubert 1998), which confirms that intra-group financing constructions involving special affiliates in third countries are widely used. The anti-abuse rules do not apply to the Netherlands, though, so Dutch financing affiliates are not included in the analysis.

The four destinations of undisturbed operating income are regressed on marginal tax prices and a few other variables. The main result is that high marginal tax prices on dividends reduce dividend repatriations, but do not increase retained earnings. This supports the assumption that income is shifted out by other means. Furthermore, higher withholding taxes significantly reduce the corresponding type of intra-group payments, and interest and royalties are found to be highly substitutable. The marginal tax price of dividends in case residual taxes in the US would apply has no significant effect on dividend payments. According to the author, this suggests that dividends are paid to non-US shareholders in exemption countries, which is consistent with the findings of Desai, Foley, and Hines (2003) on chains of ownership.

In a more recent study, Grubert (2003) analyses various forms of income shifting with a focus on transfer pricing and intangible income. The analysis uses the same type of IRS data, this time for 1996. The sample is restricted to some 1,750 manufacturing affiliates in 60 countries. The

empirical analysis starts with a regression of the ratio of affiliate pre-tax earnings (after deductions of royalties and interest) to sales, a measure of profitability, on host country STR. A number of parent and affiliate characteristics are included, such as log of parent sales and affiliate age categories. The coefficient on STR is -0.13 and highly significant, indicating that reported profitability in high tax countries is lower. A second regression shows that about half of the observed negative effect of higher taxes on the profitability of affiliates seems to be due to income shifting by R&D-intensive firms. A similar interaction effect is not found for advertising intensive firms (Grubert 2003)

A variation on this last regression includes total affiliate leverage as an additional explanatory variable, which has a highly significant negative effect on reported profitability. Moreover, in this regression the coefficient on STR alone becomes negligible. This suggests that after controlling for some basic parent and affiliate characteristics, the apparent negative effect of a higher STR on the profitability of foreign manufacturing companies can be entirely accounted for by the shifting of intangible income and debt financing strategies (Grubert 2003). This is a very strong result.

In another study, Altshuler and Grubert (2002) analyse alternative strategies used by US-based multinationals to avoid residual taxes on dividend repatriations. As noted above, these are only relevant to affiliates in countries with lower tax rates than the US. The authors focus on three main strategies. First, affiliates in low tax countries use retained earnings to provide intra-group loans or make equity investments in other affiliates. This is similar to the 'triangular' and 'multiple tiers' strategies of Desai, Foley and Hines (2003). Second, affiliates in low tax countries invest in passive assets, which the parent can borrow against. Third, intermediate holding companies in high tax countries (with an exemption system) are used to hold affiliates in low tax countries, and repatriated dividends are 'blended' at the level of the intermediate holding (Altshuler & Grubert 2002).

The use of these strategies is analysed using IRS data for 1996 including financial as well as manufacturing affiliates. Passive assets, investment in subsidiaries and loans to affiliates, all as a proportion of total assets, are regressed on the marginal tax price of dividends (for a parent in excess limit position) and different sets of control variables. In most cases, the coefficients are positive, substantial and highly significant. This is consistent with the use of the first two strategies above. Next, the proportion of dividends paid to foreign affiliates (instead of directly to the ultimate parent or to another US affiliate) is regressed on the marginal tax price and on the withholding tax of dividend repatriations directly to the US. The first coefficient is positive and the second is negative, which is again in line with the use of intermediate holdings.

In addition, the effect of host country STR and interest withholding tax (to the US) on affiliate capital structure is analysed. A one percentage point increase in STR is associated with a 0.39 percentage point increase in the ratio of affiliate debt to total assets. A higher interest withholding tax rate is associated with substantially lower loans from US affiliates and higher loans from foreign affiliates and third parties (Altshuler & Grubert 2002). This suggests that different sources of debt can easily be substituted, which is consistent with other studies (Desai *et al.* 2004; Mintz & Weichenrieder 2005). Furthermore, accumulated earnings have a substantial negative effect on affiliate leverage. The authors conclude that retained earnings may be used to pay off debts, similar to Huizinga *et al.* 2007.

Many of the affiliates analysed by Grubert (1998) and Altshuler and Grubert (2002) are probably themselves intermediate holdings or group financing companies because they are the affiliates of US-based multinationals with the greatest total assets. This could have important implications. First, Huizinga *et al.* (2007) shows that intermediary holdings are much more sensitive to host country STR than other affiliates. The strong results of Grubert (1998) may therefore not be entirely valid for normal affiliates. Second, financing companies may play a central role in reallocating equity and debt among other affiliates. Apart from the triangular strategies and multiple

tiers strategies assumed by Altshuler and Grubert (2002), the findings could therefore also be consistent with central financing hubs, as suggested by Huizinga *et al.* (2007).

Bartelsman and Beetsma (2003) use a new method for isolating income shifting from real activity in OECD countries. Basically, they regress the ratio of nominal value added to labour income on STR differences using sectoral data. The data set includes 15 sectors, together the entire manufacturing industry, in 16 OECD countries for the period 1979-1997. Only income shifted between the selected countries is picked up in the STR difference variable (Bartelsman & Beetsma 2003). In brief, the estimates for the transfer pricing parameter are significantly negative, which confirms that reported income is shifted away from high tax countries. The parameter for the sub-sector of 'other manufacturing' is positive, but this may be explained by the large proportion of small firms in this sector that are unable to shift income. The authors conclude that not only income shifting to tax havens but also between OECD countries is important. This might be due to the large existing trade flows between OECD countries, which facilitate income shifting (Bartelsman & Beetsma 2003).

Finally, Stöwhase (2002) investigates the FDI of German multinationals in 8 host countries, using panel data on about 100 very large German multinationals for 1991-1998. It is shown that the a low average tax rate significantly attracts manufacturing companies, whereas a low STR significantly attracts service, finance and R&D operations that may shift income more easily (Stöwhase 2002).

3.4.2   Implications for this research

The studies on alternative forms of income shifting and profit repatriation suggest that intra-group financing constructions may not only be driven by tax rate arbitrage but also by tax deferral considerations. All studies suggest that multinationals are effectively avoiding residual home country taxes on foreign profits in some way. Differences in withholding taxes may influence the use of debt shifting and other income shifting strategies as well. Moreover, it is possible that different strategies such as dividend blending, dividend conduits, and group financing or financing conduits are combined within a multinational. This could make it difficult to distinguish the effect of specific types of Dutch financing affiliates.

However, two important restrictions can be imposed on the selection on of multinationals to facilitate the analysis and the interpretation of the results. First, the sample can be limited to manufacturing industries, and especially relatively R&D extensive manufacturing, because this substantially reduces alternative possibilities for income shifting. Manipulation of transfer prices can not be completely controlled for, though, also this also occurs among manufacturing affiliates in OECD countries. Second, the sample can be limited to EU-based multinationals and their EU-based subsidiaries only. The EU Parent Subsidiary Directive eliminates dividend withholding taxes as a reason for using intra-group financing constructions. For the resulting selection, intra-group debt shifting will then be an important vehicle for arbitration between different host country tax rates.

4 Research design

4.1 Research question and hypotheses

Taking into account the available micro data, one of the most interesting options is to analyse the effect of Dutch financing SFIs on affiliates in other European host countries using regression analysis. The main research question for this thesis is therefore:

How does the use of Dutch financing SFIs affect the capital structure of European multinationals?

The analysis only includes publicly listed multinationals of which the ultimate parent company is based in the EU (but outside the Netherlands). Affiliate leverage is also analysed for affiliates in EU countries (also excluding the Netherlands). In addition, the data set is limited to a selection of manufacturing industries.

In order to answer the main research question, three hypotheses are tested. The first hypothesis is that on average, the use of a financing SFI is associated with higher affiliate leverage. If the hypothesis were to be supported, that would imply the affiliates of a multinational with an SFI make higher tax deductible interest payments. The larger proportion of debt financing would probably consist mainly of intra-group loans (Mintz & Weichenrieder 2005) and the interest payments would remain inside the group, effectively causing profit to be shifted and tax to be avoided in the host country.

The second hypothesis is that different types of financing SFIs can be distinguished and that the effect on financing structure differs per type. More specifically, it is expected that SFIs can be classified as in the table below and that the expected effects mentioned in the table can be identified. The characteristics of financing conduits, fund raising vehicles, and group financing companies are based on the description in section 2.4. If the hypothesis is true and the expected effects are found, the implications would be even stronger. It would suggest that differences in the financing structure of affiliates are not merely correlated with the use of SFIs, but a direct causal result of certain types of financing activities.

The third hypothesis is that affiliates of a multinational with a financing SFI are more sensitive to differences in tax rates among countries. It is expected that the use of special financing affiliates, particularly group financing companies, increases flexibility to reallocate debt and shift profit among affiliates.

Table 2: SFI types and expected effects

Type	Financial income	Capital ratio	Financial expenses ratio	Expected activities	Expected effect
Financing conduits and fund raising vehicles	Substantial (>€10 mln)	High ratio of liabilities to total assets (>0.85)	Ratio of financial expenses to financial income near 1 (>0.85 and <1.15)	Obtaining internal or external loans or issuing bonds and lending the funds onwards to other affiliates or back to the parent	Higher affiliate leverage due to use of financing conduits, higher consolidated leverage due to cheaper access to external debt
Group financing companies	Substantial (>€10 mln)	Low ratio of liabilities to total assets (<0.15)	Substantial financial income (>€ 10 mln), low ratio of financial expenses to financial income (<0.15)	Accumulating interest payments and dividends from affiliates, making intra-group loans and equity investments, possibly using special low tax GFA regime	Higher affiliate leverage due to use of special low tax regime, no effect on consolidated leverage because no transactions with external parties
Mixed financing companies	Substantial (>€10 mln)	Intermediate ratio of liabilities to total assets (>0.15 and <0.85)	Ratio of financial expenses to financial income is intermediate (>0.15 and <0.85) or very high (>1.15)	Any combination of financing conduit, fund raising, group financing and other activities	Effect on affiliate or parent leverage cannot be predicted
Small SFIs	Relatively small (<€10 mln)	-	-	Other activities, not making large interest bearing intra-group loans	No significant effect on affiliate or parent leverage

4.2   Research method

The effect of financing SFIs on the (worldwide) consolidated leverage of a multinational is analysed using ordinary least squares regression. The explanatory variables of interest are a general SFI dummy or SFI type dummies. Various control variables are included. The dependent and explanatory variables are all measured at the level of the parent or consolidated company.

