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TRANSFER PRICING AND PROFIT SHIFTING BEHAVIOR BY U.S.-BASED MNEs

Empirical Evidence from U.S. Intrafirm Trade Balances

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ABSTRACT

Using data on bilateral intrafirm trade balances relative to the U.S., on aggregate and per industry, I find suggestive evidence of profit shifting behavior by U.S.-based multinational enterprises (MNEs) through transfer pricing. The dataset covers the intrafirm trade balances of the U.S. with 55 other countries for the period 1999-2011. The output provides mixed results concerning the effect of the statutory marginal tax rate of country *i* (hereafter: $SMTR_f$) on the intrafirm trade balance between the U.S. and country *i*. There is no consistent evidence that supports the theory of tax induced profit shifting behavior, through transfer pricing, by underpricing U.S. exports to related parties in low tax jurisdictions and overpricing U.S. imports from related parties in low tax jurisdictions. On the one hand, some results show a clear positive relationship. A 1% increase of the $SMTR_f$ in country *i* results in a 0.9% increase in the intrafirm trade balance of the U.S. and country *i*. On the other hand, other results indicate a negative relationship between the $SMTR_f$ and the intrafirm trade balance per industry for the panel dataset used.

Keywords: Profit shifting behavior, transfer pricing, tax rates, intrafirm trade balance, U.S.-based MNEs, industries

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1. Introduction

Profit shifting behavior of multinational enterprises (hereafter: MNEs) is no new phenomenon. Recent media attention to tax avoidance practices by multinational firms (e.g. Google, Amazon, and Starbucks) has raised public awareness.[1] In fact, it is the public's opinion that such firms should behave socially responsible and that everyone should contribute their 'fair share' in taxes. However, MNEs actively make use of aggressive tax planning schemes by manipulating the tax rules and legislation in order to reduce the tax bill of the firm. Tax avoidance is not illegal, though tax evasion is. At what point MNEs cross the line of tax avoidance is not clear and does seem to depend on the specific circumstances of each case.[2] But here we enter the realm of tax lawyers. This research however focuses on the profit shifting behavior from an economic point of view. However, it is inevitable to discuss certain aspects of international tax law sometimes.

One of the main concepts of profit shifting behavior from a tax perspective is transfer pricing. Transfer pricing can be denoted as the setting of prices on international intrafirm transactions to minimize the combined effects of taxes on a firm's global profits (Bowen *et al.*, 2012). By manipulating intercompany transactions (by playing around with the prices and/or conditions of the transactions), MNEs are able to reduce their overall tax bill.

To illustrate, think of company X that is established in both a low-tax jurisdiction as well as in a high-tax jurisdiction. X has a plant in the low-tax jurisdiction and this plant produces all goods that X sells in both the low- and high-tax jurisdictions. In order to sell the goods in the high-tax jurisdiction, X has to import the goods from the low-tax jurisdiction into the high-tax jurisdiction. Assume now that the intercompany transaction has a higher price than the price that is 'at arm's length'. In short, a transaction is said to be at arm's length when prices and conditions of the specific transaction are similar to third party transactions.[3] The importer in the high-tax jurisdiction has to pay this higher price to the related party in the low-tax jurisdiction. Therefore, the profits in the low-tax jurisdiction are higher than would be the case with at arm's length prices. These profits are now taxed at the lower corporate income tax rate (hereafter: CIT rate). In the high-tax jurisdiction costs have increased due to

[1] BBC News: http://www.bbc.com/news/business-20288077

[2] See for example ECJ 12 September 2006 C-196/04 (Cadbury Schweppes) in which the criterion is established of a "wholly artificial arrangement". Are the specific circumstances of an arrangement artificial in such a degree that abuse of tax legislation can be presumed?

[3] See also OECD Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations.

the high intercompany transaction. These costs are deductible from revenues at the higher CIT rate, therefore reducing profits and the tax bill in the high-tax jurisdiction. Hence, the taxes paid by company X at a global level are reduced.

The illustration above is relatively easy to understand. However, tax practices of MNEs are more complex in reality, and they are not as straightforward as the above. MNEs, with the help of (expensive) tax lawyers, try to lower the effective tax rate of their (client's) firm by making use of international tax planning structures. On the other hand, governments and tax authorities try to fight, more and more intensively, aggressive tax planning methods by multinationals. Of course, when multinationals go across borders, governments and tax authorities go international as well. The Organisation for Economic Co-operation and Development (hereafter: OECD) provides a platform for governments to work together and to seek solutions for all kinds of policy issues. The OECD acknowledges in the Transfer Pricing Guidelines that "the growth of MNEs presents increasingly complex taxation issues for both tax administrations and the MNEs themselves since separate country rules for the taxation of MNEs cannot be viewed in isolation but must be addressed in a broad international context." Therefore, the Committee on Fiscal Affairs (the main tax policy department of the OECD) has issued several reports on MNE taxation in order to reduce risks for both the governments and the MNEs in the process of taxation.

In February 2013 the OECD published its report on tax planning practices of multinationals. According to the OECD the fundamental problem is that "the international common principles drawn from national experiences to share tax jurisdiction may not have kept pace with the changing business environment." The report, Addressing Base Erosion and Profit Shifting, considers six pressure areas, namely:[4]

- Hybrids and mismatches which generate arbitrage opportunities;
- The residence-source tax balance, in the context in particular of the digital economy;
- Intragroup financing, with companies in high-tax countries being loaded with debt;
- Transfer pricing issues, such as the treatment of group synergies, location savings;
- The effectiveness of anti-avoidance rules, which are often watered down because of heavy lobbying and competitive pressure, and;
- The existence of preferential regimes.

[4] OECD (2013) http://www.oecd.org/forum/what-the-beps-are-we-talking-about.htm

In addition, the OECD published an Action Plan on Base Erosion and Profit Shifting (hereafter: BEPS). According to the OECD and the ministers of finance of several countries the action plan is a sound plan, that helps countries to challenge aggressive international tax planning schemes and that ensures cooperation between governments and tax authorities from different countries, while at the same time providing for a stable business environment. Currently, the OECD is still in the development phase of the Action Plan on BEPS, after consultation rounds with governments and global business partners, and is "on schedule" to report to the G20 summit in September 2014.[5] Needless to say, this thesis will focus primarily on the pressure area of transfer pricing.

Inspired by the illustrious world of international tax planning and the increased public awareness on tax avoidance, this study tries to examine the effect of taxation on profit shifting behavior by U.S.-based MNEs. The following research questions can be established:

- Is there evidence of profit shifting behavior, through transfer pricing, by U.S.-based MNEs?
- Does transfer pricing activity differ between industries?

With respect to methodology this paper refers to Clausing (2001), in which she uses data on U.S. multinational activity and trade flows from the Bureau of Economic Analysis (hereafter: BEA), to determine the impact of profit shifting behavior on U.S. trade flows, indirectly. In a later study, Clausing (2003) applies a direct method by using survey data on U.S. international trade transactions, which are flagged when the transaction is intrafirm, and trade prices for the period 1997-1999. Performing a study using the direct method in accordance with Clausing (2003) is preferred. However, due to the lack of appropriate, systematic and comparable data, this study focuses on the indirect method, that is applied in most studies concerning this topic.

This thesis contributes to the academic literature by taking new available data into account in order to measure transfer pricing activity in recent years up to 2011. Furthermore, this thesis tries to examine whether or not there is a difference in tax induced profit shifting behavior between industries. This study considers 13 different industries ranging from chemicals to transportation equipment. Distinguishing between industries is important because measuring and documenting differences between industries of tax induced profit

[5] To check the current state of affairs I refer to the OECD Centre for Tax Policy and Administration: http://www.oecd.org/ctp/.

shifting behavior can help in the understanding how MNEs behave as a result of taxation. Especially, the OECD faces different challenges that relate to the taxation of MNEs, which are constantly adapting to the environment in which they operate. Within that context, research in this field is needed so, in the end, policymakers can make the right decision.

The thesis is structured as follows. Section 2 gives an overview of earlier academic research. In Section 3, the theoretical framework of this empirical study is provided. Section 4 discusses the data and methodology. In Section 5, I will present and discuss the empirical results. In Section 6, I will provide a summary of the main findings of this research.

2. Literature Review

Profit shifting behavior, through transfer pricing, has been a topic of earlier research even though it is difficult, sometimes impossible, to get appropriate and systematic data. In this section, this thesis will summarize the main results of research that has been conducted over the last couple of decades.

Horst (1971) examines from a theoretical point of view how tariffs and tax rates affect the optimal production and pricing strategy of a monopolistic firm that is active in two different countries. To this extent, Horst (1971) does a partial equilibrium analyses and shows that especially the sign of the marginal cost function and the height of import and export tariffs are important factors that determine the profit-maximizing strategy of the firm. In addition, Kant (1995) shows that the 'level of ownership' influences intrafirm trade, since firms may be inclined to shift profits away from affiliates which they only partially own. Furthermore, the possibility to defer taxes on non-repatriated foreign income in the home country also influences intrafirm trade. Kant (1995) states that the nature of internal transactions changes from "efficient to perverse" due to the factors mentioned above. Tariffs, preferred over quotas, can mitigate this effect. Eventually, Kant (1995) concludes by stating that intrafirm trade differs significantly from trade between unrelated parties.

Grubert and Mutti (1991) find, by using survey data on affiliate profitability across 33 countries in 1982, that CIT rates and tariffs do have a significant influence on profit shifting behavior of MNEs and that there is a relationship between foreign direct investment (hereafter: FDI) in a country's manufacturing sector and a host country's tax rate and tariff. Afilliate profitability is measured as the after-tax profit as a percentage of net sales. In their study, Grubert and Mutti (1991) show that a firm in a country with a 40% tax rate will report profits of 5.6% of sales, compared to 12.6% in a country with a 20% tax rate, ceteris paribus. Moreover, their empirical results show that statutory tax rates are "a better determinant of income shifting than effective tax rates". In addition, Elitzur and Mintz (1996) study the role of transfer pricing rules on tax competition between home and host governments from a theoretical point of view and find out that host countries could increase their rates of taxation on foreign firms if changes in productivity and costs induce higher profits earned by the multinational. Furthermore, harmonization would result in a lower effective tax rate (hereafter: etr) on the margin for MNEs. According to Elitzur and Mintz (1996), this would not only improve tax revenues for both governments but also improve aggregate social

welfare by a reallocation of resources in the international economy. Elitzur and Mintz (1996) find a Pareto-optimal solution in the absence of taxes. Hence, harmonization of tax rates will improve social welfare because tax rates will be closer to zero.

Another study by Koenigsberg (1999) examines the effect of government policy on transfer pricing activity and FDI, also from a theoretical point of view. By using economic simulation techniques Koenigsberg (1999) analyzes the effect of government audits and penalties on cross-border activity of MNEs and shows that transfer pricing regulations move the optimal transfer price closer to the statutory arm's length price. Thus, according to Koenigsberg (1999) MNEs are less likely to do investments abroad when governments and tax authorities have implemented transfer pricing regulations than in the absence of such regulations because Koenigsberg (1999) assumes that investments are initiated by tax reasons. According to Koenigsberg (1999) this might be the result of the tradeoff between gains from profit shifting behavior and the potential losses associated with governmental penalties. Thus, In addition, tax policy that focuses on minimizing income shifting behavior, through transfer pricing, may reduce FDI and local tax revenues for the government.

Clausing (2001) considers taxes and the intrafirm trade flows between U.S. parent companies and their affiliates abroad. She finds that an effective tax rate in the affiliate country of 10% points lower is associated with an intrafirm trade balance that is 4.4% points smaller.[6] Since this study forms the starting point of this thesis, I will not elaborate on this study at this stage.

