

# Minimizing tax burdens in the 21st century: transfer pricing by European MNEs

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Master Thesis  
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## **Abstract**

Using firm-level panel data, this thesis addresses transfer pricing behaviour by European MNEs. It analyses a comprehensive dataset containing more than 24,000 observations for the years 2009-2017. The panel regressions suggest that European MNEs report higher profits in low-tax countries, and vice versa. The preferred estimation reports a semi-elasticity of reported operating profits to the top statutory tax rate of -1.3. There thus remains scope for present-day MNEs to reduce their global tax burden through transfer pricing. Separate models contain a proxy for the effective transfer pricing laws. These indicate that introduction of transfer pricing laws decreases the transfer pricing incentive of MNEs. Hence, the results suggest that governments will need to adopt additional legislation to further counteract transfer pricing manipulation.

## **Preface**

This thesis concludes my master's programme in Economics and Business. Studying both economics and law, I enjoyed working on a topic which fits both the field of international economics as well as the field of tax law.

I want to thank Mr Spiritus for his valuable comments and help.

Gijs van Koeveringe

Rotterdam, October 2018

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## **List of abbreviations**

ADF-test – Augmented Dickey Fuller-test

APA – Advanced Pricing Agreements

BEPS – Base Erosion and Profit Shifting

CCCTB – Common Consolidated Corporate Tax Base

CIT – Corporate Income Tax

EBIT – Earnings Before Interest and Taxes

EU – European Union

FDI – Foreign Direct Investment

GDP – Gross Domestic Product

JTPF – Joint Transfer Pricing Forum

OECD – Organisation for Economic Co-operation and Development

MNE – Multinational Enterprise

SMTR – Statutory marginal tax rate

TP – Transfer Pricing

## 1. Introduction

The Dutch government withdrew its proposal to abolish the tax on dividends. The proposal lacked support from society, business and academics. Instead, it will accelerate the decrease in its statutory corporate tax rate. The top corporate income tax rate (CIT) in the Netherlands will become 20.50% in 2021, whereas it currently is 25.00% (Leijten, 2018).

Corporate taxation has always been part of parliamentary debates. Not only in the Netherlands, but also on an international level. In response to the avoiding of corporate taxes, the OECD has recently introduced the Base Erosion and Profit Shifting-Project (BEPS-project). This project aims to counteract profit shifting behaviour by MNEs, such as Apple, Google and Starbucks (Drucker & Bowers, 2017).

One of the mechanisms to shift profits is the manipulation of transfer prices. Transfer pricing concerns the pricing of transactions between subsidiaries of an MNE. International legislation determines that transfer prices must be set at arm's length: the actual value of the good or service. It often appears problematic to exactly determine this value, since comparable markets are not always available. Firms thus have a degree of flexibility in determining their transfer prices. When the subsidiaries are subject to different national tax rates, the MNE can exploit this degree of flexibility by determining the transfer price at a tax-minimizing value (Hirshleifer, 1956).

Suppose that an MNE has a domestic subsidiary and a foreign subsidiary. The foreign subsidiary produces an intermediate good, which it exports to the domestic subsidiary. The MNE must set a price on the transfer of the intermediate good. Setting a higher transfer price will shift profits from the importing subsidiary to the exporting subsidiary. The total tax burden of the MNE decreases when the domestic tax rate is higher than the foreign tax rate (Bowen et al., 2012). For each euro of shifted profits the MNE gains the difference between the foreign and domestic tax rate. A firm can thus manipulate its transfer prices to reduce its total tax burden.

This thesis aims to add new empirical evidence on whether present-day MNEs manipulate transfer prices to reduce their tax burdens. It relies on a European panel dataset. The focus is on European MNEs for a variety of reasons. Past papers generally focus on the US or on a limited set of countries. A recent study on transfer pricing manipulation by European MNEs is lacking. The advantage of focusing on Europe is that comprehensive and detailed data is generally available for European firms. Also, transfer pricing ranks high on European policy agendas. The European Commission has recently proposed to introduce a common consolidated corporate tax base. This proposal aims to make optimal transfer pricing less profitable by introducing a common tax base for every European MNE. The research question of this thesis is:

*Is there evidence for profit shifting through transfer pricing by European-based MNEs nowadays?*

The final dataset contains over 24,000 observations and comprises all European countries (see Appendix B for the details). The dataset contains firm-specific data from the Orbis database, data on corporate tax rates, macro-economic variables and a measure of the effective transfer pricing legislation for the years 2009-2017. The analysis relies on various panel regressions.

The identification strategy hinges on the difference between the *true* and *reported* profits of firms. It analyses the relationship between the earnings before interest (EBIT) and the statutory marginal tax rate. Using the EBIT as the dependent variable isolates the manipulation of transfer prices from the debt-shifting channel, since debt financing does not impact the EBIT (Heckemeyer and Overesch, 2013). To disentangle the effect of the corporate tax rate on transfer pricing incentives from the effect of the corporate tax rate on real activity, the estimations control for determinants of the true profit of firms (Bartelsman and Beetsma, 2003). These determinants include the labor input, the capital input and the economic state of a country. The total employee cost, the fixed assets and the GDP/capita measure these determinants, respectively. The baseline specification also includes time- and firm-fixed effects. Profits that are attributable to the various control variables represent the true profits of the firms. This leaves the tax variable to account for the profits which are shifted by transfer pricing manipulation. The true profits and the shifted profits together constitute the reported profits: the EBIT. After estimating the baseline model, separate models additionally include country- and industry-fixed effects.

Separate estimations also control for the effect of national transfer pricing legislation on the transfer pricing incentives of MNEs. These estimations include a variable for the number of years that have passed since a country introduced its first transfer pricing documentation rules. These documentation rules require MNEs to maintain a detailed administration of their transfer pricing strategy. Introduction of the rules varies across countries. The variable is a rough proxy for the enforcement of national transfer pricing legislation. It hinges on the assumption that enforcement of transfer pricing rules is stricter in countries which introduced transfer pricing legislation earlier than others (Beer and Loeprick, 2015). The additional estimates also contain a dummy variable indicating whether national legislation offers the possibility for MNEs to enter into an Advanced Pricing Agreement (APA). An APA pre-anchors a transfer pricing strategy to the MNE for a fixed period of time. Such an agreement mitigates the risks of changes in the transfer pricing legislation in the meantime.

The analysis answers the question to what degree contemporary European firms use transfer pricing as profit shifting mechanism. It relies on estimations of the semi-elasticities of the reported profits to the corporate tax rate. These semi-elasticities measure the percentage change in reported profits in response to a one-percentage point change in the corporate tax rate. The regression results suggest that there exists a negative and significant relationship between reported profits and the statutory marginal tax rate. The preferred estimation reports a semi-elasticity of -1.3. The estimates are thus consistent with the hypothesis that firms which face a lower corporate tax rate, on average, report higher profits. Furthermore, the estimates suggest that the introduction of transfer pricing legislation reduces the sensitivity of reported profits to the statutory tax rate.

The findings of this thesis are by and large in line with existing literature. Most of the studies predict a negative relationship between the reported profits and the statutory marginal tax rate. But most of them contain 20<sup>th</sup> century US data. So does one of the leading studies on profit-shifting, by Hines and Rice (1994). They analyse cross-sectional data from 1982 and show that American MNEs report higher profits in low-tax countries.

Some studies contain data from the beginning of the 21<sup>st</sup> century, such as the one by Lohse and Riedel (2013). The latter find evidence for a decrease in the reported profits of 3.94%, following a ten percentage point increase in the corporate tax rate. The study analyses panel data on European MNEs, covering the period 1999-2009. Huizinga and Laeven (2006)

also conduct a study on European MNEs. Using cross-sectional data from 1999, they find a *semi-elasticity* of -1.43 of the reported profits to the top statutory tax rate. Comparing these results to the estimated semi-elasticity of -1.30 in this thesis indicates that the extent of transfer pricing manipulation barely declined since 1999. Possible implications are that the legislative measures on transfer pricing have hardly had any effect yet.

The structure of this thesis is as follows. After the introduction, chapter 2 discusses the background of transfer pricing. Hereafter, chapter 3 presents a review of the existing literature. Chapter 4 contains a basic model on transfer pricing, whereas chapter 4 and 5 discuss the methodology and the data, respectively. Chapter 5 presents the results. The last chapter, chapter 6, consists of the conclusion and discussion of the results.

## **2. Background**

This chapter discusses the background of transfer pricing. It elaborates upon general profit shifting, the economic concept of transfer pricing and concludes with a brief discussion of the existing legislation on transfer pricing.

### *2.1 Profit shifting*

Differences in national corporate tax rates induce profit shifting. MNEs generally shift profits from high-tax countries to low-tax countries. Profit shifting is attractive for firms which have subsidiaries in tax havens. Tax havens are countries with favourable fiscal conditions for firms. The OECD identifies these conditions. The most important condition is a relatively low or even zero corporate tax rate. The second factor includes a lack of international exchange of information on MNE activities. The third factor is a lack of transparency on national taxation. The last factor is that tax havens do not require firms to exercise real economic activity in the tax haven (OECD, 2009). Europe resides six of the global top 10 tax havens: Belgium, Ireland, Luxembourg, Malta, the Netherlands and Switzerland. Estimates suggest that the Netherlands received 47 billion dollars of shifted profits in 2015: 29 percent of the total domestic profits (Zucman et al., 2018). The Netherlands is considered to be a tax haven for a variety of reasons. The first reason is that Dutch legislation provides an exemption from tax on dividends and capital gains for foreign subsidiaries. Another important reason is that Dutch legislation offers the possibility for MNEs to engage into APA's. APA's are agreements between MNEs and the national tax authority for a fixed period of time. By engaging in an APA, the MNE can secure a specific transfer pricing strategy for this fixed period. As such, the MNE can mitigate the risks of changes in the transfer pricing legislation in the meantime.

MNEs can shift profits through different profit shifting channels (Johansson et al., 2016). Unless firms move production factors to the low-tax countries, profit shifting creates a mismatch between the location where the profits are reported and the location where those profits can operationally be attributed to. The literature generally distinguishes two main profit shifting channels. The first channel involves the financial structure of firms. Financing subsidiaries in high-tax countries with debt is attractive for MNEs, since the interest on debt is usually tax-deductible. Locating debt in high-tax countries can thus lead to less tax expenses for a company. The second main profit shifting channel involves transfer pricing (Heckemeyer & Overesch, 2013).

Profit shifting has redistributive effects. It leads to a redistribution of tax revenues across countries. Zucman et al. (2018) find that for every dollar of taxes that MNEs avoid in high-tax jurisdictions, tax havens' tax revenues increase by 0.25 dollars. The remaining part of the avoided taxes benefits the MNE: it increases the wealth of its shareholders. Since equity wealth concentration is high, profit shifting benefits only a small group of people; it is associated with an increase in inequality (Saez and Zucman, 2016). Profit shifting *can* also affect labor wages. Labor wages can rise when profit shifting occurs through the inflow of tangible capital, as there exists a finite elasticity of substitution between labor and capital. But when profit shifting occurs without shifting any assets, there is no immediate effect on labor wages. For a given level of MNE profits, profit shifting without moving assets does not affect labor productivity (Zucman et al., 2018). The latter is the case for transfer price manipulation, a mechanism which shifts profits *on paper*.

