

Keller, Sara; Schanz, Deborah

Working Paper

Tax attractiveness and the location of German-controlled subsidiaries

argus Discussion Paper, No. 142

Provided in Cooperation with:

argus - Working Group in Quantitative Tax Research

Suggested Citation: Keller, Sara; Schanz, Deborah (2013) : Tax attractiveness and the location of German-controlled subsidiaries, argus Discussion Paper, No. 142, Arbeitskreis Quantitative Steuerlehre (argus), Berlin

This Version is available at:

<https://hdl.handle.net/10419/72144>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

(arqus)Arbeitskreis Quantitative Steuerlehre

Diskussionsbeitrag Nr. 142

April 2013

Sara Keller / Deborah Schanz

Tax Attractiveness and the Location of German-Controlled Subsidiaries

www.arqus.info

arqus Diskussionsbeiträge zur Quantitativen Steuerlehre

arqus Discussion Papers in Quantitative Tax Research

ISSN 1861-8944

Tax Attractiveness and the Location of German-Controlled Subsidiaries

Sara Keller
WHU – Otto Beisheim School of Management
sara.keller@whu.edu

Deborah Schanz*
Ludwig-Maximilians-University Munich
schanz@lmu.de

This draft: 2 April 2013

Abstract: This paper analyzes whether taxation has an influence on the location decisions of multinational enterprises. As a tax measure, we employ the *Tax Attractiveness Index* (see Keller and Schanz 2013). This index covers 18 different tax factors, such as the taxation of dividends and capital gains, withholding taxes, the existence of a group taxation regime, and thin capitalization rules. Our count data regression analysis is based on a novel hand-collected data set consisting of the subsidiaries of German DAX30 companies. Controlling for non-tax effects, we find that a country's tax environment as measured by the *Tax Attractiveness Index* has a significantly positive effect on the number of German-controlled subsidiaries located there. Hence, our study implies that location decisions depend on a bundle of tax factors as captured by the index. In a second step, we show that the location decisions of German DAX30 companies cannot be explained by the statutory tax rate alone. In contrast, withholding taxes, double treaty networks, and special holding regimes seem to play a decisive role in location decisions. Previous studies examining only the influence of statutory tax rates may thus have underestimated the effects of taxation on the activities of multinational companies.

Keywords: tax attractiveness, location decision, multinational enterprise, count data model

* Corresponding author:
Ludwig-Maximilians-University Munich
Ludwigstraße 28/RG IV
D- 80539 München, Germany
Phone: +49 89 2180 3681

We thank Martin Jacob, Igor Goncharov, Martin Ruf, Maximilian André Müller, Caspar David Peter, Holger Thebeling, Robert Risse, Wolfgang Schön, Kai Konrad, and workshop participants at WHU – Otto Beisheim School of Management, Otto-von-Guericke University Magdeburg, Ludwig-Maximilians-University Munich, and the Max Planck Institute for Tax Law and Public Finance for their helpful comments and suggestions.

1 Introduction

In the course of globalization and ongoing economic integration, a growing number of companies have developed international activities. The reasons why firms establish subsidiaries in foreign countries are diverse. First, the size of the host market, lower factor prices, distance from the parent country, and market-access motives may drive them to locate production abroad.¹ Second, recent literature reveals that taxation also has an influence on location decisions for production (see Devereux and Griffith 1998; Buettner and Ruf 2007). Moreover, there is evidence that multinational enterprises establish subsidiaries in off-shore tax havens (see, e.g., Desai et al. 2006a) and furthermore set up intermediate group entities, such as holding or financial companies, for tax purposes only. In this way, complicated group structures may arise, successfully aiming at reducing the tax burden (see, e.g., Collins 2011; Drucker 2010; Mintz and Weichenrieder 2010). However, empirical evidence in this field is scarce. Therefore, we ask the question as to how taxation affects the location decisions of multinational enterprises. Specifically, this paper analyzes whether companies place subsidiaries in countries that offer an attractive tax environment.

As a measure of a country's tax conditions, we are the first to use the *Tax Attractiveness Index* (see Keller and Schanz 2013). Most existing studies either apply the statutory tax rate or a model-based effective tax rate to explain the influence of taxation on corporate decisions. It is well-known that, in most cases, the statutory tax rate is an unsatisfactory proxy for the tax environment due to the fact that it neglects tax base effects. To overcome this shortcoming at least partially, previous studies apply effective tax rates that capture tax base determinants, such as depreciation allowances and interest deductions. However, existing measures focus on very few tax rules that are important for the location and volume of real investments. Many other important real-world domestic and cross-border tax rules, such as group taxation regimes, thin capitalization rules or double tax treaty networks have not been integrated yet. We argue that the location decisions of multinational enterprises depend on a bundle of tax factors. Hence, the *Tax Attractiveness Index* that we employ for this study covers 18 tax factors, such as the taxation of dividends and capital gains, withholding taxes, the existence of a group taxation regime, the double tax treaty network, and thin capitalization rules (see Keller and Schanz 2013). In this way, it also reflects a country's tax planning op-

¹ Economic theory distinguishes between two main driving forces for becoming a multinational firm. According to the vertical model, differences in factor prices across countries lead to the emergence of multinational companies (see Helpman 1984, 1985). According to the horizontal model, the internationalization decision is motivated by market access (see Markusen 1984, 2002).

portunities that multinational enterprises may take advantage of by establishing intermediate group units, such as holding companies there.

To investigate the location decisions of multinational firms, we focus on the number of subsidiaries that German parent companies operate in different host countries. To be precise, on the basis of count data regression models, we analyze whether the tax environment, as measured by the *Tax Attractiveness Index*, has an influence on location decisions and, hence, the number of subsidiaries. Our empirical analysis is based on a novel data set consisting of the subsidiaries² of German DAX30 companies³ over years 2005 to 2009. We consider Germany to be a suitable reference country since dividends from foreign affiliates are exempt from taxation.⁴ Therefore, parent country taxation can be neglected and, hence, the corporate tax environment of the host country which is subject to our study is critical. To ensure a comprehensive picture of German-controlled affiliates abroad, we do not rely on existing databases, but we hand-collect our data. Our final sample includes subsidiaries of German DAX30 parent companies that are located in 97 different host countries – including tax havens – spread across the world.

The main finding of our study is that a host country's tax environment, as measured by the *Tax Attractiveness Index*, plays a significant role in determining the number of German-controlled subsidiaries located there. Controlling for non-tax influences, our analysis reveals that the *Tax Attractiveness Index* has a positive impact on the number of subsidiaries. Since the effect that we find is substantial, we can conclude that taxation has an influence on the location decisions of multinational enterprises. Our results imply that the location choices depend on multiple tax factors as combined in the *Tax Attractiveness Index*. Multinational companies establish (an increased number of) affiliates in tax attractive countries, suggesting that they implement tax-efficient corporate group structures by making use of intermediate companies in favorable holding locations and by placing subsidiaries in off-shore tax havens. We perform several robustness checks to ensure confirm the reliability of our results. Furthermore, we show that the location decisions of multinational enterprises cannot be explained by the statutory tax rate alone. Although the corporate tax rate has a significant effect on the number of subsidiaries in a country, location decisions can be better explained by a bundle of

² We include all legally independent entities held by a parent company. We use the terms “subsidiary” and “affiliate” interchangeably.

³ DAX30 is the major German stock market index (*Deutscher Aktien Index*) and comprises the 30 largest listed companies based on order book volume and market capitalization.

⁴ According to Section 8b of the German corporate income tax code (*Körperschaftsteuergesetz*), dividends distributed by national or foreign affiliates can be received free of tax. Only 5% of dividends are taxed as non-deductible operating expenditures.

tax factors as combined in the *Tax Attractiveness Index*. Decomposing the *Tax Attractiveness Index*, we identify the withholding taxes that a country imposes as well as its double tax treaty network and the existence of a special holding regime as key tax drivers for foreign subsidiary location decisions.

Our research is relevant for different groups of addressees: first, it is important for policy makers. The *Tax Attractiveness Index* makes it possible to rank countries according to their tax environment, and our analysis reveals which countries succeed in attracting foreign subsidiaries. From this, governments and politicians can compare their current tax position to other countries and learn about firm location positions. In addition, our study provides insight into the tax factors that multinational enterprises consider to be the most important in their location decisions. Policy makers might use this knowledge in regard to future tax reforms that may be targeted to enhance location attractiveness. Furthermore, for German policy makers, it is valuable to be aware of the location of German-controlled subsidiaries. Since Germany is a high-tax country, tax authorities could potentially lose tax revenue and the economy might even lose jobs.⁵ The issue of international tax base erosion caused by profit-shifting has been recently addressed by the OECD (2013). Second, our findings are relevant for companies as well as consultants. This group could gain insight into the location strategies of other multinational enterprises. Furthermore, from the *Tax Attractiveness Index* which we provide per country, they can identify favorable tax jurisdictions that might be used for future tax planning purposes. Third, researchers can benefit from our analysis. We reveal that the foreign subsidiary location decisions depend on a bundle of tax factors, most of which have never been previously included in empirical research. This might drive international researchers to employ the *Tax Attractiveness Index* as a tax measure in future studies. Moreover, we provide an idea of which tax factors matter most for the location decisions of multinational firms. This knowledge could be valuable for forthcoming research.

All mentioned groups of addressees might be interested in our comparison of the statutory tax rate's influence on location decisions with the *Tax Attractiveness Index*' influence on location choices. In the past, many studies and also the public media (see, e.g., Rapoza 2011; Isidore 2012) have focused mainly on the corporate tax rate when comparing different countries' taxes. Although there is no doubt that the corporate tax rate has an important signaling function (see, e.g., OECD 2001), we show that multinationals take additional tax factors into

⁵ However, recent articles reveal that internationalization is not necessarily associated with less tax revenue in high-tax countries. The possibility of shifting profits into low-tax countries might even have a positive effect on the investment level in high-tax countries, such as Germany and the U.S. (see Becker and Fuest 2010; Overesch 2009; Desai et al. 2006b).

account in their location decisions. Therefore, relying only on statutory tax rates will not be sufficient in the future, e.g., for politicians regarding their own tax system as well as those of competing countries or for consultants and investors. Accordingly, the importance of taking the entire tax system, including double taxation conventions, into account, instead of only tax rates, has recently been emphasized by the OECD (2013).

The remainder of the paper is organized as follows: in the next section, we relate our topic to existing literature providing the theoretical background for our analysis, and we develop our hypothesis. In section 3, we present the *Tax Attractiveness Index*, our firm data set and the econometric methodology that we apply. Section 4 is dedicated to the results of our empirical analysis. In section 5, we subject our results to multiple robustness checks, we replace the *Tax Attractiveness Index* with the statutory tax rate and we decompose the index to learn about the key drivers of our results. In the last section, we reveal the limitations of our study and we draw conclusions.

2 Theoretical Background and Hypothesis

Existing studies dealing with the influence of taxation on the location decisions of multinational enterprises form part of a sizeable body of empirical research that investigates the impact of taxation on foreign direct investment (FDI). This literature confirms a significantly negative effect of the host country's tax level on the volume and frequency of FDI.⁶

In contrast to our study, tax measures used in prior literature take only very few tax rules into consideration when analyzing the effect of taxation on location decisions. Most studies use either the statutory tax rate or they apply model-based effective tax rates which only include information about the depreciation of assets, financing activities, and the statutory corporate tax rate. The underlying methodology developed by King and Fullerton (1984) and put forward by Devereux and Griffith (1999, 2003) is to determine the effective tax burden of a hypothetical standardized investment project. The basic approach refers to the influence of taxation on an investment that only earns the cost of capital (effective *marginal* tax

⁶ Hines (1997, 1999) and Devereux (2007) provide comprehensive reviews of the existing literature. Based on previous studies, De Mooij and Ederveen (2003, 2006) and Feld and Heckemeyer (2011) conduct meta-analyses. Early contributions in the field of taxation and FDI are based on aggregate FDI flows (see Hartman 1984, for pioneering work). Other analyses use aggregated firm-level data on property, plant, and equipment to investigate real economic activity more accurately than FDI in its broad definition (see Grubert and Mutti 1991, 2000; Hines and Rice 1994; Altshuler et al. 2001). However, due to the underlying data structure, they are not capable of disentangling the discrete location choice and the subsequent continuous choice of the investment level. With the availability of firm-level data, the number of studies examining international location decisions has increased (see the framework developed by Devereux 2007).

rate) (see, e.g., Devereux et al. 2002). However, prior studies claim that location decisions depend on the effective *average* tax rate, rather than on the effective *marginal* tax rate (see Devereux and Griffith 1998). The effective *average* tax rate represents the impact of taxes, assuming a higher profitability of the underlying investment project.⁷

Based on the statutory tax rate or the effective tax rate as a proxy for the tax environment of a country, one strand of literature applies logit estimation models to analyze tax effects on location decisions. Devereux and Griffith (1998) analyze how taxation influences the decisions of U.S. multinational enterprises whether to place a subsidiary in the UK, France, or Germany (conditional on having chosen to produce in Europe) over the years 1980 to 1994. As expected, they identify the host country's effective average tax rate (but not the effective marginal tax rate) to be important for the location decision. Similar to this approach, Buettner and Ruf (2007) examine the impact of taxation on German outbound FDI in 18 different host countries between 1996 and 2003. Their results indicate that the statutory tax rate has considerably more predictive power for the location decision than the effective marginal tax rate; Hebous et al. (2011) find a similar result when analyzing differences in tax sensitivity between M&A and Greenfield investments. Consistent with Devereux and Griffith (1998), Buettner and Ruf (2007) find no effect of the effective marginal tax rate. Barrios et al. (2012) are the first to integrate parent country taxation into the location choice of European multinational firms over the period 1999-2003.⁸ Making use of a conditional logit model, their findings suggest that the corporate taxation of both the host country and the parent country exerts a negative influence.

As an alternative method for modeling discrete foreign subsidiary location decisions, studies applying count data estimation have recently emerged (see Becker et al. 2012; Overesch and Wamser 2009, 2010; Stöwhase 2002).⁹ In contrast to binary choice models (logit), count data models are able to take the fact that multinational enterprises mostly operate more than one subsidiary in one host country into consideration. Hence, a count variable contains more information than a binary variable. Although the regression technique in recent literature has changed from logit models to count data models, the tax measures applied to explain foreign subsidiary location decisions remain the same: either the statutory tax rate or model-based effective tax rates are employed. Based on the number of German outbound FDI

⁷ Devereux and Griffith (2003) argue that, for the discrete location choice, the effect of taxation on the after-tax profit of the total investment project is decisive.

⁸ Parent country taxation occurs in case of countries that tax the income of multinational enterprises on a worldwide basis (in contrast to Germany, where foreign dividends are exempt from taxation).

⁹ On a national level, previously, Papke (1991) has used count data estimation to investigate the influence of tax rate differentials between U.S. states on the number of firm births in the manufacturing sector.

positions in 30 European countries over the years 1989 to 2005, Overesch and Wamser (2009) show that the host country's effective average tax rate has a negative influence on the location decision. Furthermore, they aim at investigating asymmetries in tax elasticity depending on different FDI characteristics. Dividing FDI according to the type of business activity, their analysis reveals that financial services and R&D activities are most tax sensitive. In line with other studies, Overesch and Wamser (2009) put forward the argument that the statutory tax rate is decisive for the location choice of non-manufacturing group units, such as holdings and financing companies (see Stöwhase 2002; Overesch and Wamser 2010). Remarkably, they do not find a significant effect in the case of holding companies.¹⁰ Overesch and Wamser (2010) find a negative impact of the effective average and the statutory tax rate on the location decisions of German companies in ten eastern European countries.