Furthermore, there is suggestive evidence of income shifting behavior due to differences in CIT rates in OECD countries (Bartelsman and Beetsma, 2003). This study distinguishes itself from all other literature by using the ratio of total value added to wage payments as a dependent variable. Bartelsman and Beetsma (2003) do so in order to distinguish between the effect of tax rates on income shifting behavior and on real economic activity. Their results also suggest that a unilateral increase in the CIT rate has a substantial negative effect on reported income. They estimate that at the margin more than 65% of additional revenue resulting from a unilateral tax increase is lost because of income shifting. However, the authors advocate international cooperation against aggressive tax planning and transfer pricing practices.

[6] The intrafirm trade balance is measured as "the amount of U.S. exports sent from parent firms to their affiliates abroad minus the amount of U.S. imports sent from affiliates to U.S. parents, relative to the total amount of trade between the U.S. parents and affiliates".

Clausing (2003) states that there is substantial evidence of tax-motivated transfer pricing in U.S. intrafirm trade prices. She finds that there is a strong and statistically significant relationship between tax rates and the prices of intrafirm transactions. In fact, she finds evidence for the export/import example mentioned above. Most of the literature on transfer pricing and profit shifting behavior derive a relationship between profit shifting and tax rates indirectly. However, Clausing (2003) uses a direct method by using the Import/Export Price Index (hereafter: MXP) provided by the Bureau of Labor Statistics (hereafter: BLS). Clausing (2003) uses monthly data on U.S. international trade prices in the period 1997 to 1999 (intrafirm transactions are flagged based on the respondents acknowledgement as to whether the trade is between related parties) and finds a difference in intrafirm trade prices and at arm's length prices due to taxation. Clausing (2003) finds that a tax rate that is 1% lower in the country of destination/origin is associated with intrafirm export prices that are 1.8% lower and intrafirm import prices that are 2.0% higher, relative to non-intrafirm transactions. In addition, Bernard *et al*. (2006) find out that the prices U.S. exporters set for non-related parties are substantially larger than intercompany price by using international trade transaction data for the period 1993-2000 provided by the U.S. Customs Bureau. Bernard *et al*. (2006) provide evidence that transfer pricing might be an important factor for profit-shifting behavior and that tax-minimizing strategies influence transfer pricing decisions. Furthermore, Bernard *et al*. (2006) provide some results on the relationship between exchange rates and transfer pricing decisions. They find that intrafirm trade, and therefore transfer pricing, might be an important way for MNEs to control and minimize exchange rate risk.

Furthermore, the application of the arm's length principle distorts financing and investment of MNEs, the choice between outsourcing and direct investment, and leads to a reduction of world welfare (Devereux and Keuschnigg, 2008). The authors come to this conclusion by analyzing a theoretical model that considers heterogeneous firms with a two-stage production process and distinguishes between outsourcing and offshoring production activities.

In addition, Cristea and Nguyen (2013) find robust evidence for profit shifting behavior by Danish MNEs through transfer pricing. Cristea and Nguyen (2013) use firm level data in the manufacturing sector for the period 1999-2006 and show "that multinationals who trade both with affiliated and unaffiliated parties have an incentive to deviate the arm's length invoice price from profit maximizing levels in order to reduce the gap from transfer prices and

thus conceal profit shifting." Cristea and Nguyen (2013) find evidence for 5.7 to 9.1 percent lower export prices for intrafirm trade to affiliates in low-tax countries. As a consequence, the Danish tax authorities lose tax revenues up to 3.2 percent of Danish MNEs tax returns.

Below I provide a table that indicates the size of the estimated effects of previous literature as discussed in this chapter.

Table 1
Overview of results

Paper	Change	Result
Grubert and Mutti (1991)	CIT rate from 40% to 20%	Profits of 5.6% of sales vs. 12.6% of sales
Clausing (2001)	ETR decreases by 10%	Intrafirm trade balance decreases by 4.4%
Bartelsman and Beetsma (2003)	Unilateral tax increase by 1%	Loss of 65% of additional tax revenue because of income shifting
Clausing (2003)	ETR decreases by 1%	Intrafirm export price decreases by 1.8%, intrafirm import prices increase by 2.0%, relative to non-intrafirm transactions
Cristea and Nguyen (2013)		5.7-9.1% lower export prices to affiliates in low-tax countries

3. THEORETICAL FRAMEWORK

3.1. Transfer Pricing and Profit Optimization

Horst (1971) and Kant (1995) developed a model that illustrates the mechanism by which differences in tax rates between countries influences transfer pricing activity, and how transfer pricing can influence a firm's profits. The model assumes the MNE has some degree of market power and that it is operating in two countries: the home country *H* and the affiliate's residence country *F* abroad. The MNE produces and sells its goods in each country. Part of its output is exported from *H* to *F*. This model allows for tax deferral and assumes the use of a tax credit system in country *H*.

The profit functions of the MNE for the home country, the foreign country, and globally are given by the following equations:

(1) $$\pi_h = R_h(s_h) - C_h(s_h + m) + pm \quad \text{and,}$$

(2) $$\pi_f = (s_f) - C_f(s_f - m) - pm \quad \text{and,}$$

(3) $$\pi = (1 - t_h)\pi_h + (1 - t_f^e)\pi_f \quad \text{and,}$$

(4) $$t_f^e = t_f + (t_h - t_f)f$$

As illustrated by these equations the profit in each country depends on revenue *R* that is a function of sales *s*, and costs *C* that is a function production. Production consists of the quantity of goods sold at home, *s*, and *m*, which denotes the quantity of goods that are exported to the affiliate abroad. Assume that $s_f > m > 0$. p denotes the transfer price. Furthermore, t_h, t_f, and t_f^e illustrate the CIT rate in *H*, the CIT rate in *F*, and the effective CIT rate in *F*, respectively. It is assumed that $t_h > t_f$. The effective tax rate in *F* is implemented since the model allows for tax deferral and assumes the use of foreign tax credits. This is illustrated by Eq. 4. f denotes the share of profits that is repatriated, where $0 \leq f < 1$. It is assumed that $f \neq 1$ since otherwise $t_f^e = t_h$ (no gain from profit shifting).

By substituting Eq. 1, and Eq. 2, into Eq. 3, the global net profit function for the MNE is illustrated by the following equation:

(5) $$\pi = (1 - t_h)[R_h(s_h) - C_h(s_h + m) + pm] + (1 - t_f^e)[R_f(s_f) - C_f(s_f + m) + pm]$$

Taking the first order condition with respect to the transfer price p, leads to:

$$\pi_p = (1 - t_h)m - \left(1 - t_f^e\right)m \tag{6}$$

Plugging Eq. 4 into Eq. 6 and rearranging results in the following equation, which can be attributed to Horst (1971) and Kant (1995):

$$\pi_p = -\left(t_h - t_f\right)(1 - f)m \tag{7}$$

Eq. 7 shows that if $t_h > t_f$, π_p is negative, implying a net profit decrease when the transfer price increases. Thus, firms have an incentive to underprice goods sold (export) to low tax countries in order to shift profits to low tax locations (Clausing, 2001). On the other hand, MNEs have an incentive to overprice goods bought (import) from affiliated entities in low tax jurisdictions. If $t_h < t_f$, π_p is positive, implying a net profit increase when the transfer price increases. Thus, firms have an incentive to overprice goods sold (export) to high tax countries. On the other hand, MNEs have an incentive to underprice goods bought (import) from affiliated entities in high tax jurisdictions. To summarize, the relationship between the intrafirm trade balance ($p_{ex}m_{ex} - p_{im}m_{im}$) and the SMTR_f (SMTR_f is the statutory marginal tax rate in country *i*, which is similar to t_f) is expected to be positive due to p_{ex} ↑ and p_{im} ↓, which leads to an increase in the intrafirm trade balance, if a U.S. company trades with an affiliate in a relatively high tax jurisdiction compared to a low tax jurisdiction (SMTR_f ↑). Of course, the intrafirm trade balance is not only dependent on the prices of intrafirm transactions, but also the quantity of shipped goods to foreign affiliates, which might also depend on taxes. It might be the case that the price effect is (more) than offset by the quantity component of the intrafirm trade balance. In the econometrical model that I will present in the next chapter, I try to control for this quantity component by including several control variables.

This result contrasts with the traditional competitive open market theory since firms, in intrafirm transactions, want to maximize joint profits instead of maximizing profits at each other's expense (Lall, 1973). The normal conflict of interests between buyers and sellers in an open market transaction does not occur in intrafirm transactions. As a result, transfer pricing is the result of two incentives of the MNE. On the one hand, transfer pricing is induced by the desire of the MNE to maximize the present value of overall profits (especially by minimizing tax payments) and on the other hand, the desire to minimize the present and future risks or

uncertainty about the value of the overall profits. This second desire is the topic of the paragraphs below and discusses the constraints to the model above.

Transfer pricing is a multidisciplinary process for the allocation of profits of the MNE as a group. So, one might ask how intrafirm transactions on their own, or aggregated, which form the basis of this study, relate to the broader view which transfer pricing tries to grasp. In fact, transfer pricing focuses on the business as a whole by allocating profits for tax purposes in such a way that it corresponds with the functions performed within the group, the risks taken by different group entities, and the assets that are used by those different group entities. Each entity within the group should receive proper remuneration for its activities. In order to do so, tax authorities (and tax lawyers/consultants) should distinguish between routine functions and the real entrepreneurial functions. Profits should be allocated to the activity and/or entity where the profits are *earned*, thus where the entrepreneurial functions are performed. This does not mean that routine functions do not receive any remuneration. Routine functions receive a standard remuneration in accordance with normal business terms and/or conditions. The residual profit, the profit that is left after the routine functions have been remunerated, is then allocated according to transfer pricing rules and legislation. Of course, MNEs operate on a global scale, so the profits that are allocated to the different entities mostly arise in different countries.

The helicopter view that is, at first, necessary to conduct the transfer pricing analysis does not interfere with the intrafirm trade specific analysis that I will conduct here. Needless to say, related parties, performing intrafirm transactions, should adhere to the at arm's length principle. However, manipulating the price, the terms and/or other conditions of a transaction can still occur within a certain range. This range is important because 'playing around' with the price, the terms and/or conditions of a transaction too much will trigger an investigation by the tax authorities, after all. The basic assumption that transfer pricing should focus on the functions performed, risks assumed, and assets used on a consolidated basis will have a mitigating effect on profit shifting behavior, through transfer pricing within the allowed boundaries, because tax authorities can adjust corporate income tax returns retro-actively to correct aspects of the transaction that were not in line with the at arm's length principle.

As a result, a constraint should be added to the theoretical model because otherwise MNEs will choose a corner solution for the optimal transfer price p. Kant (1988a) assumes that penalties can be imposed by tax authorities with probability α, and that the arm's length

price is equal to $\hat{p}$. If the transaction between the group entities equals the arm's length price $\hat{p}$ then the probability of a penalty α is equal to zero. On the other hand, Kant (1988a) assumes that p_p is the transfer price which triggers an investigation and an imposition of a penalty by the tax authorities with certainty. In this case, α equals 1. Furthermore, it is assumed that the probability of the imposition of a penalty increases non-linearly. To summarize, the probability of a penalty "depends on the divergence between the transfer price charged and the arm's length price" (Kant, 1988a) and is modeled as follows:

(8) $$\alpha(p-\hat{p}),\ \alpha\ is\ a\ function\ of\ the\ difference\ in\ price;$$

$$with\ \hat{p} < p < p_p, 0 < \alpha(p-\hat{p}) < 1, \alpha'(p-\hat{p}) > 0, \alpha''(p-\hat{p}) > 0\ for\ the\ increasing\ transfer\ price\ case;$$

$$with\ \hat{p} > p > p_p, 0 < \alpha(p-\hat{p}) < 1, \alpha'(p-\hat{p}) < 0, \alpha''(p-\hat{p}) < 0\ for\ the\ decreasing\ transfer\ price\ case.$$

In addition Kant (1988a) adds $\sigma > 0$ which represents the transfer pricing penalty. As a result, the expected loss from the penalty, constraining extreme over- and underpricing behavior, is equal to:

(9) $$\sigma\alpha(p-\hat{p}) + 0[1-\alpha(p-\hat{p})] = \sigma\alpha(p-\hat{p}) > 0$$

Hence, the objective function of the MNE, denoted by φ, and the first order condition with respect to transfer price *p* are equal to:

(10) $$\varphi = \pi - \sigma\alpha(p-\hat{p}) \text{ and,}$$

(11) $$\varphi_p = Tm - \sigma\alpha(p-\hat{p}) = 0$$ [7]

According to Kant (1988a), Eq. 11 shows that the derivative of MNEs objective function with respect to the transfer price *p* does not have the same sign for all values of *p*. As a result, the MNE may not find it optimal to charge the corner solution of transfer price *p*. An increase in the transfer price increases the probability of a penalty imposed by the tax authorities. This negative effect is illustrated by the negative term in Eq.11. Still, a corner

[7] *T* is a complex term used by Kant to model partial ownership of the foreign subsidiary: $T = (1-t_h)(1-k) - k(t_h - t_f)(1-m)$. *k* denotes the fraction of the foreign subsidiary owned by the MNE, where $0 \leq k \leq 1$. Following Clausing (2001), *k* equals 1, illustrating full ownership. As a result, $T = -(t_h - t_f)(1-m)$.

solution is possible if the first term is positive. However, since the probability of the penalty increases non-linearly, it is more likely that the MNE will choose an interior solution.