## 2.2 Transfer price manipulation

Transfer pricing is a synonym for inter-company pricing. It relates to the pricing of transactions between units which have a common centre of control (Murray, 1981). Such a common centre of control exists for subsidiaries of the same MNE. Transfer pricing can involve the transfer of rights, goods and services. The value which firms declare to these transactions is the transfer price. If a firm uses intangible assets (e.g. intellectual property) which belong to a subsidiary of the same MNE, it pays a compensation for this intra-group use of the intellectual property. This compensation is known as a royalty payment: a specific kind of transfer price.

If the transaction occurs between subsidiaries in two different countries, the MNE can benefit from differences in national tax rates. Consider a subsidiary in a high-tax country and a subsidiary in a low-tax country. Both subsidiaries belong to the same MNE. A transaction between the two subsidiaries involves the transfer of a good from the low-tax country to the high-tax country. Declaring a higher transfer price to this transaction shifts profits to the low-tax country, leading to a decrease in the overall tax burden of the MNE. The manipulation of transfer prices is thus an accounting technique which artificially shifts profits in the firms' accounting books.

There is a limit to the degree to which MNEs can manipulate their transfer prices: the arm's length principle. The arm's length principle is an international standard which OECD countries agreed to follow when determining reasonable values of transfer prices. The standard applies to transactions between associated parties. According to article 9 of the *OECD Transfer Pricing Guidelines*, associated parties are defined as firms which engage (in)directly in the control of another firm (OECD, 2017). Firms should treat these transactions between associated parties as if they occur at arm's length: as if the parties are independent of each other. A comparability analysis must reveal whether the reported value of the transaction deviates from the arm's length value. The profits of the associated firms are adjusted when the authorities can demonstrate that both values significantly differ from each other.

The difficulty lays in the complexity of establishing arm's length prices. To establish the arm's length price, it has to be clear what a comparable transaction between unrelated parties looks like. This hinges upon the availability of a comparable market. Difficulties arise in situations which concern a *unique* transaction, in which case there is no comparable market available. This can occur in a transaction that involves capital goods or intangibles. In the case of unique intellectual property, there does not exist a market value. The lack of a market value



for intangibles is the reason that manipulating transfer prices (royalties) is attractive for MNEs; the probability that the manipulation will be detected is lower than for goods and services. Determining arm's length prices is particularly difficult in monopolistic markets. For these markets there may be no comparable transactions to deduce the arm's length price from. Establishing the arm's length value is even more complicated when other economic factors have to be specified. Think of the currency and the corresponding exchange rate, the delivery terms, the time period of payment, insurance costs and discounts (Murray, 1981). Determining all the relevant factors can lead to varying results, particularly in a time characterized by differentiation in commodities and globalization. There thus remains scope for altering transfer prices. It is in this scope where the incentive for tax minimization lays.

### 2.3 Recent developments

The attention for transfer pricing has increased as a result of the enhanced multinational activity. Global FDI inflows increased from 205 billion dollars in 1990 to 1,430 billion dollars in 2017. MNEs and their subsidiaries accounted for ten percent of the global GDP in 2017 (UNCTAD, 2018). A substantial share of international trade consists of *intra-firm* trade: transactions between MNE subsidiaries across national borders. One-third of the global exports in 2015 consist of intra-firm transactions (Worldbank, 2017).

The digitalisation of the global economy has led to an increase in the use of intellectual property. The importance of the compensation for its use, royalty payments, has increased simultaneously. The OECD acknowledges that the increasing importance of intangible assets and their mobility bring about profit shifting incentives for MNEs (OECD, 2015). Intra-firm transfers of intellectual property are attractive for MNEs. Due to the usual lack of a market value for the intellectual property, it is difficult to detect manipulation of royalty payments. Consider the case of Google. Google has a subsidiary in Bermuda, a tax haven. This subsidiary officially owns Google's search engine. Google charges its subsidiaries, which reside in higher-tax countries, for using it. It shift profits to the tax haven by *overpricing* the use of the search engine to other subsidiaries (Juraneck et al., 2017).

Differences in national tax rates motivate profit shifting. Currently there is an ongoing reduction in national corporate tax rates: *the race to the bottom in corporate tax rates*. The latest OECD tax report (OECD, 2018) shows that the decrease in the average CIT accelerated over the latest years. The average CIT among OECD countries decreased by 0.75 percentage points in the period 2008-2015, while its decrease between 2015 and 2018 was one percentage point (OECD, 2018). The development of corporate tax rates in Europe follows a comparable pattern. The average CIT in Europe decreased from 35.00% in 1996 to 19.48% in 2018 (de Groot & Molenaar, 2016). Despite the general decrease in corporate tax rates, the incentive for profit shifting remains: the difference between the European country with the highest CIT, Malta with 35.00%, and the European country with the lowest CIT, Hungary with 9.00%, remains considerable (KMPG, 2018). Table 1 and 2 show the European countries with the highest and lowest CITs.

Country	CIT 2018
Malta	35.00%
Belgium	33.99%
France	33.33%

Germany	29.72%
Greece	29.00%

Table 1: Highest top corporate income tax rates (CIT) in Europe 2018 (KPMG, 2018)

Country	CIT 2018
Hungary	9.00%
Bosnia	10.00%
Bulgaria	10.00%
Gibraltar	10.00%
Macedonia	10.00%

Table 2: Lowest top corporate income tax rates (CIT) in Europe 2018 (KPMG, 2018)

## 2.4 International policy response

The OECD and the G20 have recently introduced the BEPS-project. The project contains 15 actions which aim to counteract profit shifting. Three of those actions concern transfer pricing. Those actions have led to guidelines that specifically aim to counteract the manipulation of transfer prices: the *OECD Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations* (OECD, 2017). These guidelines codify the standards transfer prices have to adhere to. The first chapter elaborates upon the arm's length principle. It stresses that the arm's length principle is the international standard to follow when evaluating transfer prices. The guidelines furthermore provide directions for determining comparable transactions to deduce the arm's length price from. They also provide standards for documentation requirements for MNEs and directions for non-compliance penalties.

In the beginning of the 21<sup>st</sup> century, the EU also started to closer watch transfer pricing behaviour. The European Commission acknowledged that 'the pricing of intragroup transactions calls for urgent actions' (EC, 2001). It therefore set up the Joint Transfer Pricing Forum (JTPF) in 2002. The goal of the JTPF is to improve international coordination in counteracting transfer price manipulation. It provides advice to the European Commission regarding transfer pricing issues. The JFTP composes one tax official of each member state, complemented with 18 independent tax experts.

Simultaneous with the introduction of the JTPF, the European Commission proposed a consolidated corporate tax base (CCCTB). According to the proposal, MNEs in the EU will have to report consolidated profits for their EU activities. A special formula then apportions the profits to the separate countries in which the MNE operates. Reporting consolidated profits removes the profit shifting channel that transfer pricing offers, because it removes the visibility of intra-firm trade. While the EU Commission already brought up the proposal for this common tax base in 2002, it has not entered into force yet. After some alterations by the EU Commission in 2011, the Commission launched the proposal again in 2016. It is still under revision now.

Most of the *national* legislation on transfer pricing comprises the arm's length principle. However, specific transfer pricing regulation still differs across countries. Differences exist in rules that determine the arm's length value of transactions, required documentation of intra-firm transactions and applicable penalties. For example, Germany introduced its first specific legislation on transfer pricing documentation in 2003, whereas Belgium only introduced comparable rules in 2016. Audit risks and the possibility to engage in APA's also still differ across countries (Lohse et al., 2012). Contemporary legislation in Bosnia & Herzegovina, Bulgaria, Estonia and Serbia still does not allow MNEs to engage in bilateral APA's (EY, 2018).

### 3. Literature review

Various studies aim to assess the profit shifting behaviour of MNEs. Grubert and Mutti (1991) study profit shifting through transfer pricing by US MNEs in 1982. They stress that there are two important aspects which one has to consider when examining profit shifting. The first aspect is the use of the tax measure. The authors show that the statutory tax rate is a more suitable explanatory variable for the profitability of firms than the effective tax rate. In addition, the authors explain that the average tax rate causes an endogeneity problem, since the average tax rate depends on the profit level. The average tax rate would only be suitable when using an appropriate IV-approach. According to the authors, the second important aspect when examining profit shifting is the measure of profitability. Using the EBIT isolates profit shifting through transfer pricing, since debt financing does not affect this measure. Grubert and Mutti (1991) use the ratio of pre-tax profits to sales as the measure for profitability, which is influenced by debt financing. Hence, they do not exclusively observe transfer price manipulation. Their cross-sectional empirical study involves data on 33 countries. They show patterns of MNEs shifting income from high-tax countries to low-tax countries, by analysing the relationship between reported profits and the corporate tax rate. They control for the general profitability of a country's economy by including the control variable GDP/capita in their regression. Their estimations suggest the following. A subsidiary that faces a corporate tax rate of 40% reports, on average, profits that represent almost six percent of its sales. A subsidiary that faces a tax rate of 20% reports profits of almost thirteen percent of its sales.

Hines and Rice (1994) build on the research by Grubert and Mutti (1991). Like Grubert and Mutti, the paper demonstrates that US companies report higher profits in low-tax countries. Their dataset covers data from 1982. Their dependent variable consists of the pre-tax total profits of firms, which also seizes the effect of profit shifting through debt financing. Their explanatory variable is the statutory corporate tax rate. They control for the input of production factors by adding proxies for the labor and capital input to their regression. Hines and Rice (1994) use the total employee compensation as a proxy for the labor input, while they use the fixed assets as a proxy for the capital input. They find that, on average, a one percent decrease in the tax rate leads to an increase of three percent in the pre-tax profits. Interpreting the results requires caution, since the models contain at most 73 observations.

Aforementioned studies focus on general profit shifting. More recent studies limit the focus to profit shifting through transfer pricing. Conover and Nichols (2000) study whether US MNEs use transfer pricing to shift profits to low-tax jurisdictions. They analyse 490 firms in the period 1982-1984 and 657 firms between 1988 and 1990. By adding a year dummy, the authors control for changes in the period between 1984 and 1988. This is important, as the US Tax Reform Act became effective in 1986. This Tax Reform Act led to a reduction in the US corporate tax rate from 46% to 34%. The authors make use of different cross-sectional regression models, observing each firm at one specific point in time. Their final sample contains 1,147 observations. Conover and Nichols (2000) regress the MNE's global taxes payable on the MNE's total amount of transfers to foreign subsidiaries in dollars. They assume that MNEs with a higher amount of intra-firm transfers report lower global taxes on average, indicating the manipulation of transfer prices. Their control variables are the global pre-tax profits of the MNE, the ratio of foreign sales to global sales as a measure for the multinational activity, and the global assets as a proxy for the size of the firm. Their results suggest that MNEs increased transfer pricing manipulation after the introduction of the Tax Reform Act.

