

**Profit Shifting through Transfer Pricing:
Evidence from 16 OECD Countries (1979-2005)**

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Abstract

The rise in the number of multinationals enterprises has induced interdependency not only in markets and production across countries but also within multinational groups. Transactions that occur within these groups offer incentives to maximize global profits through profit shifting to tax favourable jurisdictions. Evidence shows that MNEs take advantage of tax differentials across countries to minimize their global tax liabilities through transfer pricing, this is a cause for great concern for governments since profit shifting significantly reduces their tax revenues. The OECD along with authorities in member and non-member countries have been persistent in combating profit shifting activities through setting regulations and developing income reporting standards such as country-by-country reporting. This study examines 16 OECD countries to present compelling evidence of profit shifting in response to corporate tax differentials. I use the approach employed by Bartelsman and Beetsma (2013) to disentangle the effects of tax rates on profit shifting from those on real economic activity. My estimates suggest that a large portion of revenue is lost from a unilateral increase in combined corporate tax rate. Moreover, the coefficient estimates for the last sub-period under analysis (1998-2005) reveal that the efforts to combat profit shifting are effective.

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Introduction

Multinational enterprises (MNEs), through extending their corporate networks across borders, have and continue to play an essential role in globalization. The earliest evidence of this comes from the surge of foreign direct investment (FDI) during the 1980s.¹ According to Bonturi and Fukasaku (1993), "markets and production across countries have become more inter-dependent through trade in tangible/ intangible goods, services, flows of capital, and exchanges of technology." As MNEs have established their branches and subsidiaries around the world, the flows of international trade that is carried out within MNE groups² has also increased, meaning that goods and services are traded around the globe without a change of ownership. Kobetsky (2008) found that in the 1980s inter-company³ trade amounted to about 25% of world trade, whereas in 2006, it was estimated to be as high as 60%. In a business environment where most MNE's day-to-day operations rely on cross-border intercompany transactions, transfer pricing has become one of the most important tax issues not only for MNEs but also for tax authorities around the globe.⁴ In a survey of 47 countries Borkowski (1997) found substantial evidence that transfer pricing is a growing cause of concern for both developed and developing countries.⁵ Transfer prices⁶ are one of the factors which determine

¹ "The annual compound growth rate of world FDI flows during the 1983-89 period was estimated to be 28.9 percent by the United Nations Centre on Transnational Corporations." (Graham & Krugman, 1993)

² A group of associated companies with business establishments in two or more countries.

³ Intercompany transactions are between two or more related legal entities with common control, (Inter = Latin for "BETWEEN").

⁴ Global Transfer Pricing Surveys reveal transfer pricing to be an "absolutely critical" tax issue.

⁵ She explains that some developing countries, due to fear of losing foreign direct investments, vote against implementing strict transfer pricing regulations. See also Fuest and Riedel (2010) for more on profit shifting out of developing countries.

⁶ "Transfer prices are the prices at which services, tangible property, and intangible property are traded across international borders between related parties." (Canada Revenue Agency, 1999)

the distribution of reported income across MNE groups. This is important to MNEs because they want to minimize their global tax liability while tax authorities on the other hand, are concerned with maximizing their tax revenues.⁷

Transfer pricing is a complex but neutral concept; it refers to establishing a price charged or paid upon transfer of assets or provision of services in a transaction between related parties that adheres to the arm's length principle.⁸ This is particularly complicated when transactions are for firm-specific assets such as services and intellectual property (IP). Increasingly so, transfer pricing has become an issue that is linked to the malpractice of shifting profits in pursuit of minimizing tax liabilities. The shifting of profits has induced a downward trend in corporate tax rates around the world as governments compete to keep taxable profit from leaving their borders, providing verification to Michael Devereux's statement,

If I can make a bold prediction, I would say that corporate taxes will eventually just wither – there will be no corporate tax at all, partly because of the process of competition between states and partly as companies can organize their affairs effectively to reduce their corporation tax. (House of Lords, 1999)

For this reason, the OECD has instigated a great amount of effort ensuring that both member and non-member countries implement and uphold regulations to combat profit shifting "ensuring that profits are taxed where economic activity occurs and where value is created", (OECD, 2017a). Despite these efforts, differences across countries regarding how arm's length prices should be determined, documented and what penalties applied upon noncompliance still

⁷ See Dharmapala (2014) for insight into the tax revenue consequences arising from profit shifting in the literature.

⁸ In the OECD glossary of statistical terms the arm's length is described as a "valuation principle commonly applied to commercial and financial transactions between related companies. It says that transactions should be valued as if they had been carried out between unrelated parties, each acting in his own best interest." (OECD, 2007)

exist. In a later study of 20 OECD countries, over a period of 40 years Michael Devereux (2006) did observe an overall downward trend in corporate tax rates since the 1980s; however, he states that “the prospect of rates falling to zero still seem distant.” Additionally, he also observes that on average revenue as a percentage of GDP is higher than at almost any time in the last 40 years.

Before 1979, administrative guidance on the application of legal enforcements related to transfer pricing was limited. With the increase of MNEs and the increase of transactions within MNE groups throughout the sixties, the OECD produced a report in 1979 entitled, *Transfer Pricing and Multinational Enterprises*. The intent of the report was not to provide detailed guidelines on regulating transfer prices, but rather to identify the challenges transfer pricing can introduce and propose some considerations and practices for determining transfer prices. Five years later, in 1984, the OECD published a second report, comprised of three topics; the mutual-agreement procedure, transfer pricing in the banking sector and the allocation of central costs. The 1984 report is an elaboration of its predecessor, which further defines key aspects of transfer pricing. By further revising the reports the New OECD Guidelines were published in July of 1995 entitled, *Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations*. In 2009, a partial update was made to reveal the adoption of the updated *Model Tax Convention* in 2008. The guidelines were extensively revised in 2010 and more recently this year (2017) on July 10th.

This paper explores how tax rate differences across countries impact the probability of profit shifting via transfer pricing of intercompany transactions, which is measured in this paper

by the value-labor ratio. The analysis examines ten manufacturing sectors within 16 OECD countries over the period 1979 - 2005. The primary sources of data are the OECD Structural Analysis (STAN) and tax databases. There are four different specifications of the regression model. The first looks solely at the effect of weighted combined corporate tax rate differences on the value-labor ratio, considering country and time fixed effects. The second specification adds sector fixed effects, then transfer pricing enforcement variables and the annual GDP growth rate are added in the third and fourth specifications to make the model more robust. Across all four specifications the results indicate that there is a negative relationship between corporate tax rate differentials and value-labor ratio that is both economically and statistically significant. This suggests that a relative increase in a country's tax rate leads MNEs to claim lower transfer prices relative to arm's length prices and under-report their profits in that country.⁹ My paper extends Bartelsman and Beetsma's (2003) analysis by including data for an additional eight years (1998-2005). In a variation of my final regression specifications, I analyze three sub-periods to find evidence that profit shifting activities have subsided in the final sub-period (1997-2005), conceivably due to the efforts exerted by authorities in OECD member and non-member countries to combat profit shifting.

The structure of this paper is as follows: section 2 provides an overview of previous literature on evidence of profit shifting and more specifically, profit shifting via transfer pricing. Section 3 describes the methodology borrowed from Bartelsman and Beetsma (2003) for the

⁹ For example, consider a simplified case with two countries A and B. If country A's tax rate τ_A increases from 30% to 31%, while country B's (τ_B) remains unchanged at 20% this implies an increase in $\tau^d = \tau^A - \tau^B$ from 10% to 11%, meaning that an MNE in country A has a larger incentive to shift profits to country B. To do so the MNE will claim a lower transfer price relative to the arm's length price in country A in order to under-report profits, which in return lowers the value-labor ratio.

empirical motivation of this paper, section 4 details the data sources and descriptive statistics. Section 5 presents the econometric model used to conduct the empirical analysis, for which the results are explored in section 6 along with regression variations and robustness checks. Finally, section 7 concludes the paper.