3.2. Transfer pricing differences between industries

With respect to differences between industries in profit shifting behavior of U.S. MNEs, the degree in which certain industries use intangible assets (e.g. intellectual property) might be important. According to Harris *et al*. (1993) intangible assets by their very nature, do not have readily available arm's length prices and therefore the flexibility with which MNEs can set prices for specific transactions is relatively high. In the absence of comparables it is more difficult for tax authorities to contradict the arguments of an MNE why certain conditions/prices in a (relatively) unique business situation are agreed upon in an intrafirm transaction. In addition, intangible assets are relatively easy to move compared to tangible assets. For instance, a trademark can easily be moved (e.g. sold) to another country, in contrast to machinery and buildings. Hence, the more important intangible assets are for a specific industry (e.g. the pharmaceutical industry), the higher the degree of profit shifting behavior. According to Morck and Yeung (1991) research and development spending or advertising spending may serve as proxies for the presence of intangible assets. In this study I try to distinguish between the intrafirm trade balance of the following industries: mining, utilities, food, chemicals, metals, machinery, computers, electrical devices and components, transport, information, financials and insurance, professional science and technology, and other.

Analyzing industries differences with respect to profit shifting behavior, through transfer pricing, is prone to heterogeneity problems. These differences between industries can be the result of different market structures (market power: competition vs. monopoly), the focus on different continents, the use of infrastructure (non-digital vs. digital) in the industry, the sensitivity of the industry to changing macroeconomic conditions (business cycle; cyclical, countercyclical, and/or acyclical), and social aspects (e.g. difference in the need for highly educated workforce). Therefore, comparing the different industries becomes harder. However, R&D expenses per industry might control for this heterogeneity between the industries and can be considered to be a good proxy for industry differences. For a thorough description of this process, I refer to the data section of this thesis.

4. METHODOLOGY AND DATA

4.1. Methodology

This study will perform an empirical analysis of profit shifting behavior, through transfer pricing, by U.S. MNEs. To answer the research questions about profit-shifting behavior of U.S.-based MNEs, I will estimate the following equation:

$$
\begin{aligned}
(12) \qquad Intrafirm\ Trade\ Balance_{ijt} = {} & c + \beta_1 SMTR_{it} \\
& + \beta_2 SMTR_{it} \times Dummy\ Variables_j \\
& + \beta_3 Overall\ Trade\ Balance_{it} \\
& + \beta_4 Unaffiliated\ Trade\ Balance_{it} \\
& + \beta_5 NetFDI_{it} \\
& + \beta_6 Exchange\ Rate_{it} + \beta_7 Income\ Growth_{it} \\
& + \beta_8 R\&Dexp_j + e_{it} + \alpha_{ij} + \delta_t
\end{aligned}
$$

Using panel data, I will estimate the effect of the $SMTR_f$ on the intrafirm trade balance. Furthermore, I will try to estimate the effect of the $SMTR_f$ on the intrafirm trade balance per industry by creating an interaction term of the $SMTR_f$ and industry dummies. Keeping in mind the theoretical framework presented in the previous paragraph, the associated null hypothesis and alternative hypothesis are equal to:

$$H_0: \beta_{1,2} = 0$$
$$H_a: \beta_{1,2} > 0$$

The alternative hypothesis tests for the sign and the magnitude of the relationship between the $SMTR_f$ and the intrafirm trade balance between the US and country *i.* In this equation *i* indicates countries, *j* indicates industries and *t* indicates years of the intrafirm trade balance of the U.S., which is "the amount of U.S. exports sent from parent firms to their affiliates abroad minus the amount of U.S. imports sent from affiliates to U.S. parents, relative to the total amount of trade between the U.S. parents and affiliates" (Clausing, 2001). This variable is used as a proxy for $p_{ex}m_{ex} - p_{im}m_{im}$. As was mentioned before, the relationship between the intrafirm trade balance ($p_{ex}m_{ex} - p_{im}m_{im}$) and the $SMTR_f$ ($SMTR_f$ is the statutory marginal tax rate in country i, similar to t_f) is expected to be positive due to p_{ex} ↑ and p_{im} ↓, which leads to an increase in the intrafirm trade balance, if a U.S. company trades with an affiliate in a relatively high tax jurisdiction compared to a low tax jurisdiction ($SMTR_f$ ↑). The intrafirm trade balance in equation form equals:

(13) $$Intrafirm\ TB_{ijt} = \frac{Intrafirm\ EX - Intrafirm\ IM}{Total\ EX + Total\ IM}$$

The intrafirm trade balance depends on the $SMTR_f$ and some other variables to control for other economic conditions/factors that might influence the intrafirm trade balance. Amongst those variables are the exchange rate, and the income growth of a country. These variables will be discussed in more detail in the following paragraph.

As I mentioned before, theory suggests that U.S. intrafirm trade balances will be less favorable if foreign taxes are low and firms systematically employ transfer pricing to shift profits to low-tax countries, since intrafirm exports from the U.S. are underpriced and intrafirm imports into the U.S. are overpriced. However, the data concerning all trade balances also has a *quantity component* next to the already mentioned *price component*. By dividing the net intrafirm exports (imports) by total trade, I try to control for this effect. Furthermore, *NetFDI* tries to capture the quantity effect as well since it shows the investment activity in or out of a country. This will be considered in more detail below.

Data on trade is crucial in this study. I include the overall trade balance and the unaffiliated trade balance to control for general trade patterns. The overall trade balance is constructed as follows, in accordance with Clausing (2001): The overall trade balance equals total U.S. exports to country *i* minus U.S. imports from country *i*, relative to total trade (which is exports plus imports) between the U.S. and country *i*. However, intrafirm trade between parents and affiliates in country *i* is excluded from this. In equation form:

(14) $$Overall\ TB_{it} = \frac{(Total\ EX - Intrafirm\ EX) - (Total\ IM - Intrafirm\ IM)}{Total\ EX + Total\ IM}$$

This variable is included to control for general factors that influence the overall trade balance between the U.S. and country *i*.

Furthermore, I include the unaffiliated trade balance, which is constructed by taking U.S. exports by unaffiliated entities to affiliates in country *i* and subtracting U.S. imports from U.S. affiliates in country *i* to unaffiliated entities in the U.S., relative to the total trade between unaffiliated entities in the U.S. and affiliates in country *i*. Unaffiliated exports and unaffiliated imports can be calculated by subtracting total intrafirm exports from total exports, and subtracting total intrafirm imports from total imports, respectively. In equation form:

(15) $$Unaffiliated\ TB_{it} = \frac{(Total\ EX - Intrafirm\ EX) - (Total\ IM - Intrafirm\ IM)}{(Total\ EX - Intrafirm\ EX) + (Total\ IM - Intrafirm\ IM)}$$

In line with Clausing (2001), this variable potentially controls for unobserved characteristics of affiliated entities that may influence their trade with the U.S.

Below I provide a table with the expected signs of the coefficients.

Table 2

Expected signs of the coefficients

Variable	Expected sign of the coefficient	Explored variation
$SMTR_f$	+	Tax rates
$SMTR_f$ x Dummy variable(s)	+	Tax rates
Income Growth	+	Quantity/activity
Exchange Rate	-	Relative prices
Foreign Direct Investment	-	Quantity/activity
Overall Trade Balance	+	Quantity/activity
Unaffiliated Trade Balance	+	Quantity/activity
R&D expenses	+/-	Industry differences

According to Clausing (2001) the intrafirm trade balance of U.S. MNEs with affiliates in country *i* will be less favorable, if host-country taxes are low and firms systematically employ transfer pricing to shift profits to low-tax countries, since intrafirm exports from the U.S. are underpriced and intrafirm imports into the U.S. are overpriced. As a result, if the $SMTR_f$ decreases (increases) the intrafirm trade balance will decrease (increase) if the affiliate is established in a low (high) tax jurisdiction. Hence, if tax-motivated transfer pricing is important, the coefficient β_1 is expected to be positive.

Furthermore, the variable income growth is included by taking the growth rate of real GDP of each country in the time period 1999-2011. In general, income growth is considered to be a measure of how well an economy is doing in terms of overall demand for goods and services. Therefore, if income growth in country *i* is relatively high, this will result in a relatively high demand for U.S. goods and services, which in the end might lead to a more favorable trade balance due to an increase in U.S. exports. Hence, the expected sign of the coefficient for income growth is positive.

As I mentioned in the previous paragraph, if the U.S. dollar appreciates relatively to the other country's currency, we can expect that the volume of exports falls relative to the volume of imports. Hence, an appreciation, which is illustrated by a rising exchange rate, should result in a lower trade balance. Thus, a negative relationship between the intrafirm trade balance and the exchange rate is expected.

The variable on FDI (including its lags) is constructed by taking the FDI outflow and subtracting the FDI inflow, relative to the U.S. Hence, if net FDI is positive, the country is a net invester in the U.S. However, if net FDI is negative, the country is a net receiver of U.S. investment money. The more the U.S.-based MNEs invest in a specific country, the more negative the net FDI variable. Since investments lead to larger affiliates, more trade (in terms of quantity) between group entities is expected. Hence, I control for investments across countries relative to the U.S and the *quantity component* of the trade balance.

The two variables concerning trade, the trade balance and the unaffiliated trade balance, are expected to have a positive relationship. The positive coefficients might be the result of general country-specific factors that affect both types of trade balances (Clausing, 2001). For example, the ratio between total savings and total investments in both country might have influence on the level of trade between both countries, since a country that is a 'net saver' will have global trade surpluses and a country that is a 'net invester' will have global trade deficits. These factors are expected to have an important influence on bilateral trade balances.

Finally, the variable for R&D expenditures is included to control for the heterogeneity between the industries. The R&D expenditures per industry are averaged over the period 1999-2011. As was mentioned in the previous chapter, industries that are R&D-intensive might be induced by tax reasons to shift profits to lower tax jurisdictions by transfer pricing more than less R&D-intensive industries. Hence, the relationship between R&D expenditures and the intrafirm trade balance depends on the tax differential between the U.S. and country *i*. The relationship is expected to be more positive if $SMTR_{US} > SMTR_f$, and more negative if $SMTR_{US} < SMTR_f$.

In this study I will use the pooled Ordinary Least Squares approach and the fixed effects approach to analyze the panel data. Panel data estimation exploits variation across individuals (between variation) and over time (within variation) and is relatively efficient to repeated cross-section data. However, assuming that different observations on the same individual are independent is quite hard. On the one hand, the fixed effects approach is based solely on the within transformation (differences within individuals) and therefore any time-invariant variable is eliminated. On the other hand, the random effects approach exploits both the within and the between dimensions. Generally, the fixed effects approach is preferred if the individual units belong to a similar group (e.g. countries). However, in order to make sure

that the estimation results are consistent and the appropriate approach is adopted, the Hausman test should be performed. The Hausman test rejected the null hypothesis that the random effects model is appropriate, in almost all cases. Hence, the fixed effects model is more appropriate than the random effects model. Moreover, SMTRs can be considered to be an exogenous source of variation over time regarding the effect of taxes on behavior (Triest, 1998). But it is important to be aware of other factors that change over time and influence the behavior of MNEs as well. These factors should be controlled for.