Swenson (2001) also exploits the introduction of the US Tax Reform Act. She focuses on the period between 1981 and 1988. Her study analyses panel data on US MNEs and intra-company imports from an exclusive set of countries: Canada, France, Germany, Japan and the United Kingdom. Using product-level data, Swenson (2001) focuses on transfer pricing manipulation by investigating the responsiveness of reported intra-firm transactions to changes in the statutory corporate tax rate. She finds that intra-firm reported prices tend to increase when tax rates provide an incentive for firms to alter their transfer prices. But this finding does not appear to be strong. While Swenson's results turn out to be statistically significant, their economic significance seems to be moderately small. A reduction in the foreign tax rate of five percent is related to an increase in the reported transfer price of only 0.024 percent. The analysis includes 9,105 observations, considerably more than the previously mentioned studies.

Bartelsman and Beetsma (2003) study transfer pricing in 16 OECD countries. They elaborate upon the different measures of profitability. Observing the total pre-tax profit in relation to the corporate tax rate seizes profit shifting both by debt allocation and by transfer pricing. Considering the EBIT in relation to the corporate tax rate instead, isolates transfer price manipulation from other profit shifting channels. The EBIT does not include financial income and is thus not influenced by profit shifting through debt allocation. Their dataset covers the period 1979-1997, containing 4,100 observations. They use panel data on 16 different industry sectors. Bartelsman and Beetsma (2003) find statistically and economically significant evidence for profit shifting through transfer pricing. They conclude that, due to profit shifting, a unilateral tax increase of one percentage point leads to a loss of 65 percent of its extra tax revenue. They show that MNEs do not only shift profits from OECD countries to tax havens, but also across OECD countries. As part of their robustness checks, the authors add a measure for the national transfer-pricing enforcement laws. This measure includes an index which captures the transfer pricing rules, documentation requirements and the possible sanctions when the authorities detect transfer price manipulation. The regression includes this legislation index as a dummy variable. The disadvantage of transforming transfer-pricing enforcement into such an index is the arbitrariness. Nevertheless, the index provides an indication of how transfer pricing enforcement affects the reported profits of firms. Bartelsman and Beetsma (2003) find that the elasticity of reported profits to the tax rates is lower in countries with stricter transfer pricing rules.

Huizinga and Laeven (2009) conduct a comprehensive study comprising European cross-sectional firm-level data for the year 1999. The authors stress the suitability of Europe for a study on this particular topic. They claim that data on European firms is widely available, detailed and reliable. Like Bartelsman and Beetsma (2003), they isolate transfer pricing manipulation from other profits shifting channels by analysing the relationship between the statutory tax rate and the EBIT. Their baseline specification analyses 12,175 observations. They find that reported profits depend on, and are negatively related to, a weighted average of differences in the tax rates that apply to the different subsidiaries of an MNE. The authors find a semi-elasticity of reported profits to the statutory tax rate measure of -1.43. Hence, an increase of the statutory tax rate by one percentage point is related to a decrease in the reported profits of 1.43 percent.

Sikka and Willmott (2010) claim that the use of transfer pricing to shift profits received too little sustained interest. According to the authors, transfer pricing can be a harmful method in terms of social welfare, as it avoids the payment of taxes. They use the enhanced transfer pricing legislation in Australia to demonstrate the tax issue. Since Australian transfer pricing

audits have been intensified in 2000, the government raised an extra tax revenue of 2.5 billion Australian dollars in five years (Sikka and Willmott, 2010). The purpose of the paper is to stimulate further detailed research on transfer pricing.

Further research seems to have increased over the latest years. Lo et al. (2010) study transfer pricing behaviour of Chinese firms in 2004. Using cross-sectional data, they exploit variances in corporate tax rates among the different regions across the country. The authors use OLS regression to analyse a final sample of 283 observations. Their profitability measure is the ratio of the gross profit from intra-firm sales over the gross profit from unrelated-party sales. They regress this profitability measure on the marginal tax rates that the firms face. For firms facing lower tax rates, the authors expect to observe a higher ratio of the gross profit from intra-firm sales over the gross profit from unrelated-party sales. Their findings are that for every percent increase in the statutory tax rate, the reported gross profit of the firm is expected to decrease by almost 2.5 percent on average.

Recent studies on transfer pricing behaviour by European MNEs are scarce. Lohse and Riedel (2013) study transfer pricing manipulation by European MNEs in relation to transfer pricing legislation. To isolate the manipulation of transfer prices from other profit shifting channels, they investigate the sensitivity of the EBIT to changes in the statutory corporate tax rate. Their models analyse panel observations and control for time-, firm-, industry- and country-fixed effects. The study includes 26 countries over the period 1999-2009. They find that an increase in the corporate tax rate of ten percent leads to a reduction in the reported profits of almost four percent (3.9) on average. Furthermore, the authors investigate the sensitivity of reported profits to enhanced transfer pricing legislation. To do so, they assign the observed countries to three categories. The categories comprise the extent to which national transfer pricing legislation is applicable. The first category contains countries with barely any legislation on transfer pricing. The second category consists of countries with moderate transfer pricing legislation, meaning that firms are required to regularly document details on their transfer prices. The third category contains countries with stricter rules on transfer pricing documentation, meaning that firms have to show transfer pricing documentation annually or when authorities request to do so. Again, allocation to these categories seems arbitrary. Especially the transition from the second to the third category seems somewhat ambiguous. The various regression analyses include the categorization as an additional dummy variable. The authors find evidence for an average reduction in profit shifting behaviour of 50 percent following the introduction of transfer pricing legislation.

Beer and Loeprick (2015) rely on a proxy for the applicable transfer pricing legislation. They use the number of years that have passed since countries introduced laws on transfer pricing documentation. Such laws require firms to document details on intra-firm transactions and their transfer pricing strategy. They assume that their measure proxies the national enforcement of transfer pricing legislation and the experience that tax authorities with transfer pricing matters have. Although their proxy perhaps does not fully seize national transfer pricing legislation, it is an objective measure which provides a basic indication of the applicable legislation. Using panel data on nearly 15,000 MNE subsidiaries over the years 2003-2011, they observe the sensitivity of the EBIT to the statutory corporate tax rate. They control for the applicable transfer pricing legislation by including the legislation proxy itself, as well as its interaction with the corporate tax rate. They find that the introduction of transfer pricing legislation significantly reduces the sensitivity of the reported profits to the statutory corporate

tax rate: two years after the introduction of the legislation, profit shifting behaviour decreases by an expected 52 percent on average.

Heckemeyer and Overesch (2013) investigate the existing literature on profit shifting through a meta-analysis. They overview 25 different studies on profit shifting. The studies contain both US data as well as global data. All of them contain some measure of profitability as their dependent variable. The authors stress the different profit shifting channels and how to isolate them from each other. They separate the studies that observe profit shifting through all possible shifting channels from the ones that observe profit shifting through transfer pricing. The former studies consider the total pre-tax profits as their dependent variable, while the latter studies consider the EBIT as the dependent variable. Based on the six studies that consider transfer price manipulation, they find a mean semi-elasticity of -1.07 of the EBIT to the statutory corporate tax rate. They claim that transfer pricing incentives differ across industries, indicating the need to include industry-fixed effects.

Table 3 summarizes the quantitative results stemming from previous studies.

<b>Study</b>	<b>Aim</b>	<b>Result</b>
Hines and Rice (1994)	Assess the impact of tax havens on the US domestic tax base (1982)	Semi-elasticity of reported profits to the tax rate of -3.00
Swenson (2001)	Analyse transfer pricing by US MNEs (1981-1988)	A reduction in tax rate of 5% leads to an increase in the reported transfer price of 0.024%
Bartelsman and Beetsma (2003)	Study transfer pricing in 16 OECD countries (1979-1997)	65 percent of the additional revenue of a unilateral tax increase is lost due to tax-motivated transfer pricing
Huizinga and Laeven (2009)	Study transfer pricing behaviour of European MNEs in 1999	Semi-elasticity of reported profits to the tax rate of -1.43
Lo et al. (2010)	Study transfer pricing of firms based in China in 2004	Semi-elasticity of reported profits to the tax rate of -2.5
Lohse and Riedel (2013)	Study transfer pricing by European MNEs over the period 1999-2009	Semi-elasticity of reported profits to the tax rate of -0.39
Heckemeyer and Overesch (2013)	Transfer pricing meta-analysis including 6 different studies	Semi-elasticity of pre-tax profits to the tax rate of -1.07

*Table 3: summarized results of the existing literature on transfer pricing*

The reviewed studies agree on the negative relationship between the reported profits and the corporate tax rate. However, they are inconclusive regarding the *extent* to which tax rates affect the reported profits of firms. Semi-elasticities range from -0.39 to -3.00. There is thus still much question about the *current* extent to which profit shifting and transfer pricing behaviour occurs.

#### 4. A basic transfer pricing model

A basic model illustrates the economic problem which MNEs face around transfer pricing. This model is based on earlier research, amongst which are studies from Kant (1988), Lohse and Riedel (2013) and Choi et al. (2017).

Consider a representative MNE. This MNE operates in two different countries. Subsidiary  $x$  operates in the one country, subsidiary  $y$  operates in the other country. The MNE aims to reach its general rational objective of overall profit maximization. This means it aims to maximize the combined after-tax profits of the two subsidiaries. The MNE determines the reported transfer prices at a central level (i.e. at the headquarters of the MNE). Following Huizinga and Laeven (2008), the profit shifting motive of the firm fully results from differences in the relevant national tax rates.

Both of the subsidiaries produce output  $q_i$ , with  $i$  representing the subsidiary (hence:  $i \in \{x, y\}$ ). The price of this good is set to unity.  $x$  produces an additional good which both  $x$  and  $y$  depend upon for production.  $x$  sells one unit of this intermediate good to  $y$ . The corresponding price  $p$  is the transfer price. The intermediate good is new and unique. Determining its true value  $\bar{p}$  is therefore complex for the tax authorities. The MNE thus maintains a certain manoeuvring space when establishing the transfer price  $p$ . The model neglects any further costs of production for simplification reasons (Lohse & Riedel, 2013). No tariffs apply on the intra-firm trade of the goods. Hence, the *individual* pre-tax earnings are:

$$\pi_x = q_x + p \quad (1)$$

$$\pi_y = q_y - p \quad (2)$$

Note the composition of the individual profits. They consist of the earnings resulting from selling the final product, corrected for the earnings/costs (the transfer price) resulting from the transfer of the intermediate good.

Establishing the transfer price at a different value than the *true* value comes at a cost for the firms. The firms may have to incur administrative costs for altering their transfer prices. They may also have to make expenses in case the tax authorities confront them with transfer pricing audits. These audits can result in legal costs for submitting evidence which must prove that the transfer price adheres to the arm's length standard. If the firm does not succeed in the latter, there is a chance that the authorities impose a penalty. The more the transfer price  $p$  deviates from  $\bar{p}$ , the higher the costs of the firm become. Convincing the authorities will then be harder to succeed, while the possible penalty will be more severe.