For the effect of financing SFIs on the leverage of individual affiliates, this is not the case. On the one hand, the dependent variable affiliate leverage, as well as some control variables, such as the log of affiliate sales, are measured at the level of the affiliate. On the other hand, the SFI dummies, which are the explanatory variables of interest, and some other control variables, such as industry fixed effects, are measured at the level of the parent company. Therefore multilevel analysis is used (also called hierarchical linear modelling). This method is widely used in pedagogical sciences, for example to study the effect of teacher and school characteristics on the school performance of children. It is also commonly used in medical sciences to analyse the results of clinical trials. In economic studies, though, it seems to be rarely applied, which is rather surprising because studies with dependent and explanatory variables measured at different hierarchical levels are relatively common.

In principle, a multilevel model can include explanatory variables at two or more different hierarchical levels as well as interaction effects between variables at different levels. The different

levels need to be nested and the variables at one level are assumed to be independent from the all variables at other levels (Hox 1995). In the present analysis, the latter is only approximately true.

In a multilevel model with two levels, the level 1 dependent variable Y (in this case affiliate leverage) is related to the level 1 explanatory variables X_1, X_2, ..., X_k (such as the log of affiliate sales), almost as in a normal regression model:

$$Y_{ij} = \beta_{0j} + \beta_{1j} X_{1ij} + \beta_{2j} X_{2ij} + ... + \beta_{kj} X_{kij} + e_{ij}.$$
1)

Note that each observation carries two indices, i indicates the level 1 observation within a group (the affiliate) and j indicates the level 2 group to which the observation belongs (the parent). In the two level model, the level 1 coefficients β_0, β_1,..., β_k are allowed to differ per group and therefore in the equation above they carry a j index as well.

The intercept generally consists of a linear combination of the level 2 variables Z_1, Z_2, ..., Z_l (in this case the parent variables, such as SFI types dummies or the log of parent sales) plus a random residual group effect u_{0j}. Thus, for each group j, the intercept β_{0j} is predicted as follows:

$$\beta_{0j} = \gamma_{00} + \gamma_{01} Z_{1j} + \gamma_{02} Z_{2j} + ... + \gamma_{0l} Z_{lj} + u_{0j}.$$
2)

The same applies to the slope coefficients β_1, β_2,..., β_k:

$$\beta_{1j} = \gamma_{10} + \gamma_{11} Z_{1j} + \gamma_{12} Z_{2j} + ... + \gamma_{1l} Z_{lj} + u_{1j};$$
...
3)
$$\beta_{kj} = \gamma_{k0} + \gamma_{k1} Z_{1j} + \gamma_{k2} Z_{2j} + ... + \gamma_{kl} Z_{lj} + u_{kj}.$$

The set of equations above specifies the interaction terms. Note that some level 2 variables may be irrelevant in explaining the level 1 intercept β_{0j} or some of the level 1 slopes β_1, β_2,..., β_k. Usually some the γ coefficients are assumed to be zero, and thus not all variables Z_1, Z_2, ..., Z_l will be included in all of the level 2 equations. If all level 1 slopes β_1, β_2,..., β_k. are assumed to be constant across groups and the level 1 intercept β_0 consists of a residual group effect u_{0j} only, the model reduces to a normal regression with random group effects and produces the same results. In other cases, the estimations can still be relatively similar to a single level model with residual random group effects, but there can be non-trivial differences in coefficient estimates and standard errors as well.

Multilevel models are solved using maximum likelihood estimation and currently this requires considerable computation time, even on fast computers. This is especially the case with large datasets, many variables at the lowest level, and/or cross level interactions. The model estimations were performed in Stata using the special 'gllamm' command for latent and mixed models. With the computer hardware available for this research, estimations with 14,000 observations and various variables at both the affiliate and parent level usually take over an hour. Including cross level interactions is feasible, but preferably with a reduced data set. In most regressions, only the equations 1) and 2) above are estimated and the level 1 slope coefficients β_1, β_2,..., β_k. are assumed to be constant across groups. In a limited number of regressions, cross level interaction effects are included for one or two level 1 slope coefficients.

5 Data

5.1 SFI data

In general, suitable micro data on company accounts could be available from four main sources. The possibilities offered by each of these sources with regard to SFIs data are briefly described below.

1. **Data from tax authorities.** In the US, for example, confidential data from corporate tax returns are available for academic research. However, they can only be used by researchers working inside the Internal Revenue Service (IRS).

2. **Central bank data.** In the US and Germany, detailed data on international transactions of multinationals are available from the central bank. Due to confidentiality reasons, the use of such data is strongly restricted, though. DNB has made some aggregate data on SFI transactions available. These data include the geographical composition of four main types of stocks and flows, distinguishing regions and some individual countries. The data can be used for consistency checks, but are not sufficient for the purpose of this research. It seems that DNB has not made micro enterprise data available so far.

3. **Survey data.** Statistics Netherlands (CBS) has a micro data set called *Statistieken Financiën Grote Ondernemingen* (Financial Statistics Large Enterprises, SFGO) based on surveys to which participation is compulsory. SFIs are required to report non-consolidated financial data while other companies are required to report on a consolidated basis. Thus, the data set contains the right type of financial data for SFIs. There is no survey item that explicitly distinguishes SFIs from other companies, but they might be filtered out on the basis of reporting differences. The survey distinguishes intra-group loans and interest as separate items, which is extremely useful. The direct and ultimate owner of the Dutch company and the countries in which these owners are located are also included. However, the survey does not collect any financial data from the parent nor any data on subsidiaries or other affiliates. This makes the data set on its own unsuitable for this study.

4. **Company registers and commercial databases.** For some Dutch companies, unconsolidated accounts are available from the Chamber of Commerce (KvK). However, the KvK search engine and data format are currently not suitable for quantitative research. Commercial databases, such as those from Bureau van Dijk, provide a partial solution. These are based on registers from the chambers of commerce supplemented with other data, have comprehensive search engines, and allow to export selected data in different formats.

This research uses the Dutch Reach database from Bureau van Dijk to obtain data on SFIs. The database does not have a separate variable that identifies SFIs, but there exists a variable 'commercially active' that can be used for this purpose. Companies are classified as not commercially active if they conduct transactions with other companies within the same group only. By definition, SFIs are not commercially active. Furthermore, SFIs by definition have a foreign ultimate owner, so this is added as a criterion. The ultimate owner is defined as the highest quoted company or the highest owner of which no shareholders with a known share are identified. Each intermediate owner, in case of a chain of owners, must be characterised by a controlling stake of at least 50.01%. This yields a selection of some 14,000 companies.

DNB estimates the number of SFIs at just over 10,000 (Weyzig & Van Dijk 2007), so the selection probably includes some foreign owned not commercially active companies that do not classify as SFIs. At the date of retrieving the data, on 5 June 2007, the REACH database contained 604,606 companies registered at the Chamber of Commerce as not commercially active. At 18 July 2007, this number had dropped by almost a third to 431,602. Less than 12,500 of these are foreign owned, which is closer to the estimate of just over 10,000 SFIs. The change may be a result of recent reclassification efforts by DNB or the Chamber of Commerce, which are uploaded into Reach with a delay of about one month. The data of 5 June had already been processed when this was discovered.

The criterion 'BIK activity code = financial holdings (65234)' was used to select financial SFIs only. This resulted in a selection of approximately 8,300 companies. Apparently, most selected SFIs have the activity code 'financing holding', even though the majority of SFIs have holding activities only and no financing activities. The selection may therefore include some companies that are no SFIs as well as some SFIs that are not primarily engaged in financing activities.

Approximately 5,100 selected companies had filed unconsolidated financial accounts in the last year for which financial data were available. For most of the other selected companies, no accounts were available at all. When certain conditions are met, affiliates can be exempted from filing accounts at the Dutch Chamber of Commerce, and possibly the companies use this exemption.

5.2 Parent data

The direct and ultimate foreign owners of the companies with financial data were retrieved from Reach. However, in case of intermediate holdings in secretive tax havens, such as Bermuda or the Netherlands Antilles, Reach cannot identify ultimate shareholders correctly. 31 missing parents were corrected using Amadeus, a European company database of Bureau van Dijk that contains only a limited selection of Dutch companies but apparently more data on European ownership relations. Some companies do not have a controlling ultimate parent because they belong to a joint venture. In checks on suspicious parents, a few circular ownership relations were found, indicating the some European ownership data in Reach and Amadeus may be incorrect. Without correcting for this, 1,782 unique EU-based ultimate parents were identified. Some of these have several affiliates that meet the selection criteria. British American Tobacco Plc, for example, has 48.

It is unlikely that SFIs can have a significant impact on the leverage of other group companies if they do not provide substantial intra-group loans. However, most balance sheets do not mention intra-group positions separately. Instead, they contain the item 'fixed financial assets', which includes intra-group loans as well as equity participations and external loans. Therefore a proxy is used and the analysis is limited to SFIs with a financial income of more than € 10 million. Probably most of this income consists of intra-group interest receipts. In the end, 61 multinationals were identified that met the following set of criteria:

- The multinational is publicly listed (and not controlled by another publicly listed multinational)
- The ultimate parent company is located in the EU but not in the Netherlands
- The multinational is not a bank, insurer or other financial company
- The ultimate parent is included in Amadeus
- Consolidated financial data of the multinational is available in Amadeus
- The multinational has at least one Dutch financial holding that is not commercially active and therefore probably an SFI with financing activities
- Financial data on at least one of these SFIs are available in Reach

- The combined financial income of all SFIs of the multinational (for which financial data are available) is more than € 10 million

In order to select a control group, the key competitors of selected multinationals with SFIs were identified on the basis of the most recent Hoovers company profiles. Such profiles are available for all selected companies and include a list of key competitors as well as categories of main business activities and industry classifications. Amadeus has a peer group function as too, but classifies the activities of many parent companies as 'management activities of holding companies'. This reflects the activities of the parent rather than the activities of the multinational as a whole and makes the Amadeus peer group function unsuitable for this research.

