Bachelor Thesis

How good are multinational EU companies at escaping from paying taxes?

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JEL codes: F38, H26

April 2022

Riga

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Title of the Thesis: How good are multinational EU companies at escaping from paying taxes?

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Table of contents

1. Abstract

Profit shifting is a topic that has been relevant for quite some time, and getting even more attraction currently, as more high-profile examples occur. In general, most multinational companies engage in profit shifting by reporting profits in low-tax countries, which in turn decreases government revenues. Therefore, it is an important topic to look into, as there are also new policies and frameworks being implemented by multiple institutions. We look at the main dynamics of multinational companies that engage in profit shifting in the European Union, during 2012-2020, by calculating a composite tax variable C, based on a paper done by Huizinga & Laeven in 2008. The variable C is a proxy for the incentive to shift profits, whereas the semi-elasticity that we compute with regressions show whether companies engage in it. We find that 75% of companies engage in profit shifting, and the larger the company, the more they shift their profits. Additionally, we find some other trends regarding geographical location, namely, that companies are more likely to shift profits in Eurozone countries, and in comparison with previous research; it is likely that the overall scope of profit shifting has decreased over a longer time period.

2. Introduction

Every corporation's goal is to make a profit and provide for its stakeholders. At the same time, every government's goal is to collect money for its budget, with one of the channels being taxing corporate income or profits. Every company is subject to paying corporate income tax (CIT) in the respective country where they operate, which has a toll on their after-tax profits. Once companies have reached a significant magnitude, many decide to expand their business to other countries, which makes them Multinational Corporations (MNCs). These types of companies have a parent company in the home country, and a subsidiary/affiliate in at least one other country, which means that, as legal entities, they have to pay tax in their respective countries, however, in certain situations such as dividend or royalty payments, they are subject to double taxation (Hines, 2001). However, in reality, this is rarely the case as there are numerous treaties between countries that agree on specific terms on how multinational companies would be taxed. In most cases, this removes or at least reduces double taxation. Nevertheless, the whole system of foreign taxation is very complicated, which allows for opportunities to exploit the system, with the underlying goal being to avoid or reduce taxes. One of the ways this is achieved is by engaging in profit shifting.

Profit shifting is done by registering most of the company's income in a country with more favourable tax rates. Often, these countries with more favourable taxes are specific countries known as "tax havens" (Hines & Rice, 1994). There are multiple ways to avoid taxation and shift profits, which also makes it hard to track these manipulations, especially because they are legal, which further makes it a problem for the European taxation system. Many countries miss out on substantial government income due to profit shifting by MNCs; according to Missing Profits (n.d.), most European countries actually lose out on potential income from CIT. Therefore, profit shifting is an interesting topic from both the economic and business point of view.

Famously, there have been multiple multinational corporations such as Apple, Facebook, and Google, that have opened their European headquarters in Ireland due to their low corporate tax rate, or in other words because Ireland is a "tax haven" (Lyons, 2021). Such a move is mutually beneficial, as companies gain by reporting larger profits, while Ireland can boost their economy by having large corporations operate in the country. Moreover, there was a large-scale court case as recently as 2016, where the European Commission claimed that Apple owes 13 billion euros to Ireland in tax payments, that have arisen due to illegal tax benefits. Ireland had allegedly offered Apple a substantially lower corporate tax rate than their already-low 12.5%, which is illegal under

EU state aid rules (European Commission, 2016). This shows how much companies can gain from profit shifting, how important of an issue it is for countries, and how topical this subject is overall.

The basic overarching idea is that MNCs are likely to open subsidiaries in countries with lower corporate tax rates and report their profits there. By decreasing the taxes to be paid, the company increases its after-tax profits, thus, companies seek opportunities to engage in such manipulations. Our research focuses on MNCs based in the European Union (EU) for the time period of 2012-2020, covering most of the last decade. The EU is a very transparent market, especially considering the Euro currency which is present in most countries, thus making trading with other countries easier. This, together with other factors such as treaties, makes it very common and popular for European companies to expand to other countries within the union, therefore creating opportunities to engage in profit shifting. Based on the composite tax variable, which is a proxy for company's incentive to shift profits, we will see that most companies use their incentive, and gain from profit shifting. We also find that company size is a crucial parameter, as larger companies engage in profit shifting more. Furthermore, we also look into other general factors that might influence profit shifting and measure these effects, to confirm our results. Finally, we want to compare our findings to the findings in the already existing literature. Considering this information, the research question we propose is as follows:

RQ: What is the extent and nature of profit shifting among the EU multinationals?

Our paper is structured in the following way; in section 3 we look into the literature about profit shifting and see what research has been done in the field and their findings. In section 4 we lay out the basis for our methodology and introduce new variables based on the findings from the previous section. In section 5 we explain where our data is coming from and show a basic summary analysis. In section 6 we perform the analysis and interpret the results, as well as provide basic explanations for them. Continuing in section 6, we also perform robustness checks by dividing the sample and seeing the effect on the results. In section 7, we discuss our findings, possible explanations, and the reason why results might differ from the literature. In section 8, we conclude the findings of the paper.