A different type of effective tax rates is analyzed by Markle and Shackelford (2012). They empirically investigate *accounting* effective tax rates based on financial statement information. Their analysis reveals that the location of the parent company strongly affects a multinational's worldwide effective tax burden, while the locations of its subsidiaries have much less impact. Moreover, the authors show that mean values of the financial statement-based effective tax rates per country are highly correlated with the statutory tax rates of the parents' home countries. Dyreng and Lindsey (2009) also investigate effective tax rates based on financial accounting data. Their findings indicate that U.S. firms with subsidiaries in tax havens face a lower worldwide tax liability than those who do not operate in tax havens. Overall, the *accounting* effective tax rate approach is interesting for analyzing the *ex post* tax burdens of multinationals depending on their locations; however, this approach is not suitable for an *ex ante* analysis of the influence of a country's tax environment.

Next to statutory tax rates and tax base determinants, such as depreciation, included in model-based effective tax rates, few other tax factors have been analyzed so far. Mintz and Weichenrieder (2010) are the first to investigate indirect group structures empirically. Exploiting data on German outbound FDI, they reveal that multinational enterprises set up holdings in a third country in order to gain access to favorable tax rules agreed on in a double tax treaty (so called *Treaty Shopping*), such as reduced withholding taxes. Moreover, they find that intermediate entities may be used to implement tax-efficient financing structures.¹¹ In addition, it is shown that the existence of a group taxation regime increases the probability of

¹⁰ The authors identify holding companies according to industry code. In a similar approach, Stöwhase (2002) suggests that the effective average tax rate is a significant determinant of real investment. In the case of service, finance and R&D activities, he finds an influence of the statutory tax rate.

¹¹ Mintz (2004) develops a corresponding model.

setting up a country holding.¹² Further tax planning strategies involving holding companies can be found, e.g., in Eicke (2009).

Apparently, existing tax measures focus only on few tax factors. Contributing to existing literature, we apply the *Tax Attractiveness Index*, which does not only include tax factors that determine the location decisions of real investment, but also captures those that may explain the cross-border location decisions of non-operative group units, such as holdings or similar tax planning entities.

Mintz and Weichenrieder (2010) descriptively identify the Netherlands, Switzerland, Luxembourg, and Ireland as favorable holding locations. This evaluation is confirmed by Desai et al. (2003) who analyze the influence of indirect structures on FDI of U.S. multinational enterprises. Typical off-shore tax havens, such as Bermuda, the Bahamas, and the Cayman Islands seem not to play a significant role in hosting intermediate companies because they lack a comprehensive treaty network (see Mintz and Weichenrieder 2010). Still, very low statutory tax rates that apply in tax havens represent incentives to place subsidiaries there (e.g., as profit-shifting entities). We aim at analyzing the importance of tax havens for the location of foreign affiliates. The activities of U.S. multinational enterprises in tax havens have been widely studied (see Hines and Rice 1994; Grubert and Slemrod 1998; Hines 2005; Desai et al. 2006a). However, evidence for the operations of German multinational firms in tax havens is scarce.¹³ Therefore, this paper seeks to examine the role that tax havens play in the location decisions of German multinational enterprises.

We put forward the theory that the location decisions of multinational enterprises can be explained by the *Tax Attractiveness Index*. Hence, we examine the following hypothesis:

The host country's tax environment as measured by the Tax Attractiveness Index has a positive influence on the location decisions of German multinational enterprises.

We operationalize the location decisions by counting the number of subsidiaries a German DAX30-parent company holds in a distinct host country.

3 Data Description and Empirical Methodology

3.1 Tax Attractiveness Index

¹² Oestreicher and Koch (2010) empirically analyze the determinants of forming a German tax group. They reveal that the introduction of the exemption method for corporate shareholders in 2001 leads to an increase in the probability of establishing a tax group.

¹³ Gumpert et al. (2011) are a recent exemption. They investigate variation in tax haven use between different industries for a sample of German multinational companies.

As a tax measure that is relevant for the location decisions of multinational enterprises, we apply the *Tax Attractiveness Index* (see Keller and Schanz 2013).¹⁴ This index intends to provide a detailed picture of a country's tax environment. It especially aims at reflecting the tax planning opportunities offered by a particular location. Therefore, in contrast to existing tax measures, the *Tax Attractiveness Index* also captures the tax factors that may drive multinational enterprises to establish intermediate affiliates, such as holding companies.

The *Tax Attractiveness Index* covers 18 different tax factors, including the statutory tax rate, the taxation of dividends and capital gains, withholding taxes, loss offset provisions, the group taxation regime, the double tax treaty network, thin capitalization rules, controlled foreign company (CFC) rules, anti-avoidance legislation, the personal statutory income tax rate and the existence of a special holding regime. Most of the tax factors are qualitative in nature, but have been quantified in order to be summarized in one index value per country. All tax factors are restricted to values between zero and one. In each case, a value of one indicates the optimum (e.g., a statutory tax rate of 0%; the possibility of cross border group relief; no thin capitalization rules) while a value of zero signifies least favorable tax conditions (e.g., the highest statutory tax rate in the sample; no group relief; the existence of thin capitalization rules). Adding values for all single tax factors and dividing the sum by 18 yields the country-specific *Tax Attractiveness Index*. Consistent with the single tax factors, the index varies between zero and one with high values indicating an attractive tax environment. The index is constructed for 41 European countries, 18 countries that are situated in Africa and the Middle East, 19 in North and South America, 16 in Asia-Pacific, and 6 in the Caribbean; it is measured on an annual basis.

As a first element, the index includes the statutory tax rate since it determines the general level of taxation faced by corporate entities. The statutory tax rate is defined as the corporate income tax rate plus surcharges and local trade taxes. For the purpose of standardization, it is put into relation to the highest statutory tax rate of the 100 sample countries. Thus, a value of one stands for a zero tax rate, while a value of zero is reached in the case of the highest tax rate in the sample. Furthermore, taxation of dividends and capital gains is taken into account. In many countries, a participation exemption applies which allows that dividends from affiliated companies as well as capital gains can be received free of tax. This is an attractive feature that companies might take into consideration when making their location decision.

¹⁴ In other contexts, the application of indices is widely accepted. A famous example is the creditor rights index introduced by La Porta et al. (1998) that has been applied in many subsequent articles (see, e.g., Djankov et al. 2007; Spamann 2010). In the sense of Hung (2000), Jacob and Goncharov (2012) construct a tax accrual index that counts accrual norms codified in tax law.

The *Tax Attractiveness Index* accounts for the extent to which dividends and capital gains are tax exempt. Next, withholding taxes that a country levies are measured, since it is very much in the interest of multinational companies that withholding taxes be abolished as they cause double taxation. Therefore, the EU Parent-Subsidiary Directive and the Interest and Royalties Directive are in effect eliminating withholding taxes within the European Union. Moreover, in most double tax conventions, the minimization of withholding taxes is codified. To provide a detailed picture, the *Tax Attractiveness Index* includes six different withholding taxes. On the one hand, it covers withholding taxes on dividends, interest and royalties that are constituted in domestic law. On the other hand, it considers withholding taxes on dividends, interest and royalties that each host country levies in its relationship with Germany. In this way, the index accounts for the possibility that either an EU provision or a double tax treaty applies that abolish or lower withholding taxes.¹⁵

In addition, the *Tax Attractiveness Index* considers the loss offset provisions that a country offers by including measures for loss carry back as well as loss carry forward opportunities. As a further tax factor, the index includes the possibility of filing a consolidated group return. Under a group relief, profits from one subsidiary can be used to compensate for losses incurred by another group member. Thereby, the overall group tax burden is lowered. Next, the index includes the number of double tax treaties that a country has concluded. A comprehensive treaty network may represent an important determinant of the location decision. By setting up a subsidiary in such countries, companies obtain access to favorable tax rules agreed upon in a double tax convention that they could not have otherwise exploited. Furthermore, the index incorporates thin capitalization rules, CFC rules, and a country's general anti-avoidance legislation to account for measures that countries put into force in order to secure tax revenue. From the multinational firms' perspective, the existence of such provisions is not desirable as they hinder them from allocating their profits in the most efficient way. Additionally, the *Tax Attractiveness Index* incorporates the personal income tax rate to allow for the level of taxation faced by the employees of a subsidiary. As a last criterion, the index considers whether a jurisdiction offers a special holding regime which decreases the corporate tax burden below the standard level by, for example, offering lower corporate tax

¹⁵ In its original version, the *Tax Attractiveness Index* contains a dummy variable indicating whether the respective country is part of the European Union and, therefore, benefits from the EU directives (see Keller and Schanz 2013). However, in this study, we replace the dummy variable with the specific withholding tax rates to Germany, making our analysis more precise for our Germany-related research question. Data for both versions of the *Tax Attractiveness Index* are available upon request.

rates for holding companies. Table 1 reports mean values of the *Tax Attractiveness Index* for 100 countries over the 2005 to 2009 period.

[Insert Table 1 about here]

3.2 Firm Data

Our empirical analysis is based on a hand-collected data set consisting of the subsidiaries of German DAX30 companies. We consider the DAX30 enterprises to be most suitable for our purposes since they operate great numbers of subsidiaries in diverse countries all over the world. For several reasons, we refrain from using existing databases. First, the AMADEUS database provided by Bureau van Dijk that has been used in several previous publications (see, e.g., Barrios et al. 2012) offers financial data for exclusively European affiliates. Nevertheless, the names and the respective locations of non-European subsidiaries are listed, which would yield sufficient information for our main analysis. However, a crosscheck reveals that the database rarely includes *all* subsidiaries of German DAX30 companies. At least in some cases, several affiliates are lacking. These are supposed to be predominantly small ones with minor operating activities. However, we consider including virtually all subsidiaries in our sample to be important since certain intermediate group units or small subsidiaries in tax havens might otherwise be disregarded. Next, we took the MiDi database provided by the German Central Bank into consideration. Data collection is enforced by German law¹⁶ and German companies are required to report their investment positions held abroad if the participation is 10% or more and the balance sheet total of the investment exceeds € 3 million.¹⁷ However, small subsidiaries that fall below the threshold do not have to be reported. This gives rise to the assumption that the database does not include *all* foreign German-controlled subsidiaries. Comparisons of the number of subsidiaries in our hand-collected data set with randomly chosen MiDi-based studies reveal much higher numbers in our case. Therefore, to ensure that the number of subsidiaries is correctly specified and to yield a comprehensive picture of the affiliates of German DAX30 companies held abroad, we hand-collect our data. Due to the high level of effort required for data collection, we concentrate solely on the German DAX30 companies. Extending the sample, for example, to non-listed firms offers room for further research.

¹⁶ See Section 26 of the Foreign Trade and Payments Act (*Aussenwirtschaftsgesetz*) in connection with the Foreign Trade and Payments Regulation (*Aussenwirtschaftsverordnung*).

¹⁷ For further information about MiDi, see Lipponer (2009).

We source the enumeration of all subsidiaries from the full list of shareholdings which is part of the group appendix according to German commercial law.¹⁸ The full lists of shareholdings are published in the electronic German Federal Gazette (www.ebundesanzeiger.de) and the commercial register or they are available on the firm websites. Our sample period covers the years 2005 to 2009. To avoid survivorship bias, we include parent companies that have been listed in the DAX30 at any time during the sample period. Furthermore, we restrict our data set to non-financial firms since financial firms apply different accounting methods. This leads us to 29 parent companies. We collect all subsidiaries (legally independent entities) each parent company holds per year. However, data does not allow differentiating between types of subsidiaries (e.g., operative units, holding companies). Although this differentiation seems to be desirable, anecdotal evidence shows that multinationals often establish mixtures of different types, e.g., to avoid controlled-foreign-corporation rules (CFC-rules) applicable on passive income only. Taking all five years together, we accumulate a total number of 76,442 subsidiaries located in 189 different countries. For each subsidiary, we obtain information on its location, the group equity share (in %), and its scope of consolidation.¹⁹ For a number of 43,161 affiliates, information on equity is available.

We employ the number of subsidiaries that German multinational enterprises operate per year in different host countries to analyze the determinants of location decisions. The number of affiliates represents the sum of location choices in favor of a distinct country. Therefore, we count the subsidiaries that parent company j holds in year t in host country i . This provides us with the dependent variable of main interest, *Number Subsidiaries*.²⁰ For the purpose of more detailed analyses and to be able to conduct robustness tests, we generate certain alternative dependent variables. First, we count the number of consolidated subsidiaries (*Number Cons. Subsidiaries*) that parent company j holds in year t in host country i . Next, we generate *Number Subsidiaries (relative)*, defined as the number of subsidiaries that parent company j holds in year t in host country i divided by the total sum of foreign subsidiaries that parent company j holds in year t . Furthermore, we sum up the equity that parent company j holds in year t in host country i measured in mill. EUR (*Equity*). We also generate *Equity (relative)*, defined as the sum of equity that parent company j holds in year t in host country i divided by the total sum of the equity that parent company j holds in year t in foreign coun-

¹⁸ See Section 313 (2) and Section 285 No. 11 of the German Commercial Code (*Handelsgesetzbuch*).

¹⁹ We are able to differentiate between consolidated affiliates, non-consolidated affiliates, associated companies and joint ventures. However, about 70% of the subsidiaries included in our initial sample are consolidated affiliates.

²⁰ The following example illustrates our approach: if parent company 1 operates five affiliates in Spain in year 2006, then *Number Subsidiaries* equals five.

tries. For an aggregated analysis, we count the subsidiaries that all 29 parent companies together hold in year t in host country i (*Number Subsidiaries (all)*).

As a next step, we merge the tax data (*Tax Attractiveness Index*) with our firm sample. Complete tax data are available for 100 countries, including Germany. However, we analyze the location of German-controlled subsidiaries *abroad*. Hence, we exclude Germany as a host country. In addition, we have to drop observations for the British Virgin Islands and Jersey due to a lack of country-level control variables presented in the next section. Thus, our analysis is based on 97 countries and our initial sample contains 14,065 observations (29 parent companies \times 5 years \times 97 countries). We have to drop observations for Belarus 2005, as we lack tax information (minus 29 observations), and for three parent companies for which we do not have access to the list of shareholdings for 2005 (minus 3 parent companies \times 96 remaining countries for 2005 = 288 observations). Our final sample consists of 13,748 observations representing 97 different host countries.²¹

The dependent variable that we apply in our main analysis is *Number Subsidiaries*. Figure 1 displays its distribution, revealing that our data set contains 6,668 zeros ($\sim 47.77\%$).

[Insert Figure 1 about here]

The high number of zeros can be explained by the fact that each of our 29 parent companies does not operate subsidiaries in all 97 host countries in each year of the sample period. We will address the issue of excess zeros in the next chapter. Summary statistics for all dependent variables used in this study are presented in Table 2 Panel A.

[Insert Table 2 about here]

Number Subsidiaries ranges from zero to 524. The mean is 3.861, revealing that each German DAX30 company operates, on average, 3.861 subsidiaries in each of the 97 host countries per year. *Number subsidiaries (all)* has a minimum of zero and a maximum of 2,056 affiliates, with a mean of about 110, i.e., the German DAX30 companies together have, on average, 110 subsidiaries in each of the 97 host countries per year. Comparing the mean and median of *Number Subsidiaries* and of *Number Subsidiaries (all)* shows that variance is high in both cases. Equity of one parent company in one host country goes up to 92 billion EUR per year.

²¹ Thus, we finally capture 53,078 of the initial 76,442 subsidiaries.

3.3 Econometric Approach

3.3.1 General Econometric Framework

As we want to consider the fact that multinationals might operate more than one subsidiary in one host country, we apply count data regression models. We employ *Number Subsidiaries* that reflects the number of subsidiaries that parent company j holds in year t in host country i to analyze the effect of taxation on the location decisions of German multinational enterprises. Thus, our main dependent variable is a count variable, meaning that it has only non-negative integer outcomes. A natural starting point for the analysis of count data is the Poisson regression model.²² However, the Poisson model implies that the mean of the count variable is equal to the conditional variance (*equidispersion*) (see, e.g., Winkelmann and Zimmermann 1995). In applied research, this assumption is frequently violated. Table 2 Panel A reveals that this is also true in our case: the variance of *Number Subsidiaries* clearly exceeds its mean, revealing that our data are overdispersed. Further formal tests we conduct to reinspect descriptive examination likewise reject the null hypothesis of equidispersion. *Number Cons. Subsidiaries* and *Number Subsidiaries (all)* that we use as alternative dependent count variables suffer from overdispersion as well. Hence, the Poisson model is not appropriate in our application. However, as it is widely applied, we use it as a benchmark.