4.2. Variables Description

Using data that is readily available from the BEA, this study will perform an empirical analysis on profit shifting behavior, through transfer pricing, by U.S.-based MNEs. Relevant and systematic data on multinational activity can be found in the Direct Investment and MNC section of the BEA database.

To calculate the intrafirm trade balance, I use data on U.S. exports (imports) to (from) foreign affiliates by country and industry for the period 1999-2011. The variables that will be used in this study, which depend on trade data, will be discussed more thoroughly in the next paragraph. The BEA provides data on 69 countries exclusively. However, due to several missing values the number of observations in the cross section is reduced to 55 countries.[8] Furthermore, U.S. direct investment data by country is available in order to analyze the investment positions of U.S. MNEs across countries The different industries are measured by the NAICS (North American Industry Classification System) by the BEA as of 1999.[9] Furthermore, NAICS data can be aggregated into the two-digit divisions of ISIC Rev. 4/NACE Rev.2 for comparability reasons (even though NAICS is product-based instead of activity-based).[10] The different industries used in this study are presented on the next page.

In addition, data on tax rates is essential in this study. Theory suggests the use of marginal tax rates on the corporate level since tax-induced behavior is best represented by the amount of taxes paid on each additional U.S dollar earned. Of course, the SMTRs can be found in each country's CIT act. However, these rates do not directly take into account tax

[8] Countries included are Canada, Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Russia, Spain, Sweden, Switzerland, Turkey, United Kingdom, Argentina, Brazil, Chile, Colombia, Ecuador, Peru, Venezuela, Costa Rica, Honduras, Mexico, Panama, Barbados, Bermuda, Dominican Republic, Egypt, Nigeria, South Africa, Israel, Saudi Arabia, United Arab Emirates, Australia, China, Hong Kong, India, Indonesia, Japan, Republic of Korea, Malaysia, New Zealand, Philippines, Singapore, Thailand.

[9] Untill 1998 the BEA adopted SIC (Standard Industrial Classification) in order to distinguish between industries.

[10] See Eurostat on NACE Rev.2 Statistical classification of economic activities in the European Community.

Table 3

Overview of industries

Industry	Subsectors	Abbreviation
Chemicals	Basis chemicals; resins and synthetic rubbers, fibers, and filaments; pharmaceuticals and medicines; soap, cleaning compounds, and toilet preparations; other; plastics and rubber products; nonmetallic mineral products	Chem
Computers and eletronic products	Computers and peripheral equipment; communications equipment; audio and video equipment; semiconductors and other electronic components; navigational, measuring, and other instruments; magnetic and optical media	Comp
Electrical equipment, appliances, and components	-	Elect
Finance and insurance	Finance, except depository institutions; securities, commodity contracts, and other intermediation and related activities; other finance, except depository institutions; insurance carriers and related activities	FinIns
Food	-	Food
Information	Publishing industries; motion picture and sound recording industries; broadcasting (except internet) and telecommunications; broadcasting and telecommunications; internet, data processing, and other information services; information services and data processing services	Info
Machinery	Agriculture, construction, and mining machinery; industrial machinery; other	Mach
Primary and fabricated metals	Primary metals; fabricated metal products	Met
Mining	Oil and Gas Extraction; other	Min
Other	Agriculture, forestry, fishing, and hunting; construction; retail trade; transportation and warehousing; real estate and rental leasing; management of nonbank companies and enterprises; administration, support, and waste management; healt care and social assistance; accomodation and food services; miscellaneous services	Other
Professional, scientific, and technical services	Architectural, engineering, and related services; computer systems design and related services; management, scientific, and technical consulting; advertising and related services; other	PST
Transportation equipment	Motor vehicles, bodies and trailers, and parts; other	Trans
Utilities	-	Util

provisions, which in the end influence the amount of taxes paid by the MNEs, thereby influencing the SMTR. According to Clausing (2001) the use of "marginal (read: effective) tax rates is a theoretically superior alternative" since "the published marginal tax rates are an imperfect proxy for the actual tax rates firms face, because such rates do not account for the many subtleties that determine the true tax treatment of firms." However, due to the lack of data on marginal effective tax rates, Clausing (2001) prefers to use the ETR (foreign income taxes paid divided by income). On the other hand, Graham (1996) reports that the statutory marginal tax rate (amongst others) is one of the best alternatives to use as a proxy for the true corporate marginal tax rate. Furthermore, appropriate data on worldwide marginal tax rates, that takes into account tax deductions, exemptions, and tax holidays and so on, hardly exists. However, I will use the SMTR as a proxy for the true marginal tax rate, even though some researchers prefer to use the effective tax rate.[11] The SMTR has fewer problems with interference due to investment decisions than the ETR. A low ETR can be a reason to invest in a specific country, but can also be the consequence of such investment in the country. The SMRT does not suffer from such interference and therefore indirectly controls for location-related investment decisions. The SMTRs for the OECD countries and the various non-OECD countries in my sample are retrieved from the KPMG Worldwide Corporate Tax Rate Survey over the period 1993 to 2006. The period from 2006 onwards is covered by data on global corporate tax rates and is provided by KPMG as well.[12]

Data on FDI between the U.S. and other countries is retrieved from the BEA as well. The Direct Investment and MNC section provides data on FDI for the 55 countries included in this study. The data covers the period 1999-2011 and is specified for different industries. With the help of this data I control for the influence of investments on intrafirm trade. Furthermore, net FDI data is divided by 1000 for interpretation purposes. Hence, the coefficients of these variables illustrate the effect on the intrafirm trade balance per billion USD.

Furthermore, exchange rate data and GDP data (to derive income growth) can be retrieved from the International Monetary Fund and the WorldBank, respectively. The exchange rate data is included due to its importance in the international trade environment. If the currency of country x appreciates relative to the currency of country, exporting from country x becomes relatively expensive, but importing becomes relatively cheaper. Therefore,

[11] Grubert and Mutti (1991), and Clausing (2003) use both the statutory tax rate as well as the ETR as a proxy for the marginal tax rate. Bernard and Weiner (1990) and Collins *et al*. (1998) use the ETR as an exogenous variable in their estimation. However, Hines and Rice (1994) use the statutory tax rate in their study.

[12] http://www.kpmg.com/global/en/services/tax/tax-tools-and-resources/pages/corporate-tax-rates-table.aspx

the (intrafirm) trade balance will be smaller than it would be without the appreciation of the currency of country x. The nominal exchange rate is included in order to measure a depreciation or an appreciation of the currency of country *i* relative to the U.S. dollar. The year 1999 counts as the base year for the time frame of this study (1999-2011). Furthermore, GDP data is included to control for the general economic environment. The growth rate of GDP is used in this study to transform the variable from a potential trending one to a stationary variable.

Last but not least, data on R&D expenditures is retrieved from the BEA database on multinational activity. The data on R&D expenditures covers the same period as the intrafirm trade balance data, namely 1999-2011. The R&D expenditures per industry are averaged over the period 1999-2011. Furthermore, R&D expenditures are divided by 1000 for interpretation purposes. Hence, the coefficients of these variables illustrate the effect on the intrafirm trade balance per billion USD. The data concerns U.S. parent companies and distinguishes between all industries in Table 3.

4.3. Data Description

This section focuses on the data used in this study to examine profit shifting behavior by U.S.-based MNEs, describes the main patterns that can be found by analyzing the data graphically, and provides descriptive statistics.

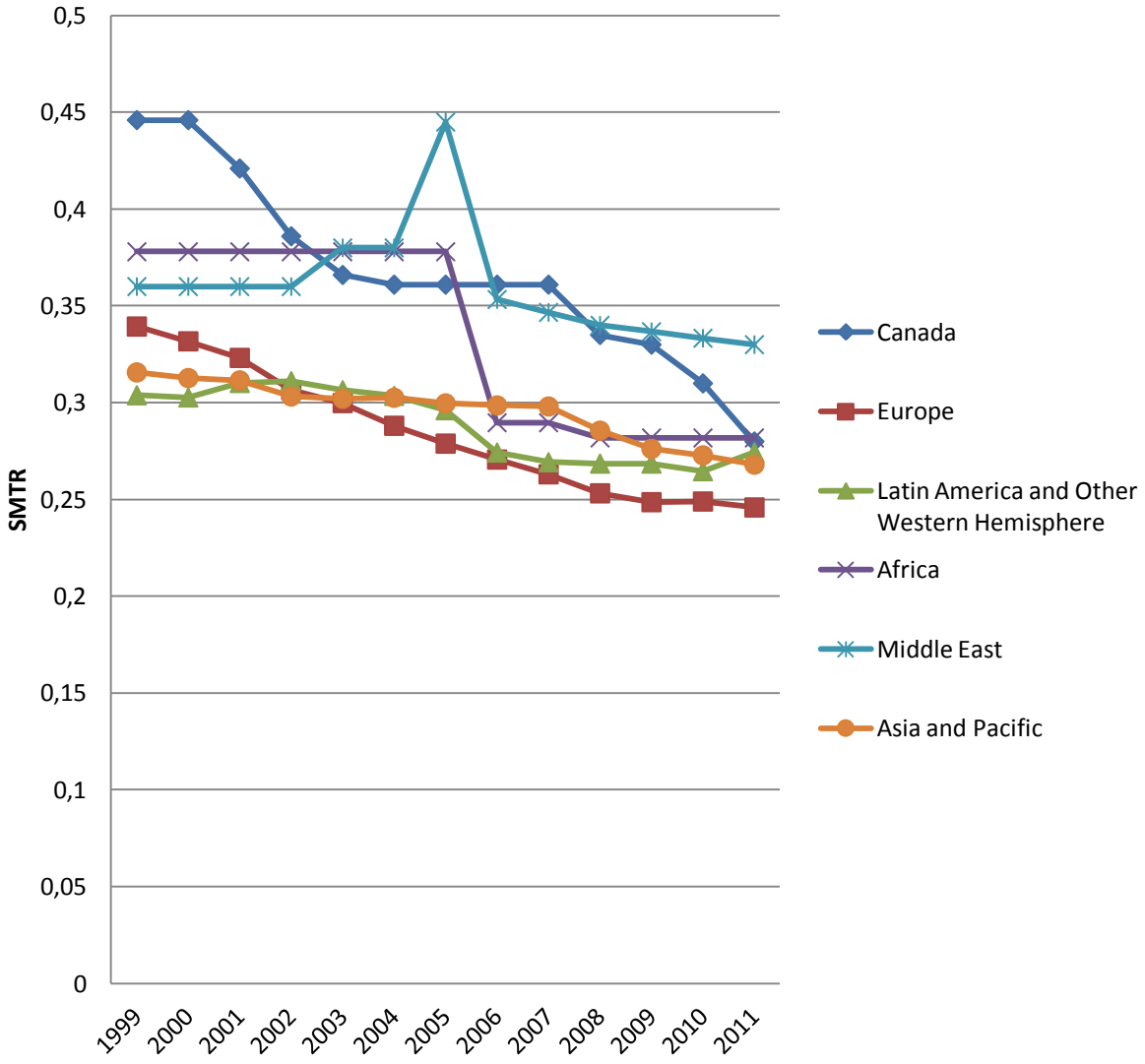
The most important variables in this study are the intrafirm trade balance and the $SMTR_f$. On the next page, I provide a figure that illustrates the relationship between the intrafirm trade balance, in total and per industry, and the $SMTR_f$ as found in the dataset. The vertical axis considers the intrafirm trade balance, denoted by ITB, and the horizontal axis considers the $SMTR_f$. Figure 1 illustrates a positive relationship between the intrafirm trade balance and the $SMTR_f$. There is a fair concentration around the zero line of the ITB with the $SMTR_f$ ranging from 0 to 0.55. As the figure shows, the more the $SMTR_f$ moves to the 40% CIT rate of the U.S., the less negative the ITB value. On the contrary, the more the $SMTR_f$ moves away from the U.S. CIT rate, the more negative the ITB value. Appendix 1 provides a similar figure for the intrafirm trade balance per industry and the $SMTR_f$.