3. Literature Review

3.1. Theoretical literature

3.1.1. Corporate Income Tax

According to the Tax Foundation (n.d.), "A corporate income tax (CIT) is levied by federal and state governments on business profits". Thus, CIT is a tax that governments charge from companies and organisations for their operations in the respective country. The incentive to tax their income is to boost the country's economy, finance government operations, and use this revenue for public goods and services such as roads, parks, government-funded structures, hospitals. Income tax laws are different across the world, for example, in the USA the tax system used to be progressive, meaning that there were different brackets of tax amount depending on the income. In short, the more you earn, the more you pay, though, of course, it is never infinitely progressive. It used to vary from 25% to 35% (Tax Policy Center, n.d.), though, since 2018 the CIT in the USA is also flat (Watson & McBride, 2021). Most EU countries also have a flat CIT, though some exclusions are present. For example, currently, in 2022, The Netherlands has two income brackets - 15% which is taxed for income up to 395 000 euros, while any income higher than that is taxed at 25.8% (Tax Summaries PwC, n.d.-b). This is done so that the bigger companies would contribute the most to the tax revenue because they can afford to do so, while smaller companies with little income are taxed less so that they could continue their business. However, as mentioned, most EU countries have a flat CIT, in 2021 ranging from 9% in Hungary to 31.5% in Portugal (Clarke, 2021).

CIT can influence the economic behaviour of corporations, because their aim, of course, is to pay as little tax as possible and to have higher profits. Hines (2001, p.4) writes that "taxation influences the timing, magnitude, and composition of corporate investment in plant and equipment, inventories, research and development, and other business assets", which means that high taxation, besides other factors, reduces investment. Therefore, corporations can be discouraged from investing. Governments often intervene in this, usually by encouraging business capital formation. This is done by allowing investors to depreciate their investments in a shorter time span for tax purposes which then is beneficial for the company as they will accrue smaller tax liability. CIT can influence the creation of profitable businesses as such, thus, some organisations will choose to be defined as small corporations, partnerships, or sole proprietorships, in order to gain some tax

relief (Hines, 2001), while Limited Liability Companies (LLCs) are the ones that are subject to CIT. Most importantly, however, corporate income tax allows for opportunities to do and set up a business in such a way, as to avoid paying such taxes and be admitted to several tax reliefs. Hines (2001) mentions examples of how corporate taxation can be used to one's own advantage, which we will delve into later. Moreover, this subject becomes especially important once companies decide to "go global" as the strategy and structure get more difficult and confusing which allows for very advanced systems to avoid or reduce taxes.

3.1.2. Multinational Corporations (MNCs)

There are many companies that do not operate in one country only and have expanded globally to other countries and opened subsidiaries there. The definition that Lazarus (2001, p.10197) proposes for multinational corporations is "a business organisation whose activities are located in more than two countries and is the organisational form that defines foreign direct investment". The organisational form mentioned in the definition accounts for the country the company is in and for the establishments of the subsidiaries themselves. As MNCs do business internationally, they also make profits in different countries through their subsidiaries and are subsequently required to pay tax in their respective corporate residences on it, however, there are different methods to account for this profit, which means that businesses are not always subject to CIT in foreign countries. In fact, once businesses start their operations in another country (and become MNCs), an array of complications with taxation present themselves.

3.1.3. Tax Avoidance

When it comes to taxes, same as most things, corporate companies are the ones to innovate and governments are slow to follow. The same can be said about profit shifting and how companies and governments approach that. The companies usually have advanced, sometimes even incomprehensible systems to pay as little taxes as possible, which often involves multiple countries and manipulations of profits over the border. However, profit shifting is not anything new and governments have rules in place. First, some home countries decide not to tax foreign affiliates as the tax on the profits should already be paid in the affiliate country. Second, home countries do tax income earned in the host country, however, they allow companies to claim credits for foreign taxes paid, thus they basically pay the difference between the two countries' tax rates for the

income earned abroad. In reality, the actual method of double tax relief is usually a combination of both systems. Most countries choose to refrain from taxing foreign income, while some countries also practice the credit method. (Hines, 2001). However, expanding business to other countries implies a complication in the taxation system, and methods to exploit it appear. In a more recent paper Beer, De Mooij & Liu (2018, p.7) propose more methods of tax avoidance subject to both the home and the host country. They mention that, although the precise channels of tax avoidance can vary, there are seven methods to minimise taxation: "transfer mispricing (stretching, violating or exploiting weaknesses in the arm's length principle); strategic location of management of intellectual property to low-tax countries to reduce taxes on associated income; debt shifting through intercompany loans (excessive borrowing in high-tax countries and lending to low-tax countries); treaty shopping (exploiting treaty networks to route income so as to avoid tax); risk transfer (conducting operations in high tax jurisdictions on a contractual basis to limit profits attributable there); avoiding PE (permanent establishment) status; locating asset sales in low-tax jurisdictions (to avoid taxes on the capital gains)" (Beer, De Mooij & Liu, 2018, p.7). Overall, there are different methods; companies can register their parent company in a low-tax country, they can "push debt" onto subsidiaries in high-tax countries, they can decide that the subsidiary has to pay licensing fees to the parent company in which case they do not make any profits and are not taxed, and there are many more examples.

One of the main methods used for transfer pricing is the arm's length standard. The arm's length principle is "the principle associated with a transaction where the affiliates are dealing from an equal bargaining position, neither party is subject to the other's control or dominant influence, and the transaction is treated with fairness and legality" Yao (2013, p.2). In case the transfer price and arm's length price are significantly dissimilar, national authorities would tax the company not for the price of the transaction, but for the arm's length price. As mentioned, there are some weaknesses; Beer, De Mooij & Liu (2018) argue that there is no "correct" arm's length price if there are no third-party transactions present to compare with, therefore, they can artificially adjust the prices to decrease taxes payable. The arm's length principle to avoid tax also applies to the strategic location of intellectual property, because it is basically impossible to determine an arm's length price for intercompany intangible transactions. In cases like these, the transfer prices can be manipulated and set so it benefits the company, thus hurting the country's tax income and there are almost no ways for tax institutions to prove them wrong.