Next, we take the negative binomial model into consideration since it is more flexible than the Poisson model. In the negative binomial model, the conditional variance is specified differently and, thus, it allows for overdispersion. Specification tests that compare different model-fits confirm that the negative binomial model is more suitable for our data. Therefore, we employ the negative binomial model as the preferred specification in our empirical estimations. Precisely, we apply the negative binomial model of type 2 that allows for overdispersion which increases with the conditional mean (see, e.g., Cameron and Trivedi 1998).²³

Furthermore, we account for the fact that zero is a frequent observation for *Number Subsidiaries*. A zero-inflated negative binomial model is able to handle the large number of zeros. Therefore, we apply it as an alternative to the negative binomial model (see, e.g., Cameron and Trivedi 2010).²⁴

²² For a detailed technical description of the underlying econometric framework, see Appendix B.

²³ Becker et al. (2012) and Overesch and Wamser (2009) also opt for this version of the negative binomial model.

²⁴ Working with count data, there is typically no clear cut-off that determines that one model fits better than another. In our case, specification tests suggest both the negative binomial and the zero-inflated negative binomial model.

Moreover, we use OLS estimation as an alternative to count data models. In our robustness checks, the dependent variable is sometimes not a count variable (such as *Number Subsidiaries (relative)*, *Equity* and *Equity (relative)*). In those cases, we only use OLS estimation.

3.3.2 Regression Equation

Apart from the *Tax Attractiveness Index*, we include several country-level control variables to model the location decisions of multinational enterprises. Applying count data models, we estimate the following regression (with host country i , parent company j and year t):

$$\begin{aligned} \text{Number Subsidiaries}_{ijt} = & \alpha_0 + \beta_1 \text{Tax Attractiveness Index}_{it} + \beta_2 \text{GDP}_{it} + \beta_3 \text{Similarity}_{it} \\ & + \beta_4 \text{Distance}_{it} + \beta_5 \text{Adjacency}_{it} + \beta_6 \text{Rule of Law}_{it} \\ & + \beta_7 \text{Voice \& Accountability}_{it} + \alpha_{jt} + \varepsilon_{ijt} \end{aligned} \quad (1)$$

As non-tax parameters that may affect the location decision and, hence, the number of subsidiaries, we take account of *GDP*, *Similarity*, *Distance*, *Adjacency*, *Rule of Law* and *Voice & Accountability*. All country-level control variables are measured on an annual basis. Moreover, we include parent-year fixed effects (α_{jt}) to control for exogenous firm-year characteristics. However, in alternative specifications, parent and year fixed effects are incorporated separately. The error term is denoted with ε_{ijt} .

Our independent variable of interest is the *Tax Attractiveness Index*. The higher the score, the more attractive the tax environment offered by a host country. Therefore, we expect the *Tax Attractiveness Index* to have a positive effect on the location decisions of multinational enterprises and, thus, we expect it to be positively associated with *Number Subsidiaries*. Since our sample period covers only five years, the *Tax Attractiveness Index* does not show sufficient within-country variation over time. Hence, the identification of the index as a regressor relies on its cross-country variation. For this reason, we pool the data over time, providing us with a pooled cross-sectional data set. Accordingly, we refrain from using panel data models, but we apply pooled estimation techniques. However, as a consequence, standard errors may be correlated over time on a within-country basis. To prevent standard errors from being biased, we take two different measures: first, we include year-fixed effects to control for special time effects. Second, we cluster the standard errors by country.²⁵

²⁵ The clustering by country-year results in lower standard errors. To apply the most conservative specification, we therefore cluster standard errors by country. Moreover, standard errors allow for heteroskedasticity.

In accordance with the existing literature on the determinants of the location decision, we take *GDP* as a first control variable (see Overesch and Wamser 2009, 2010; Buettner and Ruf 2007). *GDP* captures the size of the host market and, therefore, we expect it to be positively related to *Number Subsidiaries*. *GDP* is defined as the natural logarithm of host country *i*'s gross domestic product measured in constant U.S. dollars, based on the year 2000. Second, we include *Similarity* as a proxy for similarity in the endowment with skills and human capital. *Similarity* is an index expressing the difference between Germany's GDP per capita and the GDP per capita of the host country (see Buch et al. 2005).²⁶ It is based on the assumption that a higher GDP represents higher productivity. Though, recent literature suggests using measures, such as school enrollment, that reflect the endowment with skilled labor more explicitly (see Carr et al. 2001; Overesch and Wamser 2009). Barrios et al. (2012) apply the logarithm of labor costs. However, data coverage for most of the 97 sample countries is poor. This is why we rely on the *Similarity* index. *Similarity* ranges between zero and one, with high values indicating that countries are more similar. Expectations regarding the sign of *Similarity* are ambiguous (see, e.g., Barrios et al. 2012). If market access motives dominate (horizontal model), enterprises are more likely to establish subsidiaries in countries that are similar (see, e.g., Markusen 1984, 2002). This would lead to an expectation of a positive coefficient for *Similarity*. In contrast, if production costs-savings motives dominate (vertical model), companies set up affiliates in countries which are dissimilar in their endowment with human capital and skilled labor (see, e.g., Helpman 1984, 1985). This is an argument for a negative association between *Similarity* and *Number Subsidiaries*.

Next, we control for the geographic distance between Germany and the respective host country.²⁷ Primarily, geographic distance is regarded as a proxy for transportation costs. Moreover, it may capture cultural distance and, therefore, reflect communication and information costs incurred due to language barriers and differing business practices (see Buch et al. 2005; Carr et al. 2001; Overesch and Wamser 2009). Thus, geographic distance should have a negative effect on the location decisions of multinational enterprises. We apply two different measures for geographic distance: first, we use *Distance*, defined as the distance between Germany's main agglomeration and the main agglomeration of host country *i*, weighted by the share of the agglomeration in the overall country's population, respectively, provided by

²⁶ The corresponding formula can be written as: $1 - (\text{abs}[GDP \text{ per capita}_{it} - GDP \text{ per capita DEU}_i] / \max[GDP \text{ per capita}_{it}, GDP \text{ per capita DEU}_i])$ (Buch et al. 2005). *GDP per capita* is measured in constant U.S. dollars based on the year 2000, respectively.

²⁷ This is in line with the gravity approach that explains international activity by a combination of mass variables (e.g., GDP and population) and distance variables (see, e.g., Bellak et al. 2009).

the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) (see Mayer and Zignago 2011). Second, we include a dummy variable, obtaining a value of one if host country i shares a border with Germany (*Adjacency*) (see, e.g. Barrios et al. 2012). While we anticipate a negative coefficient for *Distance*, we expect *Adjacency* to have a positive sign.

Finally, we control for the perceptions of governance in respective host countries using the *World Governance Indicators* developed by Kaufmann et al. (2010). The authors differentiate six dimensions of governance. We opt for including *Rule of Law* and *Voice & Accountability*.²⁸ *Rule of Law* reflects the level to which negotiators have confidence in, and stick to the rules of, society. It captures particularly the quality of contract enforcement, property rights, the police, as well as the probability of crime and violence in host country i . *Voice & Accountability* indicates the degree to which citizens of host country i are given the possibility to elect their government. In addition, it represents the extent to which the freedom of expression, the freedom of association and a free media are established. Both governance indicators may range between -2.5 and 2.5. The higher the score, the better is the perception of governance. Hence, we expect both variables to be positively related with *Number Subsidiaries*. Appendix A provides detailed descriptions of the independent variables used in this study as well as the corresponding data sources. Table 2 Panel B summarizes descriptive statistics for all country-level parameters. The *Tax Attractiveness Index* ranges between 0.166 indicating the score for Argentina in 2009, and 0.889 reflecting the score for Bermuda and the Bahamas in years 2005 to 2009. The mean and median of the index are close to 0.5. It can be seen that all variables show sufficient variation. In the appendix, Table C.I presents a correlation matrix for all dependent and independent variables applied in this study.

4 Results

4.1 Graphical Evaluation

As a first step, we graphically analyze the location of German-controlled subsidiaries. Figure 2 gives an impression of where parent countries included in our sample place their affiliates. On the abscissa, all 97 sample countries are entered in alphabetical order. On the ordinate, the yearly average of *Number Subsidiaries (all)*, defined as the number of affiliates all sample parent companies together operate in year t in host country i is plotted.

[Insert Figure 2 about here]

²⁸ Since the parameters are highly correlated with each other, we are not able to include all six indicators.

The United States and Great Britain host the highest numbers of subsidiaries. From Figure 2, it is not possible to deduce motives for the location decisions. However, the increased numbers of affiliates in both countries might be explained by the close relationship and the intense trade connections existing with Germany. The United States and Great Britain are large economies that form important markets for German companies. With regard to the tax environment as expressed by the *Tax Attractiveness Index*, Great Britain has a considerably high score (on average 0.6367) while tax conditions in the United States are weak (on average 0.3781). The third highest number of German-controlled subsidiaries is located in the Netherlands. Although the Netherlands is a neighboring country, this is a somewhat surprising result since the Dutch economy is not among the largest in Europe. The Netherlands, however, offer a very attractive tax environment as indicated by an index value of 0.7400 on average. Consistent with previous studies that have identified the Netherlands as an important holding location (see Mintz and Weichenrieder 2010), there is reason to assume that some German-controlled subsidiaries located there do not serve operative purposes, but are established mainly for tax motives. Furthermore, a considerable number of German-controlled subsidiaries are located in Austria, Switzerland and Belgium, respectively. Since all countries provide favorable tax conditions (index values of on average 0.6603, 0.6428 and 0.6627, respectively), taxation might play a role in locating large numbers of subsidiaries in these countries.

Figure 3 focuses on countries hosting, on average, less than 85 German-controlled subsidiaries per year. In this way, it yields a deeper look into the cloud depicted at the bottom of Figure 2. Locations with an attractive tax environment as indicated by a high *Tax Attractiveness Index* are highlighted.

[Insert Figure 3 about here]

Figure 3 reveals that German multinational enterprises operate subsidiaries in classical off-shore tax havens. Affiliates are located in countries such as Bermuda, the Bahamas, the Cayman Islands, and the Netherlands Antilles. Due to the fact that these economies are very small, there is hardly any operative reason to establish subsidiaries there. The same is true for highly tax attractive European countries, such as Luxembourg, Liechtenstein, Malta, Cyprus, and Guernsey. Although absolute figures are low, the mere fact that German multinational enterprises establish subsidiaries in these countries may serve as an indication for tax planning

and the existence of tax-optimized group structures. Hence, we can conclude that tax havens play a role in the location decisions of German multinational firms.

4.2 Regression Results

Table 3 presents results for our regression specified in equation (1). We apply pooled cross-sectional data. Although specification tests reject the Poisson model, we use it as benchmark (column 3). As our preferred model, we apply the negative binomial model since it is more suitable for our analysis (column 1). Results from employing a zero-inflated model are reported in column (2). Moreover, we use OLS estimation as an alternative to count data models (column 4).

[Insert Table 3 about here]

Results reveal that the *Tax Attractiveness Index* plays a significant role in determining the number of German-controlled subsidiaries in a particular country. As expected, the *Tax Attractiveness Index* is significantly positively associated with *Number Subsidiaries* in all specifications. Hence, we can confirm the hypothesis that an attractive tax environment as measured by the *Tax Attractiveness Index* has a positive influence on the location decisions of multinational enterprises. Regarding the economic interpretation and the magnitude of the effects observed, we focus on the negative binomial model (column 1). Coefficients can be interpreted as semi-elasticities. However, this direct interpretation is not useful in our setting, since a one-unit change in the *Tax Attractiveness Index* cannot be defined. Thus, we make use of the exponentiated coefficients that can be given a multiplicative interpretation (see Cameron and Trivedi 2010). Hence, a one standard deviation increase in the *Tax Attractiveness Index* (about 0.149), which equals approximately the difference in index values between France (0.5840) and the Netherlands (0.7400), is associated with about 35% more subsidiaries ($\exp^{0.149 \times 2.0116} - 1 = 0.35$). Evaluated at the mean of *Number Subsidiaries* (3.861), such an increase in the tax attractiveness represents about one and a half (1.4) additional subsidiaries that a host country attracts from each parent company per year. Therefore, we can conclude that our results are not only statistically significant, but also have an economic impact. Since the *Tax Attractiveness Index* that combines multiple tax factors proves to be highly significant, our findings reveal that location decisions depend on a bundle of tax factors, implying that multinational firms carry out tax planning activities. In line with the graphical evaluation, there is reason to assume that multinational enterprises make use of intermediate companies to

exploit favorable tax provisions in distinct countries, thus increasing the number of subsidiaries located there.²⁹

With regard to the non-tax parameters that we include as country-level control variables, the results in Table 3 show that *GDP* has a significant influence on the location of German-controlled subsidiaries. In line with our expectations, the size of the host market is positively associated with *Number Subsidiaries*. Economically, the coefficient for *GDP* can be interpreted as follows: a one standard deviation change in *GDP*, which approximately represents the difference in *GDP* between Great Britain and Belgium, is related to about 12 additional affiliates (evaluated at the mean of *Number Subsidiaries*). In accordance with Overesch and Wamser (2009), we find a significantly negative effect for *Similarity*, which is used as a proxy for differences in the endowment with skilled labor. This allows the conclusion that cost-saving motives realized by differences in factor prices are relevant for location decisions as proposed by the vertical model. In magnitude, the coefficient for *Similarity* is very close to the estimates presented in Overesch and Wamser (2009). Moreover, our analysis confirms the findings of previous studies revealing that *Distance* has a negative impact on location decisions (see, e.g., Buch et al. 2005; Overesch and Wamser 2009; Hebous et al. 2011). Like *GDP* and *Similarity*, *Distance* is also highly significant. In contrast, *Adjacency*, which indicates whether the host country has a common border with Germany, does not have a significant effect; however, the coefficient has the predicted sign. As expected, *Rule of Law* and *Voice & Accountability*, which serve as proxies for the perceptions of governance in the respective host country, are positively associated with the number of subsidiaries. However, only *Voice & Accountability* proves to be statistically significant.

Qualitatively, the results hold if a zero-inflated model is used (column 2). If alternative model specifications (Poisson model (column 3), the (less adequate) OLS estimation (column 4) or negative binomial and zero-inflated models with separate parent fixed effects and year fixed effects (Table C.II in the appendix)) are applied, the *Tax Attractiveness Index* proves to be highly significant. In the OLS regression, however, *Similarity* has no significant influence on the number of subsidiaries. Though, with respect to the magnitude of the coefficients, the different models are not directly comparable.

5 Robustness Tests and Further Analyses

5.1 Robustness Tests

²⁹ Our main results hold when the *Tax Attractiveness Index* in its original version (EU-dummy instead of withholding taxes to Germany, see Keller and Schanz 2013) is applied.

5.1.1 Control for Outliers

As a first robustness test, we control for outliers. Depicting the distribution of *Number Subsidiaries*, Figure 1 reveals that the main dependent variable may take on high values (above 20). However, for reasons of readability, Figure 1 shows only the first part of the distribution. In fact, *Number Subsidiaries* may equal 100 and more (up to around 500), meaning that in certain years some multinational enterprises hold extremely high numbers of affiliates in distinct countries. Primarily, these countries are the United States and Great Britain; but in Austria, Sweden, the Netherlands, Spain, and Poland enormously high numbers of subsidiaries are also established. Since several of these countries offer an attractive tax environment as indicated by high scores in the *Tax Attractiveness Index* (e.g., the Netherlands and Austria), we try to rule out the possibility that our results are driven by outliers. To address this issue, we cut off high outcomes for *Number Subsidiaries*, yielding us six different samples with decreased numbers of observations, respectively. We run our regression for each of the reduced samples. In all cases, we apply negative binomial regression models. Results are reported in Table C.III in the appendix. We find that the coefficient for the *Tax Attractiveness Index* is highly significant in all columns. Hence, our results hold even in the case where high outcomes for *Number Subsidiaries* are excluded.