Figure 1: Intrafirm Trade Balance and the SMTR

Below I present Figure 2 illustrating the time variation in the average SMTR per region over the time period 1999 to 2011. Figure 2 indicates a downward trend for the SMTRs (excluding the Middle East), indicating some sort of tax competition. In order to compare the different tax rates more easily, I choose to present the time variation per region, even though this study focuses on the SMTR of 55 countries relative to the SMTR of the U.S. It is important to note that a large group of countries do not show significant (variation of 2 percent) time variation during the period 1999 to 2011.[13] Furthermore, Bermuda is considered to be an outlier in the sample with a SMTR of 0%. In addition, Chile and United Arab Emirates seem to be the only countries that increased their SMTR during this period from 15% to 17% and 40% to 55%, respectively. The countries that have lowered their corporate tax rate the most in the period 1999 to 2011 are Russia, Germany, and Ecuador with more than 20 percentage points.

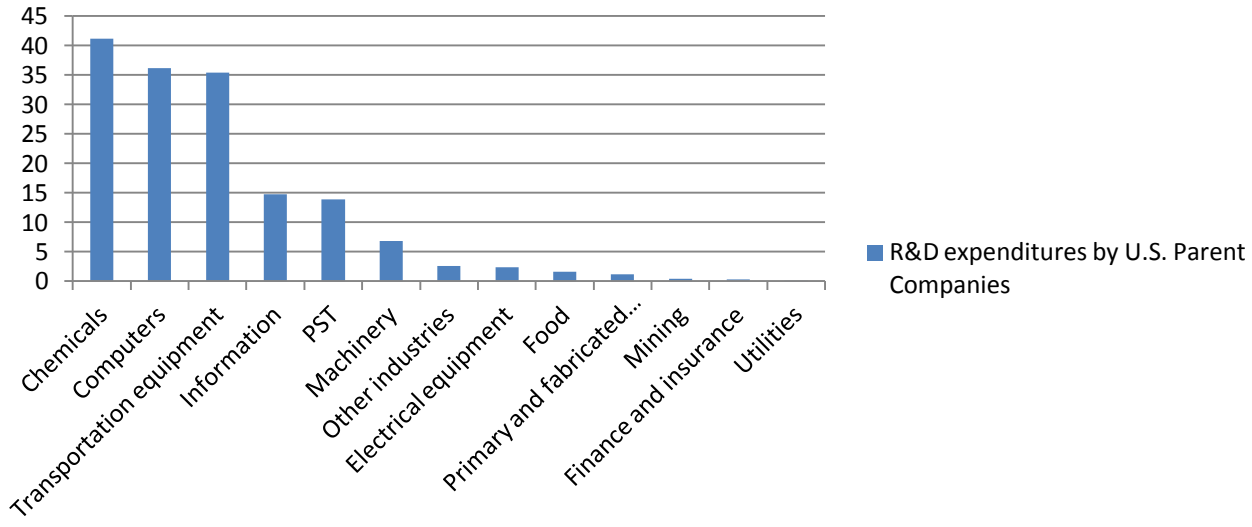
[13] Amongst them are Norway, Sweden, Argentina, Brazil, Colombia, Peru, Venezuela, Barbados, Dominican Republic, Bermuda, Egypt, Nigeria, Saudi Arabia, Hong Kong, and Thailand.

Figure 2: Statutory Marginal Tax Rates per Region



Furthermore, R&D expenditures are crucial to control for the heterogeneity between industries. Figure 3, on the next page, shows the R&D expenditures of U.S. parent companies per industry provided by the BEA. These R&D expenditures are averaged over the period 1999 to 2011. This figure shows that the industries one might expect to invest a lot in research and development have indeed the largest expenses. The expenditures range from 41,182 Million USD for the Chemicals industry to 49 Million USD for the Utilities industry. Considering this figure with the previous graph, might already lead to a small indication that industries that are R&D-intensive might be induced by tax reasons to shift profits to lower tax jurisdictions by transfer pricing practices.

Figure 3: R&D expenditures of U.S. Parent Companies per Industry (in billions USD)



Below I provide the summary statistics for the dataset used in this study.

Table 4

Summary Statistics

Variable	N	Mean	Standard Deviation
Intrafirm Trade Balance	6760	-0.004	0.014
Gross Domestic Product Growth	8580	1.095	0.124
$NetFDI_{t-1}$	8580	15.534	0.063
Nominal Exchange Rate (base year: 1999)	9295	1.125	0.609
Overall Trade Balance	6760	0.876	0.141
R&D expenditures	9295	12.082	14.789
Statutory Marginal Tax Rate	8697	0.293	0.076
Unaffiliated Trade Balance	8970	-0.105	0.504

5. RESULTS

In this section I will present the main econometric results obtained in the analysis of the relationship between taxation and the intrafirm trade balance (per industry). Before discussing the regression output, I will shortly comment on the correlation between the variables used in the regressions. The correlation matrix is presented on the next page.

As Table 5 illustrates, there is no strong correlation between the variables. Hence, the variables can be used together in the analysis without any risk of multicollinearity between the variables. The most significant correlation is between ITB and ITB_{t-1} with a value of 0.764.

In the tables below, I present the estimation output for several econometric specifications. The different tables provide the estimates for the coefficients in a standard pooled OLS model and a fixed effects model. As I mentioned before, the Hausman test rejects the null hypothesis that the random effects model is appropriate in all cases. As a result, the fixed effects model is preferred over the random effects model.[14] In addition, time variation of tax rates can be useful in measuring the effect of taxation on (individual) behavior, according to Triest (1998). Furthermore, the Durbin-Watson statistic is presented in the bottom of the table to test whether or not the econometric specifications suffers from strong time dependency. To correct for this measurement error, White-period standard errors are used. In addition, it is important to note that the coefficients and the standard errors are rescaled for convenience. All variables are multiplied by 100 (except the time lag of the intrafirm trade balance). Since the intrafirm trade balance is measured as a percentage, multiplying all variables by 100 results in the fact that all coefficients of the independent variables can be interpreted in terms of percentages. Similarly, the standard errors are also rescaled.

Each column provides the estimation results for different econometric specifications. The first five columns of Table 6 show the results of the OLS approach adopted by Clausing (2001). In each column an additional variable is added to see the sole effect of each variable. Ultimately, the specification of Clausing (2001) is presented in column (5). In all cases, the constant, the $SMTR_f$, the overall trade balance, and the unaffiliated trade balance are statistically significant at the 1% level. The magnitude of the $SMTR_f$ in column (5) is equal to 0.923. Hence, if the SMTR in country *i* changes by 1 percent relative to the U.S, the intrafirm

[14] The results for the random effects model are included in Appendix 2.

Table 5

Correlation matrix

	GDPGR	ITB	ITB_{t-1}	$NETFDI_{t-1}$	NOMEXCH99	OVERALLTB	R&Dexp	UNAFFTB	R&Dexp
GDPGR	1								
ITB	0.003	1							
	(0.79)								
ITB_{t-1}	-0.001	0.764	1						
	(0.94)	(0.00)							
$NETFDI_{t-1}$	-0.014	-0.023	-0.024	1					
	(0.29)	(0.07)	(0.07)						
NOMEXCH99	0.030	0.026	0.028	-0.011	1				
	(0.02)	(0.05)	(0.03)	(0.40)					
OVERALLTB	0.144	0.124	0.096	-0.213	0.066	1			
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)				
R&Dexp	0.000	-0.061	-0.058	0.000	0.000	0.000	1		
	(1.00)	(0.00)	(0.00)	(1.00)	(1.00)	(1.00)			
$SMTR_f$	-0.040	0.061	0.065	-0.194	0.100	0.207	0.000	1	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(1.00)		
UNAFFTB	-0.115	0.048	0.053	0.166	-0.012	-0.201	0.000	-0.130	1
	(0.00)	(0.00)	(0.00)	(0.00)	(0.35)	(0.00)	(1.00)	(0.00)	

p-values in parentheses.

Table 6
Clausing (2001) replication and expansion

ITB	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
C	-0.043***	-0.428***	-0.424***	-1.381***	-1.353***	-1.353	-1.320	-0.466***	-0.466***
	(0.00)	(0.08)	(0.08)	(0.12)	(0.19)	(0.84)	(0.19)	(0.12)	(0.12)
$SMTR_f$		1.275***	1.401***	0.954***	0.923***	0.923	0.881	0.063	0.101
		(0.26)	(0.26)	(0.26)	(0.26)	(0.74)	(0.28)	(0.18)	(0.18)
$SMTR_f$ *R&Dexp									-0.003
									(0.00)
OVERALLTB				1.274***	1.273***	1.273*	1.264*	0.533***	0.533***
				(0.13)	(0.13)	(0.74)	(0.13)	(0.09)	(0.09)
UNAFFTB			0.212***	0.315***	0.313***	0.313*	0.320*	0.073**	0.073**
			(0.05)	(0.05)	(0.05)	(0.18)	(0.05)	(0.03)	(0.03)
GDPGR					-0.046	-0.046	-0.055	-0.018	-0.018
					(0.14)	(0.06)	(0.14)	(0.09)	(0.09)
NOMEXCH99					0.028	0.028	0.028	0.002	0.002
					(0.03)	(0.02)	(0.03)	(0.02)	(0.02)
NETFDI(-1)							-0.008	0.074	0.074
							(0.03)	(0.02)	(0.02)
ITB(-1)								0.736***	0.736***
								(0.01)	(0.01)
Observations	6760	6526	6526	6526	6526	6526	6058	6058	6058
R^2	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.59	0.59
Durbin-Watson	0.47	0.48	0.48	0.49	0.49	0.49	0.48	2.27	2.27

Standard errors in parentheses (the specifications in columns 6 and 7 use White period standard errors); * shows significance at 10% level. ** shows significance at 5% level. and *** shows significance at 1% level.

trade balance between the U.S. and country *i* changes by around 0.9 percent. This is twice the magnitude measured by Clausing (2001), who reports a value of 0.518. However, she uses the ETR rather than the $SMTR_f$. As I mentioned above, I deem the $SMTR_f$ to be more appropriate for testing purposes since the $SMTR_f$, in contrast to the ETR, is less influenced by investment decision making. In addition, Clausing (2001) has only 449 observations her sample in contrast to the 6526 observations (715 observations if no division is made between industries) in this study. Furthermore, the R-squared of the econometric specifications in the first five columns hints on very low explanatory power and the Durbin-Watson statistic shows values of around 0.48, indicating strong time dependency within the model. As a result, I try to correct for this by using White-period standard errors. Clausing (2001) does not use White-period standard errors in her study. The specification of Clausing (2001) is reproduced, including these White-period standard errors, in column (6). The significant effect of the $SMTR_f$ (and the constant) on the intrafirm trade balance vanishes due to the use of corrected standard errors. Even the overall trade balance and the unaffiliated trade balance, which control for the quantity component within the intrafirm trade balance lose in terms of statistical significance. Both variables were significant at the 1% level, but now due to the use of White-period standard errors only at the 10% level. In column (7), I add the time lag of Net FDI. The time lag of Net FDI is not significant at all. As the table shows, the R-squared is still very low and the Durbin-Watson statistic shows strong time dependency within the model. Hence, I expand the econometric specification by adding the time lag of the intrafirm trade balance, ITB_{t-1}, in column 8. As is shown, the time lag of the intrafirm trade balance is statistically highly significant, namely at the 1% level. This variable captures a large amount of the time dependency within the model since the Durbin-Watson statistic now has a value of 2.27. As a result, the model is adjusted for autocorrelation and the R-squared increases to 0.59. Due to the inclusion of the time lag of the intrafirm trade balance and its significance from statistical point of view, the dynamic component of the model changes from a long term focus to a short term focus. Furthermore, the constant, the overall trade balance, and the unaffiliated trade balance coefficients are significant as well. However, the magnitude of the constant and the variables have more than halved and the unaffiliated trade balance is significant at the 5% level instead of the previous 1% level. Unfortunately, including the time lag of the intrafirm trade balance has resulted in the insignificance of the $SMTR_f$. Furthermore, the magnitude of the $SMTR_f$ has dropped enormously. Column (9) presents the estimates when the R&D expenditures per industry are added as an interaction term with the $SMTR_f$. By including this term, the $SMTR_f$ does not become significant again. To summarize,

I find a strongly significant positive relationship between the intrafirm trade balance and the $SMTR_f$ in the basic specification used by Clausing (2001). The magnitude of the effect in this study is 0.923, which is around twice the effect measured by Clausing (2001). This result implies that if the SMTR of country *i* changes with 1% (relative to the U.S.), the intrafirm trade balance increases by around 0.9%. The significant positive coefficient provides suggestive evidence for the underpricing (overpricing) of exports and overpricing (underpricing) of imports if the affiliate of the U.S.-based firm is located in a low (high) tax jurisdiction. However, if White-period standard errors are used to correct for the strong time dependency in the model, the effect of the $SMTR_f$ on the intrafirm trade balance vanishes. Including the time lag of the intrafirm trade balance, thereby controlling for the strong time dependency, does not result in a significant coefficient of the $SMTR_f$. As a result, there is only suggestive evidence of profit shifting behavior by U.S.-based MNEs through transfer pricing.