The presence of opportunities to avoid tax is exactly what causes profit shifting. As mentioned in Beer, De Mooij & Liu's (2018) paper, intragroup profit shifting is an entirely legal technique or even an array of techniques to achieve tax avoidance. In other words, if you can choose where to pay taxes, you can choose to gain larger profits.

3.1.4. Base Erosion and Profit Shifting (BEPS)

According to OECD BEPS (n.d.), "Base erosion and profit shifting (BEPS) refers to tax planning strategies used by multinational enterprises that exploit gaps and mismatches in tax rules to avoid paying tax". In other words, profit shifting is an action that companies take in order to record higher profits by avoiding or in other ways manipulating tax. The array of methods on how to achieve this are mentioned in the previous paragraph. Similarly, Huizinga & Laeven (2008) also mention the variety of methods in their paper. In short, profit shifting is achieved by registering the company's income in a country with more favourable corporate tax rates. There are some extreme cases where countries have very low or even no taxes on corporate profits. This is usually done to attract companies (although often illegitimate, as in the aforementioned Apple example), and these countries are called tax havens. Tax havens are "a group of countries with unusually low (corporate) tax rates" (Hines & Rice, 1994, p.149). According to Dharmapala & Hines (2009), about 15% of all countries are tax havens, and they tend to be wealthy and small in terms of both size and population. There is not one single official list of all the tax havens, they tend to differ depending on the scope of research, context, and results, however, it mostly includes countries such as Switzerland, multiple "island countries" such as the Cayman Islands, British Virgin Islands, and the Bahamas, Malta, also Luxembourg, Ireland, and others. If we look at OECD country-level data of their CIT, we can see that it correlates and these countries are the ones with the smallest corporate tax rates (Stats.OECD, n.d.).

Profit shifting is a serious problem for many countries because they lose out on potential income which could boost their GDP. Generally, the distribution of corporate income tax revenues is very disproportionate due to profit shifting, countries lose out on USD 100-240 billion in income every year (OECD BEPS, n.d.). To ensure more transparent and democratic taxation globally, and to decrease the losses that countries suffer, OECD together with the strategic partner G20 is cooperating with 141 countries and jurisdictions to tackle this problem and take appropriate measures and actions. They have developed a framework that includes 15 actions that "equip

governments with domestic and international rules and instruments to address tax avoidance, ensuring that profits are taxed where economic activities generating the profits are performed and where value is created" (OECD BEPS, n.d.). To name a few - limitations on interest deductions, BEPS data analysis, neutralising the effects of hybrid instruments and entities, implementing a Multilateral Instrument that would offer governments solutions to avoid any loopholes in international tax treaties, and others.

To understand the problem on a more regional level, we will take a look at our country's - Latvia's – impacts from profit shifting. Tørsløv, Wier & Zucman (2018) have a working paper where they estimate the approximate losses of countries' governments due to profit shifts. They are also updating the statistics based on this paper on their website called missingprofits.world (Missing Profits, n.d.), where they have put a map of the world and one can check what is the loss of profits for each country that has available data. Of course, this is not official data, however, this is the only data that can be found on this, and considering they have analysed the whole world (or at least all the countries that have relevant data), the relative estimation should be of some relevance. Therefore, according to their estimates, Latvia, for example, has lost 23% of corporate tax revenue in 2018 (CIT in Latvia at the time was 20% (Tax Summaries PwC, n.d.-a)), which goes to show just how crucial profit shifting is not only for corporations but for governments as well. One of the reasons governments welcome foreign investments is because they tend to have good revenues and their taxes can be useful for a country's economy. If the companies end up not paying the income tax, the country misses out on potential income, they can get dissatisfied and in a way, they are cheated, but admittedly - legally cheated. It does, however, make sense from the company's point of view, as they want to maximise their profits, and if they can somehow avoid paying the tax and pay it in another country with lower tax rates, it is their gain. After all, as Milton Friedman (1970) argues in his famous article, the sole purpose of a business is to maximise profits.

3.1.5. Ethical implications

While tax avoidance and profit shifting are legal, it is not as straightforward and easy as that. As already mentioned, it does create a problem, and OECD/G20 is working to tackle tax avoidance (OECD BEPS, n.d.) because one of the main stakeholders, the governments, are affected. Then there is the other side - the fact that companies work to gain profit and serve the other group of stakeholders, which are employees, managers, and shareholders, not to mention that

such practice is legal. By summarising remarks from West (2017), it can be concluded that there is no right or wrong in profit shifting. One of the main stakeholders, governments are indeed negatively affected, but other stakeholders gain. Corporations have responsibilities for all of them, but in this case, it is borderline impossible to serve all of them to the maximum extent. So it happens that governments mostly are the ones that lose in such a case. There are many ways to look at it, but the overarching idea, we believe, does make sense, especially when again considering Friedman's ideology. We would argue that this issue is a philosophical loop of what is right and wrong, therefore, it is good that there are organisations such as OECD working on the issue. As long as there are no new guidelines, laws and measures implemented for a more transparent and equal tax environment, one cannot really argue with corporations' choice of engaging in profit shifting.

3.2 Empirical literature

3.2.1. Basics of profit shifting

There is a substantial amount of literature on profit shifting, and thorough research, we have concluded that a large part of it references a paper by Hines & Rice (1994) where they talk about the incentives behind profit shifting, the channels through which it is done, tax havens, factors influencing it, and others, for US multinational companies. Overall, they define what BEPS is, explain tax havens, etc. The main idea of their framework is to look at pre-tax income as the combination of their true income and shifted income, and this is one of the main methods used in literature. Furthermore, they find that perhaps unexpectedly, low foreign corporate taxes actually enhance tax collections in the USA due to the fact that by paying little to no taxes, the companies avoid foreign tax credits. An even earlier paper by Grubert & Mutti (1991) also found that the higher the reported profit, the smaller the tax rate in the foreign country for US multinational companies. Newer research by Dowd et al. (2017) finds that a small decrease in the tax rate for a country with high taxes will result in very little profit shifting from US MNCs, whereas a decrease in tax rates by 1 percent has a more significant effect on income shifting in a country with smaller tax rates and that the trend is quite linear. This goes to show that the incentives and trends of profit shifting have been fairly consistent over time. Based on the literature and the overarching trend with the correlation between statutory tax rate and the reported before-tax profit, we pose the following hypothesis:

Hypothesis 1: Companies will report lower profits in countries with higher statutory tax rates.

