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Rewa Makke

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Master Thesis



Artificial Intelligence and Transfer Pricing: Promising Changes Towards Compliance, Evidence from European MNEs

“The effect of multi-nationality, tax havens, and intangible assets on transfer pricing compliance of European MNEs and the role of artificial intelligence in achieving compliance”

Presented by: MAKKE Rewa

Thesis advisor: Pr. BLUM Véronique

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Preface:

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SUMMARY

Tax non-compliance scandals have attracted the attention of media accounts, and profit shifting activities have been at the top of international policy agenda for several years. Several channels exist for multi-national companies (MNCs) to shift profits from high- to low-tax jurisdictions. Yet, transfer pricing and intangible assets remain the most important channel for MNCs to use for profit shifting, and therefore, to minimize their tax liabilities. In an attempt to combat these practices and achieve tax compliance, the Organization of Economic Cooperation and Development (OECD) launched BEPS Action Plans. This project provides guidelines for MNCs on pricing their intra-firm transactions, especially those involving intangibles. An important guideline is the “Arm’s-Length Principle” which requires that prices of intra-firm transactions should be the same as the ones charged for independent neutral parties (i.e. it should be the market price). At a first blush, this could be an easy task. However, extracting arm’s-length prices (particularly for intangible assets) could be difficult. MNCs are required to find relevant data for independent transactions involving similar products. This could negatively affect MNCs compliance with the tax rules. Therefore, artificial intelligence is used to aid companies in their transfer pricing process from data extraction, computation, visualization, to transfer pricing documentation. Hence, this study aims to study the determinants of transfer pricing in European MNCs, because understanding these determinants is crucial to understand how artificial intelligence should be applied to achieve compliance.

Keywords: tax compliance; profit shifting; transfer pricing; intangible assets; arm’s-length standard; Big Data; artificial intelligence; tax planning.

RÉSUMÉ

Les scandales de non-conformité fiscale ont attiré l'attention des médias et les activités de transfert de bénéfices figurent en tête de l'agenda politique international depuis plusieurs années. Il existe plusieurs canaux permettant aux sociétés multinationales (multinationales) de transférer leurs bénéfices de juridictions à fiscalité élevée à fiscalité faible. Pourtant, les prix de transfert et les actifs incorporels restent le canal le plus important que les multinationales peuvent utiliser pour le transfert de bénéfices et, par conséquent, pour minimiser leurs obligations fiscales. Afin de lutter contre ces pratiques et de se conformer aux obligations fiscales, l'Organisation de coopération et de développement économiques (OCDE) a lancé les plans d'action BEPS. Ce projet fournit des directives aux multinationales sur la tarification de leurs transactions intra-entreprise, en particulier celles impliquant des actifs incorporels. Une directive importante est le «principe de pleine concurrence», qui exige que les prix des transactions intragroupe soient les mêmes que ceux pratiqués pour les parties neutres indépendantes (c'est-à-dire que ce devrait être le prix du marché). À première vue, cela pourrait être une tâche facile. Cependant, l'extraction des prix de pleine concurrence (en particulier pour les actifs incorporels) pourrait être difficile. Les multinationales sont tenues de trouver des données pertinentes pour les transactions indépendantes impliquant des produits similaires. Cela pourrait nuire au respect par les multinationales des règles fiscales. Par conséquent, l'intelligence artificielle est utilisée pour aider les entreprises dans leur processus de prix de transfert depuis l'extraction des données, le calcul, la visualisation, jusqu'à la documentation des prix de transfert. Par conséquent, cette étude vise à étudier les déterminants des prix de transfert dans les multinationales européennes, car la compréhension de ces déterminants est cruciale pour comprendre comment l'intelligence artificielle doit être appliquée pour atteindre la conformité.

Mots-clés: conformité fiscale; transfert de bénéfices; prix de transfert; les actifs incorporels; norme de pleine concurrence; Big Data; intelligence artificielle; planification fiscale.

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INTRODUCTION

“If one concept will dominate tax in the next 10 years, it is transparency” stated Jeffrey Owens, a Senior Tax Policy Advisor at Ernst & Young and a previous Director for the Centre of Tax Policy and Administration at the Organization of Economic Cooperation and Development (OECD). This statement was documented in EY’s report “Insights for Business Leaders – The Future of Tax” published in 2014. Yet, it is clear that tax transparency and compliance will be of increasing importance in the future. Tax compliance is defined by the OECD as: *“the degree to which a taxpayer complies (or fails to comply) with the tax rules of his country, for example by declaring income, filing a return, and paying the tax due in a timely manner”*¹ ([Glossary of Tax Terms - OECD](#)). Lack of transparency and compliance, due to tax avoidance or evasion or other reasons, are prominent in public debate. These issues have been challenging for both tax authorities and tax payers for several years. On one hand, tax authorities are concerned about the loss of tax revenues and real economic activity that may be the result of aggressive income shifting by multi-national enterprises (MNEs). Media accounts have reported tax scandals of large profitable firms where the erosion of corporate tax base has incurred governments millions of losses in tax revenues. For instance, a Reuters report in 2012 showed that *“Starbucks had been announcing to its investors that its U.K. unit was highly profitable while telling British authorities the unit was lossmaking, and thereby not liable for tax”* ([Thomson Reuters, 2012](#)). *“In 2018, 60 of the 500 largest companies – including Amazon, Netflix, and General Motors – paid no US tax, despite reporting joint profits on a global basis of some \$80bn”* ([Stiglitz, 2019](#)). Other examples include Microsoft that was charged by the Chinese government \$140m in back taxes and interest ([Clover, 2014](#)). On the other hand, MNEs face risks of non-compliance such as penalties. *“The penalties that national tax authorities are now able to impose provide additional momentum for tax compliance”* as stated by [Cools & Emmanuel \(2007\)](#).

Going beyond these illustrative insights, tax base erosion and profit shifting have gained significant attention in the academic literature as well. Numerous empirical studies have measured the sensitivity of reported profits or intra-firm trade to tax rate differentials between a parent company and its affiliates, especially for U.S.-based MNEs. They found a deflation of reported profits in countries with high corporate income tax and strict tax rules, and an inflation of these

¹ As it is noted by the OECD, *“The explanations on the terms are very condensed and may not be complete. They are not considered to necessarily reflect official position of the OECD in interpreting international tax terms”*.

profits in countries with low corporate income tax and lax tax rules. The channels employed to shift profits from high to low-tax jurisdictions are generally distinguished to be three: financial structures (i.e. intra-firm financing), and non-financial techniques which are transfer pricing and licensing. Yet, the scope of this study is transfer pricing as the most of world trade is carried on by multi-nationals through their associates, and that constitutes a large share of cross-border tax avoidance.

The OECD has defined transfer price as being *“the price adopted for book-keeping purposes, which is used to value transactions between affiliated enterprises integrated under the same management at artificially high or low levels in order to effect an unspecified income payment or capital transfer between those enterprises”* ([Glossary of Statistical Terms - OECD](#)). Put simply, transfer pricing is a term used to define the price charged between associated enterprises (whether international or domestic) for the transfer of goods, services, and intangible property. Therefore, transfer pricing *per se* is not illegal. But, it is often considered by tax authorities as a vehicle for corporate tax avoidance especially that difference in national tax rates between affiliates’ countries could be exploited by MNEs to efficiently allocate their costs and resources. For example, an affiliate located in a high-tax regime sells a product at a low price to another affiliate located in a low-tax regime. This reduces the profits and taxes paid by the affiliate in a high-tax regime and, consequently, taxes paid at the level of the multi-national corporate group.

To counterpart these practices at the international level, the OECD has taken the initiative in 2013 and launched “BEPS Action Plans” with the support of the G20 to combat profit shifting and tax base erosion (BEPS). To manage prices of transactions between affiliates, MNEs are required to comply with the “Arm’s-Length Standard” where the OECD stated that: *“conditions are made or imposed between the two enterprises in their commercial or financial relations which differ from those which would be made between independent enterprises, then any profits which would, but for those conditions, have accrued to one of the enterprises, but, by reason of those conditions, have not so accrued, may be included in the profits of that enterprise and taxed accordingly”* ([OECD Model Tax Convention, Article 9](#)). In other words, the price charged for a transaction between associated parties should be the same as the price charged for a similar transaction with a neutral independent party under similar conditions. This ensures that transactions between associated enterprises take place at the market price, and companies are able to maintain their business structure at a flexible manner. Moreover, companies are required to submit specific transfer pricing documentation for tax authorities: country-by-country reporting (CbCR), master file and local file. *“CbCR requires MNEs to report annually and for each tax jurisdiction in which they operate the*

amount of revenue, profit before income tax and income tax paid and accrued. In a master and local file, firms should provide global and local overview of their transactions respectively as well as the nature of these transactions and assets held” (OECD Action 13, 2014).

In this respect, MNEs are required to have access to data related to independent enterprises to compare their results with these of independent enterprises. At a first blush, this seems easy especially for transactions involving traditional goods and services where public data is available. However, this is not the case for intangible assets (e.g. trademarks, copyrights, patents, brands, etc.). The reason is that these assets are non-physical and non-monetary in nature. They are also distinct (i.e. firm-specific), and lack well-established over-the-counter (OTC) markets. Thus, this has created challenges for firms when looking for comparable data to assess and document the arm’s length character of transactions involving intangibles, and complying with their obligations (Lagarden, 2014).

Against this backdrop, how can firms increase their tax compliance? One answer is Big Data and Artificial Intelligence (AI). It has been said that *“Data is the new oil of nowadays, AI is the refinery”*. In line with this quote and in a period marked by the use of algorithms and big data, it is not surprising to use these innovations to aid MNEs and tax authorities. Artificial intelligence is a branch of computer science dealing with the implementation of humans’ intelligent behavior in a machine. Transfer pricing practitioners collect their arm’s length data using computer programs which depend on human input, and perform comparability analysis to determine which transaction is similar and to what extent it is similar. This is time-consuming, requires high levels of effort and may not be accurate. Therefore, AI can support transfer pricing estimation in seeking the results of independent parties, performing comparability analyses, producing master files and local TP reports, and filling in all tax forms automatically. AI can correct or adjust non-arm’s length compliant prices in a self-optimizing IT environment.

To settle the matter, previous studies provided direct and indirect evidence on the impact of taxes on outbound and inbound transfer prices and the price wedge between these prices and arm’s length prices (Bernard et al., 2008; Clausing, 2003; Davies et al., 2018; Overesch, 2006). Others have tested the effect of corporate tax rate differences on intangible property size and location (Dischinger & Riedel, 2011; Karkinsky & Riedel, 2012), or the effect of R&D expenses on ETRs (Belz et al., 2016), etc. (as is explained later on). Yet, these mostly consider US-based MNEs with some others examining these issues in individual European countries only. Moreover, they provided evidence on the outcomes of transfer pricing without investigating the inputs triggering transfer

pricing activity itself (Taylor et al., 2015; Richardson et al., 2013). To the best of my knowledge, none of these studies investigated the determinants of transfer pricing in a European setting as a whole which are good candidates to study transfer pricing due to their economic integration and large cross-border trade.

Realizing this gap, this study extends a long line of research and aims to understand the key drivers of transfer pricing intensity and transfer pricing risk of non-compliance in European MNEs. Two aspects of transfer pricing are deeply examined: on one hand, we seek for possible ways to efficiently manage and measure the transfer pricing compliance; on the other hand, we explore the potential contribution of artificial intelligence and big data in reaching those objectives. Therefore, the research problem is to determine (empirically) the effect of specific variables on transfer pricing intensity in European MNEs particularly multi-nationality, tax haven status, and intangible assets (which were determined to be key factors of transfer pricing risk). In order to shape the empirics, the study relies on a sample of 96 European-based MNEs, and covers the years 2016-2018. To measure the intensity of transfer pricing, a transfer pricing index previously developed by Taylor et al. (2015) and Richardson et al. (2013) is employed. This index captures intra-firm transactions that are either non-arm's length or lack commercial justification and fall in the gray area of tax compliance.