Previous Literature

Profit shifting behaviour of MNEs is largely undisputed in the current literature. The meta-analysis of 25 empirical studies¹⁰ by Heckemeyer and Overesch (2013) reveals that the profitability of MNEs responds systematically to international tax rate differentials. They conduct a meta-regression analysis and arrive at the prediction that a one percentage point increase in the tax differential leads to a decrease in reported profits by approximately 0.8 percent. Their results support Hines (1997) who iterates quantitative studies examining whether firms operating in relatively low tax jurisdictions are more profitable than those in high tax jurisdictions¹¹ and finds tax rates and profitability to be negatively correlated.

The current literature; however, provides various, even contradicting conclusions about the different types of channels through which profit shifting occurs. MNEs can shift profits to a tax favorable jurisdictions via three main channels;¹² intra-group loan agreements,¹³

¹⁰ Empirical studies included cover periods dating as far back as 1982 till as recently as 2005, based on six different databases which contain data on different types of firms and geographic regions.

¹¹ This way of looking at profit shifting is regarded as an indirect measure of the matter.

¹² For details about all three channels refer to the Center for European Economic Research Taxation Papers entitled "The Impact of Tax Planning on Forward-Looking Effective Tax Rates".

¹³ An intragroup loan agreement is a loan in which the borrower and lender belong to the same MNE group. The MNE can manipulate the interest rate which is paid by the borrower to shift profits from a high to a low tax country.

intellectual property (IP) licensing¹⁴ and transfer pricing of goods and services. Heckemeyer and Overesch (2013) additionally provide an insight into the significance of the channels employed to shift profits. The studies used in their meta-analysis have two ways of capturing profit shifting activities, either by looking at tax sensitivity of pre-tax profit¹⁵ or the tax sensitivity of earnings before interest and taxes (EBIT)¹⁶. By utilizing this feature of the literature, they distinguish whether intercompany debt financing or transfer pricing is the most prominent shifting channel. They argue that since neither internal nor external interest paid or received is reflected in EBIT, the significant tax sensitivity of EBIT in the studies can be interpreted as profit shifting through non-financial channels. Their estimates reveal that strategic transfer pricing accounts for approximately 72 percent of the magnitude of profit shifting while the remaining 28 percent can be attributed to debt financing. Employing a similar approach Dharmapala and Riedel (2012) analyze a comprehensive data set of European MNEs over the 1995-2005 period. They conclude that the strategic use of intercompany debt financing is a relatively more important channel of profit shifting.¹⁷ Buettner *et al.* (2012) use MiDi panel data on foreign affiliates of German-based MNEs, over the 1996-2004 period to investigate the effects of tax rates and rules on the use of debt by MNE affiliates. They find that an increase of 10 percentage points in the local statutory tax rate is associated an 8 percent increase in an affiliate's internal ratio debt to capital ratio. In this section, I focus on reviewing studies of profit shifting in

¹⁴ In case the IP (e.g. patent or brand) is licensed from an affiliate in a low tax country to one in a high tax country, the royalty payments can be manipulated to reduce the tax base in the high tax country.

¹⁵ This type of estimation captures shifting activity via all possible channels.

¹⁶ Estimations using EBIT exclude the tax effects originating from intercompany financing.

¹⁷ The database, Amadeus used in this study doesn't report inter-company and external debt separately for this reason their estimates can only be interpreted indirect. However, when a parent company has a positive earning shock the resulting increase in the financial income of affiliates in relatively low tax countries can be interpreted as convincing evidence of strategic intercompany debt financing.

general, from the OECD countries included in my empirical analysis and where attainable, profit shifting through transfer pricing.¹⁸

A large proportion of the research on these topics is based in the United States; therefore, it seems appropriate to review it first. In 1991, Grubert and Mutti investigated the influence of tax rates on the after-tax profitability of U.S. manufacturing affiliates in 33 countries using cross-sectional data from the Bureau of Economic Analysis (BEA). They found evidence that MNEs increase their after-tax profits by shifting taxable income from affiliates incorporated in high-tax countries to those in low-tax countries. Their estimates show that tax rates are a significant determinant of reported profits and conclude that an increase in the tax rate from 20 to 40 percent results in a reduction of reported profits from 12.6 to 5.6 percent.¹⁹ Harris (1993) presents evidence of tax motivated profit shifting by highlighting the patterns in the U.S. taxes paid and the geographic distribution of income reported by U.S. MNEs. Jacob (1996) extends Harris' work by inspecting whether the patterns he observed were merely a result of operational factors or the manipulation of prices for intercompany transactions. The assumption behind his approach is that the greatest opportunities to use price manipulations in order to minimize global tax liabilities exists for firms with a substantial amount of cross-border intercompany transactions and significant differences in tax rates between countries where they operate. He uses data from Compustat to select a random sample of U.S. firms that report pre-tax earnings separately for their U.S. and foreign operations. The analysis focuses on two-

¹⁸ Although there is a large amount of literature on profit shifting to tax havens, my focus lies on OECD countries; therefore, this topic will be ignored.

¹⁹ Regressions using statutory tax rates had more explanatory power than ones using average effective tax rate i.e. higher adjusted R^2 values.

time periods, 1982-1984 and 1988-1990, before and after the Tax Reform Act of 1986 was put into place. The estimates imply that regardless of the time-period, firms with sizeable intercompany transactions have lower world-wide tax liabilities than otherwise similar firms, but that U.S taxes paid by these firms are lower before the reform. This suggests that tax-motivated profit shifting through transfer prices was occurring in both periods and that the level of the shifting is related to the volume of intercompany cross-border transactions of goods and services and differences in tax rates.

More recently, Clausing (2003) studies the relationship of tax differentials on transfer prices using monthly international trade data of U.S. MNEs in the period 1997 - 1999. Consistent with prior findings she concludes that relatively lower tax rates in a country result in higher import and lower export prices for U.S. intercompany transactions when compared to arm's length transactions. More specifically, a 1 percent lower tax rate in the country of origin/destination is associated with import prices that are 2 percent higher and export prices that are 1.8 percent lower. Bernard et al, (2006) stress the importance of understanding cross-border pricing behaviours by pointing out three facts, namely the concentration of U.S. exports among a small number of firms, the essential role of MNEs in that group, and the substantial role of intercompany transactions in global trade. Upon examining export transactions of U.S. based MNEs from 1993 to 2000 using the Linked/Longitudinal Firm Trade Transaction Database (LFTTD)^{20,21} it becomes apparent that there are large differences between prices in unrelated

²⁰ A useful attribute of this database is that it records whether transactions are at arm's length or between related parties. This is also true for the Bureau of Labor Statistics (BLS) database used by Clausing (2003). Related party or intercompany refers not only to shipments between U.S. companies and their foreign subsidiaries but also trade between U.S. subsidiaries of foreign companies and their affiliates abroad.

and related company exports. More surprisingly, these differences persist even if the product is produced by the same firm, shipped to the same country, in the same month by the same means of transportation. Their estimates suggest that there are significant differences in price wedges for the same product in countries with different tax rates; more specifically a one percentage point decrease in foreign tax rates leads to an increase in the price wedge of 0.56 to 0.66 percent. Using their estimates, they calculated that these pricing responses to tax rate differences across countries lowered U.S. corporate tax revenues by \$5.5 billion in 2004. In another study, Clausing (2009) disentangles financial and real tax avoidance channels and estimates that in the period under analysis (1982-2004), \$180 billion USD of the corporate income shifted out of the U.S. was tax-motivated profit shifting while approximately \$80 billion USD were lost due to real economic activity shifts.