5.1.2 Alternative Dependent Variables

For further robustness tests, we replace *Number Subsidiaries* with alternative dependent variables. We first provide an analysis of *Number Subsidiaries (relative)*, which is defined as the number of subsidiaries that parent company j operates in year t in host country i divided by the total number of foreign subsidiaries that parent company j holds in year t . Hence, the dependent variable *Number Subsidiaries (relative)* abstracts from absolute numbers. In this way, we address the issue that the denominator representing the total number of affiliates that a certain parent company operates per year in foreign countries differs heavily across our sample. Observations range from around 20 to more than 1,000, revealing that parent companies vary widely in their degree of internationalization. By using the share of affiliates in a certain host country instead of employing the absolute figure, cases in which *Number Subsidiaries* takes on small values may gain importance. Since *Number Subsidiaries (relative)* is not a count variable, we apply OLS estimation. Results are presented in column (1) of Table 4.

[Insert Table 4 about here]

Consistent with our main results, we find that the *Tax Attractiveness Index* has a significantly positive effect on *Number Subsidiaries (relative)*. Thus, our results are robust to altering the dependent variable from absolute to relative values.

Next, we apply the amount of equity that German multinational enterprises locate in foreign countries as a dependent variable. A large strand of literature deals with the influence of taxation on corporate financing structures (see, e.g., Desai et al. 2004; Huizinga et al. 2008; Ramb and Weichenrieder 2005; Buettner et al. 2009). The rationale behind these studies is that, in most countries, interest expenses are deductible for corporate tax purposes while dividends have to be paid out of profits *after* tax. Hence, there is a general incentive to prefer debt financing over equity financing, even for national companies.³⁰ However, multinational enterprises have the opportunity to allocate their debts across countries in the most efficient way by means of internal financing strategies. The deductibility of interest expenses is perceived to be most valuable in high-tax countries. From a multinational's perspective, it is therefore advantageous to equip subsidiaries in low tax locations with equity.³¹ Hence, we expect the *Tax Attractiveness Index* to be positively associated with the amount of equity in a particular location. Though, this prediction is not straightforward, since the statutory tax rate alone seems to be the decisive tax parameter for financing structures and some countries have high index values while, at the same time, levying high statutory tax rates. However, there are other tax factors that might incentivize companies to place large amounts of equity in certain countries, such as a notional interest deduction or a preferential tax treatment of interest income.³² These special regimes can be found in countries that offer an attractive tax environment in general as indicated by the *Tax Attractiveness Index*. Hence, we expect the *Tax Attractiveness Index* to have a positive effect on the amount of equity. We apply two different measures for equity: first, we use *Equity*, defined as the sum of equity (in mill. EUR) that parent company j holds in year t in host country i (weighted by the respective share in equity). Second, we employ *Equity (relative)* defined as the sum of equity that parent company j holds in year t in host country i divided by the total sum of equity that parent company j holds in year t in foreign countries. Results from OLS estimations are reported in columns (2) and (3) of Table 4. We

³⁰ To prevent the extensive use of debt financing, some countries enforce thin capitalization rules.

³¹ Mintz (2004) suggests that financial structures involving an intermediate entity in a low-tax country are used to achieve a double dip of interest deductions. In such cases, the parent company borrows capital and passes it to the intermediate company in the form of equity. The intermediate company, in turn, lends the capital to another subsidiary located in a high-tax country. Hence, interest can be deducted twice, once at the level of the high-tax affiliate and again at the level of the parent company. Interest is taxed at the level of the intermediate group unit. The overall group tax burden can be decreased if the local tax rate of the interposed company is comparably low or if interest income is subject to a reduced tax rate.

³² A notional interest deduction applies, for instance, in Belgium. It allows the deduction of a fictitious interest on equity.

find that the coefficient for the *Tax Attractiveness Index* is significant in both cases, revealing that a host country's tax environment has a positive effect on the amount of equity that German multinational enterprises allocate there.

As a further robustness check, we restrict our sample to a parent company's fully consolidated subsidiaries. By using *Number Cons. Subsidiaries* as a dependent variable, we try to proxy for the most important subsidiaries of a multinational group. Thereby, we rule out the possibility that multinational enterprises place primarily those subsidiaries in attractive tax locations that are not directly included in the group's consolidated financial statements, such as special purpose entities. Since *Number Cons. Subsidiaries* is a count variable, we use negative binomial as well as zero-inflated models. As a benchmark, we apply OLS estimation. Table C.IV in the appendix reports regression results. In all specifications, the *Tax Attractiveness Index* shows a significantly positive coefficient, indicating that an attractive tax environment is linked with an increased number of consolidated subsidiaries.

Finally, we use *Number Subsidiaries (all)* as an alternative dependent variable. It specifies how many affiliates all parent companies together operate in year t in host country i . Since we refrain from considering each parent country separately, this enables us to analyze the location decisions of German multinational enterprises in aggregated form (see Figures 2 and 3). We run count data models and OLS estimation.³³ Results are presented in Table C.V in the appendix; our result holds. Taking an aggregated view, the *Tax Attractiveness Index* still has a significant impact on the number of subsidiaries and, thus, on the location decisions of German multinational enterprises. All coefficients for the control variables show the same signs as in our initial regression. Significance levels also correspond to those depicted in Table 3.

5.1.3 Breakdown by Year

Our data are structured as a pooled cross-section since the *Tax Attractiveness Index* does not yield sufficient within-country variation over time. However, this may lead to artificially increased levels of significance since we treat each parent-country observation independently even though they may be correlated over time (see section 3.3.2). Therefore, as a further robustness check, we provide analysis of a breakdown by year. Analogical to our main investigation, *Number Subsidiaries* is employed as a dependent variable. Results from running individual cross-sectional regressions are reported in Table C.VI in the appendix. We apply

³³ Zero is not a frequent observation for *Number Subsidiaries (all)*. Therefore, we refrain from using a zero-inflated negative binomial model.

negative binomial as well as zero-inflated models. Regression outputs show that results are robust. In all annual analyses, the *Tax Attractiveness Index* is significantly positively associated with the number of subsidiaries. Hence, our main result is not biased from pooling the data.

5.2 Further Analyses

5.2.1 Statutory Tax Rate and Location Decision

For further analysis, we investigate whether the statutory tax rate can explain the location decision of multinational enterprises and, hence, the number of subsidiaries. In previous studies, the statutory tax rate is often used to identify a country's tax environment (see, e.g., Devereux and Griffith 1998; Buettner and Ruf 2007). We analyze the impact of the statutory tax rate in order to compare it to the influence of the *Tax Attractiveness Index*. Applying count data models, we run our regression with the statutory tax rate in replacement of the *Tax Attractiveness Index*. Since we employ the statutory tax rate without modifications (i.e., not in standardized form as it enters the *Tax Attractiveness Index*), we expect it to be negatively associated with *Number Subsidiaries*. Regression results are presented in Table 5.

[Insert Table 5 about here]

In all specifications and in line with previous studies (see, e.g., Buettner and Ruf 2007; Overesch and Wamser 2009, 2010), the statutory tax rate has the predicted sign. However, in the zero-inflated model, it proves to be insignificant. In the negative binomial as well as in the Poisson model, we find a significant effect of the statutory tax rate. However, levels of significance are not as high as in the *Tax Attractiveness Index*. Also, the pseudo-log likelihood is lower in comparison with models where the *Tax Attractiveness Index* is applied (see Tables 3 and C.II in the appendix). From this, we can conclude that the *Tax Attractiveness Index* can better explain the location decisions of multinational enterprises than can the statutory tax rate alone. An explanation of this, perhaps surprising, result is that the index and the statutory tax rate are not necessarily highly correlated with each other. Some countries offer an attractive tax environment as indicated by the *Tax Attractiveness Index* although they impose high statutory tax rates (e.g., the Netherlands and Belgium). Our findings reveal that the location decision depends on a bundle of tax factors as combined in the *Tax Attractiveness Index* rather than solely on the statutory tax rate. Previous studies may thus have underestimated the influence of taxation on location decisions. This leaves room for further research.

5.2.2 Decomposing the Tax Attractiveness Index

To shed light on the question of which of the tax factors included in the *Tax Attractiveness Index* mainly drive our finding of an influence on location decisions, we decompose the index. Due to the fact that all 18 index components are highly correlated with each other, we refrain from analyzing them separately. We rather establish six subcategories. The first one comprises the statutory tax rate (*STR*), the taxation of dividends (*DIV*), and the taxation of capital gains (*CG*) summarizing corporate tax rates. To obtain *STR_DIV_CG*, we add values for the three single elements and divide the sum by three. Accordingly, for *WHT*, we add all measures for withholding taxes and divide the sum by six. The next subcategory is *LCB_LCF_GROUP*, consisting of the figures for loss offset possibilities and the option to fill a consolidated tax return. *THIN_CFC_AAL* summarizes all anti-avoidance measures (thin capitalization rules, controlled foreign company rules, and the general anti-avoidance legislation). To obtain *DTT_HOLD*, we add values for the double tax treaties concluded (*DTT*) and the existence of a holding regime (*HOLD*). We treat the personal income tax rate (*PIT*) solely. To identify the key drivers of our result, we run our regression with each of the six subcategories once, serving as a substitute for the *Tax Attractiveness Index*. We apply negative binomial models. Analogously to the index, we expect a positive coefficient for all subcategories.

[Insert Table 6 about here]

The regression results reported in Table 6 reveal that *STR_DIV_CG* (column 1), *WHT* (column 2), *LCB_LCF_GROUP* (column 3), as well as *DTT_HOLD* (column 5) are separately positively associated with *Number Subsidiaries*. This allows the conclusion that the tax factors behind these subcategories contribute to the positive effect of the *Tax Attractiveness Index* on location decisions.³⁴ In contrast, the coefficient for the personal income tax rate is insignificant. Counterintuitively, *THIN_CFC_AAL* shows a significantly negative coefficient. However, this can be explained by the fact that several European countries host high numbers of German-controlled subsidiaries, although the enforcement of certain anti-avoidance rules is very common.

³⁴ In an alternative analysis, we analyze the six different subcategories without previously summarizing the single tax factors. For example, in the first regression, we include the statutory tax rate, the taxation of dividends, and the taxation of capital gains, separately. Results reveal that the three components are jointly significant. Confirming our results presented in Table 6, the same is true for the second (*WHT*), third (*LCF_LCB_GROUP*), and fifth (*DTT_HOLD*) subcategories.

Furthermore, we jointly include all six subcategories of the index (column 7). The coefficients for *WHT* as well as *DTT_HOLD* prove to be highly significant, suggesting that low withholding taxes as well as a broad double tax treaty network and the existence of a special holding regime are the key drivers of our results. These tax factors can be identified as being most relevant for the location decisions of German multinational enterprises. Consistent with our analysis in section 5.2.1, the statutory tax rate in connection with the taxation of dividends and capital gains also has a significant impact.

6 Conclusion and Limitations

This paper analyzes whether taxation has an influence on the location decisions of multinational enterprises. In contrast to previous studies, we are the first to employ a very broad tax measure, the *Tax Attractiveness Index* (see Keller and Schanz 2013). Capturing 18 different tax factors, the index aims at providing a detailed picture of a country's tax conditions. Employing count data regression models, we find that a country's tax environment as measured by the *Tax Attractiveness Index* has a positive effect on the number of German-controlled subsidiaries and, therefore, on the location decisions of German multinational enterprises. Our results indicate that corporate location decisions depend on a bundle of tax factors. Specifically, our analysis reveals that German multinational firms place affiliates in countries that offer favorable tax conditions. Correspondingly, the graphical evaluation shows that German multinational firms operate affiliates in off-shore tax havens. Moreover, they hold an increased number of subsidiaries in countries with extremely attractive tax environments, such as the Netherlands, Belgium, Austria, and Switzerland. Hence, there is reason to assume that multinational firms implement indirect group structures by means of holding companies in third countries and by establishing profit-shifting entities in tax havens. As key drivers for the influence of taxation on location decisions, we identify the withholding taxes that a country imposes as well as its double tax treaty network and the existence of a holding regime. Moreover, in line with previous studies, we reveal that the statutory tax rate is significantly associated with the number of subsidiaries. However, we find that the *Tax Attractiveness Index* can even better explain the location decisions of multinational enterprises. Prior studies that use the statutory tax rate as a tax measure may thus have underestimated the influence of taxation on location decisions. We encourage research to apply the *Tax Attractiveness Index* instead of the statutory tax rate or other effective tax rates in future studies.

However, our study suffers from several limitations. Most of them are inherent in the data set we explore. First, the sample does not yield the linkage *between* the subsidiaries,

making it impossible to explore corporate group *structures*. Therefore, we are not able to analyze whether the affiliates located in favorable tax locations do in fact serve as *intermediate* entities. Moreover, due to the fact that we do not have balance sheet data (e.g., assets, property, plant, and equipment) or any further information (e.g., employees) about the subsidiaries, we are not able to identify the *type* of the respective group unit. Hence, it is impossible to identify whether a certain subsidiary serves predominantly operative purposes or is a pure holding or profit-shifting entity. From the (increased number of) subsidiaries that German multinational enterprises locate in tax attractive countries, we can only assume that at least some of them are holding or financial companies with little operative activities. Finally, the sample period that we have chosen does not cover an overall “event,” such as a tax reform, making it impossible to conduct a “before and after analysis” in the form of, for example, a difference-in-difference approach. Therefore, we are not able to verify a causal link between the *Tax Attractiveness Index* and location decisions.

Nevertheless, our study has several implications. First, the finding of multinational enterprises taking various tax parameters into account when deciding where to locate their subsidiaries is important for governments and politicians. Policy makers might take this into consideration with respect to future tax reforms or the current fight against the tax avoidance of big multinationals (OECD 2013). Second, researchers might be interested in learning that several tax factors besides the statutory tax rate explain location decisions. Thus, regarding the statutory tax rate as the only important tax signal for a country’s attractiveness will not be sufficient in the future. Applying a broad measure, such as the *Tax Attractiveness Index*, in future analyses might help to reveal a more comprehensive picture of a country’s tax environment. Moreover, our investigation reveals that German multinational enterprises place their subsidiaries in tax havens and other tax attractive countries, which supports the assertion that tax motivations, rather than production costs and market access alone, play a role in the location decisions of big multinationals.

References

- Altshuler, R., H. Grubert, and T. S. Newlon. 2001. Has U.S. investment abroad become more sensitive to tax rates? In *International Taxation and Multinational Activity*, edited by J. R. Hines, Jr. Chicago: The University of Chicago Press, 9-32.
- Barrios, S., H. Huizinga, L. Laeven, and G. Nicodème. 2012. International taxation and multinational firm location decisions. *Journal of Public Economics* 96 (11-12): 946-958.
- Becker, J., and C. Fuest. 2010. Internationalization and business tax revenue – evidence from Germany. *International Tax and Public Finance* 17 (2): 174-192.
- Becker, S. O., P. H. Egger, and V. Merlo. 2012. How low business tax rates attract MNE activity: municipality-level evidence from Germany. *Journal of Public Economics* 96 (9–10): 698-711.
- Bellak, C., M. Leibrecht, and J. P. Damijan. 2009. Infrastructure endowment and corporate income taxes as determinants of foreign direct investment in Central and Eastern European countries. *World Economy* 32 (2): 267-290.
- Buch, C. M., J. Kleinert, A. Lipponer, and F. Toubal. 2005. Determinants and effects of foreign direct investment: evidence from German firm-level data. *Economic Policy* 20 (41): 53-110.
- Buettner, T., M. Overesch, U. Schreiber, and G. Wamser. 2009. Taxation and capital structure choice – evidence from a panel of German multinationals. *Economics Letters* 105 (3): 309-311.
- Buettner, T., and M. Ruf. 2007. Tax incentives and the location of FDI: evidence from a panel of German multinationals. *International Tax and Public Finance* 14 (2): 151-164.
- Cameron, A. C., and P. K. Trivedi. 1998. *Regression Analysis of Count Data*. Cambridge: Cambridge University Press.
- Cameron, A. C., and P. K. Trivedi. 2010. *Micoeconometrics Using Stata - Revised Edition*. Texas: Stata Press.
- Carr, D. L., J. R. Markusen, and K. E. Maskus. 2001. Estimating the knowledge-capital model of the multinational enterprise. *The American Economic Review* 91 (3): 693-708.
- Collins, C. 2011. *iHate Corporate Tax Dodgers: How Apple Avoids Paying Its Fair Share*. Available from: http://www.alternet.org/story/151140/ihate_corporate_tax_dodgers%3A_how_apple_avoids_paying_its_fair_share.
- De Mooij, R. A., and S. Ederveen. 2003. Taxation and foreign direct investment: a synthesis of empirical research. *International Tax and Public Finance* 10 (6): 673-693.
- De Mooij, R. A., and S. Ederveen. 2006. What a difference does it make? Understanding the empirical literature on taxation and international capital flows. European Commission Economic Papers No. 261, Brussels.