3.2.2. Multiple factors influencing profit shifting

As the original paper by Hines & Rice (1994) paper was done 27 years ago and since then has been updated and improved, we also reference a variety of other authors and works that have researched profit shifting, most of them also mentioning Hines & Rice's (1999) work and using their main premise.

Overall, it can be understood that exploiting firm-level data is specifically what drives good research on the topic of profit shifting, as it is explained by Dharmapala (2014) in his research. Hines (1999) finds that manipulation of transfer prices is one of the main ways of profit shifting, and consequently, Swenson (2001) argues that the effect of transfer price manipulation is significant yet small because such a method can turn out to be more costly than others. There are also papers done on specific industry-motivated profit shifting, for example, Beer & Loeprick (2017) and Fatica & Gregori (2020) offer insights into the oil and gas sector, and banking industry, which show that the levels of profit shifting and sensitivity to tax rates are substantially different across industries. Huizinga & Laeven (2008) use only manufacturing firms in their research, as they believe they represent output better than other industries. Furthermore, there is an additional popular framework idea among the profit shifting literature proposed by Dharmapala & Riedel (2013), and the idea is that differences in home and foreign tax rates change for exogenous reasons as a change in the statutory tax rate in one country. The research method focuses on how sensitive are the reported profits to this change in tax rate difference. They find a positive reaction between earnings shock and subsidiary profits as well as prove that the effect from exogenous shock is stronger for low tax countries (tax havens). There are plenty more papers that use the Hines & Rice (1994) approach that show how MNCs react differently to corporate taxes in different industries, countries, regions, and their effect on profit shifting.

As the topic of BEPS became substantially more important and talked about, and raised concerns, researchers started to concentrate on even more factors. For example, Beer & Loeprick (2014) analysed the role of intangible assets and the complexity of the supply chain among MNCs. They found that both variables are significant in determining the profit shifting activities, and that increase of intangible assets in comparison to total assets increases the number of profits. Moreover,

considering the importance of domestic and international legislation regarding base erosion, they also looked at documentation rules as a factor. What they found is that 2 years after mandatory documentation requirements were introduced, the profit shifting among subsidiaries decreased by 52%, highlighting the attention that this topic has received, and how substantial any changes can be to prevent profit shifting. Lastly, they find that documentation is not an efficient solution to tackle profit shifting that comes from companies' manipulations with intangible assets. Another paper that highlights the importance of the legislative side of this topic is by Marques & Pinho (2016). They developed an index that measures transfer pricing strictness in a country and looked at how effective transfer pricing frameworks are. They found that stricter transfer pricing networks do indeed indicate a lower profit shifting activity and that the costs related to it can partially discourage MNCs from profit shifting. Moreover, their research is done on European companies, which is relevant to our research.

3.2.3. Our framework

The paper that we decided to base our research on is the work done by Huizinga & Laeven (2008). They research the elasticity of the before-tax profits as well as the costs of engaging in profit shifting. Their findings prove that their theoretical model of profit shifting is empirically valid as they explain the before-tax profit elasticity to composite tax variable C (which is calculated using the weighted tax difference between affiliate countries) using company-level data and prove the negative relation between reported before-tax profits and the weighted average between home tax rate and all other affiliate tax rates. As we will be taking the Huizinga & Laeven (2008) paper as the basis for our methodology and paper itself, we pose a hypothesis based on their findings:

Hypothesis 2: The relationship between before-tax profits and composite tax variable C will be negative.

Considering our research question, this is the paper we choose to take our theoretical methodological framework from, and we have also made sure that newer papers are based on the same methodology such as Dowd et al. (2017). We plan to expand on their methodology and analyse the linearity of the semi-elasticity based on the size of the company. As Wier & Reynolds (2018) suggest, the size of the company is an important factor in profit shifting, as the largest companies are more likely to engage in profit shifting. Moreover, we take into account the research done on the above-mentioned profit shifting policies, and the fact that, even though the problem

of profit shifting as such has been topical for a long time, the extents and methods of it have changed significantly over time, thus, it is relevant to do up-to-date research to get a valid analysis of profit shifting in the past decade. Basing our assumptions on the results found by Wier & Reynolds (2018), we pose another hypothesis:

Hypothesis 3: The before-tax profits elasticity to the composite tax variable C will be larger for bigger companies.

4. Methodology

4.1. Theoretical model.

To further explore our research question, we need to establish a theoretical model that explains how MNCs engage in profit shifting and how to measure it. It is not straightforward when looking at the profit shifting as there is not a clear-cut variable to look at. It is important to note the difference between reported profits and real profits. The real profits are impossible to observe directly and need to be derived whereas reported profits can be observed from a database. We found that a model created by Huizinga & Laeven (2008) shows the relationship between real and reported profits explained by company-level factors. To calculate the shifted profits, we will look at the difference between real generated profits and the reported profits.

To explore the shifted profits, we will be building our empirical methodology on the model created by Huizinga & Laeven (2008). Although this methodology dates back to 2008, we concluded that the majority of papers up to this date use this paper as the basis for their research, thus, we find their theoretical model to be valid for our research. The theoretical model is based on a few assumptions, backed by the literature.