Evidence of profit shifting with European data has been scarce in the past but is becoming more common. Dischinger (2007) conducts a cross-sectional analysis of the year 2004 using data from AMADEUS to find that when the difference in the statutory corporate tax rate of an affiliate to its parents rises by 10% the pre-tax revenue of the affiliate falls by 7 percent, which suggests a significant negative effect of tax differentials on pre-tax profits. Utilizing the same data source for the year 1999, Huizinga and Laeven (2008) analyze MNEs and their affiliates in 32 European countries. They use statutory tax rates to calculate weighted average tax differences not only between parent and affiliates but also affiliates in different host countries. Their estimates suggest that the average semi-elasticity of reported profits is in the

²¹ The database also records product classification, source or destination country, transportation mode and value, quantity and date of shipment.

range of 1.43, with respect to the top statutory tax rate. They find that profit shifting results in substantial redistribution of corporate tax revenues to countries in Europe at the expense of Germany, which had the highest statutory tax rate in 1999. Lohse and Riedel (2013) confirm the negative correlation between corporate tax rates of the residence country and the firms' pre-tax profits. Moreover, they find evidence that stricter transfer pricing documentation requirements and higher penalties lead to reduced profit shifting for the 26 European countries over the 1999-2009 period under analysis. In some of their regression specifications, implementation of documentation requirements reduce profit shifting activities by an average of 50 percent. Dischinger et al, (2014) use a panel of European firms to examine the role of corporate headquarters in regards to profit shifting activities. They find that MNEs are less willing to shift profits away from the headquarter regardless of whether it's located in a high tax country. Estimations show that profit shifting activity is reduced by more than 50 percent in cases where the headquarter is located in a high tax jurisdiction and profits are shifted to an affiliate located in a low tax jurisdiction.

Germany not only has the highest level of MNE activity but also high statutory tax rates when compared to other European countries, for this reason it has been the focus of profit shifting research more so than other countries in the region. Overesch (2006) looks at micro-level panel data of German affiliates in 31 countries from the year 1996 to 2003. He utilizes the MiDi database²² which is produced by Deutsche Bundesbank to analyze accounts receivable data on intercompany transactions to indirectly measure intercompany prices. The results show

²² A special attribute of the MiDi balance sheets is that they contain the annual profit after taxes but before dividend distributions; therefore, the balance sheets provide information on profitability even though it does not contain formal profit and loss statements.

that transfer pricing is an important channel of profit shifting since local tax rates and accounts receivable are found to be significantly negatively correlated. Weichenrieder (2009) investigates German inbound and outbound FDI from the same data source to detect profit shifting activities. First, the author analysis the relationship between residence country tax rate of the parent and after-tax profitability of its German affiliate. In this case, he finds that a 10-percentage point increase in the tax rate of a parent's residence country translates to approximately half a percentage point increase in the German affiliate's profitability. Next, upon looking at German outbound FDI, he concludes that tax rate changes in the host country of a German owned affiliate have a stronger impact on after-tax profitability of wholly-owned affiliate compared to that of a co-owned affiliate.

In a more recent wave of research, Vicard (2015) employs the approach developed by Bernard et al. (2006) to find compelling evidence that French MNEs shift profit to affiliates in low tax countries through transfer pricing. He uses the combined corporate tax rates²³ from the OECD tax database to calculate the tax differential between France and 32 OECD countries, then using firm level import and export data by destination and product, he compares arm's length prices to those charged in intercompany transactions over the period from 2000 to 2014. In the baseline specification, he finds that a positive one percentage point tax differential between France and its trading partners leads to a 0.22 percent reduction of intercompany export prices and an increase of 0.24 percent in intercompany import prices compared to prices

²³ These are the same tax rates I use in my analysis.

prevailing in comparable uncontrolled transactions (CUTs).²⁴ This price wedge between related company transactions and CUTs points to evidence of tax avoidance through transfer pricing by French MNEs. The estimates reveal that in 2008 the under-reported taxable income by French MNEs through transfer pricing amounted to 8 billion US dollars resulting in an average 10% reduction of their tax bill. Cristea and Nguyen (2016) use the same approach to impute transfer prices for Danish exports between 1999 and 2006, extending it to control for time fixed effects in both foreign tax rates and group structures. They also find robust evidence that MNEs use transfer pricing as a profit shifting mechanism, resulting in under-reported revenue of \$141 million which translates to a loss of 3.24 percent in taxable revenue for the Danish government in 2006.

Empirical Motivation

In this section, I describe Bartelsman and Beetsma's (2003) methodology, which I follow closely in my empirical approach. The objective of their methodology is to empirically analyze the significance and magnitude of profit shifting activities among OECD countries.²⁵ Subsequently, the authors attempt to measure "true" income, a figure that is often either over or under-reported, due to differences in corporate tax rates across countries. The disparity occurs because MNEs in countries with relatively lower tax rates tend to over-report their production revenues, by claiming a higher transfer price for non-arm's length transactions. While on the other hand, MNEs in countries with relatively higher tax rates tend to under-

²⁴ A CUT is a similar transaction between the same firm and an independent firm or between two similar independent firms.

²⁵ The countries included are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Portugal, Spain, Sweden, United Kingdom and United States.

report their production revenues by claiming a lower transfer price for non-arm's length transactions, in the pursuit to reduce their world-wide tax liabilities. Haufler and Schjelderup (2000) put forward one possible reason for the recent reforms of corporate tax rates in OECD countries, which has resulted in reduced corporate tax rates over the last few decades. They conclude that governments engage in tax competition, not only to attract inward FDI flows but also flows of taxable profits. The nominal value-added (NVA) figures reported to statistical agencies are consequently impacted by the corporate tax rate in the MNE's country of residence relative to that in countries where the MNE has subsidiaries and hence measured with error:

$$NVA = P^{tr} Q^*$$

$$P^{tr} = P^* e(\tau^d), \text{ where } \frac{\partial e}{\partial \tau^d} < 0$$

where Q^* is unobserved actual real value-added. P^{tr} is the unobserved transfer price (different from market price), P^* is the observed market or arm-length price and $\tau^d = \tau_A - \tau_B$ is the difference in corporate tax rates between the residence country and the country(s) with which non-arm's length transactions occur.