- Desai, M. A., C. F. Foley, and J. R. Hines Jr. 2003. Chains of ownership, regional tax competition, and foreign direct investment. In *Foreign Direct Investment in the Real and Financial Sector of Industrial Countries*, edited by H. Herrmann and R. Lipsey. Berlin: Springer, 61-98.
- Desai, M. A., C. F. Foley, and J. R. Hines Jr. 2004. A multinational perspective on capital structure choice and internal capital markets. *The Journal of Finance* 59 (6): 2451-2487.
- Desai, M. A., C. F. Foley, and J. R. Hines Jr. 2006a. The demand for tax haven operations. *Journal of Public Economics* 90 (3): 513-531.
- Desai, M. A., C. F. Foley, and J. R. Hines Jr. 2006b. Do tax havens divert economic activity? *Economics Letters* 90 (2): 219-224.
- Devereux, M. P. 2007. The impact of taxation on the location of capital, firms and profit: a survey of empirical evidence. Working Paper, Oxford University Centre for Business Taxation No. 702.
- Devereux, M. P., and R. Griffith. 1998. Taxes and the location of production: evidence from a panel of US multinationals. *Journal of Public Economics* 68 (3): 335-367.
- Devereux, M. P., and R. Griffith. 1999. The taxation of discrete investment choices. IFS Working Paper No. W98/16, London.
- Devereux, M. P., and R. Griffith. 2003. Evaluating tax policy for location decisions. *International Tax and Public Finance* 10 (2): 107-126.
- Devereux, M. P., R. Griffith, and A. Klemm. 2002. Corporate income tax reforms and international tax competition. *Economic Policy* 17 (35): 449-495.
- Djankov, S., C. McLiesh, and A. Shleifer. 2007. Private credit in 129 countries. *Journal of Financial Economics* 84 (2): 299-329.
- Drucker, J. 2010. *Google 2.4% Rate Shows How \$60 Billion Lost to Tax Loopholes*. Available from: <http://www.bloomberg.com/news/2010-10-21/google-2-4-rate-shows-how-60-billion-u-s-revenue-lost-to-tax-loopholes.html>.
- Dyreng, S. D., and B. P. Lindsey. 2009. Using financial accounting data to examine the effect of foreign operations located in tax havens and other countries on U.S. multinational firms' tax rates. *Journal of Accounting Research* 47 (5): 1283-1316.
- Eicke, R. 2009. *Tax Planning with Holding Companies – Repatriation of US Profits from Europe*. New York: Kluwer Law International.
- Feld, L. P., and J. H. Heckemeyer. 2011. FDI and taxation: a meta-study. *Journal of Economic Surveys* 25 (2): 233-272.
- Grubert, H., and J. Mutti. 1991. Taxes, tariffs and transfer pricing in multinational corporate decision making. *Review of Economics & Statistics* 73 (2): 285-293.
- Grubert, H., and J. Mutti. 2000. Do taxes influence where U.S. corporations invest? *National Tax Journal* 53 (4): 825-839.

- Grubert, H., and J. Slemrod. 1998. The effect of taxes on investment and income shifting to Puerto Rico. *Review of Economics & Statistics* 80 (3): 365-373.
- Gumpert, A., J. R. Hines, Jr., and M. Schnitzer. 2011. The use of tax havens in exemption regimes. Deutsche Bank Discussion Paper No. 30/2011, Frankfurt.
- Hartman, D. G. 1984. Tax policy and foreign direct investment in the United States. *National Tax Journal* 37 (4): 475-487.
- Hebous, S., M. Ruf, and A. J. Weichenrieder. 2011. The effects of taxation on the location decision of multinational firms: M&A versus greenfield investments. *National Tax Journal* 64 (3): 817-838.
- Helpman, E. 1984. A simple theory of international trade with multinational corporations. *Journal of Political Economy* 92 (3): 451-471.
- Helpman, E. 1985. Multinational corporations and trade structure. *The Review of Economic Studies* 52 (3): 443-457.
- Hines, J. R., Jr. 1997. Tax policy and the activities of multinational corporations. In *Fiscal Policy: Lessons From Economic Research*, edited by A. J. Auerbach. Cambridge: MIT Press, 401-445.
- Hines, J. R., Jr. 1999. Lessons from behavioral responses to international taxation. *National Tax Journal* 52 (2): 305-322.
- Hines, J. R., Jr. 2005. Do tax havens flourish? *Tax Policy and the Economy* 19 (1): 65-99.
- Hines, J. R., Jr., and E. M. Rice. 1994. Fiscal paradise: foreign tax havens and American business. *The Quarterly Journal of Economics* 109 (1): 149-182.
- Huizinga, H., L. Laeven, and G. Nicodeme. 2008. Capital structure and international debt shifting. *Journal of Financial Economics* 88 (1): 80-118.
- Hung, M. 2000. Accounting standards and value relevance of financial statements: an international analysis. *Journal of Accounting and Economics* 30 (3): 401-420.
- Isidore, C. 2012. *U.S. corporate tax rate: No. 1 in the world*. Available from: <http://money.cnn.com/2012/03/27/pf/taxes/corporate-taxes/index.htm>.
- Jacob, M., and I. Goncharov. 2012. Accrual accounting and tax revenues. SSRN Working Paper.
- Kaufmann, D., A. Kraay, and M. Mastruzzi. 2010. The Worldwide Governance Indicators: methodology and analytical issues. World Bank Policy Research Working Paper No. 5430
- Keller, S., and D. Schanz. 2013. Measuring tax attractiveness across countries. arqus-Working Paper No. 143.
- King, M. A., and D. Fullerton. 1984. *The Taxation of Income from Capital*. Chicago: University of Chicago Press.

- La Porta, R., F. Lopez de Silanes, A. Shleifer, and R. W. Vishny. 1998. Law and finance. *Journal of Political Economy* 106 (6): 1113-1155.
- Lipponer, A. 2009. Microdatabase direct investment - MiDi. A brief guide. Bundesbank Working Paper, Frankfurt.
- Markle, K. S., and D. A. Shackelford. 2012. Cross-country comparisons of corporate income taxes. *National Tax Journal* 65 (3): 493-527.
- Markusen, J. R. 1984. Multinationals, multi-plant economies, and the gains from trade. *Journal of International Economics* 16 (3-4): 205-226.
- Markusen, J. R. 2002. *Multinational Firms and the Theory of International Trade*. Cambridge: MIT Press.
- Mayer, T., and S. Zignago. 2011. Notes on CEPII's distances measures: the GeoDist database. CEPII Working Paper 2011-25.
- Mintz, J. M. 2004. Conduit entities: implications of indirect tax-efficient financing structures for real investment. *International Tax and Public Finance* 11 (4): 419-434.
- Mintz, J. M., and A. J. Weichenrieder. 2010. Holding companies and ownership chains. In *The Indirect Side of Direct Investment – Multinational Company Finance and Taxation*, edited by J. M. Mintz and A. J. Weichenrieder. Cambridge: MIT Press, 77-120.
- OECD. 2001. *Tax and the Economy*. Paris: OECD Publishing.
- OECD. 2013. *Addressing Base Erosion and Profit Shifting*. Paris: OECD Publishing.
- Oestreicher, A., and R. Koch. 2010. The determinants of opting for the German group taxation regime with regard to taxes on corporate profits. *Review of Managerial Science* 4 (2): 119-147.
- Overesch, M. 2009. The effects of multinationals' profit shifting activities on real investments. *National Tax Journal* 62 (1): 5-23.
- Overesch, M., and G. Wamser. 2009. Who cares about corporate taxation? Asymmetric tax effects on outbound FDI. *World Economy* 32 (12): 1657-1684.
- Overesch, M., and G. Wamser. 2010. The effects of company taxation in EU accession countries on German FDI. *Economics of Transition* 18 (3): 429-457.
- Papke, L. E. 1991. Interstate business tax differentials and new firm location: evidence from panel data. *Journal of Public Economics* 45 (1): 47-68.
- Ramb, F., and A. J. Weichenrieder. 2005. Taxes and the financial structure of German inward FDI. *Review of World Economics* 141 (4): 670-692.
- Rapoza, K. 2011. *A cross country comparison of corporate income taxes*. Available from: <http://www.forbes.com/sites/kenrapoza/2011/09/09/a-cross-country-comparison-of-corporate-income-taxes/>.

- Spamann, H. 2010. The “Antidirector Rights Index” revisited. *Review of Financial Studies* 23 (2): 467-486.
- Stöwhase, S. 2002. Profit shifting opportunities, multinationals, and the determinants of FDI. Munich Discussion Paper No. 2002-11.
- Winkelmann, R., and K. F. Zimmermann. 1995. Recent developments in count data modelling: theory and application. *Journal of Economic Surveys* 9 (1): 1-24.

Figure 1
Distribution of *Number Subsidiaries*

Figure 1 displays the distribution of *Number Subsidiaries*, defined as the number of subsidiaries that parent company j operates in year t in host country i . The underlying sample is based on the subsidiaries of 29 German parent companies (DAX30) over years 2005 to 2009. The subsidiaries are situated in 97 different host countries.

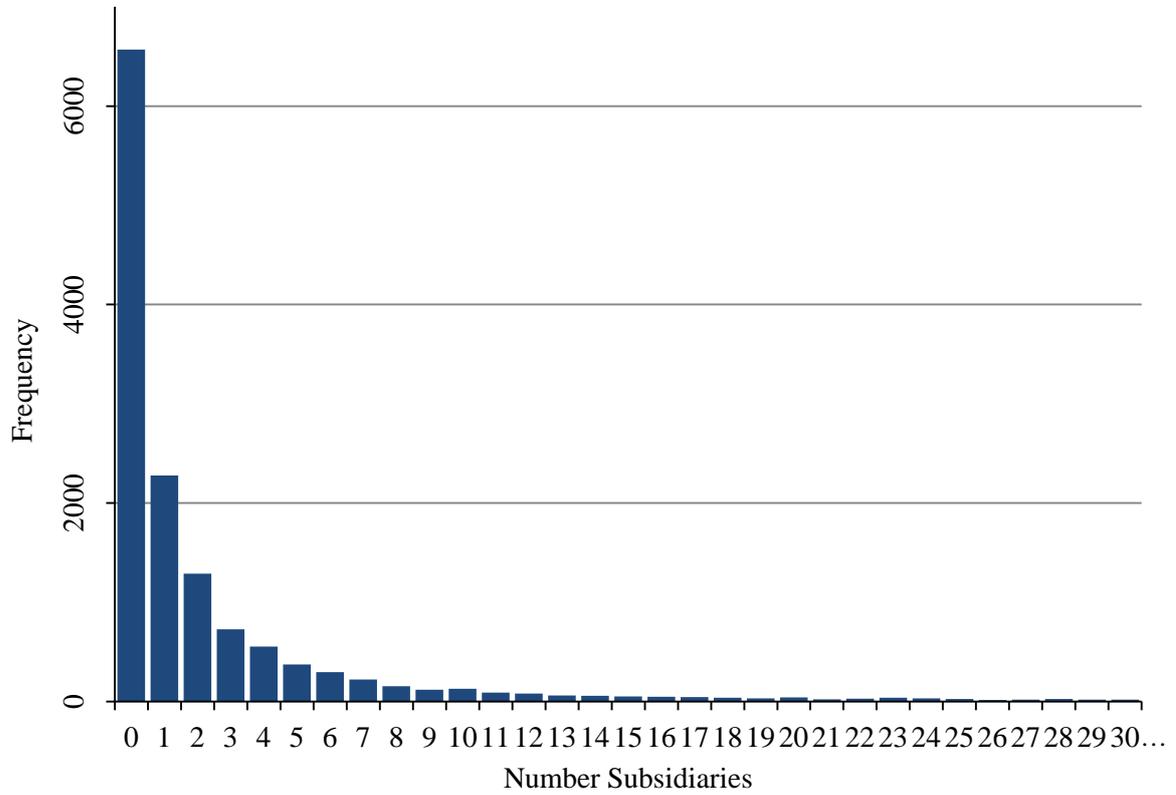


Figure 2
Location of German-Controlled Subsidiaries

Figure 2 exhibits where German-controlled subsidiaries are located. On the abscissa, sample countries are entered in alphabetical order. On the ordinate, the average of *Number Subsidiaries (all)* over years 2005 to 2009 is plotted. *Number Subsidiaries (all)* is defined as the number of affiliates that all sample parent companies together operate in year *t* in host country *i*. The underlying sample is based on the subsidiaries of 29 German parent companies (DAX30) over years 2005 to 2009. The subsidiaries are situated in 97 different host countries.

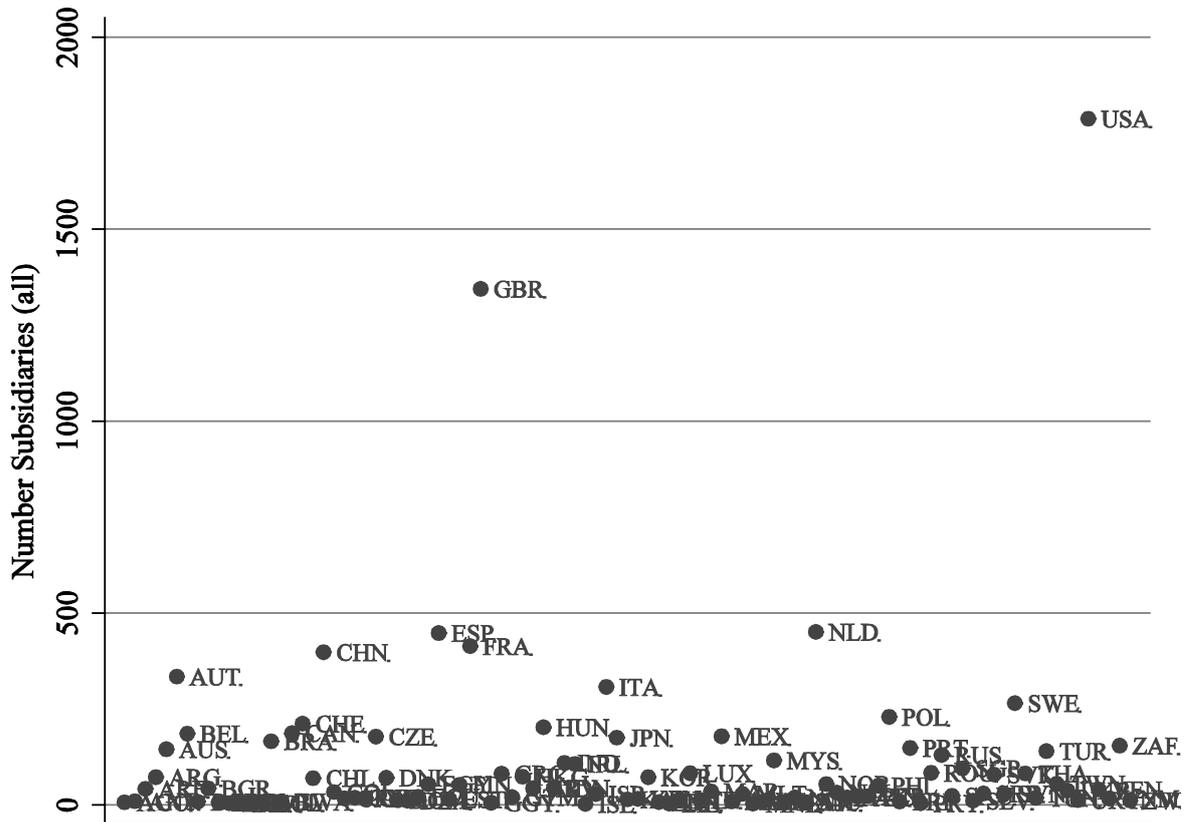


Figure 3

Location of German-Controlled Subsidiaries – Focus on Less-Frequented Countries

Figure 3 exhibits where German-controlled subsidiaries are located. On the abscissa, sample countries are entered in alphabetical order. Only countries for which *Number Subsidiaries (all)* is lesser than 85 are displayed. On the ordinate, the average of *Number Subsidiaries (all)* over years 2005 to 2009 is plotted. *Number Subsidiaries (all)* is defined as the number of affiliates that all sample parent companies together operate in year t in host country i . Locations with an attractive tax environment as indicated by a high *Tax Attractiveness Index* are highlighted. The underlying sample is based on the subsidiaries of 29 German parent companies (DAX30) over years 2005 to 2009.