The legal costs depend on the national transfer pricing legislation. Regulations like the *OECD Transfer Pricing Guidelines* aim to regulate transfer pricing at a central level. But there remain differences between countries. For example, rules on transfer pricing documentation

still differs considerably across countries (De Mooij & Liu, 2017). Costs for altering transfer prices thus depend on the specific transfer pricing regulations which the firms are subject to.  $\varphi_i$  (with  $i \in (x, y)$ ) denotes the transfer pricing regulations that the subsidiaries face. The costs for manipulation of the transfer price enters the model as follows:

$$\theta = \beta(\varphi_x, \varphi_y) * \omega(p - \bar{p}) \quad (3)$$

Additional specifications of this resource cost function  $\theta$  include: a minimum at  $\omega(p = \bar{p}) = 0$ ,  $\omega' = \text{sign}(p - \bar{p})$  and  $\omega'' > 0$  (Lohse and Riedel (2013) and Haufler and Schjeldrup (2000)). Furthermore,  $\beta(\varphi_x, \varphi_y)$  absorbs the effects of the differences in transfer pricing regulations  $\varphi_i$  (with  $i \in \{x, y\}$ ) across countries. The corresponding specifications include  $\beta \geq 0$  and  $\beta_{\varphi_i} \geq 0$ .

Hence, (3) represents the resource costs associated with concealing the manipulation of transfer prices. The resource cost function  $\theta$  is a convex function of the deviation of the established transfer price  $p$  from the true value  $\bar{p}$ . The more  $p$  deviates from  $\bar{p}$ , the higher the chance that the authorities determine the deviation as tax evasion. A higher deviation leads to a higher probability that the MNE ends up having to pay a fine. In short,  $\theta$  captures the assumption that stricter rules on transfer pricing behaviour lead to higher costs for firms that manipulate their transfer prices. The latter is in line with what Lohse and Riedel (2013) find empirically. Note the hypothetical situation in which there are no costs attached to the manipulation of transfer prices. The MNE would then set the transfer price at a level at which it shifts all of its profits from the high- to the low-tax country.

The national tax rate  $\tau_i$  enters the model next. The countries set their own tax rates. The MNE will act according to maximization of the global net-of-taxes profits. As the overall profits of the MNE decrease in the taxes payable, the objective of overall profit maximization is equivalent to minimizing the overall tax burden. The overall profits of the MNE consist of the combined net-of-taxes profits of subsidiaries  $x$  and  $y$ , corrected for the resource costs resulting from transfer price manipulation.

$$\pi = (1 - \tau_x)(q_x + p) + (1 - \tau_y)(q_y - p) - \theta \quad (4)$$

Inserting the resource cost function  $\theta$  (3) into (4) gives:

$$\pi = (1 - \tau_x)(q_x + p) + (1 - \tau_y)(q_y - p) - \beta(\varphi_x, \varphi_y) * \omega(p - \bar{p}) \quad (5)$$

$q_i$  and  $p$  represent the relevant decision variables for the MNE. The MNE chooses its transfer price  $p$  according to profit maximization with respect to  $p$ . This leads to the following first-order condition:

$$\beta \omega'(p - \bar{p}) = \tau_y - \tau_x \quad (6)$$

Rewriting equation (6) in terms of the optimal transfer price ( $p^*$ ), yields the following:



$$p^* = \bar{p} + \frac{\tau_y - \tau_x}{\beta\omega'} \quad (7)$$

Hence, the decision on the declared transfer price depends on the difference in national corporate tax rates. The incentive to alter the transfer price value declines in the marginal resource costs, denoted by  $\beta\omega'$ . Note the hypothetical situation in which these marginal resource costs are infinitely high. Marginal resource costs become infinitely high in case of extremely tight transfer pricing regulations and extremely high detection penalties.  $\frac{\tau_y - \tau_x}{\beta\omega'}$  would then approach zero. The incentive to alter the transfer price diminishes to a minimum, such that the declared transfer price will approach the arm's length value. Holding the resource costs constant, three situations can arise depending on the difference in tax rates.

Situation 1:  $\tau_x > \tau_y$

In this case,  $x$  operates in the high-tax country.  $y$  operates in the low-tax country. Recall that  $x$  produces the transferred good. The MNE has an incentive to *underprice* the good:  $p < \bar{p}$ .  $x$  then receives less for the good, while  $y$  has to pay less. This is what transfer pricing is about: maximizing expenses in the high-tax jurisdiction, while maximizing income in the low-tax jurisdiction. Underpricing the good shifts income from subsidiary  $x$  to subsidiary  $y$ .

Situation 2:  $\tau_x < \tau_y$

Now  $y$  is the subsidiary operating in the high-tax country.  $x$  operates in the low-tax country. The MNE has an incentive to *overprice* ( $p > \bar{p}$ ) the transferred good. Overpricing the good shifts income from  $y$  to  $x$ .

Situation 3:  $\tau_x = \tau_y$

In the case where the national tax rates do not differ, the MNE has no fiscal incentive to manipulate the transfer price. It only loses resources in altering the transfer prices, whereas it does not reduce its tax expenses. Without a difference in national tax rates, the optimal transfer price equals the arm's length value.

Combining the individual profit function of the subsidiaries and the resource cost function yields the relationship between the reported profits and the statutory tax rate.

$$\frac{\partial \pi_i}{\partial \tau_i} = -\frac{1}{\beta\omega''} \quad (8)$$

(8) captures the three situations outlined above. For its derivation see Appendix A. The right-side of the equation is negative, since the costs associated with profit shifting ( $\beta\omega''$ ) are positive. Equation (8) indicates that there exists a negative relationship between the reported

profits and the corporate tax rate. This suggests that a higher tax rate induces a firm to report lower operating profits, and vice versa. This study empirically assesses whether this is what occurs in practice.

## 5. Methodology

### 5.1 Hypothesis

Following the literature review and the model of the previous section, it is perceived that there exists a negative relationship between the reported profits of subsidiaries and the statutory tax rate. Therefore, the analysis tests the following transfer pricing-hypothesis:

Firms that face a lower marginal corporate tax rate, are more likely to report higher operating profits (EBIT)

### 5.2 Baseline specification

The baseline specification builds on existing literature and the basic model of the previous section. The panel regressions investigate the extent to which MNEs manipulate transfer prices. To do so, the specification aims to isolate the transfer pricing channel. In order not to observe profit shifting through debt allocation, the EBIT is the dependent variable. The EBIT is not influenced by the financial structures of firms: it excludes debt payments (Heckemeyer and Overesch, 2013). To isolate the profits resulting from (shifting) real activity, the specification hinges on the difference between *true* and *reported* profits. The difference between the two is the amount of shifted profits. This follows previous research (e.g. Huizinga and Laeven (2008)). True profits result from real economy activity, but are not observable. To measure the true profits of the firm, the specification assumes that the input of production factors and the economic state of a country determine the true profitability (Clausing, 2003). The tax rate in the country of operation determines the amount of profits that MNEs shift and captures the transfer pricing incentive of the firm. The specification takes on the following form:

$$\ln[EBIT_{it}] = \beta_0 + \beta_1 SMTR_{ct} + \beta_2 \ln[FA_{it}] + \beta_3 \ln[CEMPL_{it}] + \beta_4 \ln[GDPcapita_{ct}] + \theta_i + \rho_t + \epsilon_{it}$$

$i$  represents the subsidiary,  $c$  applies to the country, and  $t$  represents the time in years.  $\theta_i$  and  $\rho_t$  respectively denote the firm- and time-fixed effects. Additional models also contain country- and industry-fixed effects, as well as a measure for the transfer pricing legislation.

The dependent variable consists of the natural logarithm of the reported operating profit:  $\ln[EBIT_{it}]$ . It represents the earnings before interest and taxes of subsidiary  $i$  at time  $t$ . The EBIT is a measure that allows for comparison across firms due to its extensive availability. It is a suitable measure for profitability when examining transfer pricing since it is not influenced by profit-shifting through interest payments. Using the total profit instead would include profit shifting through all possible profit shifting channels. To control for the profits resulting from real activity, the specification includes the determinants of the *true profits*: the labor input, the capital input and the economic state of a country.

$SMTR_{ct}$  represents the main variable of interest. It stands for the top statutory marginal tax rate applicable in country  $c$  at time  $t$ . The corresponding estimated coefficient  $\beta_1$  is expected to be negative, suggesting that MNEs shift their profits from high-tax to low-tax countries. The academic literature compares the use of the marginal tax rate to the use of the effective tax rate. There is a general lack of complete and comprehensive data on the effective tax rates through over consistent time periods. Most of the literature therefore turns to the use of proxies. Graham (1996) investigates the use of such alternative proxies. He concludes that the use of the statutory tax rate is the best available alternative for the effective corporate tax rates. Substantial empirical evidence is available which suggests that the statutory tax rate is a significant determinant in the location of taxable income (Devereux, 2006). Following previous studies (e.g. Hines & Rice (1994), Grubert & Mutti (1991), Lohse and Riedel (2013) and Huizinga and Laeven (2008)), this study therefore uses the top statutory corporate tax rates as the main variable of interest. To assess the robustness of the obtained results, additional models consider an alternative for the SMTR; the *difference* between the SMTR in the host country of the subsidiary and the SMTR that applies in the country of the parent company.

For the use of control variables I rely on previous researches on profit-shifting channels. Saunders-Scott (2013) takes basis economic intuition as a starting point for her control variables. She follows standard economic theory: firms use capital and labor as input factors to produce their output. This is also in line with previous research by Hines and Rice (1994). They assume that firms yield their *true* profits according a Cobb-Douglas production function, in which labor and capital are the input factors. As transfer pricing is about the difference between the *true* and *reported* profits, the specification includes these input factors as proxies for the true profits of the firms.

The natural logarithm of the fixed assets ( $FA$ ) measures the capital input. Fixed assets are more likely to be exogenous to profit-shifting than a measure that also consists of the intangible assets (Saunders-Scott, 2013). As a measure for the labor input, the specification includes the natural logarithm of the employee cost:  $CEMPL$ .

To capture the macro-economic state of the host-countries of the firms, the model includes the natural logarithm of  $GDP/capita$  in country  $c$  at time  $t$ . Omitting  $GDP/capita$  from the model would possibly lead to a bias in the estimated coefficient  $\beta_1$ ; wealthier countries tend to have higher corporate tax rates (Huizinga & Laeven, 2006). The corresponding estimated coefficient ( $\beta_4$ ) is expected to be positive.

Table 4 includes the expected signs for the coefficients in the baseline specification.

	Variable	Expected sign	Justification
$\beta_1$	$SMTR$	-	A higher tax rate induces firms to report lower operating profits before taxes and interest
$\beta_2$	$FA$	+	The higher the capital input, the more output can be produced and thus, the higher the profitability
$\beta_3$	$CEMPL$	+	The higher the labour input, the more output can be produced and thus, the higher the profitability
$\beta_4$	$GDPcapita$	+	Higher GDP/capita reflects a stronger economy, generally having a positive effect on the profitability of firms

Table 4: Expected signs of coefficients corresponding to variables included in the baseline specification

### 5.3 Alterations to the baseline specification

Regression (2)<sup>1</sup> includes additional macro-economic variables: a national corruption index and an unemployment measure. The corruption index is a measure for the corruption of the national public services. Corruption could both affect the profitability of firms and the transfer pricing incentive. The unemployment variable could capture part of the effect that local productivity and demand characteristics have on profitability (De Mooij & Liu, 2017).