It is known that statistical agencies use price quotes on market transactions that align with actual market prices so that P , the product price equals P^* , the market price. Irrespective of how value added figures are deflated a higher tax difference (τ^d) will reduce the transfer price (P^{tr}) relative to the official deflator P ; therefore, the reported real value-added figures (Q) are also flawed and differ from actual real value-added (Q^*) by $e(\tau^d)$:

$$Q = \frac{NVA}{P} = Q^* e(\tau^d)$$

Evidently, if data on actual real value-added (Q^*) were attainable it would be straightforward to determine the extent of profit shifting activities, simply by figuring out if Q^* systematically changes with the corporate tax rate from reported real value-added. However, since (Q^*) is unobserved and the figure itself is correlated to tax rates, to empirically identify $e(\tau^d)$ using observed data these two problems must be overcome. A paper by De Mooij and Ederveen (2003) reviewing 25 empirical studies confirms the negative relationship between tax rates and FDI inflows for OECD countries. They find the mean value of the tax rate elasticity to be around -3.3, meaning for a 1% reduction in the host-country tax rate there is an increase in foreign direct investment in that country by 3.3%. Bartelsman and Beetsma (2003) use the methodology put forth by Roeger (1995) to disentangle the mismeasurement and productivity residual components.²⁶ Roeger (1995) added on to Hall's (1988) approach which demonstrates that productivity growth can be disentangled into a productivity component and an imperfect competition component. The intuition behind this methodology is that both the primal and the dual Solow residual contain the same unobservable productivity term which cancels out if one residual is subtracted from the other, therefore, enabling the researcher to estimate markups without using instrumental variables. A contribution of Roeger (1995) is that it overcomes the

²⁶ A criticism of Roeger's approach is that it only works under the assumption of constant returns to scale. Omitting this assumption causes upward or downward bias on markup if returns to scale are decreasing or increasing, respectively, as shown by Basu & Fernald (1997) and Kee (2002).

endogeneity problem caused by the correlation between input factors of production and the unobserved productivity shocks.²⁷

Bartelsman and Beetsma (2003) cancel out the unobserved productivity shock by taking the ratio of nominal output and nominal input expenses. The approach starts out with a standard production function and then takes the profit maximizing first-order conditions with respect to labor input:

$$Q^* = AF(K, L),$$

where Q^* is actual real-value added or production, K is capital, L is labor input and A is the unobserved productivity term. Next, they assume that MNEs hire labor until the wage equals the marginal product of revenue (at market prices P^*):

$$w = P^* \frac{\partial Q}{\partial L}$$

Lastly, with a Cobb-Douglas production function²⁸ and assuming constant returns to scale they find a relationship between the observed labor share and the factor e :

$$F(K, L) = AK^{1-\alpha}L^\alpha$$

We know that $P^{tr} = P^*e(\tau^d)$ and $P = P^*$, therefore:

$$P = P^* = \frac{P^{tr}}{e(\tau^d)}, \quad (1)$$

²⁷ Refer to Hall (1988) and Roeger (1995) for more details about the methodologies, both of which have been widely applied in the empirical literature.

²⁸ Bartelsman and Beetsma (2003) also carry out their analysis using constant elasticity of substitution (CES) production technology and find that the resulting estimations are not affected.

and that $Q^* = AF(K, L) = AK^{1-\alpha}L^\alpha$ and $Q = Q^*e(\tau^d)$, thus:

$$Q = AK^{1-\alpha}L^\alpha e(\tau^d). \quad (2)$$

Finally taking the first-order condition of the Cobb-Douglas production function with respect to labor:

$$w = P^* \frac{\delta Q}{\delta L} = \frac{P^{tr}}{e(\tau^d)} \alpha AK^{1-\alpha} L^{\alpha-1}. \quad (3)$$

Putting (1), (2), and (3) together:

$$\frac{PQ}{wL} = \frac{\frac{P^{tr}}{e(\tau^d)} AK^{1-\alpha} L^\alpha e(\tau^d)}{\frac{P^{tr}}{e(\tau^d)} \alpha AK^{1-\alpha} L^{\alpha-1} L},$$

As many of the terms in the numerator and denominator cancel out, the resulting relationship becomes:

$$\frac{PQ}{wL} = \frac{1}{\alpha} e(\tau^d), \quad (4)$$

where the left-hand side is the *value – labor ratio (VLR)*²⁹ and α is the output elasticity of labor. Notice that the unobserved productivity component (A) cancels out. Equation 4³⁰ is

²⁹ PQ is nominal output and WL is nominal input expense.

³⁰ Refer to Appendix A of Bartelsman and Beetsma (2003) for a more in-depth micro-foundation of equation 4 (referred to as 3.2 in their paper).

useful for empirically analyzing the impact of corporate tax rate differences on profit shifting activities because it controls for the effect that tax rates may have on real economic activity.³¹

Data Sources and Descriptive Statistics

I select data for ten manufacturing sectors within 16 OECD countries,³² over the period of 1979 to 2005. Manufacturing sector data is useful for my analysis of profit shifting because “trade in manufactured goods between developed countries is predominantly of the intra-industry type and often takes the form of intra-firm trade.” (Bonturi & Fukasaku, 1993) I utilize various sources to collect data for my analysis, primarily databases from the Organization of Economic Co-operation and Development (OECD). Some well-known OECD data sets are the Structural Analysis Database (STAN),³³ OECD Main Economic Indicators (MEI), and International Trade by Commodity Statistics (ITCS). These data sets include but are not limited to macroeconomic data on trade, health, environment, taxes, investment and education. Data are gathered from government statistical agencies in each country and adjusted so that it is easily comparable across all countries, making it a good source for conducting research and predicting future developments.

Value-added and labor compensation data used to compute the dependent variable (*VLR*) is obtained from the STAN database for industrial analysis. STAN is comprised of detailed information on industrial performance across OECD member countries dating as far back as

³¹ Devereux, M.P., R. Griffith (1998) looked at US firms located in Europe and found that a 1%-point increase in the effective average tax rate in the UK, France and Germany would lead to reduction in the probability of a US firm choosing to produce there by 1.3 %-points, 0.5 %-points and 1 %-point, respectively.

³² Refer to Appendix A for a list of the sixteen countries and ten sectors.

³³ “Member countries’ national accounts statistics are the primary data source for STAN; however, other sources such as national industrial survey and censuses are used to estimate missing information.” (OECD, 2017b)

1970. Examples of performance data include annual measures of output, labor input, investment and international trade, allowing researchers to construct a comprehensive set of indicators enabling them to study areas ranging from productivity growth to competitiveness and general structural changes. The version of STAN used in my analysis is based on the International Standard Industrial Classification of all economic activities, Revision 3 (ISIC Rev. 3) and covers all activities including services.³⁴ The combined corporate tax rate (CT)³⁵ and headline corporate tax rate (HT)³⁶ data are sourced from the OECD tax database, which provides comparative information on various tax statistics such as tax revenues, personal income taxes, non-tax compulsory payments, corporate and capital income taxes and taxes on consumption imposed in the 35 OECD member countries. Data on gross domestic product (GDP) growth rates are sourced from the OECD MEI database.

Using country specific profiles from large accounting firms such as KPMG and EY, I obtained information on the transfer pricing enforcements applicable to each country in my analysis.³⁷ Enforcements include transfer pricing rules, documentation requirements and transfer pricing specific penalties. I also used the same sources to find whether each country uses the exemption or credit system for relief of taxes paid abroad. When an MNE is taxed in two countries, the residence country will grant double taxation relief in the form of a tax credit for the tax paid abroad or an exemption for the MNEs' foreign income provided that the MNE can prove it has paid taxes on its income. Many countries have started to use the two systems

³⁴ For more information refer to the OECD STAN SStructural ANalysis Database webpage.

³⁵ My main regression estimates use the combined corporate tax rates, which account for sub-central tax rates if any exist. For example, for Canada the sub-central government tax rate is an average of provincial corporate tax rates, weighted by the provincial distribution of the federal corporate taxable income. (OECD, 2017c)

³⁶ Headline corporate rate is generally the highest statutory corporate tax rate.

³⁷ See KPMG (2015) website and EY (2016).

in conjunction to avoid double taxation issues, also bilateral tax treaties can vary widely from country to country,³⁸ making this variable difficult to capture.