The study should interest researchers, tax authorities, and practitioners interested in the growing area of transfer pricing implementation and compliance. From an academic perspective, it provides empirical evidence of the associations between multi-nationality, tax havens, intangible assets and transfer pricing intensity in Europe. This provides new insights into the magnitude and trends of transfer pricing. Moreover, the index used provides direct evidence on transfer pricing whereas previous studies mostly relied on indirect approaches. Also, manual collection of data from firms' financial statements can provide examples of case studies to detect differences in activities between industries. Tax authorities could consider reform options for cross-border tax and foreign income regulations especially for MNEs which operations extensively rely on intangibles. In other words, understanding the high risk of intangibles is crucial for the design and implementation of anti-avoidance rules. Literature in economics is also concerned where this study provides insights of transfer pricing in a European context that might affect European countries' GDP and other economic growth indicators. Tax and transfer pricing practitioners, and accountants are also considered where this evidence calls for more in-depth knowledge of a complex web of country tax laws, regulations, rulings, methods, and requirements especially each (European) country's local

GAAP for valuing intangibles. Furthermore, this study could be an awakening call for European MNEs themselves to seek tax compliance where transfer pricing has effects on their earnings, dividends, returns on capital and share prices and to apply AI for achieving value creation by transfer pricing.

The study is organized as follows: Part 1 offers an extensive literature review providing direct and indirect evidence on transfer pricing. In part 2, the research problem and its significance are analyzed in-depth and the hypotheses addressing the research question are developed. Part 3 presents the methodology that will be employed to test the hypotheses (data collection and analytical methods) with some insights into AI implementation as an innovative tool to achieve tax compliance. Lastly, the study concludes with recommendations for future research.

PART 1:

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LITERATURE REVIEW

Introduction

According to the International Accounting Standard 24 (IAS 24) “*Related Party Disclosures*”, companies should disclose the nature of the related party relationship² as well as information about these transactions and outstanding balances. This requires entities to assign prices to all related party transactions³ of goods and services and to the licenses for patents and trademarks that are used by a related entity. These prices determine the profit allocation among affiliates. Affiliates located in low corporate income tax jurisdictions may charge high prices for intra-firm transactions and those located in higher corporate income tax jurisdictions may charge low prices. Firms might also increase intra-firm trade or even shift valuable assets into low-tax subsidiaries in order to charge additional royalties.

To minimize intercompany price manipulation, the transfer pricing rules apply an arm’s length standard. This requires that the results of transactions between related taxpayers be consistent with the results that would have been realized if independent, unrelated parties had engaged in a comparable transaction under comparable circumstances (OECD, 2010). As described in its transfer pricing guidelines, the OECD had determined various ways of computing the arm’s length price. Yet, it remains often difficult to choose the appropriate price to use as benchmark for intra-firm transactions. Thus, the flexibility in these rules makes it reasonable that MNCs strive to set tax-optimal transfer prices and choose transfer pricing methodologies to shift profits to low-tax regimes. At the same time, it makes it a difficult empirical task for researchers. Regulatory and law enforcements are, somehow, unable to fully combat BEPS issues and there remains difficulty for MNCs to set the optimal transfer price. Therefore, the question about the ability of technological innovations – artificial intelligence in particular – in ensuring transfer pricing compliance and contributing to value creation has been raised.

This issue itself, of course is not new. What is new is the attention it is receiving from academics and policy makers. The central focus of this chapter is to review and discuss the

² As defined by IAS 24, “*a related party is a person or an entity that is related to the reporting entity: a person or a close member of that person’s family is related to a reporting entity if that person has control, joint control, or significant influence over the entity or is a member of its key management personnel. An entity is related to a reporting entity if, among other circumstances, it is a parent, subsidiary, fellow subsidiary, associate, or joint venture of the reporting entity, or it is controlled, jointly controlled, or significantly influenced or managed by a person who is a related party*”.

³ “*A related party transaction is a transfer of resources, services or obligations between a reporting entity and a related party*”.

implications of empirical findings on profit shifting in general, and tax-induced transfer pricing in specific. But before proceeding to present evidence on transfer pricing, evidence on response of profit shifting to tax differentials will be presented, as tackled by the literature. Therefore, this chapter proceeds as follows: the first section introduces literature related to profit shifting and corporate tax base erosion, the second section presents a stream of literature relevant to the issue of transfer pricing, the third introduces policy and regulatory attempts by organizations to mitigate BEPS, and then the chapter closes with the fourth section on technological innovations in the tax field.

1.1. Macro-Level Studies on Transfer pricing: Cross-Border Taxation, Profit Shifting and Tax Base Erosion

A wealth of empirical studies in the literature has tackled the concept of profit shifting and tax base erosion as an important channel for corporate tax avoidance. Most of these demonstrate that the corporate tax base is quite sensitive to tax rate differences across countries, and confirm a negative correlation between reported parent or subsidiary profits and local tax levels. Almost all observers in the academic literature and worldwide organizations describe these concepts as an increasing problem. [Hines \(1999\)](#) and de Mooij and co-authors ([de Mooij and Ederveen, 2003](#); [de Mooij and Ederveen, 2008](#)), for example, provide an earlier review of these studies. Moreover, the [OECD \(2015\)](#) estimated that the annual net tax revenue loss from tax planning is about \$ 100 billion to \$ 240 billion. In what follows, examples on recent estimates of the base erosion and profit shifting problem in the academic literature are presented.

In an attempt to estimate the magnitude of profit shifting, different approaches were considered in the empirical literature to measure this scale, using different data sources and estimation strategies. Primary approach can be derived directly from the early pioneering research on multinational income shifting, notably [Hines and Rice \(1994\)](#), and [Grubert and Mutti \(1991\)](#). Though important and widely-cited, early studies were subject to significant limitations in terms of the data that was then available and there remains much lower a consensus about the appropriate estimate to measure profit shifting activity and its responsiveness to the cross-country tax differences. On the other hand, recent attempts include that of [Heckemeyer & Overesch \(2013\)](#) as an example. They provided an estimate of the size of the tax-rate elasticity of reported parent or subsidiary profits of

S&P 500 firms. Based on a meta-regression study, “a semi-elasticity of reported income with respect to the tax rate differential across countries was estimated to be 0.8, meaning that a 10 percentage point increase in the tax rate difference between an affiliate and its parent (considering that tax rate in the affiliate’s country falls from 35% to 25%) would increase the pretax income reported by the affiliate by 8%”. After they compared the tax sensitivity of pre-tax profits with the tax sensitivity of EBIT which are only affected by non-financial shifting techniques (i.e. licensing and transfer pricing), the results suggest that transfer pricing and licensing are the dominant profit-shifting channel.

Dowd et al. (2017) provided quite similar results through a thorough study, and analyzed the profit shifting behavior of U.S. multinationals using U.S. tax return data from 2002 to 2012, including affiliates located in tax havens around the world as well as developing countries with high tax rates. Findings indicated “a semi-elasticity of reported profits with respect to the net-of-tax-rate of 1.44 for statutory tax rates and 1.08 for average tax rates”. Also, “a tax semi-elasticity of – 4.7 at corporate tax rates of 5 %, and – 0.6 at tax rates of 30 %” was detected. They estimated that 1% reduction in statutory tax rate from 5% to 4% would increase reported income by 4.7%. This indicates that firms respond aggressively to very low tax rates. This is a plausible indicator of non-linear tax response, with higher responsiveness to lower tax rates than to higher ones.

To extend further, KLASSEN & LAPLANTE (2012) raised the question of whether U.S. multinational corporations are becoming more aggressive income shifters. Examining the extent of multijurisdictional income shifting of these multinationals over the past two decades, their tests showed that U.S companies have become more active at shifting income out of the United States as the regulatory costs of shifting have changed. Interestingly, by maintaining the tax rate differences between U.S. and foreign jurisdictions constant, “the estimates suggested that the sample (comprising 380 corporations) with average foreign tax rates below the US statutory tax rate collectively shifts approximately \$10 billion of additional income out of the U.S annually during 2005-2009 relative to 1998-2002 due to varying regulatory costs of shifting” (Klassen & Laplante, 2012).

These findings are commensurate with conventional wisdom and policy makers’ concerns. Most empirical research is based on U.S. multinational corporations. However, it is crystal clear that American firms are not the only tax payers. Consistent results are provided in a recent study by Clausing (2016) which provides evidence from U.S. MNCs and shows that profit shifting is a large problem in countries with high tax rates. She states that this problem is costing the U.S. government

between \$ 77 billion and \$ 111 billion in corporate tax revenue by 2012 (constituting over 30 % of U.S. corporate income tax revenues). These revenue losses have increased in recent years (increase of 250 percent since 2004). Using Bureau of Economic Analysis (US Department of Commerce) survey data on U.S. MNCs, this study offers direct evidence on the magnitude of profit shifting throughout the years as it spans a period ranging between 1983 and 2012, making it clear that profit shifting is a larger problem today than ever before. “\$800 billion of income (75% of total foreign income) was booked in countries with effective tax rates less than 15%”. Extended estimates showed that “82% of profit shifting by U.S. multinational firms is destined for specific important tax havens: Caymans (\$ 41 billion), the Netherlands (\$172 billion), Switzerland (\$58 billion), Luxembourg (\$96 billion), and Bermuda (\$80 billion)”. Interestingly, [Clausing \(2016\)](#) found that “profits in the absence of income shifting incentives would instead be \$9 billion in the Caymans, \$33 billion in the Netherlands, \$15 billion in Switzerland, \$15 billion in Luxembourg, and \$10 billion in Bermuda; these compared to \$13 billion and \$17 billion of profits booked in France and Germany, respectively”. In addition, similar estimates in other countries indicate that profit shifting to low-tax countries may be costing headquarters’ high-tax countries approximately \$280 billion annually in revenue losses. What increases the reliability of this study is that it uses comprehensive survey data (BEA & Forbes Global 2000) that include operations in many tax haven countries, unlike many studies that rely on financial data.

Furthermore, and while there is considerable empirical evidence for advanced countries at the heart of these issues, base erosion problems are found to be quite large in developing countries and more important in this group of countries than in OECD countries. [Crivelli et al. \(2015\)](#) provide empirical evidence considering these issues in developing countries. They used aggregate panel data on corporate tax bases for 120 countries (and tax rates for 173 countries) over 33 years (1980-2013), focusing particularly on developing countries, and applying a new method to distinguish between “base” and “strategic” spillover effects through real decisions and through tax avoidance. Performing short run estimates, they found that developing countries lose \$ 105 billion in revenue (0.84 percent of GDP) from base erosion due to profit shifting. This could be quite comparable to those found in OECD countries that were estimated to be \$ 207 billion in revenue (0.23 percent of GDP). Long-run estimates are \$ 509 billion for OECD countries (0.6 percent of their GDP), and \$ 213 billion for developing countries (1.7 percent of their GDP). This could be plausible especially that less developed countries are likely to have insufficient institutional capacity to handle the enforcement difficulties associated with profit shifting behavior. To add more, base spillovers are statistically more significant for non-OECD countries than for OECD countries, and the signs

indicate that these may operate less through effects on real investment decisions than through profit shifting.