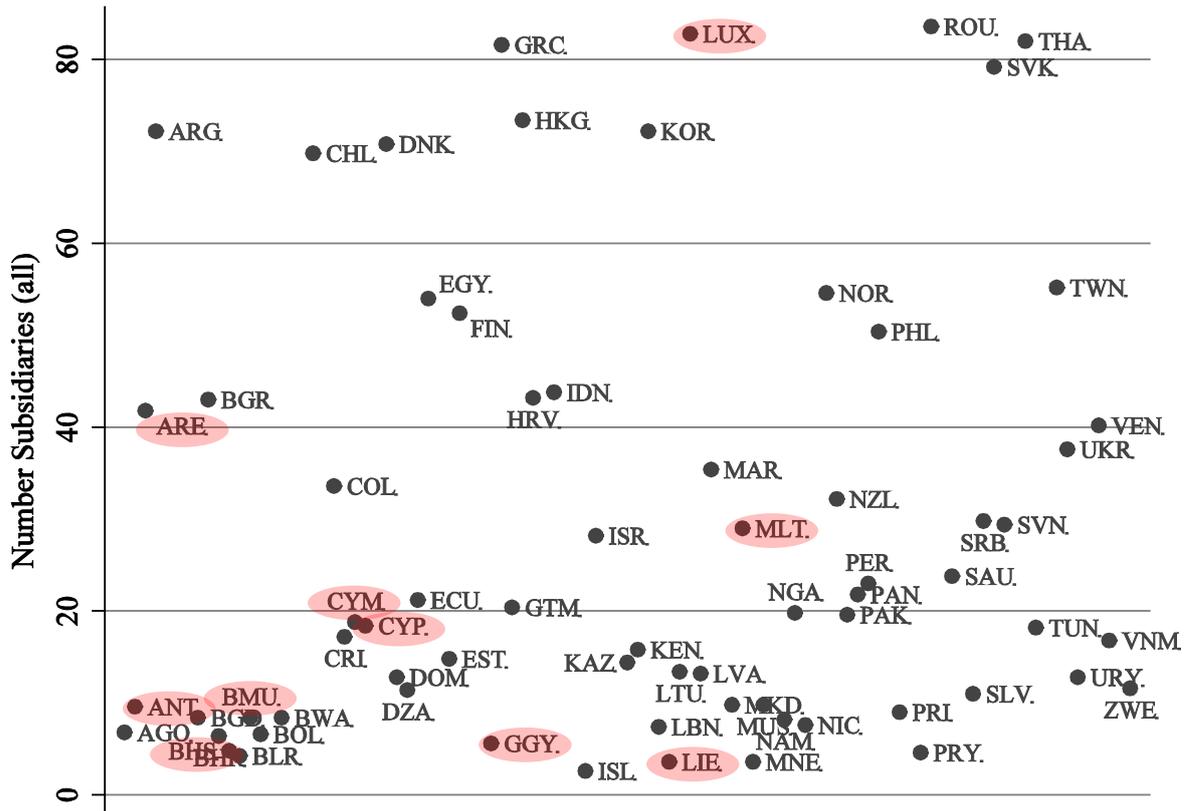


Table 1
Tax Attractiveness Index per Country

This table reports mean values of the *Tax Attractiveness Index (TAX)* per sample country over years 2005 to 2009. *TAX* represents an equally-weighted sum of 18 tax factors. It is restricted to values between zero and one. The closer the *TAX* is to one, the more attractive is the tax environment that country *i* offers.

Country (Code)	TAX	Country (Code)	TAX	Country (Code)	TAX	Country (Code)	TAX
Algeria (DZA)	0.3946	Denmark (DNK)	0.5409	Korea (South) (KOR)	0.2601	Poland (POL)	0.4583
Angola (AGO)	0.4146	Dom. Republic (DOM)	0.4120	Latvia (LVA)	0.5421	Portugal (PRT)	0.4694
Argentina (ARG)	0.1758	Ecuador (ECU)	0.4684	Lebanon (LBN)	0.5355	Puerto Rico (PRI)	0.3476
Australia (AUS)	0.4108	Egypt (EGY)	0.3747	Liechtenstein (LIE)	0.6241	Romania (ROU)	0.4823
Austria (AUT)	0.6603	El Salvador (SLV)	0.5215	Lithuania (LTU)	0.4433	Russia (RUS)	0.4752
Bahamas (BHS)	0.8889	Estonia (EST)	0.6558	Luxembourg (LUX)	0.7528	Saudi Arabia (SAU)	0.5334
Bahrain (BHR)	0.8381	Finland (FIN)	0.5562	Macedonia (MKD)	0.5545	Serbia (SRB)	0.4532
Bangladesh (BGD)	0.4364	France (FRA)	0.5840	Malaysia (MYS)	0.7404	Singapore (SGP)	0.7497
Belarus (BLR)	0.4698	Germany (DEU)	0.4928	Malta (MLT)	0.7012	Slovak Republic (SVK)	0.5928
Belgium (BEL)	0.6627	Great Britain (GBR)	0.6367	Mauritius (MUS)	0.6090	Slovenia (SVN)	0.5193
Bermuda (BMU)	0.8889	Greece (GRC)	0.4399	Mexico (MEX)	0.3936	South Africa (ZAF)	0.5717
Bolivia (BOL)	0.5650	Guatemala (GTM)	0.5256	Montenegro (MNE)	0.5612	Spain (ESP)	0.5451
Botswana (BWA)	0.4190	Guernsey (GGY)	0.6405	Morocco (MAR)	0.5134	Sweden (SWE)	0.6219
Brazil (BRA)	0.4052	Hong Kong (HKG)	0.6137	Namibia (NAM)	0.5823	Switzerland (CHE)	0.6428
Br. Virg. Islands (VGB)	0.8504	Hungary (HUN)	0.5759	Netherlands (NLD)	0.7400	Taiwan (TWN)	0.3461
Bulgaria (BGR)	0.5031	Iceland (ISL)	0.6147	Neth. Antilles (ANT)	0.7354	Thailand (THA)	0.4424
Canada (CAN)	0.4077	India (IND)	0.4797	New Zealand (NZL)	0.3718	Tunisia (TUN)	0.4779
Cayman Islands (CYM)	0.8611	Indonesia (IDN)	0.3161	Nicaragua (NIC)	0.5217	Turkey (TUR)	0.4633
Chile (CHL)	0.3055	Ireland (IRL)	0.7061	Nigeria (NGA)	0.5087	Ukraine (UKR)	0.5398
China (CHN)	0.4042	Israel (ISR)	0.3784	Norway (NOR)	0.6605	Unit. Arab Emir. (ARE)	0.8495
Colombia (COL)	0.3253	Italy (ITA)	0.4405	Pakistan (PAK)	0.4015	United States (USA)	0.3781
Costa Rica (CRI)	0.4703	Japan (JPN)	0.3643	Panama (PAN)	0.5301	Uruguay (URY)	0.6137
Croatia (HRV)	0.4841	Jersey (JEY)	0.8050	Paraguay (PRY)	0.5623	Venezuela (VEN)	0.2590
Cyprus (CYP)	0.7409	Kazakhstan (KAZ)	0.4420	Peru (PER)	0.2392	Vietnam (VNM)	0.4956
Czech Republic (CZE)	0.4443	Kenya (KEN)	0.4991	Philippines (PHL)	0.2990	Zimbabwe (ZWE)	0.3617

Table 2
Descriptive Statistics

Table 1 reports descriptive statistics for all variables used in this study. Summary statistics for different dependent variables are presented in Panel A. The underlying sample is based on the subsidiaries of 29 German parent companies (DAX30) over years 2005 to 2009. The subsidiaries are situated in 97 different host countries. *Number Subsidiaries* signifies the number of subsidiaries that parent company j operates in year t in host country i . *Number Subsidiaries (relative)* is defined as the number of subsidiaries that parent company j operates in year t in host country i divided by the total number of foreign subsidiaries that parent company j holds in year t . *Equity* is the sum of equity (in current mill. EUR) that parent company j holds in year t in host country i . *Equity (relative)* is the sum of equity (in current mill. EUR) that parent company j holds in year t in host country i divided by the total sum of equity that parent company j holds in year t in foreign countries. *Number Cons. Subsidiaries* refers to the number of consolidated subsidiaries that parent company j operates in year t in host country i . *Number Subsidiaries (all)* is the aggregated number of subsidiaries that all 29 parent companies together operate in year t in host country i . Summary statistics for country-level criteria are reported in Panel B. The *Tax Attractiveness Index* is an index summarizing 18 different tax factors representing host country i 's tax attractiveness. The index is restricted to values between zero and one. High index values indicate a favorable tax environment. *GDP* is the natural logarithm of host country i 's GDP in constant USD for the year 2000. *Similarity* is an index defined as one minus the ratio of the absolute value of host country i 's GDP per capita minus Germany's GDP per capita to the higher of both GDPs per capita (GDP per capita in constant USD for the year 2000, respectively). *Distance* is defined as the natural logarithm of the population-weighted distance between main agglomerations of Germany and host country i . *Adjacency* is a dummy variable obtaining the value of one if host country i shares a border with Germany. *Rule of Law* and *Voice & Accountability* represent governance indicators of host country i . They may range from -2.5 to 2.5. All country-level variables are measured on an annual basis. See Appendix A for information about country-level variables and data sources.

Panel A: Summary Statistics for Dependent Variables						
Variable	N	Mean	Std. Dev.	Min.	Median	Max.
Number Subsidiaries	13,748	3.861	16.564	0.000	1.000	524.000
Number Subsidiaries (rel.)	13,748	0.007	0.022	0.000	0.001	0.631
Equity	13,748	196.143	1,950.583	-19,808.400	0.000	92,177.000
Equity (relative)	13,748	0.006	0.040	-1.866	0.000	0.933
Number Cons. Subsidiaries	13,748	2.848	14.590	0.000	0.000	515.000
Number Subsidiaries (all)	484	109.973	239.639	0.000	35.000	2,056.000
Panel B: Summary Statistics for Country-Level Variables						
Variable	N	Mean	Std. Dev.	Min.	Median	Max.
Tax Attractiveness Index	13,748	0.520	0.149	0.166	0.508	0.889
GDP	13,748	24.891	1.854	20.846	24.945	30.088
Similarity	13,748	0.367	0.310	0.011	0.240	0.998
Distance	13,748	8.117	1.088	5.934	8.481	9.810
Adjacency	13,748	0.093	0.290	0.000	0.000	1.000
Rule of Law	13,748	0.383	0.995	-1.914	0.508	1.964
Voice & Accountability	13,748	0.376	0.908	-1.774	0.537	1.782

Table 3**Tax Attractiveness and the Location of Subsidiaries – Main Results**

This table reports regression results for the location of German-controlled subsidiaries. The dependent variable is *Number Subsidiaries*, defined as the number of subsidiaries that parent company *j* operates in year *t* in host country *i*. The underlying sample is based on the subsidiaries of 29 German parent companies (DAX30) over years 2005 to 2009. The subsidiaries are situated in 97 different host countries. We apply pooled estimation techniques. In column (1) we use a negative binomial model, in column (2) we apply a zero-inflated model and in column (3) we apply a Poisson model. Column (4) provides results from OLS estimation. To measure host country *i*'s tax attractiveness, we use the *Tax Attractiveness Index*. The index summarizes 18 different tax factors and is restricted to values between zero and one. High index values indicate a favorable tax environment. *GDP* is the natural logarithm of host country *i*'s GDP in constant USD for the year 2000. *Similarity* is an index defined as one minus the ratio of the absolute value of host country *i*'s GDP per capita minus Germany's GDP per capita to the higher of both GDPs per capita (GDP per capita in constant USD for the year 2000, respectively). *Distance* is defined as the natural logarithm of the population-weighted great circle distance between main agglomerations of Germany and host country *i*. *Adjacency* is a dummy variable obtaining the value of one if host country *i* shares a border with Germany. *Rule of Law* and *Voice & Accountability* represent governance indicators of host country *i*. They may range from -2.5 to 2.5. All country-level variables are measured on an annual basis (2005-2009). We use parent-year fixed effects in all specifications. Standard errors (shown in parentheses) allow for heteroskedasticity and are clustered by country. ***, **, * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	Sign	Negative Binomial (1)	Zero- Inflated (2)	Poisson (3)	OLS (4)
Tax Attractiveness Index	+	2.0116*** (0.4836)	2.0365*** (0.4476)	2.0581*** (0.7146)	12.0067** (5.2349)
GDP	+	0.7574*** (0.0459)	0.6682*** (0.0452)	0.7810*** (0.0474)	3.1577*** (1.0145)
Similarity	+/-	-1.4093*** (0.3318)	-0.9755*** (0.3013)	-1.0913*** (0.3982)	-3.0291 (3.7586)
Distance	-	-0.2195*** (0.0576)	-0.0819 (0.0499)	-0.3600*** (0.0895)	-0.8870 (0.7925)
Adjacency	+	0.1099 (0.1914)	0.1110 (0.1675)	-0.2736 (0.2049)	-2.8066 (3.4141)
Rule of Law	+	0.1509 (0.1112)	0.0217 (0.1075)	0.1732 (0.1467)	-0.1010 (1.2365)
Voice & Accountability	+	0.3777*** (0.1082)	0.3438*** (0.1004)	0.2072* (0.1184)	1.7991** (0.8242)
Parent FE		No	No	No	No
Year FE		No	No	No	No
Parent-Year FE		Yes	Yes	Yes	Yes
Observations		13,748	13,748	13,748	13,748
Pseudo Log <i>L</i>		-22,545	-21,670	-39,308	
R-squared					0.1395

Table 4**Tax Attractiveness and the Location of Subsidiaries – Alternative Dependent Variables**