Table 1 presents descriptive statistics for the 4304 observations used to analyze the impact of tax rate differences across OECD countries on the probability of profit shifting activities. The table shows the means with standard deviations in brackets and the minimum and maximum values. For the period under observation, on average the value-labor ratio across the sixteen countries is 1.6, whereas the combined corporate tax rate is 42 percent. Graph 1 illustrates that not only has the combined corporate tax rate fallen for all 16 countries over time but that it has also converged. The average drops from 49 percent in 1979 to 33 percent in 2005³⁹ and the differences between maximum and minimum tax rates reduced from 28 percent in 1979 to 14 percent in 2005.⁴⁰ The tax rate data obtained from the OECD tax database does not vary across sectors; for this reason, weights are applied, which increases the mean value to 45 percent. The weights are computed as a share of countries' sectoral value-added to the total value-added for that sector. After weights are applied the corporate tax rate slightly varies across sectors in each country. The intuition behind applying these weights is that transfer-pricing takes place between affiliates within a sector, owing to tax rates differing from those in relevant countries. Next, the combined corporate tax rate difference variable is computed by subtracting the country specific tax rate from the weighted average tax rate of all other

³⁸ The United Nations Double Taxation Convention and the OECD Model Tax Convention both recognize the main purposes of tax treaties to be the elimination of double taxation and prevent tax evasion (Harris 2013).

³⁹ This combined corporate tax rate has reduced to 27 percent in 2017.

⁴⁰ Maximum and minimum tax rates fell from: 62% (Finland) and 33% (Spain) in 1979 to 40% (Japan) and 25% (Austria) in 2005.

countries in the sample. This variable ranges from negative 21 percent to 17 percent and has a mean of negative 3 percent. The enforcement intensity variable, which is given a value of zero to three depending on how many transfer pricing enforcements are imposed, has a mean of 0.79. Enforcements include transfer pricing rules, documentation requirements and transfer pricing specific penalties. A value of zero is given when none of the three are imposed and one when at least one is imposed and so on. Graph 2 illustrates that on average enforcements have become stricter over time, going from close to zero in 1979 to 1.8 in 2005. Moreover, the GDP growth rate ranges widely from negative 6 to 7 percent with a mean of 2.5 percent. These averages and trends approximately capture the whole picture across OECD countries; however, circumstances vary across country, sector and time; therefore, before drawing conclusions about trends across-the-board further analysis needs to be conducted.

Econometric Model

As discussed in section 3, based on a Cobb-Douglas production specification the functional form of the transfer-pricing response to taxes $e(\tau^d)$ is assumed to take the form of a mark-up in the value-labor ratio varying systematically with differences between country specific and the weighted average combined corporate tax rate.⁴¹ Here, I present the three-way fixed effects regression model, used to estimate the impact that tax rate differences have on the probability of profit shifting activities among 16 OECD countries:

$$VLR_{cst} = \beta_0 + \beta_1 CTD_{cst} + \beta_2 E_{ct} + \beta_3 GDP_{ct} + \varphi_c + \zeta_s + \psi_t + \varepsilon_{cst}$$

⁴¹ The country for which the tax rate difference is being calculated is excluded from the weighted average.

where VLR_{cst} is the dependent variable, value-labor ratio of country c and sector s at time t . CTD_{cst} is the weighted combined corporate tax rate difference. For example, for Canada CTD_{cst} is calculated by taking Canada's tax rate in a specific year and sector then subtracting it from the weighted average combined corporate tax rate of all countries, excluding Canada. E_{ct} is the enforcement intensity variable, which is assigned a value of zero if no transfer pricing enforcements are imposed in country c at time t , one if at least one enforcement is imposed and so on. GDP_{ct} is the annual growth rate of real gross domestic product and lastly, φ_c , ς_s , ψ_t are vectors that account for country, sector and time fixed effects.

The first specification estimates the effect that cross-border weighted tax differences have on the value-labor ratio while accounting for country and time fixed effects. The second specification adds sector fixed effects to the regression since trade in the manufacturing industry mostly occurs within sectors. The third specification adds the transfer pricing enforcement intensity variable. Intuition suggest that a higher level of enforcement should deter the negative effect of tax differences on profit shifting activities. The fourth and final specification adds the GDP growth rate to the regression. Economic growth has an important role in the fluctuation of a country's production and wages and therefore also effects the value-labour ratio.⁴²

⁴² Recall the value-labor ratio is calculated by dividing nominal output (value-added) and nominal input expense (labor compensation) as stated in equation 3.4.

Empirical Results

Table 2 presents the results of all four regression specifications mentioned above. In specifications where country, sector and time fixed effects are included, the reference groups are the United States, the chemical sector and 1979, respectively.⁴³ Across all four specifications the corporate tax rate difference has a negative coefficient, which is both economically and statistically significant at 1%. This suggests that an increase in a country's tax rate relative to the weighted average tax rate of other countries increases the incentive for its MNEs to participate in profit shifting activities. In specification 2, after an F-test of no significance of sector fixed effects is rejected suggesting that sectors play an important role in the relationship under analysis, the empirical relationship is strengthened as suggested by the rise in the R-squared value.⁴⁴ Specification 3 results in a negative and insignificant coefficient for the enforcement intensity variable, suggesting that increasing transfer pricing enforcements does not necessarily subdue profit shifting activities. Saunder-Scott (2013) found that regulations designed to decrease profit shifting outflows can also result in decreased profit shifting inflows and increased compliance costs for MNEs (i.e. penalties), thus concluding that transfer pricing enforcements can have an overall negative effect on reported profits and therefore, tax revenues. The last specification results in a positive and significant coefficient for GDP growth at the 1% level, which is consistent with the economic theory that a growing economy has higher production capacity, thus resulting in an increased value-labor ratio.⁴⁵

⁴³ In terms of value added the United States is the largest economy, the chemical sector is largest sector and the year 1979 serves as a good reference point to see trends over time.

⁴⁴ An F-test of no significance was also rejected with a p-value of 0.0000 for country fixed effects.

⁴⁵ If both VA and LC rise proportionally, then the ratio will remain the same and if LC rises more than VA, then the ratio will fall.

Table 3 presents my calculations of the effect of a unilateral tax rate increase on corporate tax revenues. I use the estimates from regression specification 4 since it is the most robust and find that approximately 43 percent of the potential revenue from a unilateral increase in tax rate is lost due to profit shifting activities. Since the absence of profit shifting activities tax revenues from a one percent increase in corporate tax rates would have been 8.17. Bartelsman and Beetsma (2003) found the loss in tax revenues to be around 65 percent.⁴⁶

Although table 2 did not include the coefficient estimates for country, sector and time fixed effects in my results,⁴⁷ it is important to highlight the following insights about them. Across all four regression specifications it is evident that not all countries have the same level of sensitivity to differences in corporate tax rates; this is due to the cost-benefit trade-off of profit shifting varying across countries. Weichenrieder (2007) explains that beside benefit to profit shifting there are also costs and considerations, such as legal costs, cost of special activities needed to hide the shifting, loss of investors in case they are against profit shifting. The same is true for sectors although the variations of sector responses are more similar than those across countries. The sensitivity to tax differences depends on the number and size of firms in a sector that operate internationally, the ease of applying transfer pricing methods and so on. Borkowski (1997) find that transfer pricing decisions are affected by tax, customs rates and regulations, and the relative ease of using the transfer pricing method. Finally, due to the increased understanding of profit shifting, introduction of guidelines and regulations and globalization the degree of sensitivity also varies from year-to-year. Globalization has reduced

⁴⁶ Refer to Bartelsman and Beetsma (2003) pages 2238-2239 for details of this back-of-the-envelope calculation.

⁴⁷ There are just too many fixed effect coefficient estimates; 16 country, 10 sector and 27 time.

the barriers for MNEs to set up subsidiaries in other countries and partake in cross-border transactions.