The finding of [Crivelli et al. \(2015\)](#) is recently confirmed by [Johannesen et al. \(2019\)](#), using a global dataset with information on 210,000 corporations in 102 countries. Consistently, their results showed that *“the sensitivity of reported profits to profit-shifting incentives is negatively related to the level of economic and institutional development”*. This makes it clear why many developing countries impose low corporate tax rates despite their needs for revenues. What marks their study is that part of it focuses on 39 countries in Europe where there is a striking development gap between the West and the East: *“a 10 percentage point decrease in foreign affiliates’ tax rates increases the likelihood that the corporation reports zero profits by 4 percentage points in Eastern Europe, but only by 1.5 percentage points in Western Europe”*.

1.2. Direct and Indirect Evidence on Tax-Motivated Transfer Pricing

The empirical literature has sought to identify several channels through which tax base erosion and profit shifting occurs. Yet, as documented by [Heckemeyer & Overesch \(2013\)](#), *“70% of the erosion of tax bases is attributed to transfer pricing and licensing by multinationals, with the remainder attributable to the strategic use of debt”*. There exists extensive empirical evidence on companies’ behavioral response to taxation (as the ones presented above). However, the purpose is to look at previous studies, which in particular analyze tax planning via transfer pricing.

[Klassen et al. \(2016\)](#) investigated the extent to which cross-border transfer prices are a tool for tax minimization. They used a survey of tax executives (from the Tax Executives Institute TEI) from 219 multinational corporations. What is interesting in their findings was that, contrary to conventional wisdom, most transfer pricing strategies focus on tax compliance rather than tax minimizing. These firms reported effective tax rates (ETRs) that are 3.8 percentage points higher. However, firms that focus on tax minimizing were also realized to exploit transfer pricing to report lower (GAAP) ETRs by approximately 4.1 percentage points. The latter (tax-oriented firms) were found to report higher FIN 48 (Financial Interpretation No. 48) tax reserves than compliance-oriented firms, suggesting their engagement in uncertain transfer pricing arrangements. Also, it was documented that firms which focus on cash taxes reported lower ETRs when the reduction in transfer pricing risk between operating in a tax haven versus non-tax haven is greater. Their study is

the first to document that firms pursue different tax goals in their transfer pricing strategies, and to present a direct link between ETRs, tax havens, and tax-minimizing transfer pricing. The authors further suggest that different transfer pricing strategies and practices determine the extent to which transfer prices directly help in tax reduction.

Several studies focused on data of goods traded and investigated the impact of taxes on intra-firm sales. Using an approximation of intra-firm trade from firm-level balance sheet data, [Overesch \(2006\)](#) tried to give a more precise identification of transfer pricing as a specific profit shifting channel by focusing directly on the supposed tax response of balance sheet items reflecting intra-firm sales. The empirical analysis was conducted based on micro-level panel data of German affiliates in 31 countries during the period between 1996 and 2003. This data was taken from the MiDi database provided by the Deutsche Bundesbank, which contains data on virtually all German multinationals. Results reflected that *“the value of German MNEs’ intra-firm trade varies with the difference between the German tax rate and that of the foreign parent/ affiliate’s location”*. More precisely, the analysis suggested *“a negative effect of the local tax rate on the transfer prices and the size of intra-firm sales”*. The magnitude of estimated tax responses was significant, concluding that transfer pricing of intra-firm sales within multinationals represents an important channel of company tax planning despite anti-avoidance legislations and tax audits based on the arm’s length principle.

Similar studies, [Clausing \(2001,2006\)](#) as an example, confirm the impact of taxes on intra-firm trade flows between US firms and their subsidiaries by using aggregated company data on intra-firm transactions. Furthermore, [Grubert \(2003\)](#) shows, based on a cross-section analysis of US Treasury data, that the ratio of intra-firm transactions to total sales of US- controlled foreign companies is influenced by taxes.

While most of these empirical works investigate profit shifting from the most industrialized economies to tax havens, [Bartelsman & Beetsma \(2003\)](#) examined profit shifting among (relatively) large economies by considering evidence for disaggregated industrial sectors for a group of OECD countries. Their choice of OECD countries was motivated by several reasons: i) the amount of cross-border trade and the economic integration among these countries is becoming important, ii) tax authorities may focus on detecting income shifting to tax havens and neglect OECD countries, iii) profit shifting via transfer pricing mostly takes place when there is cross-border trade related to real activity; hence, the scope for income shifting among OECD countries would be larger than for income shifting to tax havens. Their results provided substantial evidence of profit shifting where

more than 65% of the additional revenue from a unilateral tax increase is lost due to a decrease in the reported income tax base. Their findings also suggest that more enforcement is associated with less income shifting.

Although some of these studies considered intra-firm sales as a dependent variable⁴, their results can be taken only as indirect hints that taxable profits are shifted through transfer pricing. From the aforementioned, a large set of literature exists that has considered indirect evidence of transfer pricing due to data limitations and the difficulty to observe the arm's length prices of an intra-firm transaction. Most of these studies identified the influence of country tax rates on affiliates' profitability and tax liability. However, direct empirical evidence on the effect of taxes on transfer prices themselves is scarce. An interesting finding is that of [Clausing \(2003\)](#) who showed evidence of tax-motivated transfer pricing in US intra-firm trade prices by testing the impact of tax influences on intra-firm trade prices. Particularly, they measured the link between corporate income tax differentials and transfer pricing manipulation. Her investigation was carried by analyzing monthly US import and export price data collected from the US Bureau of Labor Statistics between the years 1997 and 1999. After controlling other variables that affect trade prices, the results revealed a strong and statistically significant relationship between countries' tax rates and the prices of intra-firm transactions. More precisely, as country's tax rates are lower, US intra-firm export prices are lower, and US intra-firm import prices are higher than prices with independent parties.

[Bernard et al. \(2008\)](#) examined how prices set by U.S. MNCs vary across arm's length and related-party customers. A large positive gap was found to exist between firm's internal and external prices, where the prices of U.S. exporters set for their arm's length customer are higher than the prices recorded for affiliates. This result was obtained after comparing prices within firms, products, destination countries, modes of transport and tariffs. After matching related-party sales by a firm to arm's-length sales by the same firm for the same product to the same country in the same month using the same mode of transport, the average arm's-length price was found to be 43% higher than the related-party price. This wedge was detected to be smaller for commodities than for differentiated goods (8.8% and 66.7% respectively), and increasing in firm size and firm export share.

⁴ For example, [Overesch \(2006\)](#) used "*accounts receivable from affiliated companies*" and "*accounts receivable from parent company*" to reflect intra-firm sales. [Clausing \(2001, 2006\)](#) measured the amount of U.S. exports sent from parent firms to U.S. affiliates in country *i* minus the amount of U.S. imports sent from U.S. affiliates in country *i* to U.S. parents, relative to the total amount of trade between U.S. parents and their affiliates in country *i*.

Another interesting insight was provided by (Vicard, 2015). Utilizing firm-level import and export data by destination and product for France to compare prices of arm's length and related party transactions, Vicard (2015) showed that the price wedge between arm's length trade and related party trade varies systematically with the difference in corporate tax rate between France and the partner country. Furthermore, in an attempt to quantify the extent to which profit shifting through transfer prices impacts the tax base and international flows and imbalances, "*extended estimations demonstrated that these manipulations decrease the value of French exports by around 0.7 % and increases imports by 0.5 % in 2008*". Also, profit shifting through transfer prices has reduced the French corporate tax base by 8 billion USD in 2008, and its extent is growing over time in France. Moreover, the paper suggests the proposal of common consolidated corporate tax base and formulae apportionment that mitigate opportunities for profit shifting, particularly in integrated regions such as the EU.

Cristea & Nguyen (2016) provided somehow similar evidence as Vicard (2015). Using a firm and transaction-level panel dataset covering Danish exports between the years 1999 and 2006, they estimated the extent to which transfer pricing of tangible exports is used by MNCs as a strategy to shift profits to low-tax regimes. First, a significant advantage of this study is departing from U.S data on which the bulk of the existing evidence relies. The motive behind choosing Denmark is that it has a territorial taxation system which is the most pervasive taxation system in the world, unlike the residential taxation system in the U.S. Second, robust evidence for profit shifting via transfer pricing by MNCs was detected. Although this is consistent with the transfer pricing literature, an interesting result is the fact that "*in the presence of tax avoidance penalties, firms have a strategic incentive to deviate the arm's length export price from its profit maximizing level to a value that is closer to the transfer price level in order to reduce the price difference and comply with the arm's length principle of taxation*". Danish firms that own affiliates in low tax countries are found to underprice their exports relative to sales to affiliates in countries with the same tax rate as Denmark. To extend further, Cristea & Nguyen (2016) demonstrated that the larger the share of intra-firm trade to a destination, the more willing MNCs are to sacrifice profits from unaffiliated party transactions in exchange for larger after-tax profits obtained by minimizing the global tax burden via transfer pricing.

Vicard (2015) and Cristea & Nguyen (2014) tend to provide evidence of transfer pricing. However, they do not observe intra-firm and arm's length prices, rather assume intra-firm prices for transactions with countries where a related party is located⁵.

Davies et al. (2018) provided the same evidence of tax-motivated transfer pricing as the previously-mentioned studies except that their study was marked by going beyond the traditional theoretical literature and proposing a simple framework that distinguished between tax-induced transfer pricing and pricing-to-market strategies. They chose France as a country characterized by a streamlined tax system compared with the US and other countries. Utilizing firm-level data on export quantities and prices for almost all French firms exporting in 1999, these prices were observed and compared under each mode (arm's length or intra-firm) at the level of firms, countries and products, in order to examine the gap between arm's length prices and intra-firm prices and whether this gap can be accounted for by the tax differentials across countries. These prices were found to be differently sensitive to pricing-to-market determinants (tax, transport costs, tariffs, and GDP per capita). Also, intra-firm prices were found to be highly sensitive to foreign taxes once pricing-to-market determinants have been controlled where export prices drop with the destination corporate tax rate only for intra-firm transactions. Another main finding is that transfer pricing was not only influenced by destination country's corporate tax rate, but also influenced by exports to tax havens that provide a firm-friendly tax environment which facilitates income shifting via transfer pricing. Almost no evidence of tax avoidance was detected when exports to tax havens were disregarded. Most of tax avoidance came from a few large multinational firms through exports to a relatively limited number of tax havens (450 MNEs account for over 90% of intra-firm exports to ten tax havens) where intra-firm prices were estimated to be 11% lower than arm's length prices. They further state that MNCs decide not to avoid taxes if the risk to be sanctioned is high compared to the tax gap, and it may be possible to raise tax revenues and mitigate transfer pricing with minimal cost by focusing enforcement on a small number of firms.

1.2.1. Evidence on Transfer Pricing Via Intangibles

A considerable attention in recent policy debates and in academic discourse is the role of intangible assets and intellectual property in BEPS. The challenges of transfer pricing are being intensified the more the globalized economy shifts towards a digital one with the evolution of a

⁵ However, Ramondo et al. (2011) and Atalay et al. (2014), stated that most firms with an affiliate in a country do not trade with this affiliate and a firm that exports a product to its affiliates exports another product to a third firm in the same country.

broad set of hard-to-value intangibles and the rise of new trends of these assets (cloud services and other IT infrastructure). These raise novel international tax issues where it becomes difficult to establish proper market prices and determine arm's length prices for intercompany transactions⁶.