All multinationals were grouped into industries on the basis of Hoovers company profiles. One of the industry groups, electric components, combines several sub-industries with interlinked key competitors. The selection is mainly focussed on manufacturing industries that are less likely to shift income via intra-group payments related to intangible property rights. This increases the likelihood that intra-group financing constructions are used for income shifting. Pharmaceutical companies, for example, and other industries that may use financing affiliates for other special purposes, such as utilities, were excluded.

The manual identification of key competitors for each selected company was relatively time consuming. Therefore the selection was limited to a total of 18 multinationals with SFIs with financial income above € 10 million in 12 manufacturing industries. The control group consists of 28 multinationals without a financing SFI, 7 multinationals with a financing SFI with financial income below € 10 million per year, and 34 multinationals with a financing SFI of which the size and type could not be determined due to insufficient financial data. Thus, from the total of 87 multinationals in the sample, two thirds have a financing SFI, but for the majority of these, key financial data were missing or no accounts were available at all. The precise composition of the sample is shown in Table 3. For all multinationals in the sample, consolidated financial data were retrieved from Amadeus.

Table 3: Overview of selected industries and multinationals

Industry	SFI with sufficient financial data	SFI with insufficient financial data	No SFI	Total
Food products	Danisco A/S[a]	Tate & Lyle Plc Assoc. British Foods Plc Uniq Plc Kerry Group Plc Greencore Group Plc Südzucker AG[b]	Premier Foods Plc Northern Foods Plc	**9**
Tobacco	British Am. Tobacco Plc Swedish Match AB[a]	Imperial Tobacco Gr. Plc	Altadis SA	**4**
Pulp & paper	Svenska Cellulosa AB M-Real OYJ[a]	Ahlstrom OYJ	UPM-Kymmene OYJ Stora Enso OYJ Holmen AB	**6**
Paints	Imperial Chem. Ind. Plc	Lanxess AG BASF AG Rhodia[b]	-	**4**
Rubber products	Trelleborg AB	-	Continental AG	**2**
Cement	Heidelberg Cement AG Italmobiliare SpA[a]	Lafarge Hanson Plc CRH Plc Buzzi Unicem SpA Wienerberger AG[b]	Vicat Titan Cement Co. SA Imerys Flsmidth & Co. A/S	**11**
Steel	Thyssen Krupp AG	GEA Group AG	Acerinox SA	**3**
Packaging	Rexam Plc	Huhtamäki OYJ Comp. de Saint Gobain	RPC Group Plc Bunzl Plc Bespak Plc	**6**
Electric equipment	Invensys Plc Charter Plc Atlas Copco AB AB Electrolux Siemens AG[a] Pirelli & C. SpA[a] Sandvik AB[a]	Böhler - Uddeholm AG Vossloh AG SEB SA Alstom Enodis Plc Tomkins Plc Spirent Comm. Plc Vestas Wind Sys. A/S[b]	Stanelco Plc Nordex AG Indesit Company SpA Cardo AB	**19**
Tele-comunications equipment	Nokia OYJ Alcatel – Lucent	Ericsson[b]	Telent Plc (GEC) Safran Pace Micro Techn. Plc	**6**
Motor vehicles	Peugeot SA (PSA) Fiat SpA AB Volvo	Volkswagen AG Man AG Renault Saab AB Scania AB[b]	Rolls-Royce Group Plc Porsche AG Daimler Chrysler AG BMW AG	**12**
Aircraft & defense	Smiths Group Plc BAE Systems Plc	Meggitt Plc	Thales Senior Plc	**5**
Total	**25**	**34**	**28**	**87**

Source: Reach and Amadeus.
Notes: [a] 7 SFIs with financial income under € 10 million; [b] 6 SFIs with no unconsolidated accounts available at all.

5.3   Affiliate data

All approximately 11,000 EU subsidiaries of the multinationals in the sample were identified using Amadeus. Some 1,200 of the affiliates are not themselves included in Amadeus. The most complete version of Amadeus covers 9 million European companies, but it is not clear on which

basis companies are excluded. It has been demonstrated that selective coverage of company databases may affect the validity of regression results (Lara *et al.* 2006). In this study, however, another source of coverage bias is more important, because for a further 1,700 affiliates, no unconsolidated accounts were available. The figures above are estimates, corrected for the proportion of affiliates that turns out to have another ultimate parent or no ultimate parent identified. The selected parent companies have minority participations in these affiliates only. The exclusion of affiliates not in Amadeus or with insufficient financial data for any year leaves approximately 8,100 affiliates for the analysis.

As will be explained below, data are obtained for several years. On average, affiliate leverage adjusted for accounts payable can only be calculated for 4,100 affiliates per year. The more basic ratio of all long term and current liabilities to total assets could also be used as the dependent variable. This ratio can be calculated for a substantially larger number of affiliates, on average 6,300 per year. However, due to missing values for control variables, the use of this measure would hardly increase the sample size.

About a quarter of the affiliate observations for which the first leverage measure can be calculated involves affiliates located in UK. Another quarter is located in France. Remarkably, German affiliate observations represent less than 3% of the sample. With the ratio of liabilities to total assets as the dependent variable (and no control variables), the share of UK observations increases to more than 50%. This does not reflect the geographical distribution of affiliates and cannot be a result of coverage bias in Amadeus because the amount of French and German companies included in the database is roughly the same. Probably there is a bias due to higher disclose requirements in France and especially the UK.

5.4   Time period and tax rates

For the (groups of) SFIs, the multinationals as a whole, and the individual affiliates, data were retrieved for 1997, 1999, 2001, 2003 and 2005. The main reason is that for many companies, data are not available for all years. Moreover, the financing structure of companies varies considerably over time. An additional advantage is that including different years weakens the effect of large incidental financing constructions, for example for major acquisitions. The period from 1997 to 2005 is chosen because legal changes in the Netherlands with major consequences for SFIs came into effect at the beginning and end of this period. In 1997, the special tax regime for group financing activities was introduced. At the end of 2005, the interim period for the new tax ruling regime, during which old rulings were still valid, expired.

Not all SFIs fall in the same category each year. For example, sufficient financial data from the SFI of Renault are available for 1999 and 2001, but not for the other years. In addition, a few multinationals established their (first) SFI after 1997. Table 3 shows the main category for each multinational. The classification of some SFIs with sufficient financial also changes over time. The SFI of AB Volvo, for example, had a financial income below the € 10 million threshold in 1997 and 1999, but with a financial income above € 10 million (and group financing characteristics) in 2001, 2003 and 2005. The sample contains too few such observations to separately analyse the effects of changes in SFI characteristics over time, though, and all observations are pooled.

Finally, data on statutory corporate tax rates in EU countries, applying to large companies, were taken from an overview prepared by the Dutch Ministry of Finance, based on secondary sources (European Commission 2004; Deloitte 2005). The STR is assumed to be a good approximation of the effective marginal tax rate (EMTR), which was identified above as the most relevant corporate tax measure for marginal income shifting decisions.

5.5 Use of Amadeus data

The use of Amadeus data for research on tax issues appears to be relatively new. Three previous studies were identified (Huizinga & Laeven 2005; Huizinga & Nicodème 2006; Huizinga *et al.* 2007). A recent survey on corporate taxation research highlights the possibilities of the Amadeus micro data, but did not mention tax studies that had already used the database (Devereux 2006). Experiences with Amadeus in other areas of academic research are also relatively limited. Moreover, in contrast to most examples of previous studies, the present dataset had to be retrieved from Reach and Amadeus databases in several steps. First, the SFI data were obtained from Reach and the ultimate parents were identified. Second, the parent selection was imported into Amadeus, parent data were obtained and all affiliates were identified. Third, the affiliate selection was re-imported into Amadeus and affiliate data were obtained. After this, the ownership relations between the affiliates and the selected parents still had to be reconstructed. Amadeus does currently not allow to construct a complex dataset with detailed financial data at both the parent and affiliate level, or with both unconsolidated and consolidated accounts, in a single step. This study demonstrates that it is nonetheless possible to construct such a dataset.

Several studies using Amadeus mention the exclusion of companies with missing data, in particular German companies (Budina *et al.* 2000; Laitinen 2002; Konings *et al.* 2003; Huizinga & Laeven 2005; Claessens & Tzioumis 2006; Huizinga & Nicodème 2006; Huizinga *et al.* 2007). However, the articles did not mention the possibility of biased results and how this might be addressed during the selection of companies. A few records of Dutch companies in Amadeus were compared with original company accounts of the Dutch Chamber of Commerce to determine the correct interpretation of missing values for certain account items. The comparison suggests that if some or most of the other items on the same account are available, including the total or final items, then the missing values in Amadeus are actually not missing but zero. This is relevant for determining SFI types, for example.

5.6 Descriptive statistics

Descriptive statistics for the main affiliate level variables are summarised in Table 4 below. The following definitions are used:

Leverage $= \dfrac{\text{long term liabilities + short term loans}}{\text{equity + long term liabilities + short term loans}}$

Return on capital employed (ROCE) $= \dfrac{\text{operating profit (= EBIT)}}{\text{equity + long term liabilities + short term loans}}$

Tangible fixed assets ratio $= \dfrac{\text{tangible fixed assets}}{\text{equity + long term liabilities + short term loans}}$

The ratios of liabilities of total assets and operating profit to total assets are more basic measures for leverage and return on capital respectively and are used in some other studies. Leverage as calculated above is used in all regressions in this study. When comparing coefficient estimates, for example for the effect of host country STR on affiliate leverage, it should therefore be reminded that a correction might be required. The estimates from other studies using liabilities to total assets as the dependent variable need to be reduced by approximately one third to make them comparable to the estimates in this study.