Table 7 on the next page provides the results for the econometric specifications including fixed effects. Columns (5a)-(5c) present the results for the baseline specification of Clausing (2001), adding both country and industry dummies in column (5a), country dummies in column (5b), and industry dummies in column (5c). In all specifications, time-period fixed effects are applied. The same holds true for columns (8a)-(8c), which are based on the econometric specification of column (8) in Table 6, and for columns (9a)-(9c), which are based on the econometric specification of column (9) in Table 6. As we can see from Table 6, the baseline model suffers from positive autocorrelation, illustrated by the Durbin-Watson statistic that has a value of 0.51 with both country and industry dummies added and 0.49 when only one of those dummies are added. As a result, I use White-period standard errors to correct for the strong time dependency. The R-squared for all specifications are very low indicating low explanatory power of the model. However, there is no statistical evidence of profit shifting behavior by U.S.-based MNEs through transfer pricing, illustrated by a statistically significant positive relationship between the intrafirm trade balance and the $SMTR_f$. The only variables that do show significant results are the overall trade balance, the unaffiliated trade balance, and income growth. These variables are statistically significant at the 10% level. However, it is interesting to see that the sign of the $SMTR_f$ changes from strongly negative (-0.803) to strongly positive (0.947) if country dummies are excluded. This might indicate that differences in profit shifting behavior, on aggregate, are more likely to be found between countries than between specific industries.

Table 7
Fixed Effects Model

ITB	(5a)	(5b)	(5c)	(8a)	(8b)	(8c)	(9a)	(9b)	(9c)
C	-0.504	-0.549	-1.116	-0.480	-0.493*	-0.368**	-0.333	-0.493*	-0.228
	(0.77)	(0.77)	(0.71)	(0.29)	(0.29)	(0.15)	(0.30)	(0.29)	(0.15)
$SMTR_f$	-0.803	-0.803	0.947	-0.480	-0.477	0.000	-0.978*	-0.438	-0.478**
	(0.64)	(0.64)	(0.75)	(0.52)	(0.52)	(0.19)	(0.54)	(0.52)	(0.24)
$SMTR_f$ *R&Dexp							0.041***	-0.003	0.040***
							(0.01)	(0.00)	(0.01)
OVERALLTB	1.071	1.071	1.284*	0.703***	0.700***	0.567***	0.704***	0.700***	0.570***
	(0.73)	(0.73)	(0.75)	(0.14)	(0.14)	(0.09)	(0.14)	(0.14)	(0.09)
UNAFFTB	-0.032	-0.032	0.321*	-0.108	-0.108	0.086**	-0.107	-0.108	0.087**
	(0.12)	(0.12)	(0.18)	(0.08)	(0.08)	(0.04)	(0.08)	(0.08)	(0.04)
GDPGR	-0.120	-0.120	-0.237*	-0.041	-0.040	-0.105	-0.041	-0.040	-0.106
	(0.09)	(0.09)	(0.14)	(0.12)	(0.12)	(0.11)	(0.12)	(0.12)	(0.11)
NOMEXCH99	-0.009	-0.009	0.030	-0.011	-0.011	-0.002	-0.011	-0.011	0.003
	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)	(0.03)	(0.04)	(0.02)
NETFDI(-1)[a]				0.153	0.154	0.106	0.153	0.154	0.105
				(0.04)	(0.04)	(0.00)	(0.00)	(0.00)	(0.00)
ITB(-1)				0.724***	0.730***	0.731***	0.721***	0.730***	0.727***
				(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Observations	6526	6526	6526	6058	6058	6058	6058	6058	6058
R^2	0.07	0.05	0.04	0.59	0.59	0.59	0.59	0.59	0.59
Durbin-Watson	0.51	0.49	0.49	2.26	2.27	2.27	2.26	2.27	2.26
Country dummies	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Industry dummies	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses (the specifications in columns 5a, 5b, and 5c use White period standard errors); * shows significance at 10% level, ** shows significance at 5% level, and *** shows significance at 1% level.

The econometric specifications in column (8a)-(8c) considers the variations in the fixed effects model with additional variables, namely the time lag of Net FDI and the time lag of the intrafirm trade balance. The reported values of the R-squared have a reasonable level of 0.59 to 0.66. Furthermore, the inclusion of the time lag of the intrafirm trade balance corrects for the strong time dependency within the model, illustrated by the increase of the Durbin-Watson statistic to values little above 2.00. As we can see from Table 7, the overall trade balance and the time lag of the intrafirm trade balance are statistically significant at the 1% level. Furthermore, the use of only industry dummies (excluding country dummies) within the time-period fixed effects model does have an impact on the effect of the $SMTR_f$. The magnitude increases from around -0.480 to a value marginally larger than zero. Again, excluding country dummies does result in the fact that the coefficient of the $SMTR_f$ is not negative anymore. This might indicate that differences in profit shifting behavior are more likely to be found between countries than between specific industries. Furthermore, due to the exclusion of country dummies, the unaffiliated trade balance has a statistically significant effect on the intrafirm trade balance. Considering the time-period fixed effects model, the unaffiliated trade balance has a magnitude of 0.084, which is significant at the 5% level. Employing the time-period fixed effects model including country dummies results in a negative coefficient of -0.108, which is not even significant at the 10% level. Unfortunately, there is no evidence found of profit shifting behavior by U.S.-based MNEs, through transfer pricing, in the relationship between the intrafirm trade balance and the $SMTR_f$ in specifications (8a)-(8c), illustrated by a significant coefficient.

If we then consider the econometric specification in columns (9a)-(9c), including the R&D expenditures as an interaction term with the $SMTR_f$, the results change a bit. If industry dummies are excluded (9b), the coefficient of the $SMTR_f$ and the coefficient of the $SMTR_f$ interacting with R&D expenditures are not statistically significant. If industry dummies are added in column (9a) and (9c), the $SMTR_f$ and the interaction term are statistically significant. With both country dummies and industry dummies added to the model (column (9a)), the $SMTR_f$ has a magnitude of -0.978, significant at the 10% level, and 0.041, significant at the 1% level, as an interaction term with R&D expenditures. In column (9c), including only industry dummies, the effect of the $SMTR_f$ on its own has halved but increased in terms of statistical significance. The effect of the $SMTR_f$ interacting with R&D expenditures is the same as in specification (9a), namely a highly significant coefficient of around 0.040. The results indicate a negative relationship between the $SMTR_f$ and the intrafirm trade balance.

However, the effect seems to depend on the level of R&D expenditures by U.S.-based MNEs, illustrated by the positive relationship between the interaction term (capturing industry heterogeneity) and the intrafirm trade balance. Since R&D expenditures differ significantly per industry, specification (9a) and (9c) might suggest differences in profit shifting behavior, through transfer pricing, per industry. On the other hand, the negative coefficient of the $SMTR_f$ implies the opposite effect on a consolidated basis. This might be the result of an offsetting effect by the quantity component of the intrafirm trade balance, which is not captured fully by the model, or a change in multinational behavior towards tax issues. MNEs might be trying to avoid (relatively) low tax jurisdictions due to possible controversy with tax authorities as a result of not meeting 'substance requirements' (especially in R&D-intensive industries). This can be linked to the fact that supranational legislation on transfer pricing was firstly introduced by the OECD in 1995 illustrating the desire of developed countries to tackle tax induced profit shifting behavior by MNEs cooperatively. According to Triest (1998) "tax reforms that change avoidance opportunities may change the way in which behavior responds to marginal tax rates." Since this study uses data for the period 1999-2011 ('post-TP Guidelines') and Clausing (2001) covers the period 1982-1994 ('pre-TP Guidelines'), these results might indicate changed behavior of MNEs regarding tax issues (concerning intangible assets). Evidence of such a cultural shift is provided by advisory firm EY in a global transfer pricing survey.[15] EY finds a clear trend in MNE's behavior from focusing on lowering (solely) the effective tax rate towards prioritizing risk management, illustrating the increased desire of MNEs to be compliant (due to economic and social pressures). Furthermore, the same pattern evolves with respect to the other variables, as was the case with the specifications in columns (8a)-(8c). The coefficients of the overall trade balance and the time lag of the intrafirm trade balance hardly changed. So, there is only suggestive evidence, using the fixed effects approach, of profit shifting behavior by U.S.-based MNEs, through transfer pricing, as suggested by economic theory. Moreover, it is interesting that the results indicate some sort of changed behavior of MNEs towards tax issues that might be dependent on the specific industry in which a MNE operates. The view of MNEs on tax induced profit shifting behavior might have changed over time due to more cooperation between tax authorities and effective supranational policies and/or legislation. Measuring the effect of such supranational policies and/or legislation (on specific tax issues) might be an interesting topic for future research.

[15] EY (2013) Navigating the choppy waters of international tax; 2013 Global Transfer Pricing Survey. Available at: http://www.ey.com/GL/en/Services/Tax/2013-Global-Transfer-Pricing-Survey

In appendix 3, I present the regression results of the pooled OLS and the fixed effects approach per industry. Column (a) contains the results for the pooled OLS approach and columns (b), (c), and (d) provide the results for period fixed effects, country fixed effects, and both time-period and country fixed effects, respectively. The industry dummy variable is added to the equation both as an interaction term with the $SMTR_f$ as well as on its own. Appendix 3 shows on the one hand that using the pooled OLS approach and/or including time dummies, thereby exploiting country-specific variation, results in the predicted positive relationship between the $SMTR_f$ and the intrafirm trade balance per industry. On the other hand, introducing country dummies, and thereby exploiting time-specific variation, results in a negative relationship between the $SMTR_f$ and the intrafirm trade balance per industry. Hence, the results might illustrate tax induced profit shifting behavior per industry (especially in case of the chemicals and computers industry) across countries, but the effects seems to be negative during the period 1999-2011. This might be due to increased attention to transfer pricing practices by tax authorities and the rise of global cooperation between governments addressing tax issues concerning MNEs as I mentioned above.