Capturing the “pure” or causal effect of changing the independent variable, tax rate difference on value-labor ratio would be an ideal situation; however, it is impossible to isolate the “pure” effect entirely. Therefore, most econometric models suffer from an endogeneity problem, in the sense that there are other variables which belong in the equation, but are excluded.⁴⁸ Such variables are contained in the error term and are correlated to the independent variable tax differences. One example of an excluded variable⁴⁹ in my regression specification is the relative differences in tax rates of other countries where cross-border transactions occur, Huizinga and Laeven (2008) find that a MNEs profit shifting in a country depends on a weighted average of international tax rate differences between all countries where the MNE is active. Other examples are differences in personal income tax rates relative to corporate tax rates and differences in risk appetites. A lower appetite for risk could lead to decreases in profit shifting activities; MNEs are increasingly concerned about reputational risk. According to a report by Deloitte (2015) “a key business concern, especially for companies operating in the consumer and resource sectors, are the risks to their brand and reputation that could arise if they attract public criticism for their tax policies. Increasingly, shareholders and analysts are also questioning management about the organization’s tax strategies and policies.” The use of the fixed effects model is helpful in reducing the consequences of omitted variable

⁴⁸ Reasons for excluding variables are lack of data, unobservable variables and human error.

⁴⁹ Such differences can lead to increases in wage bills at the expense of corporate profits as explained by Bartelsman and Beetsma (2003).

bias,⁵⁰ and thus, those of endogeneity; however, it is important to remember that it has its limitations. For instance, the more dummy variables introduced into the model, the more “noise” is controlled for, and this can lead to the model becoming weaker, reducing both the usefulness of the model and its conclusions. Rossi (2013) states, “many report estimates of beta decline as more fixed effects are included in the model.”

Regression Variations

As discussed in the previous section the level of sensitivity to tax differences can be influenced by many factors and vary across countries, sectors and time. As presented in table 4, to capture how the sensitivity level has developed through time I run regressions for three sub-periods of equal lengths; 1979-1987, 1988-1996 and 1997-2005. In the first sub-period the coefficient for tax differences is positive but insignificant; this is reflective of the fact that tax rates are consistently high across all 16 countries and there is a lack of inter-firm trade linkages. In the 1988-1996 sub-period, as inter-firm trade grew, the coefficient becomes negative and significant at 10%. In the last sub-period, trade linkages continue to increase;⁵¹ however, so did the implementation of transfer pricing regulations, reporting standards and compliance efforts of tax authorities around the world, here the coefficient remained negative but becomes insignificant.

Next, based on the enforcement intensity variable E_{ct} I construct a strictness indicator S , by splitting the sample and giving S a value of 1 if E_{ct} is 2 or 3 (strict enforcement) and zero if E_{ct} is 0 or 1 (lax enforcement). The tax difference coefficient for strict enforcement is

⁵⁰ Omitted variable bias is caused by omitted variables that appear in the error term and if correlated to the included variables result in biased coefficient estimates.

⁵¹ Kobetsky (2008) states that in the 1980's intercompany trade amounted to about 25% of world trade, in 2006, it was estimated to be as high as 60%.

negative but insignificant; whereas, the coefficient for lax enforcement is significant at the 1% level and larger in absolute value. This result indicates that countries where enforcements are stringent generally have less profit shifting activities than those with lax enforcements. I confirmed this result by splitting the sample again and creating another indicator, F which equals 1 if the country is Australia, France or the United States⁵² (all of which were first to implement strict transfer pricing regulations) and zero otherwise. The coefficients indicate that compared to all other countries, transfer pricing activities in Australia, France or the United States are considerably reduced due to their early implementation of transfer pricing enforcements.⁵³

Robustness Checks

Table 5 presents the results of the robustness checks performed on the final specification of my regression model. Bartelsman and Beetsma (2003) stated that the incentives for profit shifting depend on two things; the differences in corporate tax rates between countries and the system that residence countries use to avoid double taxation. For this reason, I added a dummy variable X_{ct} , which equals 1 if the country uses the exemption system, and zero if the country uses the credit system. The coefficient for the exemption system dummy variable is negative but insignificant, while the one for tax difference essentially remains unchanged. This is consistent with the fact that regardless of whether the incentive to

⁵² These countries implemented all three transfer pricing enforcements in 1995, 1996 and 1994, respectively.

⁵³ Both the strictness indicator S and F are based Bartelsman and Beetsma (2003).

shift profits comes from a tax difference for an MNE residing in an exemption system country⁵⁴ or an excess foreign tax credit,⁵⁵ the overpowering motivation is to shift profit from countries with higher tax rates to those where the tax rate is lower. This effect is captured by the value-added statistic and ultimately the coefficient of the value-labor ratio in the regression. Next, I verify whether the weighting scheme I apply to the tax rates makes a considerable difference in my regression; the results verify that the weighting scheme I used do not significantly change the estimated coefficient.⁵⁶ Lastly, I run the regression with the weighted headline corporate tax rate difference variable that Bartelsman and Beetsma (2003) used, instead of the combined corporate tax rate difference and find that the coefficient estimate is still significant at 5% but lower in absolute terms.⁵⁷

Conclusion

This paper presents compelling evidence of profit shifting by MNEs to countries with relatively lower tax rate through transfer pricing manipulations. I apply Bartelsman and Beetsma's (2003) approach to disentangle the effects of tax rates on profit shifting from those

⁵⁴ In the exemption system multinationals are exempt from domestic tax payments on income taxed abroad. Here the incentive is to shift profits to a country with the lowest tax rate and the benefit of shifting a dollar is the absolute value of $\$(\tau^F - \tau^H)$.

⁵⁵ With a credit system multinationals receive a credit from their home country for income taxed abroad, the MNE has an excess foreign tax credit if the credit is greater than the tax liability at home. Here if $\tau^H > \tau^F$ then the benefit of shifting comes from deferring domestic tax liability; whereas if $\tau^H < \tau^F$ then benefit of shifting a dollar abroad is $\$(\tau^F - \tau^H)$.

⁵⁶ Bartelsman and Beetsman (2003) apply different weighing schemes and find that their results are essentially unaffected.

⁵⁷ The tax statistic used by Bartelsman and Beetsman (2003) is describes by the OECD tax database as "the basic central government statutory (flat or top marginal) corporate income tax rate", it doesn't consider the differences in sub-central taxes (state or regional). The combined corporate income tax rate is described as, "the basic combined central and sub-central (statutory) corporate income tax rate."

on real economic activity and analyze data for ten manufacturing sectors within 16 OECD countries over the period 1979 - 2005. Trade between OECD countries largely occurs in the manufacturing industry and is predominantly of intercompany type. For this reason, it is a suitable industry with which to investigate the magnitude of transfer pricing; however, one should not make conclusions about the entire economy based on these estimates.

My baseline regression estimates, although smaller in magnitude from those found by Bartelsman and Beetsma (2003) suggest that profit shifting is economically and statistically significant at 1%. I conclude that roughly half the potential revenue resulting from a unilateral increase in tax rate is lost due to profit shifting, compared to the range found by Bartelsman and Beetsma (2003) of 68 to 87 percent. This is an indication that recent developments regarding transfer pricing, such as revised OECD guidelines, heightened awareness of profit shifting among tax authorities, and increases in collaboration across countries to align how transfer price are determined and documented and the penalties applied upon noncompliance are effective in combating profit shifting. I confirm this in my regression variation section, by analyzing three sub-periods within my sample. The coefficient estimates in the last sub-period (1997-2005) are less significant and smaller in absolute terms than those in the prior period, indicating that efforts to combat profit shifting are effective and should continue to be implemented and revised.