Additional models (3, 5, 6, 8 and 10) contain country-fixed effects. Country-fixed effects reflect characteristics of the labour market and the general business climate for firms (Johansson et al., 2016). Including country-fixed effects might mitigate a possible bias in the baseline specification; there might exist a correlation between changes in the statutory tax rate  $SMTR_{ct}$  and the general business climate. Both of them are likely to affect the reported profits of firms.

Additional regressions (4, 5, 6, 9 and 10) contain industry-fixed effects. Some industries might be more competitive than others (Johansson et al., 2016). Including industry-fixed effects aims to capture systematic differences in profitability among the different industry sectors.

The distribution of subsidiaries across countries in the sample indicates that almost half of the sample consists of firms located in Belgium, Italy, Portugal and Sweden (see section 6 for more information on the data). To check whether this drives the results, model (6) leaves out subsidiaries residing in these countries.

Regressions (7)-(10) aim to rule out a bias in the baseline estimate of the transfer pricing incentive, by including an alternative independent variable of interest. This bias might arise because the model does not capture the corporate tax rate which applies in the country of the *parent company*. The corporate tax rate in the country of the parent company could influence both the transfer pricing incentive of the subsidiary and its reported profits. The estimated coefficient  $\beta_1$  would in that case suffer from omitted variable bias. Regressions (7)-(10) therefore contain an alternative independent variable of interest: the difference between the statutory tax rate in the host country of the subsidiary and the statutory tax rate that the parent company faces. Considering this international tax rate difference is in line with the intuition of the theoretical framework of section 4.

### 5.4 Accounting for transfer pricing legislation

Equation (8) in section 4 suggests that the effective transfer pricing legislation affects the transfer pricing incentive of firms. Tighter transfer pricing legislation reduces the incentive for MNEs to manipulate their transfer prices. Not controlling for a measure of the transfer pricing could be problematic. There might exist a correlation between higher corporate tax rates and stricter transfer pricing legislation. Stricter transfer pricing legislation can reflect part of the national business climate, of which the latter influences the true profitability of firms. Omitting a measure for the transfer pricing legislation would then result in estimating the transfer pricing with a bias. Previous models assume that the firm-fixed effects seize the heterogeneity in transfer pricing incentives resulting from differences in legislation. This would hold if transfer pricing legislation would not change over the observed years (Heckemeyer and Overesch, 2013). However, this assumption is questionable. Recent developments related to transfer

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<sup>1</sup> The numbers between parentheses in this section represent the different regression models. Table 7 on page 26 contains the details of these models.

pricing have led to various policy responses (see section 2.4). Additional models therefore include a measure for the transfer pricing legislation. The corresponding specification is the following one:

$$\begin{aligned} \ln[EBIT_{it}] = & \beta_0 + \beta_1 SMTR_{ct} + \beta_2 SMTR_{ct} * DOC_{ct} + \beta_3 DOC_{ct} + \beta_4 SMTR_{ct} * APA_{ct} \\ & + \beta_5 APA_{ct} + \beta_6 \ln[FA_{it}] + \beta_7 \ln[CEMPL_{it}] + \beta_8 \ln[GDPcapita_{ct}] + \theta_i \\ & + \rho_t + \epsilon_{it} \end{aligned}$$

$DOC_{ct}$  indicates the number of years at time  $t$  since country  $c$  introduced its first transfer pricing documentation laws.  $APA_{ct}$  is a dummy variable which takes on value 1 if national legislation at time  $t$  offers the opportunity for MNEs to enter into a bilateral APA, and value 0 otherwise.

Following Beer and Loeprick (2015), I use the number of years that have passed since countries introduced laws on transfer pricing documentation. This is a rough proxy for the applicable transfer pricing legislation. Documentation laws require firms to keep a detailed administration of their intra-firm transactions, which they must submit upon request to the tax authorities. The proxy hinges on the assumption that the earlier countries have introduced such laws, the stricter contemporary national legislation on transfer pricing is. Despite this proxy being a rough measure of the effective transfer legislation, it is an objective measure that gives a basic indication of the effect that transfer pricing legislation has on the transfer pricing incentive. I expect the corresponding coefficient to be negative, indicating that inward profit shifting decreases in the number of years that transfer pricing legislation applies in the host country. The models also include an interaction term of the proxy  $DOC_{ct}$  with the statutory marginal tax rate  $SMTR_{ct}$ . I expect this coefficient to be positive, which would indicate that the sensitivity of reported profits to the tax rate decreases in the number of years that transfer pricing legislation applies in the host country.

Furthermore, the additional models include a dummy variable which indicates whether national legislation allows MNEs to enter into a bilateral APA. Bilateral APA's apply to MNE subsidiaries in two different countries. Entering into an APA secures a pre-anchored transfer price strategy for a fixed period of time. An APA can thus act as an insurance to the MNE: it secures a transfer pricing strategy for a fixed period of time. During this period, the MNE does not bear the risks of changes in transfer pricing legislation. It might therefore want to *buy* this type of insurance, which lowers its reported profits (Lohse and Riedel, 2013). The latter implies that the opportunity for an MNE to enter into an APA lowers the sensitivity of the reported profits to the tax rate. I therefore expect to obtain a positive coefficient corresponding to the interaction between the dummy  $APA_{ct}$  and the statutory tax rate. I furthermore expect the coefficient estimate for the APA-variable to be negative, suggesting that firms are willing to insure themselves against future changes in transfer pricing legislation.

## 6. Data

Analysis of an extensive dataset tests the validity of the transfer pricing-hypothesis. Since the study hinges on extensive data collection, this section separately discusses the various types of data. The dataset consists of firm-specific data, complemented with country-level data on tax rates and on macro-economic variables. The observations cover a period of nine years: from 2009 till 2017. The final dataset contains over 24,000 observations.

## 6.1 Firm-specific data

Data on the European subsidiaries comes from Bureau van Dijk's Orbis. Orbis is a database which contains financial accounting data on over 280 million companies worldwide. More than 90 million of them are European. The database gathers financial data, ownership information and legal information on all different sorts of business forms. The data comes from national sources, like the various national registry offices and the Chambers of Commerce.

One of the advantages of using Orbis is that it supplies comprehensive information on the ownership structure of the firms. The ownership information allows for matching the subsidiaries with their parent companies. Orbis (and the closely related Amadeus-database from Bureau van Dijk) is, furthermore, the most common database used in the previously mentioned studies on profit shifting. The common use of the database allows for a more valid comparison with these previous studies.

Ownership data applies to the latest reporting year available, which is 2018 in this case. This might introduce a bias through misspecification of the parent-subsidiary relations. The latter would be the case when a parent-subsidiary relation is different in 2018 than it was throughout the period 2009-2017. This, however, is not a threat to the resulting inferences, as the possible misspecification would bias the results towards zero (Dischinger and Riedel, 2011).

The process of data collection consists of a few characterizing steps. Table 4 (page 22) displays these steps. The first step consists of including all subsidiaries with *foreign* shareholders, since this thesis deals with international profit-shifting. The first step also excludes non-European shareholding firms, as this thesis exclusively focuses on Europe. The shareholder must hold at least 90 percent of the outstanding shares. The latter criterion follows previous studies (e.g. Beer and Loeprick, 2015). The threshold of 90 percent matches the economic intuition explained in section 4. After all, there must exist an incentive to minimize the overall combined tax burden of the subsidiary and the parent company. The sample only includes firms on which ownership data is available.

Secondly, the sample exclusively includes firms that report unconsolidated accounts, as the focus lays on the *individual* reported profits of the subsidiaries. Reporting only consolidated accounts might indicate a lack of transparency. If there exists a correlation between less transparency and profit shifting, this second step might result in a bias. However, this does not threaten the inferences. If present, the bias results in *underestimating* the transfer pricing incentive. The second step also omits non-European subsidiaries, since this thesis is exclusively interested in European-based firms. This second step reduces the initial sample by almost half.

Thirdly, the subsidiaries need to report financial accounts over the observed time period (2009-2017). This step mainly excludes entering or exiting firms during the observed time period. These firms might have different profit shifting incentives than the firms operative over the complete period. This thesis focuses on the latter group of firms. The minority of firms which did not report accounts for different reasons might again reflect a lack of transparency. As noted by Beer and Loeprick (2015), the latter could result in a similar bias as explained in the previous step. If more transparent firms engage less in profit shifting, a bias might result. Again, that would at most result in *underestimating* transfer pricing incentives.

The fourth steps consists of criteria on the specific type of data on the subsidiaries. All of the subsidiaries must report data on the operating profit (EBIT), fixed assets, and costs of

employees. In order to mitigate reporting errors as much as possible, the sample omits subsidiaries that report zero and negative values for the fixed assets and the cost of employees. This removes reporting errors, but also results in the omission of shell corporations from the sample. This thesis only takes firms into account that exert economic activity, for which transfer pricing is relevant. The fourth step also restricts the sample to firms making positive profits, for which profit shifting is the most relevant (Huizinga & Laeven, 2006). Loss-making firms can usually offset previous losses with current profits. Consider an MNE that uses transfer pricing to shift profits to a subsidiary in a low-tax country. Suppose this subsidiary can offset these shifted profits with losses resulting from previous years. The subsidiary will then show lower profits, despite that it engages in the manipulation of transfer prices. The specification will then measure the degree of transfer pricing manipulation with error. The latter is in line with earlier research from Lohse and Riedel (2013) and Huizinga and Laeven (2008).

The fifth step removes parent companies from the sample. This step mitigates a possible bias towards locating profits at the headquarters of a company (i.e. at the parent company). Previous studies shows that biases might arise when including firms located at headquarters. Dischinger and Riedel (2010) find that firms tend to locate their profits at headquarters, in order to minimize agency costs. The sample therefore only considers the *subsidiaries*.

The final step includes removing pension funds and public authorities. The remaining companies are all corporate ones. Dischinger and Riedel (2011) find that profit shifting is most relevant for those corporate companies in their study on multinational profit shifting strategies.

Step	Subsidiaries	Observations
1 Foreign subsidiaries, European owner owning 90%	735,643	6,620,787
2 Subsidiary located in Europe, unconsolidated accounts	384,375	3,459,375
3 Available accounts for the years 2009-2017	54,376	489,384
4 Data optimization (EBIT, fixed assets, employees)	4,368	39,312
5 Restricting sample to subsidiaries: removing parents	3,162	28,458
6 Only corporate companies	2,748	24,732

Table 4: Process of firm-specific data collection

The final sample consists of data on firms across 21 European countries. It includes 2,748 different subsidiaries. Table 5 (page 23) displays the host countries of the included subsidiaries. Most of the subsidiaries reside in Italy, Belgium, Portugal and Sweden. This distribution corresponds to the coverage of subsidiaries in other studies that rely on data from Orbis (e.g. Saunders-Scott (2013)). If the distribution of the subsidiaries also corresponds to the *actual* distribution across countries, this could be due to the specific fiscal regulation in those countries. The three countries containing most of the subsidiaries (Italy, Belgium and Portugal) all have a tax system which includes an Allowance for Corporate Equity (Gerard and Kock, 2017). This means that firms can deduct the costs of equity from their pre-tax profits, similar to the tax deductibility of interest payments on debt. This makes it attractive for firms to settle in those countries. The robustness checks test whether Italy, Belgium, Portugal and Sweden drive the results.