MNCs will try to maximise their total after-tax profits by shifting profits from a high-tax country to a low-tax country with the size of the profits shifted depending on the difference between statutory tax rates. It is important to point out that the reported profits contain two parts: real profits *Bi* generated in company *i* and inwards shifted profits *Si*. Any multinational company is able to shift its profits between the countries they operate in while incurring a cost $\frac{\gamma}{2}\frac{(S_i)^2}{B_i}$ which increases with the ratio of shifted profits to the real profits *Si*/*Bi* with a coefficient λ (Huizinga & Laeven, 2008). The sum of all shifted profits will be non-positive, as shifted profits do not create any additional return. In Equation 1, it is summarized that the total reported profits B_i^r will depend

on the real generated profits, shifted profits and the implied cost of the profit shifting with the constraint that shifted profits *Si* will not create additional profits $\sum_{i=1}^{n} S_i \leq 0$ (Huizinga & Laeven, 2008).

$$B_i^r = \sum_{i=1}^{n}(1-\tau_i)\left(B_i + S_i - \frac{\gamma}{2}\frac{(S_i)^2}{B_i}\right) - \lambda \sum_{i=1}^{n} S_i \quad (1)$$

We follow Huizinga's & Laeven's (2008) assumption that any MNC will use profit shifting to maximise their after-tax profits. Thus, deriving the equation on the profits shifted into the country of operation. Additionally, the amount of shifted profits will be a function of the weighted average tax differences in the countries the MNC operates in with the company revenue $\frac{1}{1-\tau_i}\frac{\frac{B_k}{1-\tau_k}}{\sum_{k=1}^{n}\left(\frac{B_k}{1-\tau_k}\right)}$ being the weights. The shifted profits depend on the taxable base B_i, inverse being the weights. The shifted profits depend on the taxable base *Bi*, the inverse function of the $\gamma(1-\tau_k)$ and the weighted average of the tax rate differences as seen in Equation 2 (Huizinga & Laeven, 2008).

$$S_i = \left(\frac{B_i}{\gamma(1-\tau_i)}\right)\frac{\sum_{k\neq i}^{n}\left(\frac{B_k}{1-\tau_k}\right)(\tau_k-\tau_i)}{\sum_{k=1}^{n}\left(\frac{B_k}{1-\tau_k}\right)} \quad (2)$$

Continue by inserting the previously calculated shifted profits *Si* from Equation 2 into Equation 1 of the reported profits B_i^r.

$$B_i^r = B_i + S_i$$

$$B_i^r = B_i + S_i = B_i + \left(\frac{B_i}{\gamma(1-\tau_i)}\right)\frac{\sum_{k\neq i}^{n}\left(\frac{B_k}{1-\tau_k}\right)(\tau_k-\tau_i)}{\sum_{k=1}^{n}\left(\frac{B_k}{1-\tau_k}\right)} = B_i\left[1 - \frac{1}{\gamma(1-\tau_i)}\frac{\sum_{k\neq i}^{n}\left(\frac{B_k}{1-\tau_k}\right)(\tau_i-\tau_k)}{\sum_{k=1}^{n}\left(\frac{B_k}{1-\tau_k}\right)}\right] \quad (3)$$

To have more concentrated results, we take the logarithm of Equation 3 and observe:

$$b_i^r = b_i - \frac{1}{\gamma}C_i \quad (4)$$

Where $b_i^r = log\ (B_i^r)$; $b_i = log\ (B_i)$; $C_{i=}\ \frac{1}{\gamma(1-\tau i)}\frac{\sum_{k\neq i}^{n}\left(\frac{B_k}{1-\tau_k}\right)(\tau_i-\tau_k)}{\sum_{k=1}^{n}\left(\frac{B_k}{1-\tau_k}\right)}$

Variable C is at the centre of this paper, so it is important to understand its interpretation. C is a coefficient that can be interpreted as the 'incentive' for profit shifting. It entails the difference in statutory tax rates between the company in the home country and its affiliates in other countries as well as the costs or possibilities to shift which are constrained by the real revenue generated in the subsidiaries. The sign of variable C can be interpreted as the direction where the profits would

go: if C is positive, the incentive is to shift profits to other subsidiaries as they have more favourable tax rates, if C is negative, the company's home country has favourable nominal tax rates thus the incoming shifted profits.

The real profits cannot be directly observable, so we will be using the assumptions made by Hines & Rice (1994), that the company output is based on capital K, labour L, and the productivity factor A. For easier calculations, we assume the Cobb-Douglas function $Q_i = cA_i^{\varepsilon} L_i^{\alpha} K_i^{\varphi} e^{ui}$. True profits will be the output minus the labour cost, which is taken to be equal to the marginal product of labour $c\alpha A_i^{\varepsilon} L_i^{1-\alpha} K_i^{\varphi} e^{ui}$. Observing that the real profits will be a function of constants c & (1 - α), productivity factor A, capital K, labour L and the error term, we enter them all in Equation 5 (Huizinga & Laeven, 2008). For more concentrated results, we once again take logarithms of Equation 5 and get the logarithmic function in Equation 6.

$$B_i = c(1-\alpha) A_i^{\varepsilon} L_i^{\alpha} K_i^{\varphi} e^{u} \tag{5}$$

$$b_i = log\,(c) + log\,(1+\alpha) + \varepsilon a_i + \alpha l_i + \varphi k_i + u_i \tag{6}$$

Where $a_i = log\,(A_i)\,;\; l_i = log\,(L_i)\,;\; k_i = log\,(K_i)$

By inserting the real profit function from Equation 5 into Equation 4, we obtain that the reported profits are affected by i) productivity factor a, ii) labour l, iii) capital k, iv) composite tax factor C, as seen in equation 7.

$$b_i^r = \beta_1 + \beta_2 a_i + \beta_3 l_i + \beta_4 k_i - \hat{\gamma} C_i + u_i \tag{7}$$

Where $\beta_1 = log\,(c) + log\,(1-\alpha)\,;\; \beta_2 = \varepsilon;\; \beta_3 = \alpha;\; \beta_4 = \varphi;\; \hat{\gamma} = \frac{1}{\gamma}$ According to Huizinga & Laeven (2008) $\hat{\gamma}$ can be interpreted as a semi-elasticity coefficient for reported profits in regards to the composite tax variable C.