The rationale behind investing in intangibles is two-fold: First, intangible assets are increasingly perceived to be important value-drivers within MNEs. *“Up to the 1980s, tangible assets accounted for 80 percent of company value; the rest was made up by intangibles, including IP. Thirty years later, the reverse is true with 80 percent of company value made up of intangibles”* states a World Intellectual Property Organization (WIPO) publication dated 2016. Until the early 1990s, MNEs raised little or no fee from their corporate affiliates for the use of intangibles (particularly patents and trademarks). But with updated legal regulations and accounting standards (i.e. IAS 24), owners of these intangibles are required to charge for their immaterial goods transferred between their related parties. Given these developments, the business context for which tax compliance and planning strategies are framed has changed radically. As reflected in EY's 2016 survey of 623 transfer pricing executives in 36 jurisdictions across 17 industries, *“tax authorities are increasingly focusing on intangible issues in controversy”*. However, *“international tax standards have failed to follow suit, and distortions of transfer prices on large cross-border transactions become hard to detect by the tax authorities, especially when there exists no outside market for these transactions and when a large component of their value is related to intellectual input”* (Bartelsman & Beetsma, 2003).

Second, as intangibles' income become part of the owner's corporate tax base, locating them at low-tax affiliates is thus an attractive tax saving strategy as it implies that the profits is taxed at a low corporate tax rate. An example of intangible assets used for transfer pricing purposes is intellectual property IP and research and development R&D expenditures. As these intangibles are perceived to be important value drivers within a MNE, and as the transfer pricing process for these intangibles is often highly in-transparent (since the arm's length prices for these firm-specific assets are commonly not available for tax authorities), they create an incentive for MNEs to locate their patents at affiliates with relatively small corporate tax rates, which implies that the intangibles' profits become taxable at a low corporate tax rate. What governments and tax authorities fear the

⁶ Note that valuing intangibles for accounting purposes might differ from that for transfer pricing purposes. A report by William F. Finan and Susan Work (2009) in cooperation with Taj Société d'Avocats – Deloitte Touche Tuhmatsu in Paris stated that although valuing intangibles under fair value standard for accounting purposes and valuing the same assets under arm's length standard for transfer pricing purposes seem similar in the general concepts, they differ in the methods and results obtained. For example, ALP recognizes intangibles based on economic purposes whether or not the intangible is recognized on the balance sheet. However, IAS 36 recognizes intangibles for balance sheet purposes apart from goodwill when certain criteria are met.

most is the trend to fragment corporate production by locating intangible holding and management affiliate in low-tax regimes and the manufacturing affiliate in high-tax regimes. Consequently, they constitute a major source of profit shifting opportunities between multinational entities by distorting the respective intra-firm transfer price.

Using large panel data of multinationals affiliates within the EU-25 Index available for the years 1995 to 2005, and which uses the firm's balance sheet item intangible assets as a measure for intangible property holdings, [Dischinger & Riedel \(2011\)](#) pointed to a robust inverse relation between the subsidiary's corporate tax rate relative to other group affiliates and its intangible assets holding, i.e. the lower a subsidiary's corporate tax rate relative to other affiliates, the higher is its level of intangible asset investment. *"The estimations suggested a semi-elasticity of around -1.7, which means that a decrease in the average tax differential to other group affiliates by 1 percentage point increases a subsidiary's intangible property investment by around 1.7% on average"*. This effect was statistically and economically significant across a range of specifications and estimation choices. Moreover, evidence of a positive correlation between intangible ownership and income shifting behavior was found. Other evidence is that MNEs adjust their organization and investment structure to optimize profit shifting opportunities. Other studies demonstrated that *"parent firms set up tax haven subsidiaries to reach favorable cost-sharing agreements on R&D with them"* (i.e. Low-tax entities sell patents and licenses to high-tax production affiliates and receive the corresponding royalty payments as earnings.) ([Grubert and Mutti, 2007](#)).

[Belz et al. \(2016\)](#) examined how R&D expenses (as a proxy for IP) affect ETRs and considered this effect in details by separating a tax accounting effect and a profit shifting effect. Profit shifting effect exists because R&D activity gives rise to IP. Tax accounting effect is that, while R&D expenses may be immediately recorded in the tax accounts, they may be capitalized and deferred in the financial accounts. Their estimate ranges between -0.17 and -0.25, i.e. 1 percentage point increase in R&D intensity leads to a 0.17 to 0.25 percentage decrease in ETR. They detected that *"one-third of the R&D effect on the ETRs is due to the tax accounting effect which could be mitigated via book-tax conformity, and 10 % of the profit shifting effect can be traced back to R&D tax credits granted by some countries, which is a tax incentive that allows deduction of an additional fraction of R&D expenses from the firm's tax base"*. [Grubert and Slemrod \(1998\)](#) and [Desai et al. \(2006\)](#) examined the type of firms most likely to establish tax haven operations that facilitate tax avoidance, and found that parent firms with high intangible assets investments are most likely to invest in tax havens. In particular, they showed that a 10 percent greater R&D/sales

ratio increases the share of affiliates in tax havens by 4%. Also, [Grubert \(2003\)](#) showed that MNEs heavily investing in R&D engage in significantly large volumes of intra-group transactions which creates more opportunities for income shifting.

[Dischinger & Riedel \(2011\)](#) did find that the corporate tax rate exerts a negative effect on the size of intellectual property assets, as reported on company's balance sheet. However, they do not distinguish the legal assets which constitute the intangible asset figure. [Karkinsky & Riedel \(2012\)](#) took this initiative by focusing on a form of IP assets. They studied the potential effect of the corporate tax system on the location of the legally protected output to R&D activities, i.e. patents. Empirical evidence investigating the link between corporate taxation and location of intangibles is scarce, as information on IP ownership is commonly not available in standard firm data sets. Relying on a new and unique data source provided by the European Patent Office (EPO) (1995 – 2003) that connects accounting and ownership information for a large panel of European multinational subsidiaries and offers data on patent applications, their study suggested that corporate tax rate and tax rate differentials exert a negative impact on the subsidiary's number of patent applications. *“This negative effect prevails if tax measures that additionally account for withholding taxes on royalty income are constructed”*. It is noteworthy that their analysis took into account that the effective tax burden on royalty income may be affected by withholding taxes on royalty payments and by Controlled Foreign Company (CFC) rules which are imposed in the subsidiary's parent location. *“This plays a role in refraining MNCs from avoiding taxes in their residence country by making passive patent income earned at low-tax affiliates taxable at the parent location”*. This prediction was confirmed to be robust in their study.

[Lindsey & Wilson \(2015\)](#) examined similar objective to [Karkinsky & Riedel \(2012\)](#), but by considering transfer ownership of IP to subsidiaries located in foreign and domestic tax havens, such as the Cayman Islands and Delaware respectively. They examined whether U.S. firms choose between domestic tax havens (where firms enjoy permanent state income tax savings) or foreign tax havens (where the federal income tax savings are potentially larger but temporary, because U.S. firms pay a residual tax to the U.S. government based on the difference between the federal corporate tax rate and the foreign tax rate when foreign profits are repatriated to the United States; this is not required for state income taxes). They demonstrated that *“U.S. firms should have the wherewithal to shift profits”*. First, they must be profitable enough to incur the costs of transferring intangibles to subsidiaries. Second, firms operating in high-technology and pharmaceutical industries are more likely to own intangible assets. Exploiting Exhibit 21 data available from public

SEC filings, they showed that *“firms with the operational wherewithal and tax incentives to shift profits were found to have higher R&D expenses, larger gross profit percentages, and operations in high-technology and pharmaceutical industries”*. Also, *“firms with higher U.S. federal marginal tax rates, greater free cash flow, and more foreign operations are more likely to have a subsidiary located in foreign tax haven”*. In addition to wherewithal and tax incentives, no positive association between greater presence in states that permit the Delaware tax savings strategy and the use of a Delaware subsidiary, and firms with higher state tax rates are less likely to have subsidiaries located in Delaware.

Other recent empirical analyses include that of [Richardson et al. \(2013\)](#) who provided evaluation of the major determinants of transfer pricing aggressiveness for Australian firms where transfer pricing risks are considered high priority in Australia by the Australian Taxation Office (ATO). Based on a hand-collected sample of 183 publicly-listed Australian firms for the 2009 year, the regression results demonstrated that firm size, profitability, leverage, intangible assets and multi-nationality are significantly positively correlated with transfer pricing intensity after controlling for industry-sector effects. Additionally, firms enhance their transfer pricing aggressiveness via the joint effects of intangible assets and multi-nationality. These same authors provided similar evidence in their 2015 study ([Taylor et al. \(2015\)](#)) but for publicly-listed U.S multinational firms over the period 2006 – 2012.

Interesting, and considering the new trend of intangibles, [Mazur \(2016\)](#) evaluates both challenges and tax planning opportunities presented by transfer pricing rules in the context of cloud computing. She argues that, due to the nature of the cloud, the current transfer pricing rules give U.S. multinational enterprises an opportunity to shift profits to low-tax jurisdictions and avoid paying taxes in the United States. She argues that tax payers and tax administrations confront significant tax challenges in applying outdated tax principles to this new environment and adds that the OECD’s BEPS Action Plans are still not able to curb the artificial shifting of profits abroad. However, tighter enforcement of transfer pricing rules by countries with high taxes may reduce the net return on investments, thereby also causing real activity shifts to countries with lower taxes and/or laxer enforcement. This suggests a case for international coordination of transfer pricing policies. An international tax reform that adopts formulary apportionment or the profit-split method on a coordinated basis would better address BEPS ([Mazur, 2016](#)). International policy attempts to combat the BEPS issue, are discussed in the section below.

1.3. Regulatory Measures to Address BEPS via Transfer Pricing

In response to all these pressing concerns about income shifting and transfer pricing, options for reform have been on the top of international policy agendas. Several policy measures were taken to combat BEPS which were sometimes deemed ineffective by academic literature, since MNEs are able to drastically reduce their tax liability by exploiting flaws and loopholes in existing tax rules.

In an attempt to push forward the international tax cooperation, the Organization for Economic Cooperation and Development (OECD) undertook BEPS Action Plan which represents a “Herculean” effort to curb profit shifting activity. Shifting profits via transfer pricing is restricted by the “arm’s length principle” where intra-firm prices should be the same as prices used for transactions between independent firms (i.e. market price). Assigning arm’s length prices is often easy for basic goods and services, where fair market prices are observable. However, this is not the case for transactions involving intangibles. The lack of comparability of intra-group transfer prices with prices of transactions between unrelated parties makes this principle difficult to apply, because intra-firm transactions tend to be firm-specific. Also, identifying comparable transactions requires information that is hard to collect or is unobservable. Though different methods were suggested by the OECD to assess whether transfer prices comply with the arm’s length principle (CUP, Cost Plus, Resale Price, TNMM and Profit Split methods)⁷, these methods which appeared so simple in theory can be very difficult to apply to real-life intra-group transactions⁸. What make this issue

⁷ **1.** Comparable Uncontrolled Price CUP compares the price charged for exchanged goods or services in a controlled transaction with the price charged for goods or services in a comparable transaction undertaken between independent parties; **2.** Cost Plus method identifies the ‘costs of production’ incurred by the vendor of the product in a controlled transaction, and then adds an arm’s length markup to that cost base; **3.** Resale Price method is based on the difference between the price at which a product is purchased and the price at which it is on-sold to a third party; **4.** Transactional Net Margin method TNMM tests the net profit margin from a controlled transaction with the net profit margin earned by the related party on the same transaction with a third party OR the net margin earned by a third party on a comparable transaction with another third party; **5.** Profit Split method determine the way profit would have been divided between independent businesses that were party to the transaction based on the contribution of each related party to the transaction.