This table reports regression results for the location of German-controlled subsidiaries. As a dependent variable, we use *Number Subsidiaries (relative)* (column 1), defined as the number of subsidiaries that parent company *j* operates in year *t* in host country *i* divided by the total number of foreign subsidiaries that parent company *j* holds in year *t*. Moreover, *Equity* is used as a dependent variable (column 2), defined as the sum of equity (in current mill. EUR) that parent company *j* holds in year *t* in host country *i*. In column (3) the dependent variable is *Equity (relative)*, defined as the sum of equity (in current mill. EUR) that parent company *j* holds in year *t* in host country *i* divided by the sum of equity that parent company *j* holds in year *t* in foreign countries. The underlying sample is based on the subsidiaries of 29 German parent companies (DAX30) over years 2005 to 2009 and their respective equity holdings. The subsidiaries are situated in 97 different host countries. We apply pooled estimation techniques. In all columns we run OLS regressions. To measure host country *i*'s tax attractiveness in year *t*, we use the *Tax Attractiveness Index*. The index summarizes 18 different tax factors and is restricted to values between zero and one. High index values indicate a favorable tax environment. See Table 1 for a description of the other independent variables included in the regressions. In all columns, we use parent-year fixed effects. Standard errors (shown in parentheses) allow for heteroskedasticity and are clustered by country. ***, **, * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	Number Sub- sidiaries (relative)	Equity	Equity (relative)
	(1)	(2)	(3)
Tax Attractiveness Index	0.0223*** (0.0082)	866.4741** (376.9926)	0.0265** (0.0104)
Controls	Yes	Yes	Yes
Parent FE	No	No	No
Year FE	No	No	No
Parent-Year FE	Yes	Yes	Yes
Observations	13,748	13,748	13,748
R-squared	0.1994	0.0471	0.0668

Table 5**Tax Attractiveness and the Location of Subsidiaries – Statutory Tax Rate**

This table reports regression results for the location of German-controlled subsidiaries. The dependent variable is *Number Subsidiaries*, defined as the number of subsidiaries that parent company j operates in year t in host country i . The underlying sample is based on the subsidiaries of 29 German parent companies (DAX30) over years 2005 to 2009. The subsidiaries are situated in 97 different host countries. We apply pooled estimation techniques. In columns (1) and (2), we use negative binomial models and in columns (3) and (4) we apply zero-inflated models. Column (5) provides results from estimating a Poisson model. To measure host country i 's tax attractiveness in year t , we use the statutory tax rate imposed. See Table 1 for a description of the other independent variables included in the regressions. We use parent and year fixed effects in columns (1) and (3). In columns (2), (4) and (5), we use parent-year fixed effects. Standard errors (shown in parentheses) allow for heteroskedasticity and are clustered by country. ***, **, * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	Negative Binomial		Zero-Inflated		Poisson
	(1)	(2)	(3)	(4)	(5)
Statutory Tax Rate	-1.4256*	-1.4183*	-0.9824	-0.9476	-2.2122**
	(0.8291)	(0.8237)	(0.6677)	(0.6543)	(1.0123)
Controls	Yes	Yes	Yes	Yes	Yes
Parent FE	Yes	No	Yes	No	No
Year FE	Yes	No	Yes	No	No
Parent-Year FE	No	Yes	No	Yes	Yes
Observations	13,748	13,748	13,748	13,748	13,748
Pseudo Log L	-22,842	-22,665	-22,015	-21,803	-39,679

Table 6

Tax Attractiveness and the Location of Subsidiaries – Decomposing the Tax Attractiveness Index

This table reports regression results for the location of German-controlled subsidiaries. The dependent variable is *Number Subsidiaries*, defined as the number of subsidiaries that parent company *j* operates in year *t* in host country *i*. The underlying sample is based on the subsidiaries of 29 German parent companies (DAX30) over years 2005 to 2009. The subsidiaries are situated in 97 different host countries. The *Tax Attractiveness Index* summarizes 18 different tax factors representing host country *i*'s tax attractiveness in year *t*. Analogical to the index, all tax factors included are restricted to values between zero and one. High values indicate favorable tax conditions. We decompose the index by establishing six subcategories. We run regressions with each subcategory as an independent variable, respectively. Pooled estimation techniques are applied. For all specifications, we use negative binomial models. To obtain *STR_DIV_CG*, we add values for the statutory tax rate (*STR*), taxation of dividends (*DIV*) and taxation of capital gains (*CG*) and divide the sum by three. For *WHT*, we add all measures for withholding taxes and divide the sum by six (*WHTD*, *WHTI* and *WHTR* indicate withholding taxes on dividends, interest and royalties, respectively. *WHTDG*, *WHTIG* and *WHTRG* indicate the respective withholding taxes in relation to Germany). To obtain *LCB_LCF_GROUP*, we add values for loss carry back (*LCB*), loss carry forward (*LCF*) and group taxation (*GROUP*) possibilities and divide the sum by three. For *THIN_CFC_AAL*, we add values for thin capitalization rules (*THIN*), controlled foreign company rules (*CFC*) and anti-avoidance legislation (*AAL*) and divide the sum by three. Adding values for double tax treaties (*DTT*) concluded and the existence of a holding regime (*HOLD*) and dividing the sum by two yields *DTT_HOLD*. *PIT* denotes the personal income tax rate. See Table 1 for a description of the other independent variables included in the regressions. In all specifications, we use parent-year fixed effects. Standard errors (shown in parentheses) allow for heteroskedasticity and are clustered by country. ***, **, * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
STR_DIV_CG	0.7554*** (0.2187)						0.3506* (0.2071)
WHT		1.2691*** (0.4173)					1.0308*** (0.3234)
LCB_LCF_GROUP			0.6874*** (0.2516)				0.3186 (0.2556)
THIN_CFC_AAL				-0.3935* (0.2320)			-0.3932* (0.2116)
DTT_HOLD					0.8851*** (0.2583)		0.8421*** (0.2459)
PIT						0.0642 (0.3175)	-0.1354 (0.2721)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Parent-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,748	13,748	13,748	13,748	13,748	13,748	13,748
Pseudo Log <i>L</i>	-22,588	-22,574	-22,628	-22,662	-22,568	-22,696	-22,355

Appendix A: Variable Definitions

Tax Attractiveness Index	Index covering 18 different tax factors. The index represents host country i 's tax attractiveness and is constrained to values between zero and one. The more the index approximates one, the more attractive the tax environment that host country i offers. The index is measured on an annual basis (2005-2009). Data sources: The <i>Global Corporate Tax Handbook</i> and the <i>European Tax Handbook</i> published by the International Bureau of Fiscal Documentation (IBFD), PricewaterhouseCoopers' <i>Corporate Taxes – Worldwide Summaries</i> and <i>Individual Taxes – Worldwide Summaries</i> , Ernst & Young's <i>Worldwide Corporate Tax Guide</i> , Deloitte's <i>Taxation and Investment Guides</i> , KPMG's <i>Corporate Tax Rate Survey</i> and <i>Individual Income Tax Rate Survey</i> , and the OECD tax database.
GDP	Logarithm of host country i 's gross domestic product measured in constant U.S. dollars based on the year 2000. <i>GDP</i> is measured on an annual basis. Data sources: World Development Indicators of the World Bank. For Taiwan, we source data from the National Statistics of China (Taiwan) (http://eng.stat.gov.tw/) and the Directorate-General of Budget, Accounting and Statistics, Executive Yuan, R.O.C. Taiwan (http://eng.dgbas.gov.tw/). For the Netherlands Antilles, we source data from the Central Bureau of Statistics Curaçao (http://www.cbs.cw/) and Statistics Netherlands (http://www.cbs.nl/). For the Cayman Islands, we source data from the Economics and Statistics Office, Government of the Cayman Islands (http://www.eso.ky/). For Guernsey, we source data from the States of Guernsey (http://www.gov.gg/).
Similarity	An index reflecting the difference between Germany's gross domestic product per capita and the gross domestic product per capita of host country i . The index is defined as one minus the ratio of the absolute value of host country i 's gross domestic product per capita minus Germany's gross domestic product per capita to the higher of both gross domestic products per capita. Gross domestic product per capita is measured in constant U.S. dollars based on the year 2000, respectively. The index uses values between one and zero; a higher score indicates that countries are more similar. <i>Similarity</i> is measured on an annual basis. Data source: World Development Indicators of the World Bank. For Taiwan, we source data from the National Statistics of China (Taiwan) (http://eng.stat.gov.tw/) and the Directorate-General of Budget, Accounting and Statistics, Executive Yuan, R.O.C. Taiwan (http://eng.dgbas.gov.tw/). For the Netherlands Antilles, we source data from the Central Bureau of Statistics Curaçao (http://www.cbs.cw/) and Statistics Netherlands (http://www.cbs.nl/). For the Cayman Islands, we source data from the Economics and Statistics Office, Government of the Cayman Islands (http://www.eso.ky/). For

Guernsey, we source data from the States of Guernsey (<http://www.gov.gg/>).

Distance	The great circle distance between Germany's main agglomeration and host country i 's main agglomeration, weighted by the share of the agglomeration in the overall country's population, respectively. Data source: Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). For Liechtenstein, we take the Swiss value (Zurich). For Montenegro, we take the Serbian value (Belgrade). For Guernsey, we take the value of Great Britain (London).
Adjacency	A dummy variable obtaining the value of one if host country i shares a border with Germany.
Rule of Law	Reflecting the level to which negotiators have confidence in and stick to the rules of society. It captures particularly the qualities of contract enforcement, property rights, the police, as well as the probability of crime and violence in host country i . <i>Rule of Law</i> may range between -2.5 and 2.5 and is measured on an annual basis. Data source: World Governance Indicators of the World Bank. For Guernsey, we take the value of Great Britain.
Voice & Accountability	Indicating the degree to which citizens of host country i are given the possibility to elect their government. In addition, it represents the extent to which the freedom of expression, the freedom of association, and a free media are established in host country i . <i>Voice & Accountability</i> may range between -2.5 and 2.5 and is measured on an annual basis. Data source: World Governance Indicators of the World Bank. For Guernsey, we take the value of Great Britain.

Appendix B: Econometric Framework

We model *Number Subsidiaries* (for the sake of simplicity, denoted with n in the following) as a Poisson distributed random variable with the probability function:

$$f(n_{ijt}) = \frac{\exp(-\lambda_{ijt}) \lambda_{ijt}^{n_{ijt}}}{n_{ijt}!}, \quad n_{ijt} = 0, 1, 2, \dots \quad (1)$$

where λ_{ijt} is the intensity parameter. This is a one-parameter distribution with mean and variance equal to λ_{ijt} :

$$E(n_{ijt}) = \text{Var}(n_{ijt}) = \lambda_{ijt} \quad (2)$$

To integrate observable exogenous variables, such as the *Tax Attractiveness Index* and other country-level characteristics which are supposed to determine the location decision, and hence, the number of subsidiaries in a specific host country, the mean λ_{ijt} is parameterized as:

$$\lambda_{ijt} = \exp(\mathbf{x}'_{ijt} \boldsymbol{\beta}) \quad (3)$$

where \mathbf{x}'_{ijt} is a vector of regressors, $\mathbf{x}'_{ijt} = [x_{1ijt}, \dots, x_{kijt}]$, and $\boldsymbol{\beta}$ is a vector of coefficients. The exponential form of (3) ensures the non-negativity of λ_{ijt} . Equations (2) and (3) together yield the conditional mean:

$$E(n_{ijt} | \mathbf{x}_{ijt}) = \exp(\mathbf{x}'_{ijt} \boldsymbol{\beta}) \quad (4)$$

Further, equations (1) and (3) jointly define the Poisson regression model. In the statistics literature, the model is also called the “log-linear model” because the logarithm of the conditional mean is linear in the parameters ($\log E(n_{ijt} | \mathbf{x}_{ijt}) = \log \lambda_{ijt} = \mathbf{x}'_{ijt} \boldsymbol{\beta}$). Finally, the vector $\boldsymbol{\beta}$ can be estimated by using the maximum likelihood method, the standard estimation method for count models (see, e.g., Cameron and Trivedi 1998; Winkelmann and Zimmermann 1995).

Equation (2) shows that the Poisson model implies equality of (conditional) mean and (conditional) variance, which is also called the *equidispersion* property. In applied research, this assumption is frequently violated ($\text{Var}(n_{ijt} | \mathbf{x}_{ijt}) > E(n_{ijt} | \mathbf{x}_{ijt})$) which also holds in our case: the variance of *Number Subsidiaries* exceeds its mean (see Table 1 Panel A). Moreover, formal tests confirm that the null hypothesis of equidispersion must be rejected. Therefore, the Poisson model proves to be inappropriate for our purposes. However, provided that the conditional mean is correctly specified, the estimator for the regression parameters remains consistent. Then, the pseudo-maximum likelihood or quasi-maximum likelihood approach can be used to estimate $\boldsymbol{\beta}$. Nevertheless, violations of the variance assumption result in an inefficient estimator and may cause the standard errors to be biased (see, e.g., Cameron and Trivedi 1998).

Since the Poisson model is not suitable, we use the negative binomial regression model as our preferred specification. Compared to the Poisson model, it is more flexible since the underlying distribution allows for overdispersion while the mean $E(n_{ijt}) = \lambda_{ijt}$ is preserved. By using a Poisson-gamma mixture distribution, the overdispersion parameter α is integrated into the probability function for n_{ijt} , yielding the negative binomial distribution:

$$f(n_{ijt} | \alpha, \lambda_{ijt}) = \frac{\Gamma(\alpha^{-1} + n_{ijt})}{\Gamma(\alpha^{-1})\Gamma(n_{ijt} + 1)} \left(\frac{\alpha^{-1}}{\alpha^{-1} + \lambda_{ijt}} \right)^{\alpha^{-1}} \left(\frac{\lambda_{ijt}}{\lambda_{ijt} + \alpha^{-1}} \right)^{n_{ijt}}, \quad \alpha \geq 0, \quad n_{ijt} = 0, 1, 2, \dots \quad (5)$$

$\Gamma(\cdot)$ signifies the gamma integral which specializes to a factorial in case of an integer argument. If α equals zero, the negative binomial model converges to the Poisson model (see, e.g., Cameron and Trivedi 2010). The literature differentiates between the so-called negative binomial model of type 1, where the conditional variance is a multiple of the conditional mean ($\text{Var}(n_{ijt} | \mathbf{x}_{ijt}) = (1 + \alpha)\lambda_{ijt}$, $E(n_{ijt} | \mathbf{x}_{ijt}) = \lambda_{ijt} = \exp(\mathbf{x}'_{ijt}\boldsymbol{\beta})$), and the negative binomial model of type 2, where the conditional variance is quadratic in the mean ($\text{Var}(n_{ijt} | \mathbf{x}_{ijt}) = (1 + \alpha\lambda_{ijt})\lambda_{ijt}$) (see, e.g., Cameron and Trivedi 1998). We apply the negative binomial model of type 2.

Moreover, we account for excess zeros that are present in our data by applying a zero-inflated negative binomial model. The zero-inflated negative binomial model relaxes the assumption that the excess zeros and the positive outcomes for *Number Subsidiaries* result from the same data-generating process. It combines the negative binomial model with the count density $f_2(\cdot)$ with a binary process (probit or logit) with a density of $f_1(\cdot)$. If the binary process assumes a value of zero, with a probability of $f_1(0)$, then $n_{ijt} = 0$. If, however, the binary model leads to a value of one, with a probability of $f_1(1)$, then n_{ijt} takes on the count values $0, 1, 2, \dots$ from the count density $f_2(\cdot)$. Hence, zeros may appear as an outcome of the binary process, and furthermore, they may result from the count process which requires the binary variable to be one. Neglecting regressors for the sake of simplicity, the zero-inflated model has a density of:

$$f(n_{ijt}) = \begin{cases} f_1(0) + \{1 - f_1(0)\} f_2(0) & \text{if } n_{ijt} = 0 \\ \{1 - f_1(0)\} f_2(n_{ijt}) & \text{if } n_{ijt} \geq 1 \end{cases} \quad (6)$$

The variables included in the $f_1(\cdot)$ density do not have to equal those in the $f_2(\cdot)$ density. For the negative binomial model with count density $f_2(\cdot)$, the conditional mean is $\exp(\mathbf{x}'_{2ijt}\boldsymbol{\beta})$. Therefore, the whole model (including zeros) has a conditional mean of:

$$E(n_{ijt} | \mathbf{x}_{ijt}) = \{1 - f_1(0 | \mathbf{x}_{ijt})\} \times \exp(\mathbf{x}'_{2ijt} \boldsymbol{\beta}_2) \quad (7)$$

where $1 - f_1(0 | \mathbf{x}_{ijt})$ signifies the probability that the binary process takes on a value of one (see, e.g., Cameron and Trivedi 2010).