Moreover in 2012, G20 leaders tasked the OECD with developing an action plan for preventing base erosion and profit shifting (BEPS). The plan was later endorsed at the 2013 G20 St. Petersburg summit and accepted at the 2015 G20 Antalya summit. The BEPS package consists of fifteen actions designed to be implemented by individual tax administrations

(through tax treaty provisions). Among the fifteen actions there are four actions that target key aspects of BEPS; countering harmful tax practices (Action 5), treaty shopping (Action 6), transfer pricing documentation and country-by-country reporting (Action 13) and dispute resolution (Action 14). These actions are being implemented by 96 countries around the world to some extent to further ensures that profits are taxed where economic activity occurs and where value is created.⁵⁸

⁵⁸ For more information see OECD 2017a .

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Tables

Table 1. Descriptive Statistics

| Variable | Mean | Min | Max |
|--|--------------------|---------|---------|
| A. <i>Value-Labor Ratio "VLR"</i> | 1.579 (0.315) | 0.549 | 3.094 |
| B. <i>Combined Corporate Tax Rate "CT"</i> (in %) | 41.523 (9.244) | 25 | 62 |
| C. <i>Weighted CT</i> (in %) | 44.740 (4.929) | 34.49 | 53.97 |
| D. <i>Weighted CT Differences "CTD"</i> (in %) | -3.231 (7.714) | -20.556 | 17.245 |
| E. <i>Enforcement Intensity</i> (measured by three dummy variables) | 0.7870 (0.968) | 0 | 3 |
| F. <i>Gross Domestic Product Growth Rate</i> (in %) | 2.545 (1.830) | -5.910 | 7.260 |
| G. <i>Exchange Rate</i> (in national currency per US dollar) | 11.173 (38.396) | .403 | 249.077 |
| Observations | 4304 | | |

Notes: Standard deviations in brackets. 16 data points are missing for the Netherlands, for this reason the number of observations is 4304 instead of 4320.

Table 2. Main Regression Results

| Independent Variable | (1) | (2) | (3) | (4) |
|---|-----------------------|------------------------|------------------------|-----------------------|
| <i>CTD</i> (Weighted combined corporate tax difference) | -0.0024*** (.0008) | -0.0026*** (0.0006) | -0.0024*** (0.0006) | -0.0023*** (0.006) |
| <i>E</i> (Transfer Pricing Enforcement Intensity) | | | -0.0080 (0.0063) | -0.0090 (0.006) |
| <i>GDP</i> (Annual Gross Domestic Product Growth Rate) | | | | 0.0178*** (0.0021) |
| Country Controls (16) | Yes | Yes | Yes | Yes |
| Sector Controls (10) | No | Yes | Yes | Yes |
| Time Controls (27) | Yes | Yes | Yes | Yes |
| Constant | 1.4366** (0.2744) | 1.8018*** (0.0232) | 1.8119*** (0.02514) | 1.7373*** (0.0266) |
| N | 4304 | 4304 | 4304 | 4304 |
| R ² | 0.2419 | 0.5546 | 0.5548 | 0.5619 |

Notes: Standard errors in brackets. *significant at 10%; ** significant at 5%; ***significant at 1%

Table 3. Effects of a unilateral tax rate increase on corporate tax revenues

| | Initial rate =37.5% | New rate = 38.5% |
|-------------------------------|--------------------------------|--|
| Value-added | 100 | $(1 + \beta_1) * 100 = (1 - 0.0023) * 100 = 99.77$ |
| Labor share | $1.737^{-1} = 57.56 (-)$ | 57.56 (-) |
| Compensation debt providers | $0.5(100 - 57.56) = 21.22 (-)$ | 21.22 (-) |
| Reported profits before taxes | 21.22 | 20.99 |
| Corporate tax revenue | $0.375 * 21.22 = 7.96$ | $0.385 * 20.99 = 8.08$ |

Note: In the absence of profit shifting corporate tax revenue would have risen to $0.385 * 21.22 = 8.17$.

The share of revenue increase that is lost because of the decrease in reported income:
 $(8.17 - 8.08) / (8.17 - 7.96) = 0.43$ or 43%

Table 4. Regression Variations

| | <i>Constant</i> | <i>CTD</i> | <i>E</i> | <i>GDP</i> | R^2 | <i>N</i> |
|-------------------------------|-----------------|------------------------|------------------------|-----------------------|--------|----------|
| Sub-periods | | | | | | |
| 1979-1987 | 1.818*** | 0.0023 (0.0019) | 0.0093 (0.0191) | 0.0116*** (0.0037) | 0.5642 | 1424 |
| 1988-1996 | 1.9272*** | -0.0191* (0.0011) | -0.0137 (0.1802) | 0.0219*** (0.0033) | 0.5993 | 1440 |
| 1997-2005 | 2.0193*** | -0.0013 (0.0020) | -0.0068 (0.0109) | 0.0096 (0.0062) | 0.5681 | 1440 |
| Enforcement Intensity | | | | | | |
| Strict | 1.9988*** | -0.0015 (0.0036) | -0.0875 (0.0784) | 0.0265*** (0.0097) | 0.6243 | 800 |
| Lax | 1.7686*** | -0.0024*** (0.0006) | 0.0365** (0.0156) | 0.0169*** (0.0023) | 0.5633 | 3504 |
| Australia, France and U.S. | 1.8419*** | 0.0004 (0.0026) | 0.0180 (0.0150) | 0.0140*** (0.0053) | 0.6778 | 810 |
| Other countries | 1.7073*** | -0.0023*** (0.0006) | -0.0228*** (0.0081) | 0.0180*** (0.0024) | 0.5521 | 3494 |

Notes: Standard errors in brackets. *significant at 10%; ** significant at 5%; ***significant at 1%.