⁸ E.g.: **CUP** is rejected because it cannot match one or more of the comparability criteria such as similar markets, volumes and position in the supply chain; in **Cost Plus** method, determining the markup on costs can be difficult due to the inconsistencies in some costs that some companies record in their cost of goods sold and other companies may record in operating expenses; in **Resale Price** method it is difficult to identify whether the comparable business employ marketing intangibles in their business, since their presence allow the comparable entity to enjoy high levels of profitability; in **TNMM** and although there is available information on the net profits of comparable independent firms, insufficient information exists on the extent to which the comparable transaction is truly comparable; though it looks simple, a difficulty arises in **Profit Split** method to measure the relative contribution of each participant to the profit

more difficult are intangible assets where market prices are unobserved and these methods become unfeasible, and pricing behavior needs to be assessed using firm-specific information (Buettner et al., 2017). Further, the scope and design of these legislations differ substantially. Some countries only loosely acknowledge that the price setting must comply with the arm's length principle, while others have stricter transfer pricing rules and require companies to submit detailed documentation to the tax authorities justifying their intra-firm prices and profit distribution across affiliates. Failing to do so triggers non-negligible penalties. Prominent examples on the latter is the US Internal Revenue Service (IRS) which announced that it had settled a transfer pricing dispute with the pharmaceutical company GlaxoSmithKline, in which the latter paid \$3.4 billion (New York Times, 2006).

OECD is currently working to develop rules on the treatment of intangibles. Since these assets have no active markets, it is difficult to find an arm's-length price. This is especially when companies use trademarks, patents, brands, logos, and a variety of company-specific intangible assets. Besides, wide applications of cloud computing technology have arguably increased the likelihood of this widespread problem. This has created even more challenges for MNEs trying to comply with their obligations. Cloud computing technology has significantly changed the landscape of traditional transfer pricing strategies adopted by MNEs for intangibles. Tian (2018) has presented these challenges. First, he stated that *“Cloud Service Providers (CSP) focus on relocating the CSP affiliate (as a whole) from high to low-tax regimes instead of transferring IP ownership”*. Second, *“CSPs apply service subscription as a business model instead of IP licensing strategy”*. Third, *“MNEs avoid arm's length principle test by signing an IP service agreement between affiliated companies, which not only covers licensing of IP, but also covers related technical services (such as software maintenance)”*. Moreover, through cloud-service agreement, the parent company can locate its technical team for IT maintenance in one or multi low-tax jurisdictions. In addition, cost-sharing agreement CSA is another cloud-related transfer pricing strategy where related entities agree on how to allocate between them R&D costs for creating intangible assets. Another significant challenge, other than lack of comparable transactions and the complexity of IP package that makes transfer pricing assessment difficult, if not impossible, for tax authorities is the lack of information on intangible transaction in financial statements. Some intangibles do not appear on a MNE group's balance sheet unless they are purchased. In other cases, they have to be expensed rather than capitalized as investments (Tian, 2018).

share. *Note* that there is no overt hierarchy of methods, but there is now a requirement to use the “most appropriate method”, having regard to the functions and risks of all parties.

Other recommendations of OECD are, first, separation of ownership of intangibles and remuneration. This points out that the ownership of intangibles itself does not give any right to retain returns derived by the MNE group from exploiting the intangible. *“This return, if attributed to the legal owner, depends on four aspects: the functions it performs, the assets it uses, the risks it assumes, and the contributions made by other group members”* (Tian, 2018). The OECD seeks to ensure that all members within an MNE group who contribute to the value of intangibles are appropriately rewarded. MNEs exploit this rule by using business structures that separate the ownership of intangibles from their development, management, and control. Another important action is that OECD members should provide detailed transfer pricing documentation (particularly country-by-country reporting “CbCR”) which enhances transparency for tax authorities. However, Tian (2018) argues that this scheme has its limits since these new reporting requirements target large MNEs (for example, *“revenue threshold for CbCR reporting is EUR 750 million of annual consolidated group revenue, which may seem high for MNEs that may have annual consolidated group revenue less than the reporting threshold and will not be subject to the information disclosure obligation”*).

Given these regulations, Clausing (2016) suspected that profit shifting problems are not over for several reasons. First, country adoption of the proposals is uneven and incomplete. Second, a difficulty lies in the problem of establishing the source of income for firms that are truly globally integrated and it remains an arbitrary exercise to figure out where the additional profit should reside. Moreover, the intangible nature of IP makes it even more difficult to establish the source of economic value. Dharmapala (2014) confirms Clausing’s (2016) claims by stating that *“the fundamental conceptual issue is why and for whom BEPS constitutes a problem”*. He raises the question that national governments have a wide variety of legal instruments to reduce BEPS, and still they have not unilaterally taken more extensive steps in this direction. Therefore, questions on the sufficiency of these regulations are still open to answer.

Lohse and Riedel (2013) raised the question of whether transfer pricing laws limit international income shifting, using detailed information on the scope and evolution of transfer pricing laws in 26 European countries. These countries were divided into three categories: “category 1” comprises countries with no transfer pricing regulations or very general anti-avoidance rules, “category 2”, comprises countries where transfer pricing rules do exist and where tax authorities require some form of transfer pricing documentation, “category 3” comprises countries where documentation requirements are introduced into national tax law and imply that firms must provide transfer pricing

documentation upon request or directly with the annual tax return. Empirical results showed that transfer pricing regulations significantly reduce multinational income shifting. These regulations were found to reduce profit shifting behavior by 50% on average in countries of “category 1”, and stricter rules (particularly transfer pricing penalties) tend to induce stronger declines. However, they argued that stricter versions of transfer pricing laws could entail considerable administrative costs for both taxpayers and tax authorities. Similar study was conducted by [Marques & Pinho \(2016\)](#) that confirms [Lohse and Riedel \(2013\)](#) results, in which the results suggest that the stricter the transfer pricing framework the lower the tax rate difference sensitivity of reported earnings, meaning that tightening the transfer pricing framework is capable of dissuading MNCs from shifting profits from higher to lower-tax countries.

[De Mooij & Liu \(2020\)](#) provide solid evidence by using a quasi-experimental research design, exploiting a large micro data set of unconsolidated accounts of both multinational affiliates and affiliates of purely national corporations, comprising the period between 2006 and 2014. Their estimates suggested that, on average, “*the introduction of transfer pricing regulations reduced investments in multinational affiliates by more than 11%*”. This reduction in investment is larger if transfer pricing regulation becomes stricter and larger for firms that are less intensive in the use of intangible assets.

1.4. Technological Innovations for Transfer Pricing Compliance

Undoubtedly, the OECD BEPS initiative is an unparalleled effort to strengthen the international corporate tax system by somehow limiting opportunities for tax avoidance by multinationals. Nevertheless, instead of offering a complete alternative solution, the OECD Transfer Pricing Guidelines continue to rely on the long-standing arm’s length principle. As a result, some inherent challenges for tax authorities to implement the arm’s length principle remain unchanged. This arguably limits the effects of OECD’s recommendations. These results call directly to appropriate reconfiguration of international tax design. Therefore, a more “innovative solution” should be adopted that is capable of minimizing artificial profit shifting abroad and favoring tax compliance. This is considered to be Artificial Intelligence “AI”. This buzzword is becoming more than a technological fad in the field of accounting and taxation. The exploitation of big data and

algorithms are put into use to tackle tax optimization, so that transfer pricing is no longer a risk but a shield and then a new added value.

Both AI and block chain are emerging technologies in the tax field, as well as financial transactions. *“There is no reason a MNE could not reliably use block chain to track its intercompany transactions and to make payments according to pre-established arm’s length conditions via smart contracts ... this could prove especially valuable for transactions involving shared asset ownership, cost contribution arrangements, and the application of profit-split method ... it’s even possible that with block chain increasing adoption, new sources of bigger and better data will enable a more frequent application of the comparable uncontrolled price method for establishing arm’s-length prices between MNEs and their subsidiaries and related groups”* (EY, 2018). With that being said, it is obvious that the tax function is jumping towards a digital world.

On the way of how this automation will work in transfer pricing field, Martijn Krassenburg, Manager Transfer Pricing at Deloitte, explains that *“... an initial selection of a few hundred companies that are possibly similar is made by applying filters to an international database. They have to be screened manually, such as by searching for the websites of all of those companies and taking screenshots of them”*. He later adds that artificial intelligence will estimate the extent, by percentage, to which a company and a transaction are similar. The most important step is by conducting a benchmarking analysis between related party transactions and comparable market transactions. The extent to which a transaction is comparable impacts the conclusion regarding compliance with arm’s length principle.

Given the above-stated facts, it is clear that AI has promising elements and could be used as a step forward by representing a brave new world in the field of international tax planning. However, this seems to have escaped the attention of academic researchers. Research on technological innovations in accounting practices in general, tax field in specific, is scarce.

In light of all that is presented above, the research problem of this study will be examined more deeply in the next part.

Summary

In this chapter, prior literature has been reviewed and divided into four topics. The first section introduced literature related to profit shifting and tax base erosion as a result of tax rate differentials

between countries. The majority of research findings pointed out that tax rates induce income shifting practices from MNEs to minimize their tax liability and swell their profits. In the second section, a stream of literature relevant to the topic of transfer pricing as an important vehicle in corporate tax avoidance was presented. Indirect evidence (considering impact of tax rates on intra-firm trade) and direct evidence of transfer pricing (considering influence of taxes on transfer prices themselves) were discussed, and several factors were documented to increase transfer pricing intensity (e.g. tax havens, intangibles, multi-nationality, profitability, etc.). In the third section, evidence of regulatory measures taken to combat profit shifting was presented, in addition to literature about the somehow inefficient role of these measures particularly to addressing the issue of lack of comparability for transactions involving intangibles. As for the last section, insights from the professional field were presented providing evidence on the huge role AI will play in the tax field.

PART 2:

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**RESEARCH PROBLEM AND HYPOTHESES
DEVELOPMENT**

2.1. Research Problem

The previous chapter has naturally led to point out several gaps in existing literature and, consequently, define the research problem of this study. Prior literature has provided evidence on profit shifting by MNEs (most of them being US-focused). They measured, for instance, the sensitivity of profits to the tax rate differentials between parent firms and their subsidiaries using income statement profits before taxes, or by providing evidence on the increase in intra-firm trade between a parent entity and its affiliates in low-tax jurisdictions. However, these studies are indirect hints that profits are effectively shifted via transfer pricing. The studies that provide evidence on tax-motivated transfer pricing had focused on estimating the effect of tax rates on ETRs, intra-firm sales, etc. Others presented direct evidence on the impact of taxes on outbound and inbound transfer prices themselves and the price wedge between these prices and arm's length prices. Yet, these are few and mostly consider US-based MNEs with some others examine these issues in individual European countries. Additionally, several studies followed up which has stressed that it is exactly intangible assets which facilitate profit shifting behavior between multi-national entities. For example, some tested the effect of corporate tax rate difference on intangible property size and location, or the effect of R&D expenses on ETRs, etc. However, to the best of my knowledge, none of these studies investigated the determinants of transfer pricing in a European setting as a whole. European MNEs are good candidates to study transfer pricing especially that some are located in economically integrated regions (European Union), which could complicate the corporate tax problems and diminish the fiscal administrations' ability to monitor transactions and cash flows for companies with cross-border activity and to verify the accuracy of transfer prices.

As a result, and by recognizing the need to learn more about the determinants of transfer pricing intensity especially in European MNEs⁹, the general research problem is to determine the effect of specific variables on transfer pricing intensity in European MNEs. This general problem is narrowed to tackle the research question of this study:

RQ. *What impact does multi-nationality, tax haven status, and intangible assets have on transfer pricing intensity of European multinational companies?*

⁹ Richardson et al., 2013 & Taylor et al., 2015 examined the effect of these determinants on Australian and S&P 500 firms respectively.