An intermediate dummy is used that takes the value one if an affiliate has at least one subsidiary and zero otherwise, similar to the intermediate dummy in Huizinga *et al.* (2007). Table 4 shows statistics for the difference between affiliate leverage and consolidated leverage as well. Consolidated leverage is not equal to the sum of the asset weighted leverage of all subsidiaries

and the parent, because, the equity of all subsidiaries is owned by the parent and would therefore be double counted. In addition, there may be chains of ownership and intra-group loans, including from subsidiaries back to the parent. In principle, chains of ownership alone could be enough to cause the difference that is found. It is also possible that unconsolidated parent companies or Dutch financing companies, which are not included among the affiliates, have disproportionally large amounts of debt, for example due to the issue of bonds, and that part of the external capital raised by the parent or financing affiliate is invested in subsidiaries in the form of equity rather than debt.

In the table below, as well as in all regressions, some 1,300 affiliate-year observations are excluded due to extreme values for leverage, liabilities to total assets, ROCE, operating profit to total assets, or tangible fixed assets ratio. The inclusion range is 0.00 to +2.00 for both measures of leverage and -1.00 to +1.00 for both measures of profitability and for tangibility. After these exclusion of extreme values, the descriptive statistics are comparable to the reviewed literature.

Table 4: Descriptive statistics for affiliates (unconsolidated)

Variable	n	Mean	SD	5th perc.	Median	95th perc.
leverage[a]	14,289	0.41	0.37	0.00	0.34	1.00
liabilities / total assets	15,266	0.63	0.31	0.04	0.68	1.01
ROCE[b]	14,846	0.10	0.24	-0.23	0.06	0.53
operating profit / total assets	15,266	0.05	0.15	-0.14	0.04	0.27
tangible fixed assets ratio[c]	15,266	0.32	0.36	0.00	0.19	1.02
^{10}log [sales / € 1 mln]	13,552	1.3	1.0	-0.4	1.3	2.8
^{10}log [total assets / € 1 mln]	15,266	1.3	1.0	-0.3	1.3	2.9
statutory tax rate	15,235	0.335	0.053	0.280	0.338	0.402
Intermediate dummy	15,266	0.38	0.49	0	0	1
affiliate leverage minus consolidated leverage	12,822	-0.15	0.49	-0.71	-0.20	0.54

Notes: affiliates with any of first the 5 variables outside defined ranges are excluded; [a] (long term liabilities + short term loans) / (equity + long term liabilities + short term loans); [b] return on capital employed = operating profit / (equity + long term liabilities + short term loans); [c] tangible fixed assets / (equity + long term liabilities + short term loans).

Table 5 below shows similar descriptive statistics for the consolidated parent company, that is, the multinational group of companies as a whole including all subsidiaries worldwide after elimination of all intra-group balance sheet items.

Table 5: Descriptive statistics for parent companies (consolidated)

Variable	n	Mean	SD	5th perc.	Median	95th perc.
leverage[a]	343	0.57	0.36	0.21	0.53	0.96
ROCE[b]	349	1.40	0.65	0.62	1.25	2.59
tangible fixed assets ratio[c]	349	0.41	0.19	0.13	0.40	0.78
^{10}log [sales / € 1 mln]	356	3.71	0.56	2.88	3.69	4.70
^{10}log [total assets / € 1 mln]	356	3.75	0.60	2.85	3.72	4.80
statutory tax rate	403	0.337	0.075	0.280	0.310	0.516

Notes: observations of parents with less than 5 affiliates (with key variables in defined ranges) are excluded; [a] (long term liabilities + short term loans) / (equity + long term liabilities + short term loans); [b] return on capital employed = sales / (equity + long term liabilities + short term debts); [c] tangible fixed assets / (equity + long term liabilities + short term loans).

Table 6 shows slightly different descriptive statistics for all SFIs observations for which financial data are available. The variables are not directly included in the regressions, but used to determine SFI type dummies. The data are also interesting in their own right. The figures are taken from the unconsolidated accounts of the largest SFI for each parent-year, which is usually much larger than any other SFI of the same parent, if existing.

For SFIs, the ratio of liabilities to total assets is approximately equal to leverage as defined above, because they are not commercially active and accounts payable are therefore negligible. Unlike normal affiliates, most SFIs have a ratio of liabilities to total assets that is either very low (near zero) or very high (near one). This confirms that they have a special function within the group. The companies are very large with average total assets of €1.1 billion. To put this into perspective, average consolidated total assets of the multinationals to which they belong are €1.7 billion.

Most SFIs in the sample have financial income below the threshold of € 10 million, but for those above the threshold, the average is almost € 190 million. Just like the ratio of liabilities to total assets, for most SFIs the ratio of financial expenses to financial income is either near zero or near one. However, there are also a few SFI observations with low financial income but high expenses and a ratio much greater than one. Operating expenses are generally small, because SFI operations consist of financial management and administration only, and therefore earnings before tax are close to financial results. Capital gains and dividend income from participations in subsidiaries are not included in earnings before tax and shown as a separate item.

Table 6: Descriptive statistics for SFIs (unconsolidated, largest SFI per parent only)

Variable	n	Mean	SD	5th perc.	Median	95th perc.
liabilities / total assets	117	0.30	0.54	0.00	0.06	1.00
total assets (€ bn)	117	1.1	2.5	0.0	0.2	5.1
financial income (€ mln)	117	73	148	0	6	457
financial expenses (€ mln)	117	19	57	0	0	112
financial expenses / income	114	7.5	38.4	0.00	0.06	27.8
financial result (€ mln)	117	53	131	-8	2	365
earnings before tax[a] (€ mln)	117	53	129	-12	2	328
income from participations (€ mln)	117	21	177	-29	0	100
tax (€ mln)	117	0.8	6.9	-1.0	0.0	6.1
effective average tax rate[b]	116	0.12	0.54	-0.08	0.01	0.68

Notes: observations of multinationals with less than 5 affiliates (with key variables in defined ranges) are excluded; [a] excluding income from participations; [a] tax / earnings before tax excluding income from participations.

Taxes and the effective average tax rate are relatively low. In fact, they are so low that it may be suspected that some SFIs do not report tax exempt capital gains and dividend income as a separate item but include it in the reported financial income. For 74 out of the 117 SFI observations in the table, the reported income from participations was zero or missing. Nonetheless, it is possible that the selection also includes several SFIs participating in the GFA regime that exempts up to 80% of intra-group interest income from corporate tax and therefore results in effective tax rates of 6-10%. The 43 observations with nonzero income from subsidiaries imply that some selected SFIs combine financing and holding activities or are intermediate holdings rather that financing companies.

For SFIs observations with financial income above € 10 million, the SFI type is determined on the basis of the ratios of liabilities to total assets and financial expenses to financial income. The results are shown in Table 7. In each cell, the first number indicates parent-year observations and the number in brackets is the number of different parent companies for all years combined.

For the regressions, the criteria based on the capital ratio and financial expenses ratio are combined. Thus, the upper left cell with 28 (14) group financing companies and the bottom right cell with 9 (5) financing conduits and/or fund raising companies each get a separate dummy and all other cells are combined into a 'mixed SFI' dummy with 21 observations (13 parents). It is very unlikely that all group financing companies in the selection participate in the special GFA regime, because less than 100 multinationals worldwide were admitted to it. It is even possible the regime does not apply to any of them. In addition to the figures in the table, the sample includes 133 observations (46 parents) without an SFI, 153 (49) with an SFI with insufficient financial data, and

59 (30) with an SFI with financial income below € 10 million. For the last two groups, separate dummies are included in most regressions as well.

Table 7: SFI types (number of parent level observations, unique parents in brackets)

			Types by financial expenses ratio			
		Fin. expenses / fin. income	Low (<0.15)	Middle or very high	Near one (>0.85, <1.15)	**All**
	Liabilities / total assets		Group financing	Mixed	Conduit / fund raising	**All**
Types by capital ratio	Low (<0.15)	Group financing	28 (14)	5 (4)	0 (0)	**33 (15)**
	Middle	Mixed	6 (5)	5 (2)	0 (0)	**11 (7)**
	High (>0.85)	Conduit / fund raising	0 (0)	5 (3)	9 (5)	**14 (7)**
	All	**All**	**34 (17)**	**15 (8)**	**9 (5)**	**58 (26)**

Notes: observations of multinationals with less than 5 affiliates (with key affiliate variables in defined ranges) are excluded.

6 Results

6.1 Tax rate and other affiliate level controls

First, affiliate leverage is regressed on different sets of control variables to explore the effect of these variables in more detail and select the most appropriate set for multilevel analysis. At this stage, variation due to parent-year effects enters the model as a random effect only and is itself not explained. The results are shown in Table 8.

The first regression simply includes the main controls that have also been used in other studies. The two measures for affiliate size, log of sales and log of total assets, are closely correlated. If log of assets alone is included, the coefficient is similar in size to the coefficient of log of sales alone. Log of sales is a better predictor of leverage, though, and this result holds if country dummies are added. As the fit of the model is substantially better, log of sales is used in further regressions even though it generates somewhat more missing values than log of assets.

Alternative measures for profitability are also possible. Return on capital employed (ROCE) turns out to be the best predictor of leverage. It results in a better model fit than ratios such as cash to capital employed or EBITDA to total assets, which are used in other studies. In addition, it generates much less missing values. The negative coefficient on ROCE may be a result of affiliates using retained earnings to finance new investments or pay off existing debt (Huizinga *et al.* 2007).

In principle, the intermediate dummy is an endogenous variable, because affiliate leverage and ownership structure may be jointly determined. For simplicity, it is included in the model as a normal explanatory variable, but it should be reminded that there may not be a direct causal relationship between this variable and affiliate leverage. The coefficient estimate is similar to Huizinga *et al.* (2007).

Regression (2) drops log of affiliate assets and replaces the year dummies with a discrete time variable. The year dummies showed an almost perfect linear trend. The use of a time variable simplifies the model without affecting the model fit. There is a trend of decreasing affiliate leverage from 1997 to 2005. The reason for this is not clear.