4.2. Empirical methodology.

Following the theoretical model introduced in the previous section, we will be regressing the logarithm of the reported profits on the productivity factor, labour, capital and the tax composite factor using the Pooled Ordinary Least Squares (OLS) function and Fixed Effect method and compare the results between the two. Similarly, to Huizinga & Laeven (2008) and other papers using a modification of the same theoretical model, such as Fatica & Gregori (2020), we need to choose proxies for some of the factors to input in the empirical model, as many factors

in the theoretical model are not directly observable. In the theoretical model reported profit is used as the dependent variable. We will use the reported before-tax profits from the Profit-and-Loss statement as it will include the effect of the tax change without having a direct effect from it, as it would be if we used after-tax profits. As for the factors used for observing the real generated profits. By following Huizinga & Laeven (2008), we will use fixed assets as a proxy for capital and labour compensation as a proxy for labour. The productivity factor explains the differences in output between countries, thus GDP per capita is a good measure to use as a proxy. By replacing the inputs from the theoretical model with directly observable proxies, we reach the following regression in Equation 8.

$$\ln(\pi_{it}) \sim \beta_0 + \beta_1 \ln(L_{it}) + \beta_2 \ln(K_{it}) + \beta_3 \ln(GDP_{jt}) + \beta_4 C_{it} + \varepsilon_{it} \quad (8)$$

From the regression, we will be focusing on the coefficients before the variables. Labour compensation and fixed assets are explanatory variables for the real generated profits in the company *i*, country *j* at time *t*. Because we are looking at the profit elasticity based on the composite tax variable C, we will not try to interpret the β_1 and β_2 and β_3 coefficients but comment on their signs as, it is expected for them to be positive, as companies with larger capital and higher labour compensation will have higher profits as well as higher GDP per capita can be interpreted as higher productivity in a country *j*. β_4 coefficient will show the semi-elasticity of the before-tax profits in regards to the composite tax variable. We can interpret coefficient β_4 as the multiplier of change in reported before-tax profits if the composite tax changed by 1. The composite tax variable C_{it} in company *i* is positively related to the tax rate in the country *j* that company *i* operates. Because of this, we can predict a negative coefficient before C_{it}, as an increase in the domestic tax rate would cause the reported profits B_{ij}^{r} for companies located in country *j* to decrease. As we will be using pooled OLS model and fixed effect model, we will be accounting for different fixed effects. In both models, we will fix the year-specific effects to account for any unobserved year specific trends. In the OLS model, we will account for industry-specific effects, whereas in the fixed effect model we will account for company-specific effects. As company- and industry-specific effects are perfectly collinear, in the FE model the company fixed effects will already include the company-fixed effects. Coefficients for the fixed effects will not be interpreted and are just used to account for the year, company and industry-specific effects

$$C_i = \frac{\sum_{k\neq i}^{n}(B_k*(\tau_i-\tau_k))}{\sum_{k=1}^{n} B_k} \quad (9)$$

Composite tax variable C is not directly observable and must be calculated by the authors, see formula 9. For the Tax composite variable C calculations, following the theoretical model, we will be using the statutory tax rates which are country-specific and the operating income as the basis for weighing. We look at the data from 2012 to 2020 to include statutory tax changes which will create a better representation of the possible profit shifting.

As suggested by Wier & Reynolds (2018), top percentile firms shift way more profits than others. To explore this statement in our dataset, in addition to the empirical model used by Huizinga & Laeven (2008), we will add an independent variable of size $SIZE_{it}$ and explore its effect on shifted profits by introducing interaction between $SIZE_{it}$ and C_{it}, see Equation 10. Wier & Reynolds (2018) explore many variables as a measure of size, namely fixed assets, company wage spending, operating revenue and profits. We have chosen to use revenue as the better proxy for size as other variables such as total assets, the number of employees or employee compensation are already included in the regression or will be highly correlated with other independent variables like fixed assets. Bigger companies will engage in profit shifting more, because they have a higher incentive, and it is more accessible for them as well as the gain from profit shifting will be higher in monetary terms. Also, they will have more resources to devote to profit shifting in terms of money and labour as well as access to more knowledgeable accountants who have more experience (Wier & Reynolds, 2018). Based on these arguments, we expect coefficient β_6 to to be positive.

$$ln\,(\pi_{it}) \sim \beta_0 + \beta_1 ln\,(L_{it}) + \beta_2 ln\,(K_{it}) + \beta_3 \ln\,(GDP_{jt}) + \beta_4 C_{it} + \beta_5 SIZE_{it} + \beta_6 SIZE_{it} * C_{it} + \varepsilon_{it} \quad (10)$$