Country	# firms	% of sample	Country	# firms	% of sample
Italy	411	14.96	Slovenia	72	2.62
Belgium	358	13.03	France	62	2.26
Portugal	292	10.63	Germany	59	2.15
Sweden	262	9.53	Finland	51	1.86
UK	209	7.61	Bosnia & Herzegovina	29	1.06
Croatia	194	7.06	The Netherlands	23	0.84
Bulgaria	177	6.44	Ireland	22	0.80
Hungary	171	6.22	Latvia	5	0.18
Serbia	132	4.80	Luxembourg	5	0.18
Estonia	108	3.93	Poland	2	0.07
Spain	104	3.78	<b>Total</b>	2,748	100.00

Table 5: Distribution of host countries across the sample

## 6.2 Additional data

Data on the top statutory corporate tax rates and macro-economic variables complement the firm-specific data. The top statutory tax rates come from a global tax database maintained by KPMG (2018). Macro-economic data (GDP/capita, in current US dollars) comes from the Worldbank-database. Data on the transfer pricing legislation originate from annual transfer pricing guides from EY (2018) and KPMG (2018). Table 6 shows the summary statistics of the variables in the baseline specification. Appendix C includes the remaining summary statistics of the other variables.

Variable	N	Mean	Std. Dev.	Min.	Max
EBIT	24,732	2,833,020	11,900,000	33.12	450,332,269
Tax rates (SMTR)	24,732	0.24	0.07	0.09	0.33
Fixed assets	24,732	13,538,913	161,000,000	32.63	11,312,477,000
Cost of employees	24,732	4,962,452	14,100,000	443.79	286,324,000
GDP/capita	24,732	30417.04	15,975.16	4,584.24	119,225.40

Table 6: descriptive statistics of the variables included in the baseline specification

## 7. Results

### 7.1 Specification tests

To test whether the models have the appropriate specification, I conduct a specification test first. If the specification turns out to be inappropriate, the estimators will not be consistent. Running a Hausman-test demonstrates which model is the most appropriate to use: a random-effects model (null-hypothesis) or a fixed-effects model (alternative hypothesis). The



Hausman-test applies to the baseline specification. The resulting p-value provides reason to reject the null-hypothesis at a 1%-significance level. Therefore, a fixed-effects model is the most appropriate to use. Appendix H specifies the details of the test.

Furthermore, I aim to rule out that the data suffers from non-stationarity. To do so, I conduct an Augmented Dickey Fuller-test (ADF-test) on the dependent variable:  $\ln EBIT$ . In case the test would result a sign of non-stationary data, the variable would require a transformation. The null-hypothesis of the ADF-test is that all the included panels contain unit roots. The alternative hypothesis states that at least one of the panels is stationary. The resulting p-value gives reason for rejection of the null-hypothesis. There is thus evidence which suggests that there should be no concern for non-stationary data. Appendix H contains the details of the test.

## 7.2 Baseline results

The firm-specific variables (EBIT, fixed assets and cost of employees) exclusively contain positive values. It is thus unlikely that they follow a normal distribution. In order to improve this, the estimations consider the natural logarithms of the variables. The variable of interest, SMTR (and alternatively: the SMTR-difference), is measured in percentages. Its corresponding coefficient represents the semi-elasticity of the reported profits to the SMTR:

$$\beta_1 = E \left[ \frac{\delta \ln EBIT}{\delta SMTR} \right]$$

$\beta_1$  represents the *expected* percentage change in the reported profits in response to a one percentage-point change in the statutory marginal tax rate. Appendix B defines the detailed properties for all the variables.

Table 7 on page 26 displays the results of the different econometric specifications. The first column of table 7 shows the estimation results for the baseline specification. The remaining columns contain the alterations to the baseline model.

Model (1) indicates a semi-elasticity of -1.3 of the reported profits to the SMTR. This implies the following. On average, reported profits increase with 1.3 percent in response to a one percentage point decrease in the statutory marginal tax rate. The significant negative relationship suggests that European MNEs manipulate transfer prices to shift profits to low-tax countries. This finding corresponds with the literature and the economic intuition. The remaining estimated coefficients in (1) also correspond with the expected signs. The results suggest that the fixed assets and the cost of employees positively affect the reported profits of firms. The same applies to the GDP/capita: the wealth of countries positively affects the reported profits of firms.

## 7.3 Alterations to the baseline specification

Specification (2) contains additional macro-economic variables: the national unemployment levels and the national corruption index. Both do not significantly affect the dependent variable at a 10% significance level.

Model (3) adds country-fixed effects to the baseline specification. This does not affect the sensitivity of the reported profits to changes in the corporate tax rate. The only significant

change occurs in the estimate of the fixed assets-coefficient. The latter increases from 0.03 in (1) and (2) to 0.2 in (5). This implies that the profitability of assets significantly differs across countries.

Model (4) adds industry-fixed effects to the baseline specification. The estimation of the transfer pricing coefficient *does* change now, though only slightly. The decrease, from -1.3 to -1.5, is higher than the corresponding standard error. This implies that the transfer pricing incentive differs across industries.

Model (5) includes both country- and industry-fixed effects. The estimated semi-elasticity of the reported profits to the tax rate is now -1.3 again. The fixed effects enter the model being significant at a 1% significance level. The statistical significance indicates that there are systematic differences in profitability for firms across countries, as well as across different industries. Observing the adjusted R-squared of the models, including country- and industry-fixed effects in the same model is preferred over just one of them.

Model (6) includes a model that aims to rule out that Belgium, Italy, Portugal and Sweden drive the results. Omitting subsidiaries located in these countries reduces the sample by almost half. It leaves the sample with 12,807 observations. The estimated model does not indicate that the previous estimations were driven by Belgium, Italy, Portugal and Sweden. The estimated coefficient for the transfer pricing incentive is still economically and statistically significant, though now at a 5% significance level. Its magnitude (1.272) is close to the previous estimate in model (5) (1.258).

Columns (7)-(10) of table 7 consider the alternative measure for the transfer pricing incentive: the difference between the statutory marginal tax rate faced by the parent company and the tax rate faced by its foreign subsidiary. The coefficient corresponding to the transfer pricing incentive in model (7) remains negative and significant, though only at a 5% significance level. This means that MNEs which own a subsidiary in a low-tax country, are more likely to manipulate transfer prices. The *magnitude* of the effect of the SMTR-difference on the reported profits (1.5) is even higher than the magnitude of the SMTR-effect on the reported profits in the initial specification (1.3). The increase in the magnitude can be due to the fact that omitting the tax rate in the parent country indeed leads to a bias, as explained in section 5.3. Comparing the models containing the SMTR-*difference* with the ones that contain the SMTR suggests that reported profits are more sensitive to changes in the tax rate-*difference*. The coefficients of the remaining variables do not change with respect to their sign. Their magnitude does neither change substantially.

Model (8), (9) and (10) consecutively add country-fixed effects, industry-fixed effects and both of those fixed effects to the model. The resulting estimates of the transfer pricing incentive do not considerably differ from (7).

Overall, the estimations show a consistent pattern. The results meet the expectations resulting from existing literature and economic intuition. All estimated coefficients for the SMTR (as well as the SMTR-difference) turn out to be negative and significant at a 1% significance level.

If one observes the magnitude of the obtained coefficients, it is safe to conclude that they provide evidence for a semi-elasticity of -1.3 of the reported profits to the SMTR. Furthermore, they provide additional evidence for a semi-elasticity of -1.5 of the reported profits to the SMTR-*difference*.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<b>SMTR</b>	<b>-1.347***</b>	<b>-1.292***</b>	<b>-1.294**</b>	<b>-1.452***</b>	<b>-1.258***</b>	<b>-1.272**</b>				
	(0.236)	(0.240)	(0.386)	(0.156)	(0.380)	(0.510)				
<b>SMTR-difference</b>							<b>-1.500***</b>	<b>-1.533***</b>	<b>-1.518***</b>	<b>-1.500***</b>
							(0.112)	(0.143)	(0.110)	(0.140)
<b>Fixed assets</b>	<b>0.027***</b>	<b>0.027***</b>	<b>0.201***</b>	<b>0.202***</b>	<b>0.200***</b>	<b>0.235***</b>	<b>0.206***</b>	<b>0.200***</b>	<b>0.201***</b>	<b>0.200***</b>
	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
<b>Cost of employees</b>	<b>0.694***</b>	<b>0.688***</b>	<b>0.607***</b>	<b>0.633***</b>	<b>0.620***</b>	<b>0.567***</b>	<b>0.622***</b>	<b>0.608***</b>	<b>0.633***</b>	<b>0.620***</b>
	(0.016)	(0.016)	(0.007)	(0.006)	(0.007)	(0.005)	(0.006)	(0.007)	(0.006)	(0.007)
<b>GDP/capita</b>	<b>0.221**</b>	<b>0.215**</b>	<b>0.231*</b>	<b>0.221***</b>	<b>0.220**</b>	<b>0.130</b>	<b>0.228***</b>	<b>0.207*</b>	<b>0.211***</b>	<b>0.196*</b>
	(0.065)	(0.069)	(0.107)	(0.017)	(0.105)	(0.149)	(0.014)	(0.106)	(0.014)	(0.014)
<b>Unemployment</b>		<b>-0.004</b>								
		(0.002)								
<b>Corruption</b>		<b>0.002</b>								
		(0.002)								
<i>Year-fixed effects</i>	√	√	√	√	√	√	√	√	√	√
<i>Country-fixed effects</i>			√		√	√		√		√
<i>Industry-fixed effects</i>				√	√	√			√	√
<b>N</b>	<b>24,732</b>	<b>24,732</b>	<b>24,732</b>	<b>24,732</b>	<b>24,732</b>	<b>12,807</b>	<b>24,732</b>	<b>24,732</b>	<b>24,732</b>	<b>24,732</b>
<b>R-squared</b>	<b>0.5549</b>	<b>0.5517</b>	<b>0.6021</b>	<b>0.6096</b>	<b>0.6175</b>	<b>0.6352</b>	<b>0.5954</b>	<b>0.6038</b>	<b>0.6112</b>	<b>0.6191</b>
<b>Adjusted R-squared</b>	<b>0.5390</b>	<b>0.5368</b>	<b>0.6016</b>	<b>0.6091</b>	<b>0.6169</b>	<b>0.6346</b>	<b>0.5795</b>	<b>0.6033</b>	<b>0.6008</b>	<b>0.6185</b>

Table 7: obtained results from the various fixed-effects models. The dependent variable includes  $\ln(\text{EBIT})$ , the logarithm of the earnings before interest and taxes. The independent variable of interest is the SMTR, the top statutory corporate tax rate faced by the subsidiary in the country of operation. The alternative independent variable of interest is the SMTR-difference; the difference between the SMTR faced by the subsidiary in the country of operation and the SMTR which applies in the parent country. The values represent the corresponding estimated coefficients. Standard errors are in parentheses. (1) represents the baseline regression. Significance of the estimated coefficients indicated by: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

#### 7.4 Controlling for transfer pricing legislation

Table 8 on page 28 displays the models that contain variables which aim to capture the national transfer pricing legislation.