On the other hand, it is known that MNCs face worldwide transparency requirements and thorough check by tax authorities in every country, where all tax relevant data have to be filed and validated by these authorities. It is also well confirmed that MNCs take advantage of flaws and loopholes in existing tax rules to optimize their tax costs. This creates a compliance issue where transfer pricing is perceived as a major tax compliance risk, not just a tax optimization strategy. [Jost et al. \(2014\)](#) stated that “*specific determinants of transfer pricing such that intangible goods transactions increases the perception of transfer pricing as the largest tax compliance risk*”. This non-compliance raises a risk of paying penalties and losing reputation. Therefore, it is less surprising that MNEs typically pay strong attention to tax compliance issues today when setting transfer prices ([Cools and Emmanuel, 2007](#)). Moreover, transfer pricing tax compliance has implications on the management control systems of a company. [Rossing & Rohde \(2010\)](#) found that the implementation of a transfer pricing tax compliance strategy (observed as the response of an MNE to its tax regulatory environment) affects the overhead cost allocation system design. Their study was based on a single MNE that maintains a unified set of transfer prices for managerial and tax purposes.

To solve compliance issues, a recent web article published in the *International Tax Review* by [White \(2019\)](#), stated that transfer pricing automation holds the key to documentation and compliance success, especially CbCR, where companies have to file reports on their arrangements in multiple jurisdictions. Of course it is much easier to file reports for many countries and to update legal standards using a digital approach. To put that in perspective, transfer pricing calls for centralized and consistent approaches in compliance, monitoring, and price setting, as well as in risk management. The use of IT tools combining a transfer pricing task workflow, worldwide cooperation, and operational transfer pricing is simply inevitable. Therefore, AI, on one hand, is presented as a tool to comply with tax transparency and transfer pricing documentation requirements, and on the other hand, tax risk is minimized and compliance and quality are assured. This allows assert that transfer pricing is no longer a risk but a shield and then a new added value. But how can AI be leveraged for transfer pricing compliance?

This being said, **there needs to be a mutual understanding what the key drivers are behind transfer pricing intensity (or risk of non-compliance) to efficiently manage the transfer pricing compliance burden through artificial intelligence and big data.** For that reason, the objective of this study will be two-fold: 1) provide empirical evidence on the effect of multi-

nationality, tax haven status, and intangibles on transfer pricing intensity of European MNEs; 2) present some insights into AI implementation as a solution to achieve tax compliance. In what follows, the research hypotheses for the research question mentioned earlier will be developed, based on support from prior evidence, and the significance of the research problem for both academics and professionals will be stated.

2.2. Hypotheses Development of the Research Question

2.2.1. Multi-nationality

From what has been elaborated in the previous chapter, it is plausible that tax planning and optimization schemes are aggressively implemented by multi-national corporations. The evidence on cross-country profit shifting activities suggests that multinationals, located across variably taxed jurisdictions, have enhanced opportunities compared to purely national firms due to the high level of expertise and resources which they own. This has been confirmed in an early research by [Jacob \(1996\)](#) who demonstrated that multinational firms have greater opportunities and resources to shift income (e.g. higher dividends and royalty incomes than national firms). Further research has confirmed that such firms have the capacity to report lower ETRs and benefit from additional tax deductions that may not be available to purely domestic firms. For instance, in a study on US MNEs, [Dyreg and Lindsey \(2009\)](#) found that *“locating material operations in foreign countries (especially low income-tax countries) is associated with both low foreign tax rates on foreign income and high federal tax rates on foreign income”*. Furthermore, [Rego \(2003\)](#) stated that *“MNEs are more successful at avoiding corporate taxes than purely domestic firms as the former are able to achieve economies of scale in tax planning through the use of their extensive operations and inter-firm trade”*, and they *“have more than double the levels of tax aggressiveness relative to domestic firms”* ([Hanlon et al., 2005](#)). Therefore, to formally test the impact of multi-nationality on transfer pricing intensity, the first hypothesis is developed:

H1. *Ceteris paribus*, multi-nationality is positively associated with transfer pricing intensity.

2.2.2. Tax Havens

Another key determinant of transfer pricing intensity is tax haven status. *“Tax haven operations facilitate tax avoidance both by permitting firms to allocate taxable income away from high-tax jurisdictions and by reducing the burden of home country taxation of foreign income”* (Desai et al., 2006). For example, they could control the treasury, insurance, funds, business and service functions for the corporate group. Desai et al. (2006) analysis extends to indicate that *“larger, more international firms, and those with extensive intra-firm trade with high R&D intensities are the most likely to use tax havens”*. Dyreng and Lindsey (2009) documented that, *“on average, US firms that disclosed material operations in at least one tax haven country have a worldwide tax burden on worldwide income that is approximately 1.5 percentage points lower than firms without operations in at least one tax haven country”*. Similar results are confirmed by Slemrod & Wislon (2009), and Wilson (2009). Based on that, the second hypothesis of this study is developed:

H2. *Ceteris paribus*, tax haven utilization is positively associated with transfer pricing intensity.

2.2.3. Intangible Assets

It has been demonstrated in the previous chapter that firms must find comparable transactions to price their own, but it is much more difficult to find comparable sale and purchase prices when dealing with highly-valued intangible assets and the payments attributed to them (i.e. royalties), rather than common goods for which it is fairly straightforward where firms can use public data or private databases which gather comparable transactions. Therefore, as intangibles are firm-specific and their valuations are subject to firms' own analysis, it allows MNEs to take advantage of tax rate variations among jurisdictions by allocating these assets between countries (Markle & Shackelford, 2012). Earlier, this finding was confirmed by Grubert (2003) who stated that *“the risk of transfer pricing aggressiveness is increased by the variability in the interpretation of transfer pricing valuations, and the difficulty for firms to define precisely the transaction under which intangible property transfers take place”*. Also, Dischinger and Riedel (2011) demonstrates that the lower an affiliate's corporate tax rate relative to other affiliates of the corporate group, the higher is its level of intangible asset investment, knowing that intangibles can be geographically separated from other production units in the corporate group at small costs. Another study by Dudar et al. (2015) pointed to a negative impact of taxation on bilateral royalty flows. Accordingly, the following hypothesis is formulated:

H3. *Ceteris paribus*, intangible assets are positively associated with transfer pricing intensity.

2.3. Significance of the Research Problem

The problem this study aims to address could make several contributions to both academics and professional community. Its potential uses for academic research are manifold. First, by providing evidence on tax havens effect on transfer pricing manipulations, this study enriches the profit shifting and tax accounting literature which investigates to which degree multi-national enterprises can take advantage of national tax differentials and manipulate transfer prices within the confines of the arm's length standard. A second research stream is the one that focuses on management control issues of transfer pricing which views transfer prices as an instrument for coordinating the production of sales decisions of different business segments and which recognizes that transfer pricing plays a major role in subunits' performance evaluation, internal decision-making and incentives to sell goods either internally or externally (allocation of resources especially intangibles, cost determination of goods and services involved). Another recent stream is the one that aims at understanding the impact of the increasing need for transfer pricing fiscal compliance on the design and use of management control system with MNEs (i.e. the incorporation of AI in business operations as an innovative tool to achieve compliance). Moreover, literature focusing on tax reforms is directly targeted by this study which could consider reform options for cross-border tax and foreign income regulations especially for MNEs which operations extensively rely on intangibles. Literature in economics is also concerned where this study provides insights of transfer pricing in a European setting that might affect European countries' GDP and other economic growth indicators. To extend further, researchers in the technological field might be interested in developing the artificial-intelligent embedded techniques in the tax field to serve transfer pricing compliance and documentation. As for the professional community, and in light of the BEPS debate, this problem is in itself of high interest and importance for tax authorities (especially in European countries), accounting standard-setters, and international organizations (e.g. OECD and European Commission). To put that in perspective, understanding the high risk of intangibles is crucial for the design and implementation of anti-avoidance rules and transfer pricing regulations, and the design and effectiveness of tax compliance rules depends on the shifting channel at which it is targeted. Tax and transfer pricing practitioners, and accountants are also considered where this

evidence calls for more in-depth knowledge of a complex web of country tax laws, regulations, rulings, methods, and requirements especially each (European) country's local GAAP for valuing intangibles. Furthermore, this study could be an awakening call for European MNEs themselves to seek tax compliance where transfer pricing has effects on their earnings, dividends, and returns on capital.

PART 3:

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METHODOLOGY

In this chapter, the methodology that will be employed to answer the research question and test the hypotheses will be discussed. First, the sample selection and databases that will be used to collect the data are considered. Second, the analytical and statistical methods that will be used to measure transfer pricing intensity and the relationship among the various variables, as well as guidelines on how to develop the empirical analysis and possible future scenarios will be examined. Lastly, insights into artificial intelligence implementation as a suggested solution to achieve transfer pricing compliance will be presented.

3.1. Data and Sample Selection

The sample for this study will include European multinationals which names are collected from the “Analytical Database on Individual Multinationals and Affiliates” (ADIMA) released by the OECD in July 2019. This database provides online public information on the largest (by sales) publicly traded and not state-owned MNEs and their global presence (affiliates) with differences in effective tax rates (ETRs) across industry sectors. Thus the data is feasible and inexpensive to obtain. Specifically, this database contains comprehensive information on each MNE and its subsidiaries as well as detailed financial and quantitative data (including revenue, profit, income tax and number of employees) and it identifies events like large company restructurings that could have a significant impact on trade, GDP and foreign direct investment data. However, the use of ADIMA database will be limited to the extraction of European MNEs names only.

Since the list of firms contains European and non-European MNEs, the study will be restricted to European MNEs. After selecting them from ADIMA database, the initial sample comprises around 126 European MNEs operating in different industries. However, the sample is reduced to 96 firms after excluding financial and insurance firms (30), because of the differences in application of accounting policies and different regulatory constraints faced by these firms, and the time frame ranges from 2016 to 2018 including 288 firm-year observations. The sample period chosen represents a recent period after the OECD’s BEPS projects and guidelines implementation. Regarding the financial data, OSIRIS database provided by Centre d’Études et de Recherches Appliquées à la Gestion (CERAG) at UGA as well as firms’ official websites will be used to collect this financial data (manually) from the annual financial statements of each firm in the sample and for each year.

3.2. Econometric Analysis

3.2.1. Dependent Variable

The dependent variable in this study will be transfer pricing intensity (i.e. aggressiveness), represented by *TPI* as a proxy¹⁰. To measure this variable, *TPI* index will be used similar to the one developed by Richardson et al. (2013) and Taylor et al. (2015). This index comprises eight dichotomous items (listed below) which are referred to by the OECD (2012) as key indicators of aggressive transfer pricing¹¹ and are to be extracted from the firms' annual reports and notes to the financial statements. This ensures that *TPI* index is "all-inclusive" of the major types of transfer pricing risks:

- (1) *"existence of interest-free loans between related entities;*
- (2) *existence of debt forgiveness between related entities;*
- (3) *existence of impaired loans between related entities;*
- (4) *provision of non-monetary consideration (e.g. services or non-liquid assets) without commercial justification between related entities, often in different tax jurisdictions;*
- (5) *absence of formal documentation held by a firm to support the arm's length methods used or the absence of formal documentation relating to transfer pricing between related entities;*
- (6) *disposal of capital assets to related entities without commercial justification;*
- (7) *absence of arm's length justification for transactions between related entities; and*
- (8) *transfer of losses between related entities without commercial justification"*.

In addition to the above items, specific attention will be placed on transactions involving intangible assets and their associated costs and payments (R&D expenses, royalty fees, etc.) especially those lacking commercial justification.