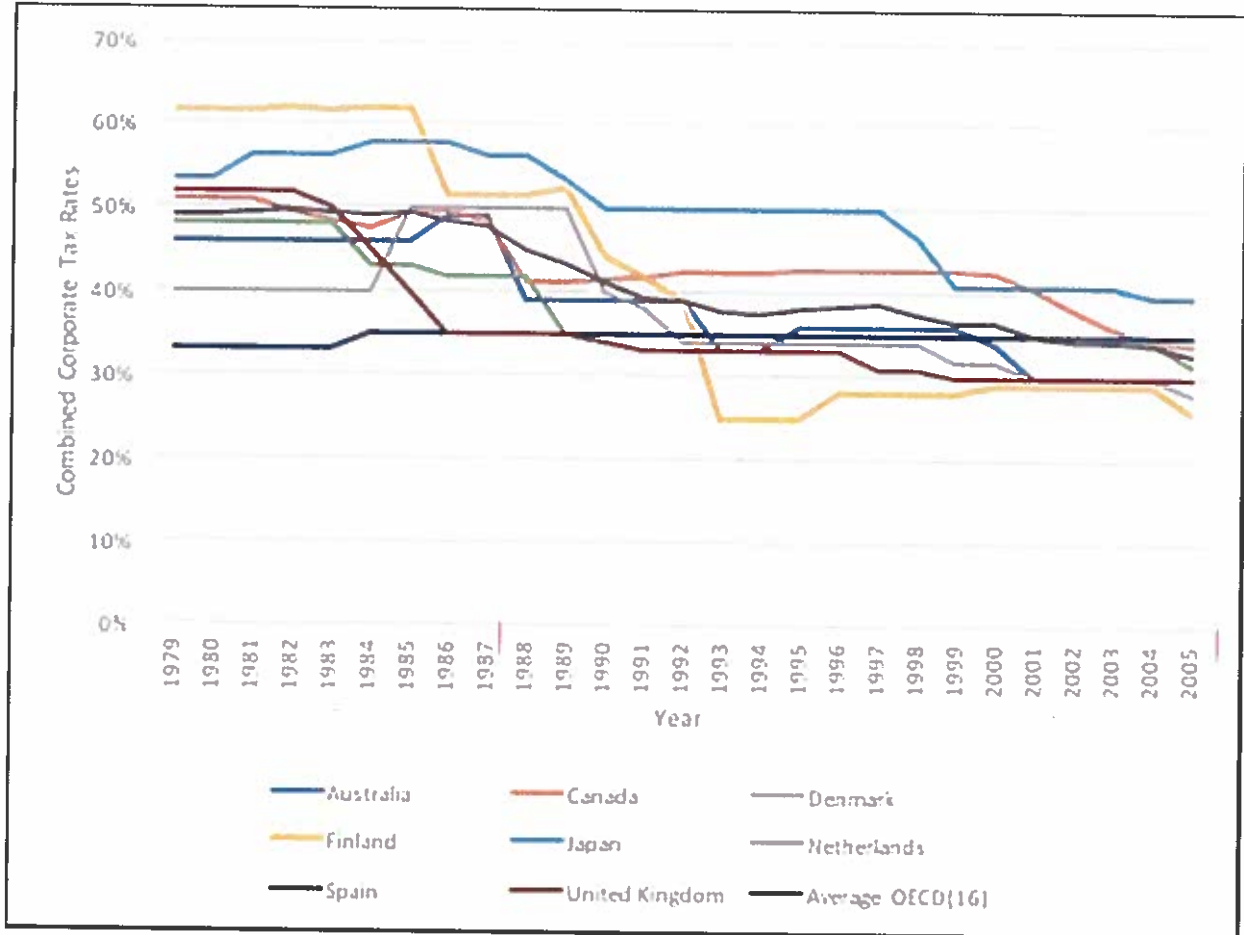
Table 5. Robustness Checks

| Independent Variable | (1) | (2) | (3) |
|---|------------------------|------------------------|-----------------------|
| <i>CTD</i> (Weighted combined corporate tax difference) | -0.0023*** (0.0006) | ---- | ---- |
| <i>UCTD</i> (Unweighted combined corporate tax difference) | ---- | -0.0025*** (0.0006) | ---- |
| <i>WHTD</i> (Weighted headline corporate tax rate difference) | ---- | ---- | -0.0016** (0.0007) |
| <i>E</i> (Transfer Pricing Enforcement Intensity) | -0.0090 (0.0063) | -0.0086 (0.0063) | -0.0140** (0.0061) |
| <i>GDP</i> (Annual Gross Domestic Product Growth Rate) | 0.0178*** (0.0021) | 0.0177*** (0.0021) | 0.0178*** (0.0021) |
| <i>X</i> (Exemption System Dummy) | -0.0137 (0.0208) | ---- | ---- |
| Country Controls (16) | Yes | Yes | Yes |
| Sector Controls (10) | Yes | Yes | Yes |
| Time Controls (27) | Yes | Yes | Yes |
| Constant | 1.7373*** (0.0258) | 1.7432*** (0.2567) | 1.7456*** (0.0257) |
| N | 4304 | 4304 | 4304 |
| R ² | 0.5619 | 0.5623 | 0.5610 |

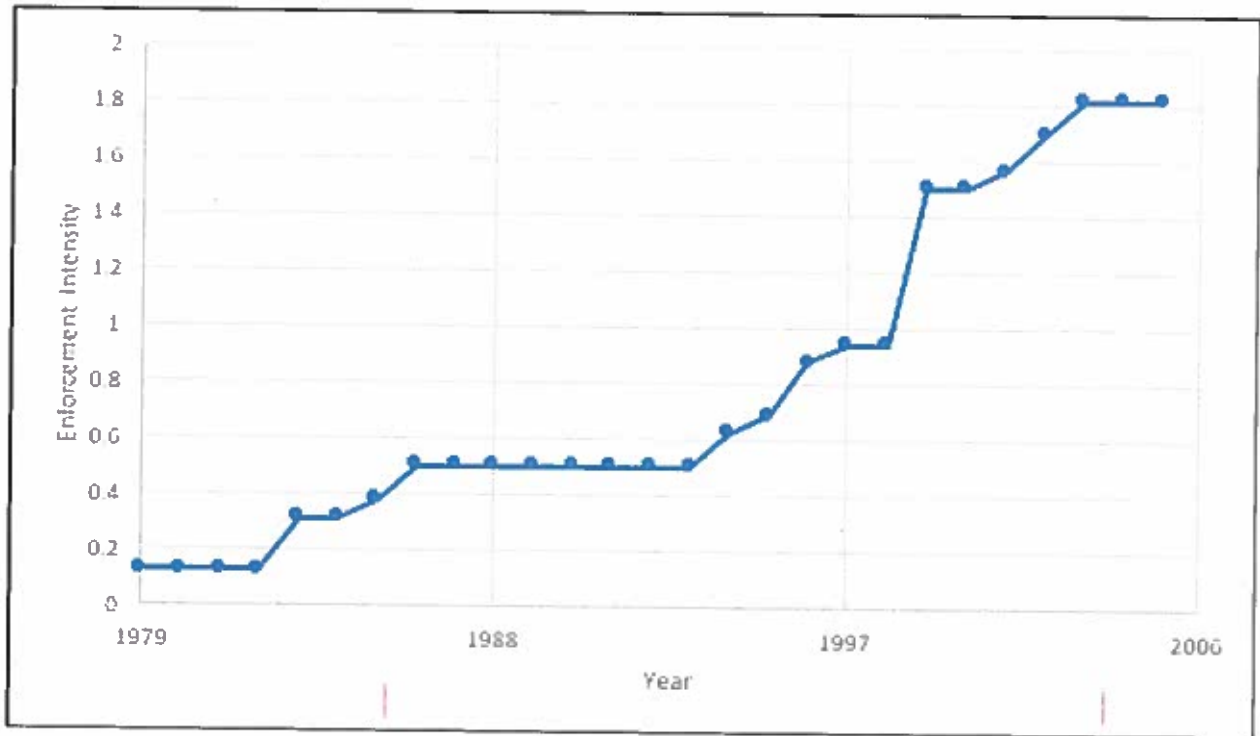
Notes: Standard errors in brackets. *significant at 10%; ** significant at 5%; ***significant at 1%.

Graphs

Graph 1. Selected Combined Corporate Tax Rates and OECD Average, 1979-2005



Graph 2. Average Transfer Pricing Enforcement Intensity of 16 OECD Countries, 1979-2005



Appendix A.

Countries:

1. Australia
2. Austria
3. Belgium
4. Canada
5. Denmark
6. Finland
7. France
8. Germany
9. Italy
10. Japan
11. Netherlands
12. New Zealand
13. Spain
14. Sweden
15. The United Kingdom
16. The United States

Sectors:

1. Chemical: C23T25 Chemical, rubber, plastics and fuel products
2. Food: C15T16 Food products, beverages and tobacco
3. Machinery: C29T33 Machinery and equipment
4. Manu: C36T37 Manufacturing n.e.c. and recycling
5. Metal: C27T28 Basic metals and fabricated metal products
6. Non-metallic: C26 Other non-metallic mineral products
7. Paper: C21T22 Pulp, paper, paper products, printing and publishing
8. Textile: C17T19 Textiles, textile products, leather and footwear
9. Transport: C34T35 Transport equipment
10. Wood: C20 Wood and products of wood and cork