Regression (3) adds affiliate country dummies. France is chosen as the default country because it accounts for a large share of affiliate-year observations and its country specific effect is close to the average of all countries. Instead of the full set of 19 dummies, a reduced set of 16 country dummies and one combined dummy for Luxembourg, Lithuania and Slovakia is used. These countries have less than 40 observations each. The use of a reduced dummy set does not affect the rest of the model. For some EU countries, there are no affiliate-year observations in the sample, mainly due to data limitations.

The coefficients of tangible assets ratio and STR switch signs when country dummies are included. As tangibility switches sign in some other studies as well (Desai *et al.* 2004; Huizinga *et al.* 2007), this suggests that its effect not as expected, and depends on further model specifications. The sign switch of STR implies that country fixed effects dominate the overall effect of STR differences among countries and over time. This is not surprising given the large country dummies. The high fixed effect for Germany, for example, suggests that differences due to tax rates are largely captured by the country dummies, and when used in combination, the STR variable loses its standard interpretation. The very large country differences are simlar to earlier studies (Huizinga *et al.* 2007), but not easily explained. Other studies do not control for country fixed effects or include capital market controls, usually political risk, creditor rights, and inflation. It is implausible that large differences within the EU, such as between Germany and France, are explained by such variables, though. Perhaps differences in tax legislation beyond STR alone play a role.

Table 8: Random effect estimations to select affiliate (level 1) controls

Dependent variable	Affiliate leverage					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Constant	0.38** (0.03)	0.37** (0.02)	0.48** (0.05)	0.28** (0.03)	0.50* (0.06)	0.29** (0.03)
^{10}log [sales / € 1 mln]	0.064** (0.004)	0.057** (0.003)	0.047** (0.003)	0.048** (0.005)	0.036** (0.005)	0.050** (0.006)
^{10}log [assets / € 1 mln]	-0.012* (0.005)	-	-	-	-	-
ROCE	-0.45** (0.01)	-0.45** (0.01)	-0.41** (0.01)	-0.46** (0.02)	-0.40** (0.02)	-0.43** (0.02)
Tangible fixed assets ratio	-0.020* (0.009)	-0.019* (0.009)	0.018* (0.009)	0.01 (0.01)	0.03* (0.01)	-0.03* (0.02)
Affiliate STR	0.16* (0.06)	0.16* (0.06)	-0.2 (0.1)	0.36** (0.08)	-0.3 (0.2)	0.37** (0.09)
Intermediate dummy	-0.030** (0.007)	-0.036** (0.007)	-0.035** (0.007)	-0.02 (0.01)	-0.02* (0.01)	-0.02 (0.01)
1997 dummy	0.03 (0.02)	-	-	-	-	-
1999 dummy	0.01 (0.02)	-	-	-	-	-
2003 dummy	-0.03 (0.02)	-	-	-	-	-
2005 dummy	-0.05** (0.02)	-	-	-	-	-
t (years)[a]	-	-0.010** (0.002)	-0.008** (0.002)	-0.008** (0.003)	-0.011** (0.003)	-0.007* (0.003)
Affiliate country dummies[b]	-	-	Red. set	-	Red. set	-
e.g. Finland dummy	-	-	-0.18** (0.02)	-	-0.16** (0.03)	-
Spain dummy	-	-	-0.10** (0.01)	-	-0.10** (0.02)	-
UK dummy	-	-	0.14** (0.01)	-	0.15** (0.02)	-
Germany dummy	-	-	0.18** (0.02)	-	0.18** (0.03)	-
Parent-year random effects	Yes	Yes	Yes	Yes	Yes	Yes
n (affiliate-year observations)	12,483	12,483	12,483	5,298	5,298	3,646
j (parent-year groups)	426	426	426	426	426	373
R^2 (within)	0.099	0.098	0.170	0.111	0.194	0.105

Notes: * $p < 0.05$; ** $p < 0.01$; [a] base year is 2001, thus e.g. t = -2 y for 1999; [b] default country is France; full set consists of 19 country dummies; reduced set has 16 country dummies + 1 combined dummy for Luxembourg, Lithuania and Slovakia, which have less than 40 observations each.

In the regressions (1) and (2), without country dummies, the STR coefficient is positive and similar in size to Desai *et al.* (2004), but relatively small compared to for example Mintz and Weichenrieder (2005) or Huizinga *et al.* (2007) and not highly significant. This is mainly due to the unbalanced

country sample, with the UK and France accounting for a quarter of observations each. Therefore regression (4) limits the number of affiliates in each country to a maximum of three per parent-year. This produces a less skewed geographical distribution of affiliates without reducing the number of parent groups. The other parameters are the same as in regression (2), but the model fit is improved. Affiliate STR is now highly significant and rather high compared to other studies. Everything else equal, a 1 percentage point increase in STR on average leads to a 0.36 percentage point increase in affiliate leverage.

In regression (5), country dummies are added, and they again dominate effect of STR variations among countries and over time. The country dummies are similar to regression (3) with a more skewed geographical distribution, but the model fit is better.

Regression (6) further restricts the sample to affiliates that are at least 98% owned by the ultimate parent company. Due to manual corrections in ownership relations, some multinationals are excluded as a whole, regardless of affiliate ownership. This includes both rubber companies. The regression results are similar to (4) and (5).

6.2 Parent level controls

Variance in affiliate leverage due to random variation between multinationals ρ accounts for approximately 6% of total variance and is highly significant. Therefore control variables at the parent level (actually parent-year level) are added using multilevel estimation. The results are shown in Table 9. As time is a general variable, it does not belong to either one of the levels.

Regression (1) introduces three consolidated financial figures and home country STR as parent level variables. Consolidated ROCE, tangibility and parent STR seem irrelevant at this point. Higher consolidated total assets are associated with higher affiliate leverage. Perhaps larger multinationals have easier access to credit, even though all multinationals in the sample already qualify as very large.

In regression (2), industry dummies are added. Electric equipment is chosen as the default industry, because it is closest to the average of the larger industry groups in the sample. Differences among industries are substantial. The results shows that affiliates of large European car manufacturers have an especially high leverage.

In regression (3), industry dummies are omitted and parent country dummies are included instead. France is the default country again. A reduced set if dummies is used for parents as well, combining Austria, Denmark, Spain and Greece in one group. A full set of dummies would not be possible, because some countries are home to only one or a few selected multinationals, resulting in overspecification of the model. The home country fixed effects are also substantial. The high leverage of affiliates with an Irish parent suggests that tax differences are largely captured by parent country dummies, similar to affiliate country dummies.

Regression (4) combines industry and country fixed effects. This produces only moderate changes in each type of dummies. Regression (5) restricts the observations again to 3 affiliates per country per parent-year and omits affiliate country dummies. The results confirm that affiliate STR is highly significant and of the same magnitude when parent level controls are included. Regression (6) further restricts the observations to affiliates that are at least 98% owned by the ultimate parent company. In the last two regressions, all standard errors increase (except for affiliate STR) and most coefficients become less significant due to the reduced number of observations. Consolidated ROCE has not been significant in any of the regressions and will be dropped in further estimations.

Table 9: Multilevel estimations to select parent (level 2) controls

	Dependent variable	Affiliate leverage					
		(1)	(2)	(3)	(4)	(5)	(6)
Overall	constant	0.29** (0.09)	0.40** (0.08)	0.39** (0.08)	0.39** (0.08)	0.23** (0.09)	0.2* (0.1)
	t (years)[b]	-0.011** (0.002)	-0.011** (0.002)	-0.009** (0.002)	-0.010** (0.002)	-0.008** (0.002)	-0.007* (0.003)
Affiliate (level 1)	^{10}log [sales / € 1 mln]	0.045** (0.003)	0.044** (0.003)	0.044** (0.003)	0.044** (0.003)	0.043** (0.006)	0.048** (0.007)
	ROCE	-0.40** (0.01)	-0.40** (0.01)	-0.40** (0.01)	-0.40** (0.01)	-0.45** (0.01)	-0.41** (0.02)
	Tangible fixed assets ratio	0.012 (0.009)	0.011 (0.009)	0.011 (0.009)	0.011 (0.009)	-0.02 (0.01)	-0.05** (0.02)
	Affiliate STR	-0.2 (0.2)	-0.2 (0.2)	-0.2 (0.2)	-0.2 (0.2)	0.41** (0.08)	0.4** (0.1)
	Intermediate dummy	-0.039** (0.007)	-0.038** (0.007)	-0.036** (0.007)	-0.036** (0.007)	-0.01 (0.01)	-0.02 (0.01)
	Affiliate country dummies[a]	Red. set	Red. set	Red. set	Red. set	-	-
Parent (level 2)	^{10}log [sales / € 1 mln]	0.051** (0.009)	0.03* (0.01)	0.05** (0.01)	0.02* (0.01)	0.004 (0.013)	0.006 (0.015)
	ROCE	0.010 (0.008)	0.010 (0.008)	0.007 (0.008)	-0.004 (0.008)	0.002 (0.011)	0.004 (0.013)
	Tangible fixed assets ratio	-0.002 (0.030)	-0.08 (0.05)	-0.06 (0.03)	-0.10* (0.04)	-0.04 (0.06)	0.03 (0.06)
	Parent STR	-0.09 (0.08)	-0.08 (0.07)	0.1 (0.1)	-0.1 (0.1)	0.1 (0.2)	0.1 (0.2)
	Industry dummies[c]	-	Yes	-	Yes	Yes	Yes
	e.g. Motor vehicles dummy	-	0.08** (0.02)	-	0.07** (0.02)	0.11** (0.02)	0.11** (0.02)
	Cement dummy	-	-0.02 (0.02)	-	-0.05** (0.02)	-0.05 (0.03)	-0.08** (0.03)
	Parent country dummies[d]	-	-	Red. set	Red. set	Red. set	Red. set
	e.g. Ireland dummy	-	-	0.12** (0.03)	0.13** (0.03)	0.15** (0.04)	0.13** (0.05)
	Italy dummy	-	-	-0.03 (0.02)	-0.06** (0.02)	-0.06* (0.03)	-0.14* (0.07)
	n (affiliate-year observations)	10,944	10,944	10,944	10,944	4,648	3,091
	j (parent-year groups)	344	344	344	344	344	290
	R^2 (overall)	0.209	0.222	0.214	0.228	0.151	0.145

Notes: * $p < 0.05$; ** $p < 0.01$;[a] reduced set has 16 country dummies + 1 combined dummy for Luxembourg, Lithuania and Slovakia; [b] base year is 2001; [c] default industry is electric equipment; [d] default country is France; reduced set has 6 country dummies + 1 combined dummy for Austria, Denmark, Spain and Greece, which are not home to selected multinationals with SFIs with known financial income over €10 mln.