5. Data

We will look at multinational companies that operate in Europe and have affiliates in at least two different EU countries. If more than one entity is placed in the same country, there is no opportunity for profit shifting between the enterprises in the same country, as the statutory tax implied by the country is the same. We have retrieved company-level data from the Orbis database. To retrieve the dataset we need, we filter for companies operating in the European Union. Then

we filter subsidiaries that have majority shareholders from the European Union or parent companies that have subsidiaries operating in the European Union. For independent variables, we have chosen the employee compensation from PnL salary expense as the labour variable, fixed assets from the Balance Sheet as the variable for capital, operating revenue (turnover), and pre-tax profits. Additionally, we include other variables which will not be directly included in the regression but will be used for calculating tax composite variable C and performing robustness checks. We include the country the company is located in, industry, and the global ultimate owner (GUO). Considering limitations that the Orbis database puts upon us, namely, they only have data starting from the year 2012, our chosen time frame is 2012-2020. Therefore, for GDP per capita data, we have retrieved panel data for all EU countries from 2012 to 2020 from Eurostat. The tax data for European Union countries from 2012 to 2020 have been retrieved from the OECD database.

After applying relevant filters and combining the data for all years 2012-2020, we extract a dataset from Orbis, which is not yet complete. Next, we need to calculate the composite tax variable C. For variable C calculations, we only take companies from groups in which at least 5 companies are under the same Global Ultimate Owner (GUO) as we aim to see the most significant effects of profit shifting. This is done to look at groups of companies with a more advanced corporate structure which will allow for more possibilities to engage in profit shifting, as there will be more affiliates located in different countries. As we address later in the limitations part, company-level databases can get messy, thus, we also manually remove any other entities that are irrelevant to our research but were included in the dataset extracted from Orbis; governments or government-owned companies, as well as individuals as Global Ultimate Owners. The last detail we omit from our sample is companies that are all set in the same country under the same GUO, because there will be no possibilities of profit shifting as all affiliates face the same statutory tax rate.

Furthermore, we take the logarithms of profit before tax, fixed assets, employee compensations, revenue, number of employees and GDP per capita. By looking deeper into the data, we see that revenue for many companies is worryingly small, often being less than $1,000 while reporting millions in profits. We assume this is due to reporting or Orbis error and aim to exclude companies with incorrect reported financials. We apply a filter for revenue and select only companies that have revenue larger than $100,000. It has to be acknowledged that the before-tax

profits can be both positive and negative, thus, by following Huizinga & Laeven's (2008) methodology - by taking the logarithm of before-tax profits - we are excluding all companies which had negative profits. By doing this we are excluding around 20% of our initial dataset.

After all the necessary manipulations with our data, we conclude our final dataset of 47,767 observations across the years 2012-2020. Our dataset can be classified as unbalanced panel data as the companies that fit our filters (especially companies from groups with more than 5 common GUO), we do not have data about all companies from all years. This can be explained by mergers and acquisitions as well as some companies possibly going bankrupt. See the number of observation distribution between years and industries in Appendix 1.

Table 1 reflects the correlation matrix of the main variables included in the analysis to check for potential multicollinearity. We explore the correlation between log of fixed assets, log of costs of employees, log of GDP per capita, log of revenue, composite tax variable C and the statutory tax rate. The matrix suggests that there is a strong and positive correlation between costs of employees and fixed assets and revenue, which can be argued quite logically; this is in line with our assumption from the methodology that a company generates revenue using capital and labour. Then there is a large and positive correlation between statutory tax rates and composite tax variable C. This is logical, as we are using the statutory tax rate when calculating variable C but this will not cause multicollinearity, as the two variables will not be in the same regression. Lastly, statutory tax rate and C have a considerably strong correlation with GDP per capita. Countries with larger GDP, usually have a more developed public sector which is done by having a higher statutory tax rate.

	FixedAssets	**CostsEmployee**	**GDP**	**Revenue**	**C**	**Tax_Nom**
Fixed Assets	1.000					
CostsEmployees	0.252	1.000				
GDP	0.063	0.121	1.000			
Revenue	0.378	0.648	0.069	1.000		
C	0.023	0.035	0.338	0.023	1.000	
Tax_Nom	0.032	0.021	0.394	0.019	0.818	1.000

Table 1. Correlation matrix for all independent variables used in further regressions - log of fixed assets, log of costs of employees, log of GDP per capita, log of revenue, composite tax variable C and the statutory tax rate. Table created by the authors

6. Results

6.1. Analysis of results

To start, the authors performed a regression (Table 2), by regressing the logarithm of before-tax profits on the logarithm of fixed assets, the logarithm of costs of employees, the logarithm of GDP per capita, logarithm of operating revenue and the statutory tax rate. The main focus of the regression is the coefficient of the tax rate, as according to Dowd et al. (2017) the tax rate should have a negative effect on the before-tax profits. The regression reveals a negative and significant coefficient suggesting that all else equal, in countries with higher tax rates, companies report lower profits which falls in line with the literature. In this instance, an average CIT increase of 1pp results in a 0.9% decrease in reported profits during our sample period. Therefore, we conclude that the base idea when talking about profit shifting is in force for our sample. **This proves that our Hypothesis 1 - companies will report lower profits in countries with higher statutory tax rates - is true.**

Regression using Statutory Tax Rate

	Dependent variable:
	Before-tax profit
Fixed Asset Margin	0.266***
	(0.003)
Employee Compensation Margin	0.523***
	(0.005)
GDP per capita	0.149***
	(0.014)
Statutory Tax Rate	-0.009***
	(0.001)
Constant	0.881***
	(0.157)
Industry Fixed Effects	Yes
Year Fixed Effects	Yes
Observations	47,767
R^2	0.590
Adjusted R^2	0.590
Residual Std. Error	1.326 (df = 47736)
F Statistic	2,293.895*** (df = 30; 47736)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 2. Regression of log of before-tax profits on log of fixed assets, log of employee compensation, log of GDP per capita and statutory tax rate. Regression accounted for industry and year specific effects. Table created by the authors.