¹⁰ Transfer pricing aggressiveness in the international context refers to the downward management of taxes paid by allocating profits (or losses) among group members located in different tax jurisdictions through the intentional manipulation of intragroup transfer prices (Taylor et al., 2015).

¹¹ It is worth noting that any indicator of transfer pricing aggressiveness means there is non-compliance with the arm's length principle in setting transfer prices. Any non-commercial justification or lack of documentation and objectivity in relation to intra-group transactions suggests that a firm engages in aggressive transfer pricing practices or poor transfer pricing risk management.

The statistical “sum-score” approach is to be employed where each of the above items is coded “1” if the firm is engaged in activities suggestive of aggressive transfer pricing and did not substantiate the arm’s length or commercial basis of transactions, and “0” otherwise. The higher the score attained for *TPI*, the greater the degree of transfer pricing intensity.

3.2.2. Independent Variables

Basically, this study will examine the effect of intangibles, multi-nationality nature of firms, and location of subsidiaries in tax haven countries on transfer pricing intensity of European MNEs. Therefore, the independent variables will be denoted by *MULTI* (multi-nationality), *THAV* (tax haven), and *INTANG* (intangible assets). *MULTI* is measured as the total number of foreign incorporated subsidiaries scaled by the total number of subsidiaries. Information on MNEs’ subsidiaries and their location can be obtained from the OECD’s ADIMA database. *THAV* is included as a dummy variable in the regression model, having a value of “1” if the firm has at least one subsidiary located in a tax haven country and a value of “0” otherwise. This information is provided by [OECD \(2006\)](#) which lists the countries considered as tax havens¹². It should be noted that the criteria followed by the OECD to classify countries as tax havens is according to: “*the absence of tax or presence of a nominal tax on the relevant income, presence of laws or administrative practices that prevent the effective exchange of information between tax authorities, lack of transparency in their financial and tax arrangements, and lack of access to financial records*” ([OECD – Glossary of Tax Terms](#)). Finally, *INTANG* is measured as intangible assets scaled by total assets.

3.2.3. Control Variables

Several control variables are to be included in the model, which are denoted by: *PROFIT* (profitability), *LEV* (leverage), *SIZE* (firm size), *IND* (fixed industry-sector effects), and *YEAR* (fixed year effects). The measurements and justifications for the inclusion of these variables are the following:

¹² These countries are the following: Anguilla, Antigua and Barbuda, Bahamas, Bahrain, Bermuda, Belize, British Virgin Islands, Cayman Islands, Cook Islands, Cyprus, Dominica, Gibraltar, Grenada, Guernsey, Isle of Man, Jersey, Liberia, Malta, Marshall Islands, Mauritius, Montserrat, Nauru, The Netherlands Antilles, New Caledonia, Panama, Samoa, San Marino, Seychelles, St. Lucia, St. Kitts and Nevis, St. Vincent and the Grenadines, Turks and Caicos Islands, and Vanuatu.

More profitable firms are more likely to engage in activities suggestive of aggressive transfer pricing. Indeed, MNEs may take advantage of their profit-making and loss-making subsidiaries by locating the entities in deficit in high-tax regimes and the profit makers in lower-tax regimes. [Duhigg & Kocieniewski \(2012\)](#) and [Womack & Drucker \(2011\)](#) provide examples of case studies on Apple, Google and Microsoft which were found to allocate their profits to low-tax countries and increase their deductible charges through royalty payments to higher tax countries to reduce the consolidated taxable income. *PROFIT* is measured as pretax income scaled by total assets in line with [Rego \(2003\)](#) and is expected to have a positive sign. *LEV* is measured as long-term debt scaled by total assets. Leverage can be used by firms in order to benefit from a tax reduction through increased deductible interest costs, lower profit, and lower ETR ([Rego, 2003](#)). Also, in their study, [Richardson and Lanis \(2007\)](#) stated that the more a firm is financed with debt, the lower will be its ETRs. Thus, *LEV* is expected to have a positive sign. As for the size effect, it is likely that large firms perform more operations worldwide and on a larger scale due to their large resources and expertise, and are able to take advantage of different tax rates where they perform business operations and apply efficient tax planning across related entities. [Jacob \(1996\)](#) demonstrated that smaller groups are less sensitive to profit shifting acts than larger corporations. [Rego \(2003\)](#) also concluded that larger enterprises tend to realize transfer of assets and services on a larger scale than a smaller firm and thus benefits from tax variations and economies of scale. Hence, *SIZE* is measured as the natural logarithm of total assets in keeping with previous research ([Richardson and Lanis, 2007](#)). This variable is expected to show a positive sign. In addition, it has also been demonstrated that transfer pricing aggressiveness differs across industry sectors. To mention as an example, [Bernard et al. \(2008\)](#) found that transfer pricing is aggressively used by firms operating in the material sector. [Mazur \(2016\)](#) further states that this intensity is intensified in high-tech companies that largely rely on hard-to-value intangibles and particularly cloud computing. To measure this variable, nine industry (*IND*) dummy variables are to be included that are coded according the two-digit industrial codes provided by the General Industry Classification Standard (GICS). The industries in the sample are distributed as follows: industrials, technologies, communication services, consumer discretionary, energy, health care, basic materials, consumer staples, and utilities. No sign predictions are made for the industry-sector dummies. Lastly, *YEAR* dummy variables are included to control for any differences in transfer pricing activities that could exist over the sample period (2016-2018), and no sign predictions are made. *IND* and *YEAR* are fixed effects.

3.2.4. Regression Model, Analysis Procedure, and Possible Future Scenarios

Given what is presented above, the following regression model will be developed and estimated using OLS regression method, similar to that of Taylor et al. (2015):

$$TPI_{it} = \alpha_0it + \beta_1MULTI_{it} + \beta_2THAV_{it} + \beta_3INTANG_{it} + \beta_4SIZE_{it} + \beta_5PROFIT_{it} + \beta_6LEV_{it} + \beta_{7-15}IND_{it} + \beta_{16-18}Year_{it} + \varepsilon_{it},$$

where α_0 = constant; i = firms 1-96; t = 2016-2018 financial years; TPI = transfer pricing intensity index; $MULTI$ = total number of foreign subsidiaries divided by total number of subsidiaries; $THAV$ = dummy variable that equals “1” if the firm has subsidiaries located in tax haven countries and “0” otherwise; $INTANG$ = intangible assets divided by total assets; $SIZE$ = natural logarithm of total assets; $PROFIT$ = pretax income scaled by total assets; LEV = long-term debt divided by total assets; IND = fixed effect industry sector dummy that equals “1” if the firm’s industry is listed in the GICS codes and “0” otherwise; $YEAR$ = fixed effect dummy that equals “1” if the year falls within the specific year category and “0” otherwise; and ε = error term.

Descriptive statistics for the above variables are to be collected, and the intensity of each variable is measured by the mean score obtained. Moreover, same descriptive statistics for the index could be applied for each industry sector to check whether it is evenly distributed across all industries or some industries’ activities tend to be more aggressive than others in their cross-border activities.

Positive correlation results are expected between TPI and each of the independent variables. If the regression coefficient for $MULTI$ is positively and significantly associated with TPI , H1 is supported and the greater the number of foreign controlled subsidiaries of European MNEs, the greater the degree of transfer pricing intensity. The regression coefficient for $THAV$ is expected to be positively and significantly associated with TPI which supports H2 that incorporation of a foreign subsidiary in a tax haven facilitates transfer pricing manipulation. Also, the regression coefficient for $INTANG$ is anticipated to be positively and significantly associated with TPI . Thus, H3 is supported and intangible assets are used to manipulate transfer prices. Finally, for the control variables, the regression coefficients for $SIZE$, $PROFIT$, and LEV are also expected to be positively and significantly associated with TPI .

To extend further, interaction variables could be incorporated to study the interaction effects of intangibles, multi-nationality, and tax havens. As mentioned in the literature review, empirical support was provided stating that MNEs are able to magnify the intensity of their transfer pricing practices by means of collective intragroup transfers of intangible assets among foreign controlled firms located in tax havens (Jacob [1996]; Grubert [2003]; Dyreng & Markle [2013]) and many others). Also, the transfer pricing index score could be used as an input variable to assess intensity of transfer pricing activities among companies and whether individual differences are detected. **At a higher interesting level, a transfer pricing risk index (TPR) could be proposed comprising several factors that could affect transfer pricing practices of a firm (particularly of intangible assets). For example, cyber risks, litigation risk, target of regulatory issues, volatility, little resilience, and risk perception were found to be given high attention from top associates in their strategies and practices (Ponemon Institute LLC., 2019).**

Several future scenarios could arise from the analysis procedure. As mentioned earlier, the utilized transfer pricing index is comprised of eight dichotomous items or activities that suggest the presence of transfer pricing risk. Some of these practices might be more important than others or used more frequently by the multi-national enterprises in the sample. Hence, regression results could be driven by few items constituting the index. To check for robustness and whether the effects of *MULTI*, *THAV*, and *INTANG* on *TPI* are the same, the activities displaying highest mean score should be excluded and the regression is run again.

Moreover, future empirical results might be affected by the proxies used to measure the variables. To capture several dimensions of these variables, alternative measures could be employed. For example, in line with Taylor et al. (2015), *MULTI* could be measured as foreign pretax profit scaled by total pretax profit, *THAV* is measured as the natural logarithm of total number of tax havens, and *INTANG* is measured as R&D expenses scaled by total assets¹³. *SIZE*

¹³ It could be argued that using balance sheet data has limitations as it does not allow for disaggregation of the legal assets which constitute the intangible asset figure, and intangible assets are usually only a *share* of a firm's IP. Therefore, R&D intensity seems to be a more robust proxy for profit shifting opportunities in general, even beyond activated IP in the balance sheet.

could also be measured as a natural logarithm of total revenues. If this sensitivity analysis shows positive and significant results, then it is concluded with certainty that H1, H2, and H3 are supported.

Furthermore, other control variables could be added to the model. To address the differences in regulatory and institutional aspects between countries, country-fixed effects and enforcement or accounting quality variables could be considered. It has been documented that the quality of enforcements affects the accounting practices in a jurisdiction. For instance, [Brown et al. \(2014\)](#) proposed an index which captures the institutional setting for financial reporting with regard to the audit environment and the regulator's enforcement activities. [Christensen et al. \(2013\)](#) measured enforcement intensity looking at the creation of specific national accounting enforcers after the mandatory adoption of IFRS. A more comprehensive measure includes that of [Hope \(2003\)](#) comprising country-level factors: audit spending, trading laws, shareholder protection, etc.

3.3. Insights on Artificial Intelligence Implementation for Transfer Pricing Compliance

From practitioners' perspective, the buzzword of AI application in the tax field is "automated fully-integrated end-to-end process". AI delivers a complete functional solution throughout the whole transfer pricing life cycle, from strategy and planning to price setting, maintenance, documentation, and dispute resolution. In fact, to be used, AI needs to be fed with "Big Data". A 2018 report published by Maik Heggmaier and Birgit Makowsky - transfer pricing leaders at WTS Steuerberatungsgesellschaft mbH in Munich¹⁴ - outline the steps needed for AI usage and present its potential future applications in transfer pricing topics. The process starts with **initial planning** where there is no documentation and no tools are integrated. Briefly, this stage defines responsibilities only (i.e. who decides on transfer prices, who approves these prices, etc.). **Documentation of processes** starts in the next level where transfer pricing's monitoring and functional concepts are recorded in manuals, partially achieving compliance with standard processes (i.e. arm's length transactions). **Automation** comes in the third step where transfer pricing data (e.g. sales orders and purchase orders) is automatically obtained and compared to arm's

¹⁴ WTS in Germany is a global tax consulting and financial advisory services firm.

length transactions to detect any deviations. After that, an **optimized** level is attained and efficiency of processes is achieved where all documentation is easily accessed, transferable and meaningful.