6.3 Affiliate leverage

After having identified the most relevant control variables at both levels, it is tested whether the presence of a financing SFI within a multinational influences affiliate leverage. The results of some regression are shown in Table 10.

In regression (1), affiliate leverage is regressed on a general SFI dummy with parent-year random effects only. Regression (2) adds all relevant affiliate level controls and the general time trend and (3) adds all parent level controls as well. In all cases, the overall effect of SFI presence is very small and insignificant. The first hypothesis, stating that in general the presence of a financing SFI is associated with higher affiliate leverage, is therefore not supported.

The regressions (4), (5) and (6) are similar to (1), (2) and (3), respectively, but include three different SFI dummies instead of one general SFI dummy. The large SFI group combines all types of SFIs with gross financial income above € 10 million and the small SFI group consists of SFIs with known financial income below this threshold (including zero income). The SFI without data dummy captures parent-year observations with SFIs with unknown financial income.

In the regressions (5) and (6), the coefficients on the last two dummies are insignificant and small, whereas the large SFI dummy becomes significant at the 5% level in the regression with full controls. This indicates three things. First, the part of the second hypothesis that SFIs with relatively low financial income do not significantly affect affiliate leverage is supported. Second, there may be a significant effect for some types of large SFIs, which will be explored in more detail below. Third, the very small and insignificant effect of SFIs without financial data could mean that these companies are even smaller than the small SFIs with financial data. It is possible that most of them are so small that they do not have to file income statements. It is then still possible that there are also a few very large SFIs in this group that substantially increase affiliate leverage. Such effects are easily diluted by over a hundred parent-year observations with small SFIs that are no financing companies.

Table 10: Multilevel estimations with general SFI dummies

	Dependent variable	Affiliate leverage					
		(1)	(2)	(3)	(4)	(5)	(6)
Overall	constant	0.425** (0.009)	0.48** (0.05)	0.39** (0.08)	0.427** (0.009)	0.49** (0.05)	0.34** (0.08)
	t (years)[b]	-	-0.009** (0.002)	-0.009** (0.002)	-	-0.008** (0.002)	-0.010** (0.002)
Affiliate (level 1)	^{10}log [sales / € 1 mln]	-	0.048** (0.003)	0.045** (0.003)	-	0.049** (0.003)	0.045** (0.003)
	ROCE	-	-0.41** (0.01)	-0.40** (0.01)	-	-0.41** (0.01)	-0.40** (0.01)
	Tangible fixed assets ratio	-	0.019* (0.009)	0.011 (0.009)	-	0.018* (0.009)	0.011 (0.009)
	Affiliate STR	-	-0.3 (0.1)	-0.2 (0.2)	-	-0.3 (0.1)	-0.2 (0.2)
	Intermediate dummy	-	-0.036** (0.007)	-0.036** (0.007)	-	-0.037** (0.007)	-0.036** (0.007)
	Affiliate country dummies[a]	-	Red. set	Red. set	-	Red. set	Red. set
Parent (level 2)	^{10}log [sales / € 1 mln]	-	-	0.02* (0.01)	-	-	0.03* (0.01)
	Tangible fixed assets ratio	-	-	-0.11* (0.04)	-	-	-0.11* (0.04)
	Parent STR	-	-	0.1 (0.1)	-	-	0.2 (0.1)
	Parent country dummies[c]	-	-	Red. set	-	-	Red. set
	Industry dummies	-	-	Yes	-	-	Yes
	General SFI dummy	-0.01 (0.01)	-0.005 (0.011)	-0.006 (0.010)	-	-	-
	Large SFI dummy	-	-	-	-0.008 (0.014)	-0.005 (0.013)	-0.03* (0.01)
	Small SFI dummy	-	-	-	-0.03* (0.01)	-0.02 (0.01)	-0.01 (0.01)
	SFI without data dummy	-	-	-	0.001 (0.013)	0.002 (0.011)	0.006 (0.011)
	n (affiliate-year observations)	14.058	12,421	10,944	14.058	12,421	10,944
	j (parent-year groups)	398	398	344	398	398	344
	R^2 *(overall)*	0.000	0.190	0.217	0.000	0.192	0.217

Notes: * $p < 0.05$; ** $p < 0.01$; [a] reduced set has 16 country dummies + 1 combined dummy for Luxembourg, Lithuania and Slovakia; [b] base year is 2001; [c] reduced set has 6 country dummies + 1 combined dummy for Austria, Denmark, Spain and Greece, which are not home to selected multinationals with SFIs with known financial income over €10 mln.

Next, group financing, conduit / fund raising and mixed SFI types are differentiated. The results are shown in Table 11. Regression (1) starts with the three large SFI type dummies, the small SFI dummy, and the SFI without data dummy only. The dummies reflect the difference in affiliate leverage compared to parent-year observations without any type of SFI. The estimated coefficients are unreliable, though, because the coefficients change completely when affiliate and parent characteristics are controlled for.

Regression (2) adds the usual control variables, including affiliate country dummies and industry dummies but without parent country dummies. The group financing SFI dummy is negative and highly significant, whereas the other SFI dummy coefficients are close to zero and not significant. This implies that everything else equal, the use of an SFI of the group financing type is associated with a 0.08 lower leverage ratio, about 20% below average. This is surprising, because a positive effect was expected for both group financing and financing conduit / fund raising SFIs. The predictions about different types in the second hypothesis are therefore not supported. However, the assumption that different types of financing affiliates have different effects is confirmed. The results further demonstrate that capital ratio and financial expenses ratio are useful criteria to distinguish SFIs, even though the activities associated low or high ratios and their effect on intra-group financing structures may not yet be fully understood.

The other regressions are variations to test the robustness of these findings. Regression (3) includes parent country dummies instead of industry dummies and regression (4) includes both. Regression (5) is the same as (4) but restricts the sample again to three affiliates per country per parent-year. Regression (6) further restricts the sample to affiliates owned for at least 98% by the ultimate parent. In these last two regressions, all standard errors increase because of the smaller sample size and in (6) the group financing dummy is no longer significant. However, none of the variations produces substantial changes in the estimated coefficients.

A few further variations not shown in the table were also tried. If SFI types are defined on the basis of either capital ratio or financial expenses ratio alone, the results are similar. Including parent consolidated leverage as an explanatory variable or omitting all country and industry dummies does not substantially affect the outcomes. Replacing leverage net of accounts payable by the more basic ratio of liabilities to total assets as the dependent variable also produces the same results.

Table 11: Multilevel estimations with SFI type dummies

	Dependent variable	Affiliate leverage					
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Overall	constant	0.424** (0.009)	0.41** (0.07)	0.20* (0.09)	0.36** (0.08)	0.4** (0.1)	0.3** (0.1)
	t (years)[b]	-	-0.013** (0.002)	-0.010** (0.002)	-0.011** (0.002)	-0.013** (0.003)	-0.011** (0.003)
Affiliate (level 1)	^{10}log [sales / € 1 mln]	-	0.045** (0.003)	0.046** (0.003)	0.045** (0.003)	0.032** (0.006)	0.039** (0.007)
	ROCE	-	-0.40** (0.01)	-0.40** (0.01)	-0.40** (0.01)	-0.40** (0.02)	-0.36** (0.02)
	Tangible fixed assets ratio	-	0.011 (0.009)	0.014 (0.009)	0.011 (0.009)	0.02 (0.01)	-0.006 (0.017)
	Affiliate STR	-	-0.2 (0.2)	-0.2 (0.2)	-0.2 (0.2)	-0.3 (0.2)	-0.3 (0.2)
	Intermediate dummy	-	-0.037** (0.007)	-0.038** (0.007)	-0.036** (0.007)	-0.02 (0.01)	-0.02 (0.01)
	Affiliate country dummies[a]	-	Red. set	Red. set	Red. set	Red. set	Red. set
Parent (level 2)	^{10}log [sales / € 1 mln]	-	0.04** (0.01)	0.06** (0.01)	0.03** (0.01)	0.03** (0.01)	0.04* (0.02)
	Tangible fixed assets ratio	-	-0.07 (0.04)	-0.05 (0.03)	-0.10* (0.04)	-0.07 (0.05)	0.001 (0.061)
	Parent STR	-	0.18* (0.07)	0.2 (0.1)	0.08 (0.12)	0.1 (0.2)	0.2 (0.2)
	Parent country dummies[c]	-	-	Red. set	Red. set	Red. set	Red. set
	Industry dummies	-	Yes	-	Yes	Yes	Yes
	Group financing SFI dummy	-0.02 (0.02)	-0.08** (0.02)	-0.07** (0.02)	-0.07** 0.02	-0.05* 0.02	-0.04 0.03
	Mixed activities SFI dummy	0.05** (0.02)	-0.03 (0.02)	0.01 (0.03)	0.006 (0.020)	0.005 (0.028)	0.01 (0.03)
	Conduit or fund raising SFI dummy	-0.08** (0.02)	0.04 (0.03)	-0.05 (0.03)	0.03 (0.03)	0.07 (0.04)	0.06 (0.05)
	Small SFI dummy	-0.03* (0.01)	-0.03 (0.01)	-0.02 (0.02)	-0.01 (0.01)	-0.02 (0.02)	-0.02 (0.02)
	SFI without data dummy	0.001 (0.013)	0.003 (0.011)	-0.003 (0.012)	0.007 (0.011)	0.004 (0.018)	0.006 (0.022)
	n (affiliate-year observations)	14.058	10,944	10,944	10,944	4,648	3,091
	j (parent-year groups)	398	344	344	344	344	290
	R^2 *(overall)*	0.000	0.215	0.207	0.219	0.230	0.225

Notes: * $p < 0.05$; ** $p < 0.01$; [a] reduced set has 16 country dummies + 1 combined dummy for Luxembourg, Lithuania and Slovakia; [b] base year is 2001; [c] reduced set has 6 country dummies + 1 combined dummy for Austria, Denmark, Spain and Greece.