To summarize, the regression output shows some mixed results concerning the effect of the $SMTR_f$ on the intrafirm trade balance as hypothesized. Theory suggest a positive relationship between the $SMTR_f$ and the intrafirm trade balance, through the mechanism of transfer pricing by underpricing (overpricing) exports and overpricing (underpricing) imports if the U.S. trades with a low (high) tax jurisdiction. In the basic specification adopted by Clausing (2001), I find a positive, and significant, relation between the $SMTR_f$ and the intrafirm trade balance. However, if the basic specification is corrected for the strong time dependency within the model, the effect of the $SMTR_f$ vanishes. Furthermore, adding country and industry dummies to the time-period fixed effects model and adding R&D expenditures as an interaction term with the $SMTR_f$ does not provide strong statistical evidence of profit shifting behavior by U.S.-based MNEs through transfer pricing as suggested by theory. In contrast, the coefficient of the $SMTR_f$ on its own is negative and statistically significant in some cases. As I mentioned above, this might be due to a cultural shift with MNEs at the tax policy level regarding profit allocation. This is also supported by a global survey study executed by advisory firm EY. In addition, industry heterogeneity does seem to have a non-negligible effect on profit shifting behavior illustrated by the industry specific results for the R&D-intensive chemicals and computers industry.

6. Conclusion

Profit shifting behavior of MNEs has recently drawn a lot of media attention and therefore attention of society as a whole. One of the main concepts of profit shifting behavior from a tax perspective is transfer pricing, which is the setting of prices on international intrafirm transactions to minimize the combined effects of taxes on a firm's global profits. When this valuation process is not conducted at arm's length, tax authorities will adjust the tax returns so MNEs pay the right and fair amount of taxes in each jurisdiction in which they operate. In order to improve and smooth the audit process by tax authorities, the OECD, as an international platform for policymakers for all kinds of economical and political issues, has published the BEPS Action Plan. This report describes how governments (and business partners) can work together on several tax related issues in order to tackle non acceptable tax induced profit shifting behavior by MNEs.

This study focuses on documenting tax induced profit shifting behavior, through transfer pricing, by U.S.-based MNEs for the period 1999-2011. In addition, I try to distinguish between transfer pricing activity between 13 different industries. In order to do so, I examine the intrafirm trade balances between the U.S. and 55 different countries, on aggregate and per industry, and regress them on the statutory marginal (corporate) tax rate.

Theory suggests that U.S. intrafirm trade balances will be less favorable, if host-country taxes are low and firms systematically employ transfer pricing to shift profits to low-tax countries, since intrafirm exports from the U.S. are underpriced and intrafirm imports into the U.S. are overpriced. As a result, if the statutory marginal tax rate of country *i* decreases (increases) the intrafirm trade balance will decrease (increase) if the affiliate is established in a low (high) tax jurisdiction. Hence, if tax-motivated transfer pricing is important, the coefficient of the $SMTR_f$ is expected to be positive. The regression output provides mixed results concerning tax induced profit shifting behavior, through transfer pricing, on a consolidated basis. On the one hand, some results show a clear positive relationship. A 1% increase of the SMTR in country *i* results in a 0.9% increase in the intrafirm trade balance of the U.S. and country *i*. On the other hand, if the basic econometric specification is corrected for autocorrelation, the significant effect of the statutory marginal tax rate of country *i* on the intrafirm trade balance vanishes. Hence, there is only suggestive evidence that supports the theory of tax induced profit shifting behavior, through transfer pricing, by underpricing U.S.

exports to related parties in low tax jurisdictions and overpricing U.S. imports from related parties in low tax jurisdictions.

Furthermore, theory also suggests that the more important intangible assets are for a specific industry (e.g. the pharmaceutical industry), the higher the degree of profit shifting behavior. This study indicates a difference in profit shifting behavior, through transfer pricing, between industries. Industry heterogeneity does seem to play an important role regarding profit shifting behavior through the transfer pricing mechanism. However, a strong positive, and significant, relationship between the statutory marginal tax rate of country *i* and the intrafirm trade balance is only found for the chemicals industry. An increase in the statutory marginal tax rate of country *i* of 1% (relative to the statutory marginal tax rate of the U.S.) results in an increase of around 2.8% of the intrafirm trade balance, between the U.S. and country *i*, for the chemicals industry. Further research should focus on these industry differences in order to define the different practices, as much as possible, through which MNEs try to shift profits to low tax jurisdictions away from high tax jurisdictions in which the real economic activity takes place. Even though it is difficult to provide reliable and consistent estimates on how corporate behavior is influenced by taxation, the importance of documenting empirical research in the field of taxation cannot be underestimated due to its socio-political relevance.

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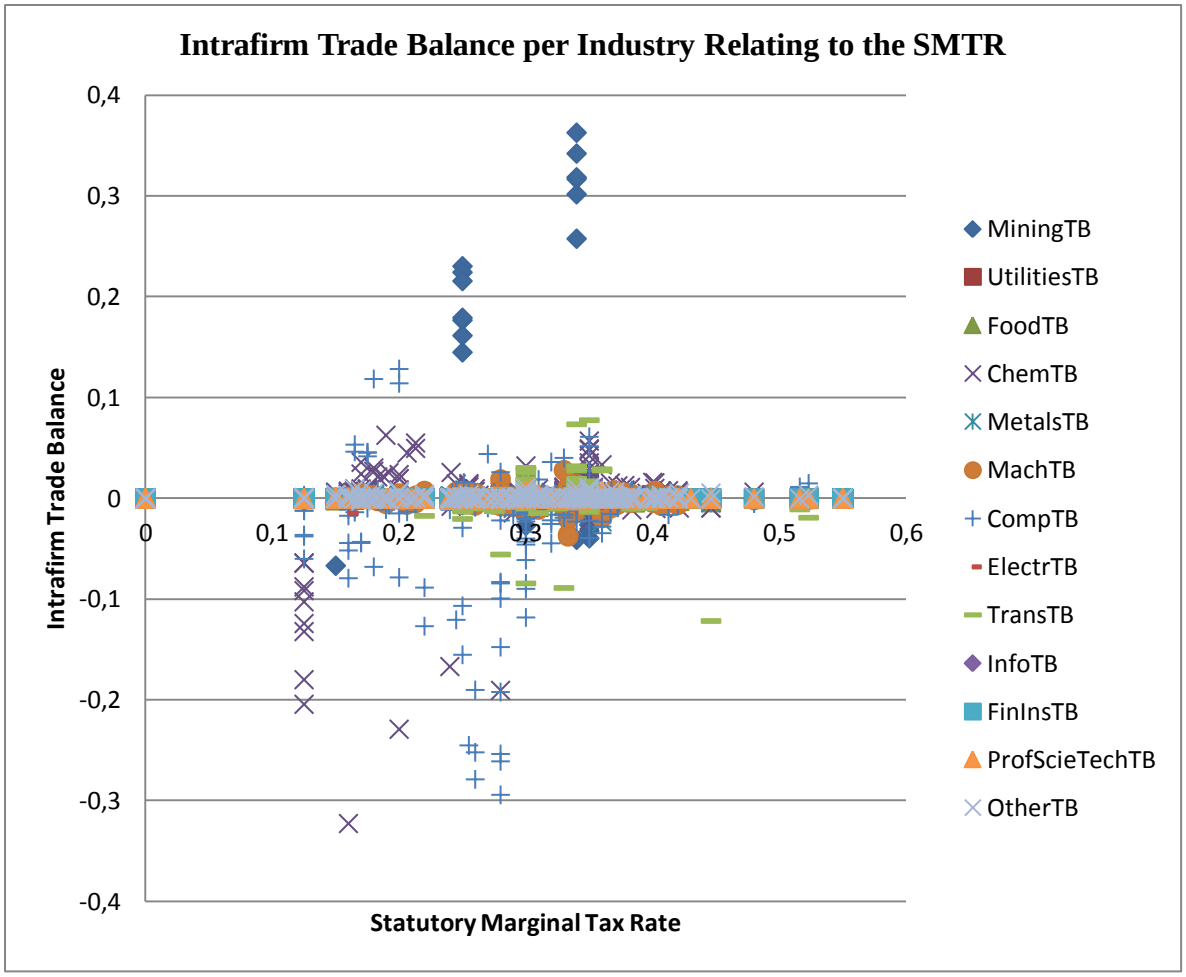
APPENDIX

Appendix 1



Appendix 2

Table 7.1
Random Effects Model

ITB	(5a)	(5b)	(5c)	(8a)	(8b)	(8c)	(9a)	(9b)	(9c)
C		-1.353	-0.881		-0.466***	-0.466***		-0.466***	-0.466***
		(0.84)	(0.58)		(0.12)	(0.12)		(0.12)	(0.12)
$SMTR_f$		0.923	-0.145		0.063	0.063		0.101	0.101
		(0.74)	(0.37)		(0.18)	(0.17)		(0.18)	(0.17)
$SMTR_f$ *R&Dexp								-0.003	-0.003***
								(0.00)	(0.00)
OVERALLTB		1.273*	1.088		0.533***	0.533***		0.533***	0.533***
		(0.74)	(0.66)		(0.09)	(0.08)		(0.09)	(0.08)
UNAFFTB		0.313*	0.014		0.073**	0.073**		0.073**	0.073**
		(0.18)	(0.10)		(0.03)	(0.03)		(0.03)	(0.03)
GDPGR		-0.046	-0.055		-0.018	-0.018		-0.018	-0.018
		(0.06)	(0.05)		(0.09)	(0.08)		(0.09)	(0.08)
NOMEXCH99		0.028	-0.009		0.002	0.002		0.002	0.002
		(0.02)	(0.02)		(0.02)	(0.02)		(0.02)	(0.02)
NETFDI(-1)[a]					0.074	0.074		0.074	0.074
					(0.02)	(0.02)		(0.02)	(0.02)
ITB(-1)					0.736***	0.736***		0.736***	0.736***
					(0.01)	(0.01)		(0.01)	(0.01)
Observations		6526	6526		6058	6058		6058	6058
R^2		0.02	0.01		0.59	0.59		0.59	0.59
Durbin-Watson		0.49	0.99		2.27	2.27		2.27	2.27
Hausman test p-value		0.45	0.02		0.08	0.00		0.12	0.00
Cross-section fixed		No	Yes		No	Yes		No	Yes
Time-period fixed		Yes	No		Yes	No		Yes	No

Standard errors in parentheses (the specifications in columns 5b and 5c use White period standard errors); * shows significance at 10% level, ** shows significance at 5% level, and *** shows significance at 1% level.
Unbalanced data set does not allow for two way random effects approach.

Appendix 3

Table 8
Industry Dummies

	Mining				Utilities				Food			
ITB (per industry)	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)
C	-0.500***	-0.496***	-0.651***	-0.565***	-0.490***	-0.486***	-0.651***	-0.565***	-0.490***	-0.486***	-0.651***	-0.565***
	(0.09)	(0.09)	(0.17)	(0.19)	(0.09)	(0.09)	(0.17)	(0.19)	(0.09)	(0.09)	(0.17)	(0.19)
$SMTR_f$	0.119	0.054	-0.386	-0.724	0.088	0.024	-0.396	-0.734	0.089	0.024	-0.430	-0.768
	(0.19)	(0.20)	(0.39)	(0.50)	(0.19)	(0.20)	(0.39)	(0.50)	(0.19)	(0.20)	(0.39)	(0.50)
$SMTR_f$ *Industry Dummy	-0.660	-0.660	0.648	0.648	-0.263	-0.263	0.783	0.782	-0.270	-0.270	1.219	1.219
	(0.65)	(0.65)	(1.33)	(1.33)	(0.65)	(0.65)	(1.33)	(1.33)	(0.65)	(0.65)	(1.33)	(1.33)
OVERALLTB	0.531***	0.551***	0.803***	0.825***	0.531***	0.551***	0.803***	0.825***	0.531***	0.551***	0.803***	0.825***
	(0.08)	(0.09)	(0.13)	(0.13)	(0.08)	(0.09)	(0.13)	(0.13)	(0.08)	(0.09)	(0.13)	(0.13)
UNAFFTB	0.074**	0.086**	-0.123*	-0.085	0.074**	0.086**	-0.123*	-0.085	0.074**	0.086**	-0.123*	-0.085
	(0.03)	(0.04)	(0.07)	(0.07)	(0.03)	(0.04)	(0.07)	(0.07)	(0.03)	(0.04)	(0.07)	(0.07)
NETFDI(-1)[a]	0.074	0.106	0.006	0.163	0.074	0.106	0.006	0.163	0.074	0.106	0.006	0.163
	(0.17)	(0.17)	(0.39)	(0.40)	(0.17)	(0.17)	(0.39)	(0.40)	(0.17)	(0.17)	(0.39)	(0.40)
ITB(-1)	0.736***	0.736***	0.455***	0.456***	0.736***	0.736***	0.455***	0.456***	0.736***	0.736***	0.455***	0.456***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Industry Dummy	0.220	0.220			0.091	0.09			0.09	0.088		
	(0.20)	(0.20)			(0.20)	(0.20)			(0.20)	(0.20)		
Observations	6058	6058	6058	6058	6058	6058	6058	6058	6058	6058	6058	6058
R^2	0.59	0.59	0.66	0.66	0.59	0.59	0.66	0.66	0.59	0.59	0.66	0.66
Durbin-Watson	2.27	2.27	2.04	2.04	2.27	2.27	2.04	2.04	2.27	2.27	2.04	2.04
Cross-section fixed	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Time-period fixed	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Standard errors in parentheses; * shows significance at 10% level, ** shows significance at 5% level, and *** shows significance at 1% level.