Appendix C: Additional Analysis

Table C.I

Correlation between Different Dependent Variables and Country-Level Controls

This table reports correlation coefficients for all variables used in this study. The underlying sample for all dependent variables used (1-6) is based on the subsidiaries of 29 German parent companies (DAX30) over years 2005 to 2009. The subsidiaries are situated in 97 different host countries. *Number Subsidiaries* signifies the number of subsidiaries that parent company *j* operates in year *t* in host country *i*. *Number Subsidiaries (relative)* is defined as the number of subsidiaries that parent company *j* operates in year *t* in host country *i* divided by the total number of foreign subsidiaries that parent company *j* holds in year *t*. *Equity* is the sum of equity (in current mill. EUR) that parent company *j* holds in year *t* in host country *i*. *Equity (relative)* is the sum of equity (in current mill. EUR) that parent company *j* holds in year *t* in host country *i* divided by the total sum of equity that parent company *j* holds in year *t* in foreign countries. *Number Cons. Subsidiaries* refers to the number of consolidated subsidiaries that parent company *j* operates in year *t* in host country *i*. *Number Subsidiaries (all)* is the aggregated number of subsidiaries that all 29 parent companies together operate in year *t* in host country *i*. *Tax Attractiveness Index* is an index summarizing 18 different tax factors representing host country *i*'s tax attractiveness. The index is restricted to values between zero and one. High index values indicate a favorable tax environment. *GDP* is the natural logarithm of host country *i*'s GDP in constant USD for the year 2000. *Similarity* is an index defined as one minus the ratio of the absolute value of host country *i*'s GDP per capita minus Germany's GDP per capita to the higher of both GDPs per capita (GDP per capita in constant USD for the year 2000, respectively). *Distance* is defined as the natural logarithm of the population-weighted great circle distance between main agglomerations of Germany and host country *i*. *Adjacency* is a dummy variable obtaining the value one if host country *i* shares a border with Germany. *Rule of Law* and *Voice & Accountability* represent governance indicators of host country *i*. They may range from -2.5 to 2.5. All country-level variables are measured on an annual basis. Insignificant correlations ($p \geq 0.1$) are reported in italics.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Number Subsidiaries	1.00												
(2) Number Subsidiaries (relative)	0.81	1.00											
(3) Equity	0.33	0.33	1.00										
(4) Equity (relative)	0.39	0.55	0.62	1.00									
(5) Number Cons. Subsidiaries	0.97	0.79	0.29	0.38	1.00								
(6) Number Subsidiaries (all)	0.51	0.65	0.31	0.39	0.46	1.00							
(7) Tax Attractiveness Index	<i>-0.01</i>	<i>-0.01</i>	<i>0.01</i>	0.04	<i>-0.01</i>	-0.02	1.00						
(8) GDP	0.29	0.40	0.15	0.20	0.26	0.58	-0.36	1.00					
(9) Similarity	0.17	0.22	0.10	0.15	0.15	0.33	0.36	0.35	1.00				
(10) Distance	-0.08	-0.09	-0.06	-0.10	-0.06	-0.16	-0.31	<i>0.01</i>	-0.29	1.00			
(11) Adjacency	0.09	0.14	0.07	0.13	0.07	0.17	0.19	0.20	0.34	-0.55	1.00		
(12) Rule of Law	0.15	0.21	0.10	0.15	0.13	0.30	0.43	0.20	0.81	-0.40	0.35	1.00	
(13) Voice & Accountability	0.12	0.16	0.08	0.13	0.11	0.24	0.25	0.09	0.64	-0.39	0.35	0.79	1.00

Table C.II**Tax Attractiveness and the Location of Subsidiaries – Alternative Specifications**

This table presents regression results for the location of German-controlled subsidiaries. The dependent variable is *Number Subsidiaries*, defined as the number of subsidiaries that parent company *j* operates in year *t* in host country *i*. The underlying sample is based on the subsidiaries of 29 German parent companies (DAX30) over years 2005 to 2009. The subsidiaries are situated in 97 different host countries. We apply pooled estimation techniques. In column (1) we use a negative binomial model and in column (2) we apply a zero-inflated model. To measure host country *i*'s tax attractiveness we use the *Tax Attractiveness Index*. The index summarizes 18 different tax factors and is restricted to values between zero and one. High index values indicate a favorable tax environment. *GDP* is the natural logarithm of host country *i*'s GDP in constant USD for the year 2000. *Similarity* is an index defined as one minus the ratio of the absolute value of host country *i*'s GDP per capita minus Germany's GDP per capita to the higher of both GDPs per capita (GDP per capita in constant USD for the year 2000, respectively). *Distance* is defined as the natural logarithm of the population-weighted great circle distance between main agglomerations of Germany and host country *i*. *Adjacency* is a dummy variable obtaining the value one if host country *i* shares a border with Germany. *Rule of Law* and *Voice & Accountability* represent governance indicators of host country *i*. They may range from -2.5 to 2.5. All country-level variables are measured on an annual basis (2005-2009). In both columns, we use parent and year fixed effects separately. Standard errors (shown in parentheses) allow for heteroskedasticity and are clustered by country. ***, **, * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	Sign	Negative Binomial (1)	Zero-Inflated (2)
Tax Attractiveness Index	+	1.9863*** (0.4851)	1.9254*** (0.4511)
GDP	+	0.7570*** (0.0460)	0.6616*** (0.0450)
Similarity	+/-	-1.4222*** (0.3318)	-0.9653*** (0.3003)
Distance	-	-0.2168*** (0.0578)	-0.0917* (0.0508)
Adjacency	+	0.1111 (0.1920)	0.0979 (0.1668)
Rule of Law	+	0.1589 (0.1119)	0.0478 (0.1066)
Voice & Accountability	+	0.3767*** (0.1077)	0.3082*** (0.0916)
Parent FE		Yes	Yes
Year FE		Yes	Yes
Parent-Year FE		No	No
Observations		13,748	13,748
Pseudo Log <i>L</i>		-22,728	-21,871

Table C.III**Tax Attractiveness and the Location of Subsidiaries – Control for Outliers**

This table reports regression results for the location of German-controlled subsidiaries. The dependent variable is *Number Subsidiaries*, defined as the number of subsidiaries that parent company j operates in year t in host country i . The sample is based on the subsidiaries of 29 German parent companies (DAX30) over years 2005 to 2009. Subsidiaries are situated in 97 different host countries. We apply pooled estimation techniques. For all regressions (1-12), we use negative binomial models. To control for outliers, we cut off high outcomes for *Number Subsidiaries*, yielding us six different sub-samples with reduced numbers of observations, respectively. To measure host country i 's tax attractiveness in year t , we use the *Tax Attractiveness Index*. The index summarizes 18 different tax factors and is restricted to values between zero and one. High index values indicate a favorable tax environment. See Table 1 for a description of the other independent variables included in the regressions. We use parent and year fixed effects separately in columns (1), (3), (5), (7), (9) and (11). In columns (2), (4), (6), (8), (10) and (12), we use parent-year fixed effects. Standard errors (shown in parentheses) allow for heteroskedasticity and are clustered by country. ***, **, * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	Number Subsidiaries < 10		Number Subsidiaries < 20		Number Subsidiaries < 30	
	(1)	(2)	(3)	(4)	(5)	(6)
Tax Attractiveness Index	1.4666*** (0.3995)	1.4809*** (0.4001)	1.6997*** (0.4513)	1.7262*** (0.4508)	1.6599*** (0.4651)	1.6941*** (0.4618)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Parent FE	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No
Parent-Year FE	No	Yes	No	Yes	No	Yes
Observations	12,571	12,571	13,192	13,192	13,453	13,453
Pseudo Log L	-16,253	-16,068	-19,169	-18,993	-20,612	-20,432
	Number Subsidiaries < 40		Number Subsidiaries < 50		Number Subsidiaries < 100	
	(7)	(8)	(9)	(10)	(11)	(12)
Tax Attractiveness Index	1.7106*** (0.4781)	1.7461*** (0.4759)	1.7812*** (0.4813)	1.8135*** (0.4801)	1.8153*** (0.4793)	1.8430*** (0.4783)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Parent FE	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No
Parent-Year FE	No	Yes	No	Yes	No	Yes
Observations	13,566	13,566	13,632	13,632	13,695	13,695
Pseudo Log L	-21,367	-21,192	-21,813	-21,633	-22,247	-22,069

Table C.IV**Tax Attractiveness and the Location of Subsidiaries – Consolidated Subsidiaries**

This table presents regression results for the location of German-controlled subsidiaries. The dependent variable is *Number Cons. Subsidiaries*, defined as the number of consolidated subsidiaries that corporate group *j* operates in year *t* in host country *i*. The underlying sample is based on the subsidiaries of 29 German parent companies (DAX30) over years 2005 to 2009. The subsidiaries are situated in 97 different host countries. We apply pooled estimation techniques. In columns (1) and (2) we use negative binomial models and in columns (3) and (4) we apply zero-inflated models. Column (5) provides results from OLS estimation. To measure host country *i*'s tax attractiveness in year *t*, we use the *Tax Attractiveness Index*. The index summarizes 18 different tax factors and is restricted to values between zero and one. High index values indicate a favorable tax environment. See Table 1 for a description of the other independent variables included in the regressions. We use parent and year fixed effects separately in columns (1) and (3). In columns (2), (4) and (5) we use parent-year fixed effects. Standard errors (shown in parentheses) allow for heteroskedasticity and are clustered by country. ***, **, * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	Negative Binomial		Zero-Inflated		OLS
	(1)	(2)	(3)	(4)	(5)
Tax Attractiveness Index	2.0921*** (0.4825)	2.1169*** (0.4806)	1.8172*** (0.4221)	1.8162*** (0.4243)	8.8622** (3.9853)
Controls	Yes	Yes	Yes	Yes	Yes
Parent FE	Yes	No	Yes	No	No
Year FE	Yes	No	Yes	No	No
Parent-Year FE	No	Yes	No	Yes	Yes
Observations	13,748	13,748	13,748	13,748	13,748
Pseudo Log <i>L</i>	-19,347	-19,170	-18,504	-18,274	
R-squared					0.1077

Table C.V**Tax Attractiveness and the Location of Subsidiaries – Aggregated Country Analysis**

This table reports regression results for the location of German-controlled subsidiaries. The dependent variable is *Number Subsidiaries (all)* defined as the aggregated number of subsidiaries that all 29 parent firms together operate in year t in host country i . The underlying sample is based on the subsidiaries of 29 German parent companies (DAX30) over years 2005 to 2009. The subsidiaries are situated in 97 different host countries. We apply pooled estimation techniques. In column (1) we use a Poisson model and in column (2) we apply a negative binomial model. Column (3) provides results from OLS estimation. To measure host country i 's tax attractiveness, we use the *Tax Attractiveness Index*. The index summarizes 18 different tax factors and is restricted to values between zero and one. High index values indicate a favorable tax environment. *GDP* is the natural logarithm of host country i 's GDP in constant USD for the year 2000. *Similarity* is an index defined as one minus the ratio of the absolute value of host country i 's GDP per capita minus Germany's GDP per capita to the higher of both GDPs per capita (GDP per capita in constant USD for the year 2000, respectively). *Distance* is defined as the natural logarithm of the population-weighted great circle distance between main agglomerations of Germany and host country i . *Adjacency* is a dummy variable obtaining the value of one if host country i shares a border with Germany. *Rule of Law* and *Voice & Accountability* represent governance indicators of host country i . They may range from -2.5 to 2.5. All country-level variables are measured on an annual basis (2005-2009). We use year fixed effects in all specifications. Standard errors (shown in parentheses) allow for heteroskedasticity and are clustered by country. ***, **, * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	Sign	Poisson (1)	Negative Binomial (2)	OLS (3)
Tax Attractiveness Index	+	2.0581*** (0.7146)	1.8466*** (0.5314)	339.5234** (149.1137)
GDP	+	0.7810*** (0.0474)	0.7152*** (0.0504)	89.5404*** (28.9183)
Similarity	+/-	-1.0913*** (0.3982)	-1.0965*** (0.3633)	-85.7372 (107.2067)
Distance	-	-0.3600*** (0.0895)	-0.1930*** (0.0616)	-25.2103 (22.6436)
Adjacency	+	-0.2736 (0.2049)	0.1822 (0.2113)	-79.4900 (97.4930)
Rule of Law	+	0.1732 (0.1467)	0.0934 (0.1029)	-2.4588 (35.4062)
Voice & Accountability	+	0.2072* (0.1184)	0.3391*** (0.1107)	50.6179** (23.4152)
Year FE		Yes	Yes	Yes
Observations		484	484	484
Pseudo Log L		-6,999	-2,198	
R-squared				0.4064

Table C.VI

Tax Attractiveness and the Location of Subsidiaries – Breakdown by Year

This table presents regression results for the location of German-controlled subsidiaries. The dependent variable is *Number Subsidiaries*, defined as the number of subsidiaries that parent company *j* operates in year *t* in host country *i*. The underlying sample is based on the subsidiaries of 29 German parent companies (DAX30) over years 2005 to 2009. The subsidiaries are situated in 97 different host countries. We break down the sample by year. Results of annually analyses are reported. We apply cross-sectional estimation techniques. For regressions (1)-(5), we use negative binomial models. In columns (6)-(10) we apply zero-inflated models. To measure host country *i*'s tax attractiveness in year *t*, we use the self-constructed *Tax Attractiveness Index*. The index summarizes 18 different tax factors and is restricted to values between zero and one. High index values indicate a favorable tax environment. See Table 1 for a description of the other independent variables included in the regressions. In all specifications, we use year fixed effects. Standard errors (shown in parentheses) allow for heteroskedasticity and are clustered by country. ***, **, * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	Negative Binomial				
	2005	2006	2007	2008	2009
	(1)	(2)	(3)	(4)	(5)
Tax Attractiveness Index	1.9914*** (0.4842)	1.9154*** (0.4668)	2.2058*** (0.5184)	1.9687*** (0.5352)	2.0333*** (0.5510)
Controls	Yes	Yes	Yes	Yes	Yes
Parent FE	Yes	Yes	Yes	Yes	Yes
Observations	2,496	2,813	2,813	2,813	2,813
Pseudo Log <i>L</i>	-3,907	-4,327	-4,692	-4,798	-4,811
	Zero-Inflated				
	2005	2006	2007	2008	2009
	(6)	(7)	(8)	(9)	(10)
Tax Attractiveness Index	1.9028*** (0.4897)	1.9722*** (0.4489)	2.0991*** (0.5027)	2.0912*** (0.5036)	1.8021*** (0.4949)
Controls	Yes	Yes	Yes	Yes	Yes
Parent FE	Yes	Yes	Yes	Yes	Yes
Observations	2,496	2,813	2,813	2,813	2,813
Pseudo Log <i>L</i>	-3,784	-4,136	-4,485	-4,606	-4,622

Impressum:

Arbeitskreis Quantitative Steuerlehre, arqus, e.V.

Vorstand: Prof. Dr. Jochen Hundsdoerfer,

Prof. Dr. Dirk Kieseewetter, Prof. Dr. Ralf Maiterth

Sitz des Vereins: Berlin

Herausgeber: Kay Blaufus, Jochen Hundsdoerfer, Dirk Kieseewetter, Rolf J. König, Lutz Kruschwitz, Andreas Löffler, Ralf Maiterth, Heiko Müller, Rainer Niemann, Deborah Schanz, Sebastian Schanz, Caren Sureth, Corinna Treisch

Kontaktadresse:

Prof. Dr. Caren Sureth, Universität Paderborn, Fakultät für Wirtschaftswissenschaften,

Warburger Str. 100, 33098 Paderborn,

www.arqus.info, Email: info@arqus.info

ISSN 1861-8944