6.4 Parent consolidated leverage

The second hypothesis predicts effects of constructions involving different types of financing SFIs on affiliate leverage as well as parent consolidated leverage. The effects on affiliate leverage have been investigated in detail above. The effect on the total external leverage of a group of multinational companies is easier to analyse, because there are only parent level variables in the model so standard multiple regression can be used.

The results are shown in Table 12. Regression (1) includes the standard parent level controls only. These are not of interest and hardly explain any variance in consolidated leverage. In contrast to affiliate leverage, there is no clear time trend. Regression (2) adds parent country and industry dummies, with France and electric equipment as the default as usual. The differences among countries and manufacturing industries are again substantial. The regressions (3) and (4) complete the model with a general SFI dummy and the five SFI type dummies respectively. The conclusion is rather straightforward: SFIs do not have a significant effect on parent consolidated leverage. Thus, the hypothesised effects regarding total external leverage can be firmly rejected.

Table 12: Estimations of SFI effect on consolidated leverage

Dependent variable	Parent consolidated leverage			
	(1)	(2)	(3)	(4)
Constant	0.3	0.6*	0.6*	0.4
	(0.2)	(0.3)	(0.3)	(0.3)
Parent characteristics & STR[a]	Yes	Yes	Yes	Yes
Industry dummies[b]	-	Yes	Yes	Yes
Telecommunications equipment dummy	-	-0.19**	-0.19**	-0.18*
		(0.08)	(0.08)	(0.09)
Cement dummy	-	-0.03	-0.03	-0.04
		(0.07)	(0.07)	(0.07)
Motor vehicles dummy	-	0.16**	0.16**	0.17**
		(0.06)	(0.06)	(0.06)
Parent country dummies[c]	-	Red. set	Red. set	Red. set
e.g. Sweden dummy	-	-0.19**	-0.19**	-0.19*
		(0.08)	(0.08)	(0.08)
Ireland dummy	-	0.06	0.06	0.07
		(0.13)	(0.13)	(0.13)
UK dummy	-	0.12	0.12	0.13
		(0.07)	(0.07)	(0.07)
General SFI dummy	-	-	0.05	-
			(0.04)	
Group financing SFI dummy	-	-	-	-0.05
				(0.08)
Mixed activities SFI dummy	-	-	-	-0.04
				(0.09)
Conduit or fund raising SFI dummy	-	-	-	0.03
				(0.14)
Small SFI dummy	-	-	-	0.03
				(0.06)
SFI without data dummy	-	-	-	0.08
				(0.05)
n (parent-year observations)	359	359	359	359
R^2 *(adjusted)*	0.011	0.232	0.233	0.234

Notes: * $p < 0.05$; ** $p < 0.01$; [a] ^{10}log [sales / € 1 mln], ROCE, tangible fixed assets ratio, and parent STR (coefficients not reported here); [b] default industry is electric equipment; [c] default country is France; reduced set has 6 country dummies + 1 combined dummy for Austria, Denmark, Spain and Greece, which are not home to selected multinationals with SFIs with known financial income over €10 mln.

6.5   Affiliate STR sensitivity

Finally, the third hypothesis regarding increased sensitivity to host country STR is tested. This requires the estimation of a cross level interaction effect between SFI dummies (a level 2 variable) and affiliate STR (a level 1 variable). For practical reasons, this is only feasible with a restricted data set and therefore the maximum of three affiliates per country per parent-year is applied again.

The results are shown in Table 13. Regression (1) provides a reference without interaction effects. Similar to regression (5) in Table 11, all affiliate and parent characteristics as well as the fixed effects of SFI types on leverage are included. However, the affiliate country dummies have been omitted to facilitate the analysis of the STR coefficient. The coefficients for affiliate and parent characteristics, time trend, and parent STR are similar to other estimations and not reported here to save space.

Regression (2) adds interaction terms for STR with each of the five SFI type dummies. The interaction effect is significantly positive and relatively large for the group financing SFIs and, surprisingly, also for small SFIs. This means that the use of these types of SFIs substantially increases the sensitivity of affiliate leverage to the host country STR. The default STR coefficient, for multinationals without an SFI, is reduced to 0.14. This is much smaller than in the average coefficient for all groups in the first regression and it is no longer significant. For the subgroup of multinationals with group financing SFIs, in contrast, a one percentage point increase in host country STR is associated with an increase in affiliate leverage of approximately 0.14 + 0.73 = 0.87 percentage point. This effect is much larger than has been found in previous studies, yet not implausible. In another regression, not shown in the table, the interaction effect is also significantly positive if all SFI types are grouped together.

The explanation stated in hypothesis three is that the use of group financing companies considerably increases a multinational's flexibility to reallocate debt among and shift profit among affiliates. This hypothesis is clearly supported by the estimation results. The effect of small SFIs is more difficult to explain. However, 'small' refers to interest and other non-equity financial income only. The total assets of these SFIs are on average still € 247 million, and five observations (4 parents) even have total assets over € 1 billion. Perhaps financing companies can also facilitate debt shifting by borrowing money from affiliates and reinvesting it in other affiliates in the form of equity capital, rather than providing loans. In that case, the income of the financing company would consist largely of tax exempt capital gains and dividends from subsidiaries, which may be reported separately from taxable financial income. In more than a third of the observations, small SFIs indeed reported equity income, ranging from a loss of € 350 million to a profit of € 252 million.

The inclusion of an interaction effect also affects the fixed effect estimates of SFI types on leverage. The coefficients are much larger now, but should be interpreted together with the STR interaction effects. At the average host country STR of 33.5%, everything else equal, the difference in affiliate leverage between a multinational with a group financing SFI and a multinational without an SFI is -0.31 + (0.74 x 0.335) ≈ -0.06. This is the same as the fixed effect of a group financing SFI in regression (1). For small SFIs, the difference is -0.19 + (0.46 x 0.335) ≈ -0.04, which is also close to the fixed effect in a model without cross level interactions.

The results seem consistent with previous findings that most European countries would gain tax revenues due to profit shifting in general, mainly at the expense of Germany (Huizinga & Laeven 2005). The fixed effect that is associated with group financing companies on average reduces leverage and thus increases taxable profits. However, for a few countries with relatively high taxes, such as Germany until 2001, the fixed effect is outweighed by the increase in leverage due to greater sensitivity to host country STR.

For multinationals based on a country with a foreign tax credit system, it is possible that debt shifting strategies are aimed at achieving tax deferral in the home country rather than optimising tax deductible interest payments abroad. This may provide an explanation for the

Table 13: Interaction effect of SFI types with affiliate STR and ROCE

	Dependent variable	Affiliate leverage				
		(1)	**(2)**	**(3)**	**(4)**	**(5)**
Overall	Constant	0.26** (0.09)	0.3** (0.1)	0.28** (0.09)	0.37** (0.06)	0.38** (0.06)
	t (years)	-0.009** (0.002)	-0.008** (0.003)	-0.009** (0.002)	-0.008** (0.002)	-0.007** (0.002)
Affiliate (level 1)	Affiliate characteristics[a]	Yes	Yes	Yes	Yes	Yes
	Affiliate ROCE	-0.44** (0.02)	-0.44** (0.02)	-0.47** (0.05)	-0.45** (0.02)	-0.47** (0.04)
	Affiliate STR	0.38** (0.08)	0.14 (0.16)	0.35** (0.08)	0.10 (0.15)	0.10 (0.15)
Parent (level 2)	Parent characteristics & Parent STR[b]	Yes	Yes	Yes	-	-
	Parent country dummies[c]	Red. set	Red. set	Red. set	Red. set	Red. set
	Industry dummies	Yes	Yes	Yes	Yes	Yes
	Group financing SFI dummy	-0.06** (0.02)	-0.31** (0.10)	-0.12** (0.03)	-0.31** (0.10)	-0.41** (0.11)
	Mixed activities SFI dummy	-0.009 (0.028)	-0.15 (0.12)	-0.02 (0.04)	-0.15 (0.12)	-0.12 (0.13)
	Conduit or fund raising SFI dummy	0.07 (0.04)	0.08 (0.17)	0.08 (0.05)	0.08 (0.17)	0.10 (0.18)
	Small SFI dummy	-0.02 (0.01)	-0.19* (0.08)	-0.05* (0.02)	-0.19* (0.08)	-0.22* (0.09)
	SFI without data dummy	-0.006 (0.014)	-0.07 (0.08)	-0.002 (0.019)	-0.07 (0.07)	-0.05 (0.07)
Cross level interactions	Affiliate STR x Group financing SFI	-	0.73** (0.30)	-	0.74** (0.29)	0.86** (0.31)
	Affiliate STR x Mixed activities SFI	-	0.24 (0.38)	-	0.44 (0.33)	0.37 (0.35)
	Affiliate STR x Conduit or fund raising SFI	-	-0.18 (0.61)	-	-0.04 (0.47)	-0.04 (0.49)
	Affiliate STR x Small SFI	-	0.68** (0.25)	-	0.46* (0.22)	0.52* (0.23)
	Affiliate STR x SFI without data	-	0.17 (0.21)	-	0.21 (0.19)	0.18 (0.20)
	Affiliate ROCE x Group financing SFI	-	-	0.30** (0.10)	-	0.31** (0.10)
	Affiliate ROCE x Mixed activities SFI	-	-	-0.02 (0.12)	-	-0.07 (0.11)
	Affiliate ROCE x Conduit or fund raising SFI	-	-	-0.01 (0.19)	-	-0.04 (0.15)
	Affiliate ROCE x Small SFI	-	-	0.12 (0.08)	-	0.9 (0.07)
	Affiliate ROCE x SFI without data	-	-	-0.05 (0.06)	-	-0.05 (0.06)
	n (affiliate-year observations)	4,447	4,447	4,447	5,035	5,035
	j (parent-year groups)	334	334	334	388	388
	R^2 (overall)	0.151	0.169	0.193	0.166	0.202