Model (11) represents the baseline specification, but now includes the interaction between the legislation proxy and the corporate tax rate, as well as the sole legislation proxy. The positive estimate of the interaction coefficient suggests that a higher degree of transfer pricing legislation fulfils its goal; it decreases the transfer pricing incentive of firms. Consider a subsidiary in a country that introduced its first transfer pricing documentation laws in the year  $t - 1$ . The variable  $DOC_{ct}$  thus takes on value 1 in year  $t$ . Comparing the semi-elasticity of the reported profits to the tax rate in year  $t$  to the semi-elasticity in year  $t - 1$ , the manipulation of transfer prices decreases by  $\frac{0.162}{|-2.352|} = 6.89\%$  (on average, all else constant). The coefficient estimate of the individual proxy for the transfer pricing legislation is negative, indicating that a higher degree of transfer pricing legislation reduces inward-profit shifting.

Model (12), relative to (11), contains a dummy indicating the possibility for MNEs to engage in bilateral APA's. The model contains both the dummy, as well as its interaction with the corporate tax rate. The estimate of the interaction coefficient turns out to be statistically significant and positive. According to the results, the opportunity to enter into a bilateral APA reduces the absolute value of the semi-elasticity of the subsidiaries' reported profits to the corporate tax rate. The latter suggests that firms are willing to insure themselves against future amendments to the transfer pricing laws, at the cost of some of its reported profits. The negative coefficient estimate for the APA-dummy confirms this. Note that the coefficient corresponding to the transfer pricing incentive (SMTR) is more negative than in (11): -4.7 compared to -2.4. The estimations in (12) suggest that, on average, the sensitivity of the reported profits to the corporate tax rate is lower for subsidiaries in countries that offer the possibility to engage in APA's.

Model (13) also controls for a measure of the effective transfer pricing legislation, but includes the *SMTR-difference* between the subsidiary and the parent company as the main explanatory variable. The estimate of the interaction term *SMTR-difference\*DOC* is slightly lower than the estimate of the interaction term in model (11): 0.101 compared to 0.162. Its positive sign and the statistical significance remain unchanged. Again, consider a subsidiary in a country that introduced its first transfer pricing documentation laws in the year  $t - 1$ . The variable  $DOC_{ct}$  thus takes on value 1 in year  $t$ . Comparing the semi-elasticity of the reported profits to the *difference* in tax rates in year  $t$  to the semi-elasticity in year  $t - 1$ , the manipulation of transfer prices decreases by  $\frac{0.101}{|-2.224|} = 4.54\%$  (on average, all else constant). Similar to model (11), the coefficient of the transfer pricing legislation proxy is negative. This implies that the introduction of transfer pricing legislation reduces inward-profit shifting.

Column (14) displays the results for the model that additionally includes the APA-dummy and its interaction with the tax rate-difference. Again, the interaction term enters the model significantly and with a positive sign. However, the estimated coefficient of the APA-dummy is now positive, compared to the negative sign in (13). This suggests that the possibility to engage in a bilateral APA increases inward-profit shifting through transfer pricing. It might imply that if MNEs can enter into a bilateral APA, their incentive to report profits in the country of operation increases. Hence, the results suggest that APA-regulation has an effect on transfer pricing incentives, but its sign remains ambiguous.

	(11)	(12)	(13)	(14)
<b>SMTR</b>	<b>-2.352***</b>	<b>-4.749***</b>		
	<b>(0.202)</b>	<b>(0.318)</b>		
<b>SMTR-difference</b>			<b>-2.224***</b>	<b>-3.282***</b>
			<b>(0.162)</b>	<b>(0.228)</b>
<b>Fixed assets</b>	<b>0.203***</b>	<b>0.203***</b>	<b>0.202***</b>	<b>0.203***</b>
	<b>(0.004)</b>	<b>(0.004)</b>	<b>(0.004)</b>	<b>(0.004)</b>
<b>Cost of employees</b>	<b>0.627***</b>	<b>0.622***</b>	<b>0.626***</b>	<b>0.621***</b>
	<b>(0.006)</b>	<b>(0.007)</b>	<b>(0.006)</b>	<b>(0.007)</b>
<b>GDP/capita</b>	<b>0.241***</b>	<b>0.267***</b>	<b>0.228***</b>	<b>0.209***</b>
	<b>(0.018)</b>	<b>(0.120)</b>	<b>(0.014)</b>	<b>(0.004)</b>
<b>SMTR * DOC</b>	<b>0.162***</b>	<b>0.168***</b>	<b>0.101***</b>	<b>0.113***</b>
	<b>(0.031)</b>	<b>(0.032)</b>	<b>(0.024)</b>	<b>(0.025)</b>
<b>DOC</b>	<b>-0.054***</b>	<b>-0.051***</b>	<b>-0.014***</b>	<b>-0.011***</b>
	<b>(0.008)</b>	<b>(0.008)</b>	<b>(0.002)</b>	<b>(0.002)</b>
<b>SMTR * APA</b>		<b>2.890***</b>		
		<b>(0.314)</b>		
<b>SMTR-difference * APA</b>				<b>1.427***</b>
				<b>(0.222)</b>
<b>APA</b>		<b>-0.494***</b>		<b>0.161***</b>
		<b>(0.071)</b>		<b>(0.026)</b>
<i>Year-fixed effects</i>	√	√	√	√
<i>Industry-fixed effects</i>	√	√	√	√
<b>N</b>	<b>24,732</b>	<b>24,732</b>	<b>24,732</b>	<b>24,732</b>
<b>R-squared</b>	<b>0.6114</b>	<b>0.6131</b>	<b>0.6131</b>	<b>0.6140</b>
<b>Adjusted R-squared</b>	<b>0.6109</b>	<b>0.6126</b>	<b>0.6127</b>	<b>0.6135</b>

Table 8: estimated models including the proxies for the national transfer pricing legislation. The variable DOC measures the number of years since specific legislation on transfer pricing documentation applies in the country of interest. The variable APA is a dummy variable, which takes on value 1 when national legislation allows MNEs to enter into bilateral APA's and 0 otherwise. Significance of the estimated coefficients indicated by: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## 8. Conclusion and discussion

This thesis assesses the extent to which European MNEs use transfer pricing as profit shifting mechanism. Equivalently, it assesses whether additional transfer pricing legislation is desirable. The central research question is:

*Is there evidence for profit shifting through transfer pricing by European-based MNEs nowadays?*

The underlying hypothesis is that firms that face a lower marginal corporate tax rate are more likely to report higher before-tax profits, and vice versa. This section concludes the thesis by answering above research question, and by discussing the interpretation of the results.

### 8.1 Conclusion

Panel-regressions assess the extent to which MNEs use transfer pricing as profit shifting mechanism. The analysis makes use of a comprehensive panel dataset. The dataset contains data on more than 2,400 European MNE subsidiaries and covers the period 2009-2017. The dependent variable consists of the earnings before interest and taxes: the EBIT. This is the operating profit that firms report in their administration. The EBIT captures transfer pricing the best, as other profit shifting channels do not influence this measure.

The results suggest that there exists a significant and negative relationship between the reported profits and the statutory marginal tax rate. The resulting semi-elasticities of the reported profits to the statutory marginal tax rate range from -1.3 to -1.5. The estimations are thus consistent with the hypothesis that firms that face a lower marginal corporate tax rate, are more likely to report higher profits, and vice versa. Hence, the results provide evidence for the manipulation of transfer prices by European-based MNEs nowadays. In addition, separate models that contain a proxy for the effective national transfer pricing laws suggest that introducing these laws decreases the transfer pricing incentive of MNEs.

### 8.2 Discussion

The preferred specifications in this thesis deal with the possible issues which regression models can suffer from. The conducted Hausman-test supports the use of a fixed-effects model. The Augmented Dickey-Fuller tests whether there is an issue of non-stationary data. Furthermore, alternative models aim to deal with a possible bias in the estimated coefficient for the transfer pricing motive. The alternative variable of interest includes the difference in national statutory tax rates between the parent and its subsidiary.

The estimations assume the statutory tax rate to be exogenous and thus not to be correlated with the error term. When governments determine their tax rates based on unobservable factors in the error terms, there would be an issue of endogeneity. Including country-fixed effects tries to prevent this issue. Other econometric specification issues, such as reverse causality, are not likely to be a concern to the estimated results. One has a hard case to make when claiming that reported profits affect statutory tax rates, rather than exclusively the other way around.

One could argue that observing the national statutory tax rates is inferior to observing the effective tax rates. It is likely that it is ultimately the effective marginal tax rates which are

the most relevant for the firms in their decision-making. After all, effective tax rates also account for tax deductibles and other relevant legislative measures. However, due to the lack of extensive data on those effective tax rates, the statutory marginal tax rate appears to be a suitable alternative for this study. Existing literature shows that the statutory marginal tax rate is indeed an appropriate alternative for the effective tax rates.

The study has practical implications. Firstly, the estimations could be supportive for corporate tax lawyers and advisers. They provide suggestive evidence that there is still scope for optimal transfer pricing to result in tax benefits for MNEs, despite the various transfer pricing legislations which have entered into force.

Secondly, the results give reason to believe that the race to the bottom in corporate tax rates has not yet reached its peak. European countries remain to have a motive to lower their tax rates as long as MNEs have a fiscal incentive to shift their profits to low-tax countries. Forasmuch there remains scope for countries to broaden their national corporate tax base, the race to the bottom in tax rates will continue.

The EU has raised its attention for transfer pricing since the beginning of the 21<sup>st</sup> century. The results provide suggestive evidence that this has not had its desired effect yet. The proposal by the European Commission to introduce a Common Corporate Consolidated Tax Base might thus be a desirable measure to counteract transfer price manipulation. This proposal leaves national tax rates as they are, but it requires firms to report consolidated profits at the MNE level. A formula apportions this consolidated profit to the separate entities of the MNE. This mitigates the scope for tax beneficial transfer pricing.

Another, more severe response to the transfer pricing behaviour would be to harmonize corporate taxes at EU-level. This is a far more complicated response in terms of bureaucracy. It is also likely that low-tax countries will not support this measure, as they benefit from profit shifting.

Policy makers should not exclusively focus on enhancing transfer pricing regulations. They should as well focus on improving the tax authorities, whose contemporary audits do not seem sufficient to detect nor counteract transfer pricing manipulation. The different national tax authorities will need to work closely together to enable international coordination of transfer price manipulation. This could involve a more frequent and intensive interchange of information on MNEs between authorities.

The results are in line with existing literature. Previous studies predict a negative relationship between the reported profits and the statutory marginal tax rate. It is interesting to analyse how the estimated semi-elasticity of -1.3 relates to the previous estimated semi-elasticities. The obtained semi-elasticity is higher than the estimated -1.07 from Heckemeyer and Overesch (2013). Their study comprises global data, which might suggest that transfer pricing as a profit shifting mechanism occurs more *severely* on a European level than on a global level. On the contrary, the obtained semi-elasticity is lower than the one from Lo et al. (2010), in their study on transfer pricing in Asia.