Table 8
Industry Dummies (continued)

	Chemicals				Metals				Machinery			
ITB (per industry)	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)
C	-0.428***	-0.424***	-0.651***	-0.565***	-0.491***	-0.487***	-0.651***	-0.565***	-0.495***	-0.491***	-0.651***	-0.565***
	(0.09)	(0.09)	(0.17)	(0.19)	(0.09)	(0.09)	(0.17)	(0.19)	(0.09)	(0.09)	(0.17)	(0.19)
$SMTR_f$	-0.144	-0.207	-0.069	-0.406	0.091	0.027	-0.378	-0.715	0.103	0.039	-0.398	-0.736
	(0.19)	(0.20)	(0.39)	(0.50)	(0.19)	(0.20)	(0.39)	(0.50)	(0.86)	(0.20)	(0.39)	(0.50)
$SMTR_f$ *Industry Dummy	2.831***	2.827***	-3.486***	-3.485***	-0.302	-0.302	0.543	0.543	-0.461	-0.461	0.808	0.808
	(0.65)	(0.65)	(1.33)	(1.33)	(0.65)	(0.65)	(1.33)	(1.33)	(0.65)	(0.65)	(1.33)	(1.33)
OVERALLTB	0.537***	0.556***	0.803***	0.825***	0.531***	0.551***	0.803***	0.825***	0.531***	0.551***	0.803***	0.825***
	(0.08)	(0.09)	(0.13)	(0.13)	(0.08)	(0.09)	(0.13)	(0.13)	(0.08)	(0.09)	(0.13)	(0.13)
UNAFFTB	0.076**	0.088**	-0.123*	-0.085	0.074**	0.086**	-0.123*	-0.085	0.074**	0.086**	-0.123*	-0.085
	(0.03)	(0.04)	(0.07)	(0.07)	(0.03)	(0.04)	(0.07)	(0.07)	(0.03)	(0.04)	(0.07)	(0.07)
NETFDI(-1)[a]	0.074	0.105	0.006	0.163	0.074	0.106	0.006	0.163	0.074	0.106	0.006	0.163
	(0.17)	(0.17)	(0.39)	(0.40)	(0.17)	(0.17)	(0.39)	(0.40)	(0.17)	(0.17)	(0.39)	(0.40)
ITB(-1)	0.731***	0.731***	0.455***	0.455***	0.736***	0.736***	0.456***	0.456***	0.736***	0.736***	0.455***	0.456***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Industry Dummy	-0.795***	-0.793***			0.104	0.104			0.151	0.151		
	(0.20)	(0.20)			(0.20)	(0.20)			(0.20)	(0.20)		
Observations	6058	6058	6058	6058	6058	6058	6058	6058	6058	6058	6058	6058
R^2	0.59	0.59	0.66	0.66	0.59	0.59	0.66	0.66	0.59	0.59	0.66	0.66
Durbin-Watson	2.27	2.27	2.04	2.04	2.27	2.27	2.04	2.04	2.27	2.27	2.04	2.04
Cross-section fixed	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Time-period fixed	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Standard errors in parentheses; * shows significance at 10% level, ** shows significance at 5% level, and *** shows significance at 1% level.

Table 8
Industry Dummies (continued)

	Computers				Electro				Transportation			
ITB (per industry)	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)
C	-0.454***	-0.450***	-0.651***	-0.565***	-0.491***	-0.487***	-0.651***	-0.565***	-0.493***	-0.489***	-0.651***	-0.565***
	(0.09)	(0.09)	(0.17)	(0.19)	(0.09)	(0.09)	(0.17)	(0.19)	(0.09)	(0.09)	(0.17)	(0.19)
$SMTR_f$	0.003	-0.060	0.000	-0.337	0.091	0.027	-0.378	-0.716	0.103	0.039	-0.302	-0.640
	(0.19)	(0.20)	(0.39)	(0.50)	(0.19)	(0.20)	(0.39)	(0.50)	(0.19)	(0.20)	(0.39)	(0.50)
$SMTR_f$ *Industry Dummy	0.933	0.931	-4.394***	-4.393***	-0.305	-0.304	0.548	0.548	-0.463	-0.463	-0.444	-0.444
	(0.65)	(0.65)	(1.33)	(1.33)	(0.65)	(0.65)	(1.33)	(1.33)	(0.65)	(0.65)	(1.33)	(1.33)
OVERALLTB	0.537***	0.556***	0.804***	0.826***	0.531***	0.551***	0.803***	0.825***	0.531***	0.551***	0.803***	0.825***
	(0.08)	(0.09)	(0.13)	(0.13)	(0.08)	(0.09)	(0.13)	(0.13)	(0.08)	(0.09)	(0.13)	(0.13)
UNAFFTB	0.076**	0.088**	-0.123*	-0.085	0.074**	0.086**	-0.123*	-0.085	0.074**	0.086**	-0.123*	-0.085
	(0.03)	(0.04)	(0.07)	(0.07)	(0.03)	(0.04)	(0.07)	(0.07)	(0.03)	(0.04)	(0.07)	(0.07)
NETFDI(-1)[a]	0.074	0.105	0.006	0.163	0.074	0.106	0.006	0.163	0.074	0.106	0.006	0.163
	(0.17)	(0.17)	(0.39)	(0.40)	(0.17)	(0.17)	(0.39)	(0.40)	(0.17)	(0.17)	(0.39)	(0.40)
ITB(-1)	0.730***	0.730***	0.453***	0.453***	0.736***	0.736***	0.456***	0.456***	0.736***	0.736***	0.456***	0.456***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Industry Dummy	-0.475**	-0.475**			0.101	0.101			0.129	0.129		
	(0.20)	(0.20)			(0.20)	(0.20)			(0.20)	(0.20)		
Observations	6058	6058	6058	6058	6058	6058	6058	6058	6058	6058	6058	6058
R^2	0.59	0.59	0.66	0.66	0.59	0.59	0.66	0.66	0.59	0.59	0.66	0.66
Durbin-Watson	2.27	2.27	2.03	2.03	2.27	2.27	2.04	2.04	2.27	2.27	2.04	2.04
Cross-section fixed	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Time-period fixed	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Standard errors in parentheses; * shows significance at 10% level, ** shows significance at 5% level, and *** shows significance at 1% level.

Table 8
Industry Dummies (continued)

	Information				Finance and Insurance				PST			
ITB (per industry)	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)
C	-0.489***	-0.485***	-0.651***	-0.565***	-0.490***	-0.486***	-0.651***	-0.565***	-0.489***	-0.485***	-0.651***	-0.565***
	(0.09)	(0.09)	(0.17)	(0.19)	(0.09)	(0.09)	(0.17)	(0.19)	(0.09)	(0.09)	(0.17)	(0.19)
$SMTR_f$	0.086	0.022	-0.403	-0.740	0.088	0.024	-0.396	-0.734	0.084	0.019	-0.411	-0.749
	(0.19)	(0.20)	(0.39)	(0.50)	(0.19)	(0.20)	(0.39)	(0.50)	(0.19)	(0.20)	(0.39)	(0.50)
$SMTR_f$ *Industry Dummy	-0.237	-0.236	0.864	0.864	-0.260	-0.260	0.783	0.783	-0.204	-0.204	0.976	0.976
	(0.65)	(0.65)	(1.33)	(1.33)	(0.65)	(0.65)	(1.33)	(1.33)	(0.65)	(0.65)	(1.33)	(1.33)
OVERALLTB	0.531***	0.551***	0.803***	0.825***	0.531***	0.551***	0.803***	0.825***	0.531***	0.551***	0.803***	0.825***
	(0.08)	(0.09)	(0.13)	(0.13)	(0.08)	(0.09)	(0.13)	(0.13)	(0.08)	(0.09)	(0.13)	(0.13)
UNAFFTB	0.074**	0.086**	-0.123	-0.085	0.074**	0.086**	-0.123*	-0.085	0.074**	0.086**	-0.123*	-0.085
	(0.03)	(0.04)	(0.07)	(0.07)	(0.03)	(0.04)	(0.07)	(0.07)	(0.03)	(0.04)	(0.07)	(0.07)
NETFDI(-1)[a]	0.074	0.106	0.006	0.163	0.074	0.106	0.006	0.163	0.074	0.106	0.006	0.163
	(0.17)	(0.17)	(0.39)	(0.40)	(0.17)	(0.17)	(0.39)	(0.40)	(0.17)	(0.17)	(0.39)	(0.40)
ITB(-1)	0.736***	0.736***	0.455***	0.456***	0.736***	0.736***	0.455***	0.456***	0.736***	0.736***	0.455***	0.456***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Industry Dummy	0.085	0.085			0.090	0.089			0.078	0.077		
	(0.20)	(0.20)			(0.20)	(0.20)			(0.20)	(0.20)		
Observations	6058	6058	6058	6058	6058	6058	6058	6058	6058	6058	6058	6058
R^2	0.59	0.59	0.66	0.66	0.59	0.59	0.66	0.66	0.59	0.59	0.66	0.66
Durbin-Watson	2.27	2.27	2.04	2.04	2.27	2.27	2.04	2.04	2.27	2.27	2.04	2.04
Cross-section fixed	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Time-period fixed	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Standard errors in parentheses; * shows significance at 10% level, ** shows significance at 5% level, and *** shows significance at 1% level.

Table 8
Industry Dummies (continued)

	Other			
ITB (per industry)	(a)	(b)	(c)	(d)
C	-0.491***	-0.487***	-0.651***	-0.565***
	(0.09)	(0.09)	(0.17)	(0.19)
$SMTR_f$	0.087	0.023	-0.423	-0.761
	(0.19)	(0.20)	(0.39)	(0.50)
$SMTR_f$ *Industry Dummy	-0.248	-0.247	1.129	1.129
	(0.65)	(0.65)	(1.33)	(1.33)
OVERALLTB	0.531***	0.551***	0.803***	0.825***
	(0.08)	(0.09)	(0.13)	(0.13)
UNAFFTB	0.074**	0.086**	-0.123*	-0.085
	(0.03)	(0.04)	(0.07)	(0.07)
NETFDI(-1)[a]	0.074	0.106	0.006	0.163
	(0.17)	(0.17)	(0.39)	(0.40)
ITB(-1)	0.736***	0.736***	0.455***	0.456***
	(0.01)	(0.01)	(0.01)	(0.01)
Industry Dummy	0.103	0.103		
	(0.20)	(0.20)		
Observations	6058	6058	6058	6058
R^2	0.59	0.59	0.66	0.66
Durbin-Watson	2.27	2.27	2.04	2.04
Cross-section fixed	No	No	Yes	Yes
Time-period fixed	No	Yes	No	Yes

Standard errors in parentheses; * shows significance at 10% level, ** shows significance at 5% level, and *** shows significance at 1% level.