Notes: * $p < 0.05$; ** $p < 0.01$; [a] ^{10}log [sales / € 1 mln], tangible fixed assets ratio, and intermediate dummy; [b] ^{10}log [sales / € 1 mln], tangible fixed assets ratio, and parent STR; [c] reduced set has 6 country dummies + 1 combined dummy for Austria, Denmark, Spain and Greece.

finding that the main effect of Dutch group financing companies is reduced affiliate leverage in low tax countries rather than increased affiliate leverage in high tax countries. Possibly constructions with group financing companies are facilitating tax deferral by blending or reinvesting dividend income from low tax affiliates. It might then become unnecessary to use intra-group debt constructions to get income out of these affiliates, allowing them to reduce their leverage. Out of the 14 selected multinationals with Dutch group financing companies, seven are based in the UK, which has a tax credit system for foreign dividend income. For these multinationals, tax deferral could be a main objective. Six of the other multinationals are based in Sweden, though, which has a participation exemption system similar to the Netherlands. For these multinationals, the Dutch group financing companies must serve a different purpose.

If the use of a group financing SFI significantly changes affiliate sensitivity to host country STR, there may exist differences for other coefficients for affiliate level variables as well. Regression (3) includes interaction terms for affiliate ROCE, instead of affiliate STR, and the SFI dummies. The default coefficient on ROCE remains approximately the same at -0.47, but the use of a group financing SFI significantly reduces the leverage effect associated with affiliate ROCE by approximately two thirds. At the average affiliate ROCE of 0.10, the fixed effect of the group financing dummy is now -0.09, which is somewhat larger than in regression (1).

Regression (4) is the same as regression (1) but without parent characteristics. The results are similar. Regression (5) includes interaction terms for both affiliate STR and ROCE. The estimates are similar to the first regressions, confirming that both interaction effects exist at the same time. At average affiliate STR and ROCE, the fixed effect of the group financing dummy is now $-0.41 + (0.86 \times 0.335) + (0.31 \times 0.10) \approx -0.09$, which is the same as in regression (3).

Following the line of reasoning that individual affiliates use retained profits to pay off their own debts or finance new investments (Altshuler & Grubert 2002; Huizinga *et al.* 2007), the findings suggests that a larger proportion of operating profits (before interest) is returned to the group financing company. It may be pooled with income or losses from other affiliates, and subsequently reinvested, either in the form of intra-group loans or equity capital. If group financing companies would invest in new subsidiaries, they should be intermediate holdings. Examination of ownership structures of the 14 selected multinationals with Dutch group financing companies confirms that all of these companies are intermediate holdings and half of them have over 20 direct and indirect subsidiaries. This also indicates that debt financing and holding activities may well be combined in Dutch SFIs.

7   Conclusion and discussion

This may be first study providing statistical evidence that financing affiliates in third countries, other than standard tax havens, play a role in the internal capital structure of multinational corporations. Their role is very important. Affiliates of European multinationals with a Dutch financing vehicle are more sensitive to local corporate tax rates. For these affiliates, differences in host country taxes lead to substantially larger adjustments in financing structure. This effect is particularly strong for financing affiliates that can be classified as group financing companies. These function as a bank within a large multinational and probably have a central role in the reallocation of income and capital among affiliates. They may facilitate the internal shifting of debt to high tax affiliates and away from low tax affiliates. Group financing companies also strongly reduce the link between affiliate profitability and leverage. This suggests that a higher proportion of affiliate profits is returned to the group financing company for reinvestment and a lower proportion is retained by the affiliate to pay of debts or make new investments.

On average, however, the use of Dutch financing affiliates in general is not associated with higher debt financing of affiliates. For group financing companies, there is even a significant negative effect. It can therefore be concluded that these companies are mainly instrumental in reducing affiliate leverage in low tax countries rather than increasing it in high tax countries. This suggests that the main purpose of some Dutch group financing companies could be to facilitate avoidance of home country residual taxes rather than to increase tax deductible interest payments abroad. In that case, the use of a group financing company could actually reduce debt shifting by providing an alternative strategy to achieve tax deferral. Only for the host countries with the highest corporate tax rates, the average reduction in affiliate leverage is outweighed by the strong increase in tax sensitivity and result in lower taxable profits.

These results support previous findings on the use of triangular and multiple tiers strategies, in which retained earnings are reinvested in other affiliates in the form of loans or equity capital (Altshuler & Grubert 2002; Desai *et al.* 2003; Huizinga *et al.* 2007). However, it can now be concluded that affiliates do not always directly invest in other affiliates. Group financing companies often play a central role, and such more centralised approaches may be visualised as hub strategies rather than triangular or multiple tiers strategies.

What is most striking about these results is that they apply to European multinationals with Dutch group financing companies compared to similar European multinationals regardless of financing affiliates in other third countries. The multinationals in the control group may still have group financing companies in Luxembourg, Belgium, Switzerland or Ireland, for example. Taking into account that 13% of all inward FDI stocks worldwide are channelled via Dutch tax planning entities, registered as Special Financial Institutions (SFIs) by the Dutch Central bank (DNB), the results are not implausible, though. It is also possible that multinationals use financing affiliates in different countries, including the Netherlands, in combination.

The distinction between group financing companies and other Dutch financing affiliates has been a central aspect of the research design. The results demonstrate not only that such a distinction is essential, but also that capital structure and financial income flows are useful criteria to classify financing affiliates. It should however be acknowledged that the different types are not yet fully understood. It was expected that Dutch financing conduits and fund raising vehicles, for example, were also associated with specific differences in capital structure compared to the control group, but no effect was found. Some financing affiliates were also classified differently in different years, while it may be expected that their purpose remained basically the same. This may not have been captured properly.

To illustrate the issue, the financing affiliates of three selected multinationals will be briefly examined. First, no financing SFI was identified for UPM-Kymmene using the financial holding activity criterion. However, UPM-Kymmene Finance BV, which is classified as a commercial

financing company, may still have an internal financing function. This is indicated by a non-interest bearing loan without repayment obligations of € 300 million to the parent company. Second, Nokia Finance International BV has been regarded as a financing SFI, most often of the mixed financing type, but was recently reclassified to 'commercially active' and would thus no longer meet the selection criteria. In 2005, its € 17.8 billion in total assets mainly consisted of 'available-for-sale' short term securities, perhaps some type of bonds issued by other affiliates. The company was mainly financed by short term intra-group loans. It paid relatively little tax on its financial income of several hundreds of millions of Euros, apparently as a result of some construction involving a Swiss financing affiliate. Third, the largest Dutch financing affiliate of Volvo, VTC Holding Holland NV, was classified as a group financing company in most years. In 2005, it was funded with 100% equity and held €487 million of fixed financial assets. These included 22 direct and indirect subsidiaries, apparently representing Volvo's main operations in the Germany and the UK. The financing company paid hardly any tax on its € 30 million of financial income. In this case, the income probably consisted mainly of tax exempt dividends and capital gains that were not reported as a separate item.

These three examples illustrate that intra-group financing strategies are relatively diverse. It is therefore difficult to properly classify the activities of financing affiliates, especially on the basis of limited criteria and data. A better understanding of different tax avoidance strategies may be required in order to improve the analysis of quantitative effects. One area of particular interest that merits further research is the role of Dutch SFIs that are financed with loans from affiliates in Caribbean tax havens and similar jurisdictions. Such loans account for a considerable part of all SFI liabilities, but in the present research such constructions could not be properly identified. It would be helpful if more detailed micro data on Dutch financing companies were available, for example distinguishing loans from capital investments and internal and external loans. Perhaps DNB could provide access to such micro data for the purpose of academic research, like the Deutsche Bundesbank does.

The validity of the present findings could be affected by corporate restructurings over the past ten years, especially the recent wave of large scale mergers. What is regarded as a single multinational in the analysis may have been two or three separate multinationals during most of the research period. However, this is most likely to lead to an underestimation of the effects. If two companies have merged and only one of them used an SFI before the merger, it may be expected that the SFI continues to be used, possibly for other affiliates of the newly merged company as well. The analysis, then, would include the affiliates of previously independent multinationals without a Dutch financing company as part of present multinationals with a Dutch financing company. If split-ups of multinationals into independent divisions would have been the dominant trend, the effect would have been opposite.

The results can not be generalised beyond EU affiliates of EU-based publicly listed manufacturing multinationals. It would therefore be interesting to extend the present research to parent companies and affiliates outside Europe. Probably the results will not be exactly the same because differences in withholding taxes and domestic capital markets could have a larger influence. From a development perspective, extending the research to affiliates in developing countries would be a priority. This would require access to similar company databases with a broader geographical scope. If a larger sample is used, it might also be useful to analyse multinationals based in countries with tax credit and exemption systems for foreign dividend income separately. This would help to distinguish tax deferral strategies and debt shifting strategies more clearly. The present study suggests that tax avoidance may lead to lower corporate tax revenues in home as well as host countries. The former could be investigated in more detail if unconsolidated accounts of parent companies are analysed as well.

A few concluding remarks on the experience with a relatively innovative data source and method of analysis – at least as far as research on taxation is concerned – are in order. The

Amadeus database has a geographical bias in coverage, probably reflecting differences among countries in disclosure requirements. It has been shown that this bias substantially affects the research results. It can therefore be useful to restore some of the geographical balance by dropping part of the observations from countries with a relatively high coverage. Finally, multilevel estimation proved to be a useful method of analysis for affiliates within multinational corporations and can be recommended for future research on taxation.

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