The studies which are most suitable for comparison are the ones which investigate transfer pricing by European MNEs. Huizinga and Laeven (2006), investigating transfer pricing in 1999, obtain a semi-elasticity of -1.43. This is nearly the same as the estimated -1.3 in this thesis. Lohse and Riedel (2013) obtain a semi-elasticity of -0.39, observing the period 1999-2009. That could suggest that the extent of profit shifting through transfer pricing has increased since 1999. It implies that the criticism on profit shifting and the resulting legislative measures taken in the intermediate period have barely had any effect.

Further research possibilities lay in expanding the research to the welfare effects of profit shifting through transfer pricing. Determining the extent of transfer pricing provides a useful handle to European policymakers and tax advisers. But estimates of the welfare costs are required to determine how harmful those MNE practices actually are. Governments spend resources on adopting new legislation. It is necessary to be able to compare those resource costs to the actual benefits of advanced legislation. While it seems desirable to make profit shifting less beneficial, policy makers should not neglect that advanced legislation on this matter will likely lead to welfare losses for low-tax countries. When reliable estimates for welfare costs are available, it is essential to assign those welfare costs to the individual countries that bear them. Only then it is possible to design enhanced, tailor-made transfer pricing regulations. After all, this study provides evidence that the contemporary regulations do not seem sufficient.



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## Appendix

### A. Transfer pricing model: derivation equation 8

Equation (5) represents the overall profits of the MNE.

$$\pi = (1 - \tau_x)(q_x + p) + (1 - \tau_y)(q_y - p) - \beta(\varphi_x, \varphi_y) * \omega(p - \bar{p}) \quad (5)$$

Differentiating (5) with respect to the transfer price  $p$  yields the relationship between the tax rate differential and the marginal resource cost function.

$$\beta \omega'(p - \bar{p}) = \tau_y - \tau_x \quad (6)$$

Rewriting this in terms of the optimal transfer price  $p^*$  results equation (7).

$$p^* = \bar{p} + \frac{\tau_y - \tau_x}{\beta \omega'} \quad (7)$$

Using comparative statics, comparable to Lohse and Riedel (2013), the model can be analysed further. Comparative statics rely on differentiating the first-order condition to observe the changes in endogenous variables ( $p, q_i$ ) resulting from changes in the parameters ( $\omega, \beta$ ) or in the exogenous variables ( $\tau_i, \varphi_i$ ). The comparative statics correspond to:

$$\frac{\partial p}{\partial \tau_x} = -\frac{\partial p}{\partial \tau_y} = -\frac{1}{\beta \omega''}, \frac{\partial p}{\partial \varphi_i} = -\frac{\beta' \omega'}{\beta \omega''}, \frac{\partial^2 p}{\partial \tau_x \partial \varphi_i} = -\frac{\partial^2 p}{\partial \tau_y \partial \varphi_i} = \frac{\beta'}{\beta'' \omega''}$$

The comparative statics show that the sensitivity of the transfer price to changes in the corporate tax rates declines in the (marginal) resource cost of altering the transfer price. In a similar way, the sensitivity of the *individual* profits of  $x$  and  $y$  to the corporate tax rate can be derived. We know that the transfer price  $p$  influences the before-tax profits of the individual subsidiaries (recall  $\pi_x = q_x + p$  and  $\pi_y = q_y - p$ ). Equation (8) follows from combining the comparative statics above with the individual profit functions.

$$\frac{\partial \pi_i}{\partial \tau_i} = -\frac{1}{\beta \omega''} < 0, \frac{\partial^2 \pi_i}{\partial \tau_i \partial \varphi_i} = -\frac{\beta'}{\beta^2 \omega''} > 0, i \in \{x, y\} \quad (8)$$

Equation (8) presumes a negative relationship between the reported profits (EBIT) of subsidiaries and the statutory tax rate. It also shows that the resource costs resulting from the applicable transfer pricing legislation impacts this relationship.

## B. Variable description

Variable	Description	Source
EBIT	Operating profit (Earnings Before Interest and Taxes) of the individual subsidiary	Orbis (2018)
SMTR	Top statutory corporate tax rate faced by the individual subsidiary in the country of operation	KPMG (2018)
Fixed assets	The amount of fixed assets of the individual subsidiary in euros	Orbis (2018)
Cost of employees	The total costs of employees in euros	Orbis (2018)
GDP/capita	GDP/capita of the country of operation, in current US dollars	Worldbank (2018)
Unemployment	National unemployment as a percentage of the total labor force	Worldbank (2018)
Corruption index	Index measuring the corruption of national public services, between 0 and 100 (0 being highly corrupt, 100 no corruption at all)	Transparency International (2018)
SMTR parent country	Top statutory corporate tax rate faced by the parent company of the individual subsidiary in its country of residence	KPMG (2018)
Tax rate-difference	Difference between the top statutory corporate tax rate faced by the individual subsidiary and the top statutory corporate tax rate faced by its parent company	KPMG (2018)
DOC	The number of years passed since the country of interest introduced legislation on transfer pricing documentation for MNEs	EY (2018)
APA	Dummy variable indicating whether national legislation allows MNEs to enter into a bilateral APA	EY (2018)

*Table 9: overview of the various variables, their description and the corresponding sources*

### C. Descriptive statistics

Variable	N	Mean	Std. Dev.	Min.	Max
EBIT	24,732	2,833,020	11,900,000	33.12	450,332,269
SMTR host country	24,732	0.24	0.07	0.09	0.33
Fixed assets	24,732	13,538,913	161,000,000	32.63	11,312,477,000
Cost of employees	24,732	4,962,452	14,100,000	443.79	286,324,000
GDP/capita	24,732	30417.04	15,975.16	4,584.24	119,225.40
Unemployment	24,732	10.58	4.48	3.41	28.05
Corruption index	24,732	61.44	17.12	30	94
SMTR parent country	24,732	0.26	0.05	0.08	0.4
Tax rate difference	24,732	-0.02	0.08	-0.26	0.24
DOC	24,732	5.15	4.04	0	16
APA	24,732	0.72	0.45	0	1

*Table 10: descriptive statistics corresponding to the observed variables in the dataset*

#### D. Tax rates across countries

Country	2009	2010	2011	2012	2013	2014	2015	2016	2017
Belgium	33.99	33.99	33.99	33.99	33.99	33.99	33.99	33.99	33.99
Bosnia and Herzegovina	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Bulgaria	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Croatia	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Estonia	21.00	21.00	21.00	21.00	21.00	21.00	20.00	20.00	20.00
Finland	26.00	26.00	26.00	24.50	24.50	20.00	20.00	20.00	20.00
France	33.33	33.33	33.33	33.33	33.33	33.33	33.33	33.33	33.33
Germany	29.44	29.41	29.37	29.48	29.55	29.58	29.72	29.72	29.72
Hungary	16.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	9.00
Ireland	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50
Italy	31.40	31.40	31.40	31.40	31.40	31.40	31.40	31.40	24.00
Latvia	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Luxembourg	28.59	28.59	28.80	28.80	29.22	29.22	29.22	29.22	27.08
The Netherlands	25.50	25.50	25.00	25.00	25.00	25.00	25.00	25.00	25.00
Poland	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00
Portugal	25.00	25.00	25.00	25.00	25.00	23.00	21.00	21.00	21.00
Serbia	10.00	10.00	10.00	10.00	15.00	15.00	15.00	15.00	15.00
Slovenia	21.00	20.00	20.00	18.00	17.00	17.00	17.00	17.00	19.00
Spain	30.00	30.00	30.00	30.00	30.00	30.00	28.00	25.00	25.00
Sweden	26.30	26.30	26.30	26.30	22.00	22.00	22.00	22.00	22.00
United Kingdom	28.00	28.00	26.00	24.00	23.00	21.00	20.00	20.00	19.00

*Table 11: Top statutory corporate tax rates (CIT) in percentages*

## E. Observed industry sectors

Industry sector	# subsidiaries
Wholesale & retail trade	1193
Other services	527
Machinery, equipment, furniture, recycling	299
Chemicals, rubber, plastics, non-metallic products	172
Transport	123
Metals & metal products	96
Food, beverages, tobacco	71
Construction	59
Textiles, wearing apparel, leather	41
Wood, cork, paper	38
Post & telecommunications	28
Publishing, printing	28
Hotels & restaurants	24
Primary sector	18
Education, Health	16
Gas, Water, Electricity	15
Total	2,478

*Table 12: overview of the distribution of the observed subsidiaries across the industry sectors*



## F. Introduction of transfer pricing legislation

Country	Year	Country	Year
Belgium	2016	Italy	2010
Bosnia and Herzegovina	2008	Latvia	2013
Bulgaria	2006	Luxembourg	2015
Croatia	2005	The Netherlands	2002
Estonia	2007	Portugal	2002
Finland	2007	Serbia	2013
France	2010	Slovenia	2005
Germany	2003	Spain	2006
Hungary	2010	Sweden	2007
Ireland	2011	United Kingdom	2008

*Table 13: table indicating the first year in which legislation on transfer pricing documentation was applicable*

### G. Bilateral APA's

Country	2009	2010	2011	2012	2013	2014	2015	2016	2017
Belgium	1	1	1	1	1	1	1	1	1
Bosnia and Herzegovina	0	0	0	0	0	0	0	0	0
Bulgaria	0	0	0	0	0	0	0	0	0
Croatia	0	0	0	0	0	0	0	0	1
Estonia	0	0	0	0	0	0	0	0	0
Finland	1	1	1	1	1	1	1	1	1
France	1	1	1	1	1	1	1	1	1
Germany	1	1	1	1	1	1	1	1	1
Hungary	1	1	1	1	1	1	1	1	1
Ireland	0	0	0	0	0	0	0	1	1
Italy	0	1	1	1	1	1	1	1	1
Latvia	0	0	0	0	1	1	1	1	1
Luxembourg	0	0	0	0	0	0	1	1	1
The Netherlands	1	1	1	1	1	1	1	1	1
Poland	1	1	1	1	1	1	1	1	1
Portugal	1	1	1	1	1	1	1	1	1
Serbia	0	0	0	0	0	0	0	0	0
Slovenia	0	0	0	0	0	0	0	0	1
Spain	1	1	1	1	1	1	1	1	1
Sweden	0	1	1	1	1	1	1	1	1
United Kingdom	1	1	1	1	1	1	1	1	1

*Table 14: dummy variable with value 1 when national legislation allows MNEs to enter into an APA and 0 otherwise*

## H. Specification tests

### Hausman specification test

$H_0$ : Random-effects model is the appropriate model to use

$H_a$ : Fixed-effects model is the appropriate model to use

$$\begin{aligned} \text{chi2}(4) &= (b - B)'[V_b - V_b]^{-1}(b - B) \\ &= 382.42 \end{aligned}$$

$$\text{Prob} > \text{chi2} = 0.0000$$

The null-hypothesis is rejected at a 1%-significance level

### Augmented Dickey Fuller-test

Z-statistic: -50.20

p-value : 0.0000

The null-hypothesis is rejected at a 1%-significance level