Furthermore, transfer prices cases that are supported by AI are grouped into three. First, AI assists in **transactional data analyses** where all transactions, invoices and contracts are collected directly from source systems, categorized and compared with probability ratios provided. This helps firms get rid of manual data collection from disparate sources, which is time-consuming and cannot be analyzed cohesively. Second, in **communications and data flow applications**, a chatbot could be used as a dialogue system which answers questions on deadlines, tax rates, thresholds, transfer pricing requirements in certain countries, transfer pricing methods, country contact persons, country-by-country reporting notifications, etc. Third, **transfer pricing consulting and compliance** make use of text-related solutions (i.e. semantics) by identifying and encompassing similar tax cases, opinions and verdicts from the past. Comparability analysis can be done by virtual or electronic assistants without having to browse up to thousands of internet sites to check arm's length transactions.

Also, an interesting report by PricewaterhouseCoopers on emerging technologies in transfer pricing identified key applications of big data. The first is **descriptive analytics** which identifies and derives trends and patterns from large data sets to support decision-making process including: collecting financial results across jurisdictions, regions, business units, and stock-keeping units, measuring KPIs or any relevant metrics, etc. Second, data computation and visualization tools (e.g. Tableau, Qlickview, PowerBI) help in **predictive analytics** by creating web and mobile-enabled dynamic dashboards in order to obtain insights into the outcomes of various scenarios and hypotheses. They include pattern recognition and prediction tools which are key competencies of AI such as developments of profit margins, accepted and rejected comparable companies, prediction of market prices, costs and sales revenue, as well as value chain tracking which is especially beneficial for the DEMPE (development, enhancement, maintenance, protection, exploitation) functions of intangibles valuations, etc. These predictive models are used in **prescriptive analysis** to determine the best course of action. Overall, it is clear that tax function, accounting, auditing, and IT would have to work together; otherwise, isolated solutions will not work or will create redundant and probably contradictory data and slow processes.

The figure below is an example representing transfer pricing analytics that span over the entire data life cycle as extracted from PwC report:

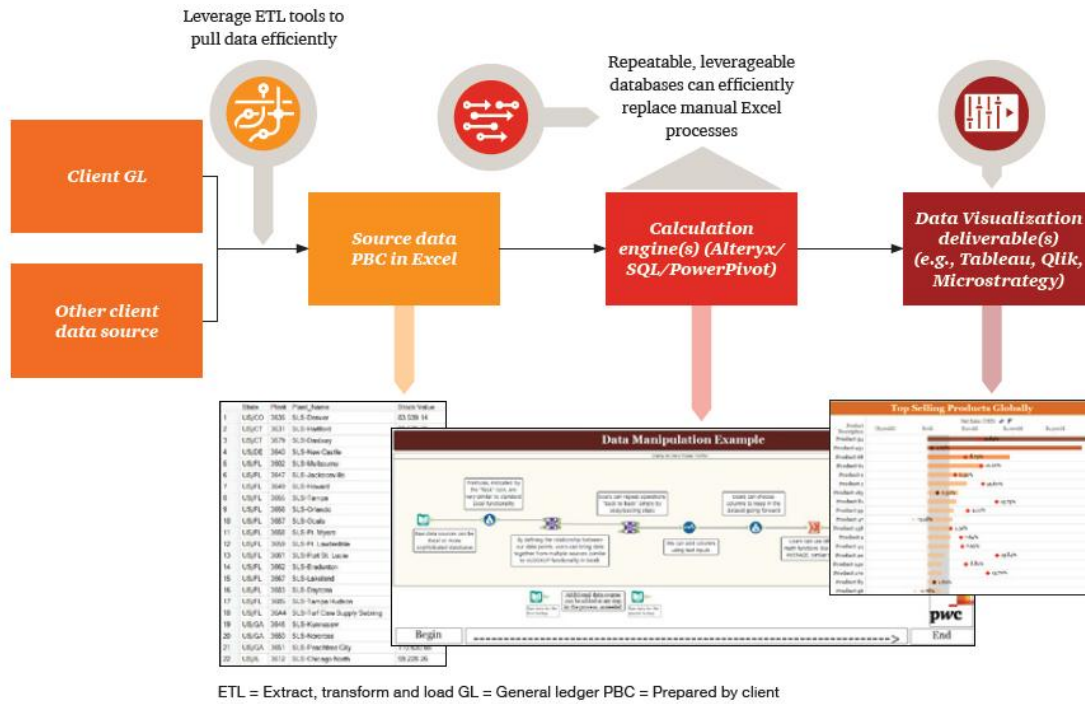


Figure 1: Process Flow of Transfer Pricing Analytics and Data Visualization Technology

Source: Transfer pricing analytics: The exploitation of Big Data and emerging technologies in transfer pricing. (Pwc.com).

CONCLUSION

Tax non-compliance and income shifting by MNEs have stimulated a large body of research and are gaining an increasing level of salience in a wealth of academic papers and professional publications. The very low tax amounts paid by MNEs have brought this issue to the forefront of public debate and international policy agenda. The OECD has launched BEPS Action Plans in 2013 to combat income shifting by MNEs. Besides, unilateral proposals are being discussed in many countries to explore a solution for tax base erosion and promote compliance by MNEs.

Several vehicles exist to shift profits from one jurisdiction to another. Yet, the bulk of corporate tax avoidance and non-compliance risk is attributed to transfer pricing. Though being defined as the price charged to products exchanged between associated enterprises, the term “transfer price” is usually burdened by a negative connotation implying tax avoidance or tax evasion. According to the OECD, the transfer price for related party transactions must comply with the arm’s length principle, i.e. it should be the price charged for the product if it was exchanged between a third neutral party outside the corporate group. The OECD has specified several methods to determine the arm’s length price and required MNEs to submit several documentations to the tax authorities (e.g. CbCR, master file, and local file); in addition to requirements by each MNE’s country. However, in the arcane world of international taxation nothing is quite so simple. To find a similar transaction involving somewhat similar product under similar circumstances is difficult and time-consuming given the huge amounts of data at hand. But, tangible assets are not the whole story. Also, this becomes even impossible in the world of intangible assets that are unique, lack external well-established markets, and their valuation is subject to the firm’s own analysis. Some intangibles do not appear in the companies’ balance sheets or within their profit and loss (P&L) accounts. Another risk is the use of cloud services or open-source software code where it is even harder to detect who actually owns the software. This implies that the arm’s length standard is arguably a complex and costly-to-administer approach, and the risks of tax disputes and tax non-compliance for MNEs are likely to increase.

Also, inherent challenges for tax authorities to evaluate whether MNEs' transactions are arm's-length compliant continue to exist.

With that being said, the use of artificial intelligence (AI) was suggested which can calculate the results of independent parties and perform comparability analyses. It also produces master files and local TP reports, and fills in all tax forms automatically. AI Solutions could correct out-of-range prices (i.e. non-arm's length compliant prices) or make dynamic adjustments in a self-optimizing IT environment.

While previous literature has provided evidence on profit shifting by MNEs, their results cannot be suggestive of transfer pricing manipulation and their methodology is based on an indirect approach. Others documented direct evidence on the wedge between arm's length prices and inter-company prices, and some examined the impact of transfer pricing activities on ETRs, R&D expenses, etc. Most of these studies are US-based or focus on individual countries. Besides, they study the outputs of transfer pricing without examining the factors increasing the intensity of transfer pricing activities by MNEs. Realizing this gap, the aim of this study is to provide direct evidence on the determinants of transfer pricing intensity of MNEs based in the European region – a region where the high level of economic integration facilitates profit shifting and transfer pricing manipulation. In particular, it studies the effect of intangibles, multi-nationality, and tax haven status on transfer pricing intensity. It also presents insights on AI implementation based on the belief that an understanding of the factors increasing transfer pricing risk is crucial to understand how innovative tools must be used.

This study has contributions to the literature. First of all, it extends previous literature and provides direct evidence on the magnitude and trends in transfer pricing activities of European MNEs. This evidence could be noteworthy in the context of a large empirical literature relying almost entirely on indirect evidence. Second, it relies on a tedious manual data collection on a firm level which enables a much firmer grip on these issues and makes the research original. On the other hand, it is important to highlight several limitations of this study that users have to keep in mind when drawing inferences. First, the financial data is collected from the consolidated financial statements of the multi-national group as a whole. The reason is that detailed information on transactions between affiliates or between an affiliate and the parent company are somewhat difficult to obtain, and some MNEs may not disclose detailed information on their intra-firm transactions. Second, multi-nationality, tax haven utilization, investment in intangibles, and degree of leverage of the firms in the sample might be driven by other factors instead of transfer pricing

purposes. Endogenous differences might exist between firms depending on the capital structure decision and the required capital, operational requirements, level of cross-border trade required, etc. Besides, the study considers only profitable firms. It might be possible that loss-making firms could be motivated to use transfer pricing to increase their cash flows. Third, this study does not distinguish between intangibles disclosures for financial and tax accounting purposes. For example, R&D expenses are treated as expenses for tax purposes and are capitalized under IFRS in certain cases. However, due to the complex nature of transfer pricing, documenting evidence on the size of transfer pricing activities of firms remains challenging.

This research suggests an agenda for further work. For instance, future research could consider going deeper into a micro-level and examine case studies to detect differences in transfer pricing intensity between European MNEs as a whole or between each MNE and its subsidiaries or between the subsidiaries themselves. Second, future research could examine the determinants of transfer pricing intensity in large transformation economies such as China. Third, whereas previous work has considered either individual firm data or country data, future research could consider product-level data and investigate the effect of specific types of intangible assets on transfer pricing manipulation especially cloud computing. Also, it is interesting to quantify R&D intensity for accounting and transfer pricing purposes to draw inferences on the relative weight of each effect. Studies could also compare transfer pricing practices before and after the novel COVID-19 virus to examine which effect the disruption of the supply chains has on transfer pricing activities. Moreover, tax compliance has escaped the attention of researchers. Hence, studies should extend the literature in other directions and consider tax compliance issue as major concern in transfer pricing regulations as well as distinguish between tax compliance, evasion, avoidance and optimization. Lastly, it is important to investigate the extent to which AI improves the quality of transfer pricing documentation and compliance.

In a nutshell, more regulatory reforms are required to address the issue of transfer pricing compliance and questions on the appropriateness of the arm's length principles itself have to be raised. This study suggests that tax compliance has to be considered not only in empirical studies, but also in theoretical transfer pricing models!

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ABBREVIATIONS AND ACRONYMS USED

ADIMA: analytical database on individual multinationals and affiliates

AI: artificial intelligence

BEPS: base erosion and profit shifting

CbCR: country-by-country reporting

IP: intellectual property

OECD: Organization of Economic Cooperation and Development

R&D: research and development

TP: transfer pricing

WIPO: World Intellectual Property Organization

GLOSSARY

Tax compliance: the degree to which a tax payer complies (or fails to comply) with the tax rules of his country

Tax avoidance: an action taken to minimize tax liability and maximize after-tax income

Tax evasion: failure to pay or a deliberate underpayment of taxes

Base erosion and profit shifting: tax planning strategies used to shift profits from high-tax regimes to low-tax regimes, thus the tax base of the higher-tax regime will be “eroded”

Transfer price: the price charged for goods, services, and intellectual property exchanged between related parties

Arm’s-length price: the price charged for products exchanged between independent parties (i.e. market price)

Comparability Analysis: comparison between controlled transaction (of related parties) and uncontrolled transaction (of independent parties) involving similar products under similar circumstances

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