Next, the authors perform the original regression (Table 3) that was proposed by Huizinga & Laeven (2008), which explains the logarithm of before-tax profits by logarithm of fixed assets, logarithm of employee compensation, logarithm of GDP per capita and composite tax variable C. The coefficient before variable C is negative and significant, which means that on average the companies will report smaller profits if their composite tax variable increases, or to put simply - this would confirm that if there is an incentive to shift profits, companies will use it. When compared to Huizinga & Laeven (2008), our result is quite similar, as our C is also negative and significant. Our C is -0.715, and theirs is -1.017, which indicates that, perhaps, over the years the incentive to shift profits might have decreased a little, which could make sense, considering that there are consistently new policies and measures being implemented.

By looking at this regression we can also observe the sign and significance of variables that will be used through further regressions; the log of fixed assets is positive and significant, as is the log of employee compensations, thus, by adding these variables which indicate capital and labour accordingly, we can, similarly to Huizinga & Laeven (2008), conclude that the sum of 0.790 indicates a technological decreasing return to scale even during 2012-2020. Log of GDP per capita is also positive and significant, which indicates that companies tend to report higher profits in wealthier countries. The effects are the same for fixed effects as well.

Continuing on fixed effects, we also perform the same regression using the fixed effects model, to account for any company fixed effects. We get that, overall, the results are the same as for the OLS regression in terms of the effects; the variables have the same signs before them, and the results are significant. More specifically, the coefficient before C is negative and significant although less negative than in OLS model. As the fixed effect model returns the same results as OLS, we can claim with bigger confidence that **our Hypothesis 2, that the relationship between before-tax profits and composite tax variable C will be negative, is true.**

Baseline regression

	Dependent variable:	
	Before-tax profit	
	OLS	*FE*
Fixed Assets	0.266***	0.245***
	(0.003)	(0.004)
Employee Compensation	0.524***	0.486***
	(0.005)	(0.007)
GDP per capita	0.125***	0.195***
	(0.013)	(0.017)
C	-0.715***	-0.590***
	(0.100)	(0.124)
Constant	0.863***	
	(0.162)	
Industry Fixed Effects	Yes	No
Year Fixed effects	Yes	Yes
Observations	47,767	47,767
R^2	0.590	0.427
Adjusted R^2	0.590	0.326
Residual Std. Error	1.326 (df = 47736)	
F Statistic	2,291.896*** (df = 30; 47736)	7,563.042*** (df = 4; 40626)
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 3. Regression of log of before-tax profits on log of fixed assets, log of employee compensation, log of GDP per capita and composite tax variable C. Regression accounted for industry and year specific effects. Table created by the authors

Furthermore, as Wier & Reynolds (2018) suggest, the size of the company is also an important factor that could affect profit shifting. For that reason, we add a SIZE variable, log of revenues as well as an interaction between revenue and the composite tax variable C to the original regression. In Table 5 we see that for both OLS and Fixed Effects, the variable C is significant and positive, while the interaction term is significant and negative. From the negative interaction term, we can observe that, for larger companies, a negative variable C will correspond to higher reported profits, which suggests that larger corporations exploit the incentive and possibility to shift profits more than smaller corporations. Thus, **we can conclude that our Hypothesis 3; the before-tax profits elasticity to the composite tax variable C will be larger for bigger companies, is true**.

Moreover, this corresponds to Wier & Reynolds (2018) findings; larger companies have higher incentives to engage in profit shifting.

One variable that was different in both regressions was employee compensation, which was, interestingly, negative in the fixed effects regression. That would mean that an increase in employee compensation decreases revenues. It has to be noted that the coefficient is significant at a 5% confidence level. We can explain this by looking at the correlation between employee compensation and revenue which is our newly added variable. From Table 1, we can see that the correlation between the two variables is 0.65. In both regressions - OLS and FE - we can see that the coefficient for employee compensation has significantly decreased while the revenue coefficient is positive and large in magnitude, meaning that the revenue variable already includes the positive effects between before-tax profit and employee compensation.

Overall, we can see that the larger the revenue, the smaller will be the coefficient for variable C, which means that, on average, the larger the company the more it uses its incentive to shift profits. From the results we can get the logarithm of revenue starting from which the combined coefficient for C becomes negative is 15.73 for the OLS regression, which amounts to $6,783,475, meaning that on average, companies with revenue larger than $6,783,475 will use their incentive of shifting profits to its affiliates in lower-taxed countries and thus will report lower profits in the home country. For fixed effects, the logarithm of revenue is 15.31, and the according revenue after which the combined coefficient for C becomes negative is $4,457,060. Considering that the overall range of log of revenue values for the whole sample is 11.52-24.37 (Table 4), both values are quite close to each other, so the results are fairly similar. Thus, we can say that on average, firms with revenue of $6,783,475 (to be safe, we use the bigger value of the two) can be expected to engage in profit shifting.

	Min	1st Q	Median	Mean	3rd Q	Max
Log (Revenue)	11.52	15.39	16.60	16.63	17.86	24.37

Table 4. Logarithm of revenue distribution by quartiles. Table created by the authors

To put it into perspective, see Table 4, the overall range of log of revenue values for the whole sample is 11.52-24.37. The 25th percentile of the log of revenue has a value of 15.39 which is between the breakeven values from both regressions discussed above, therefore, we can conclude that approximately 75% of companies engage in profit shifting.

Baseline regression with an interaction term

	Dependent variable:	
	Before-tax profit	
	OLS	*FE*
Fixed Assets	0.168***	0.172***
	(0.003)	(0.003)
Employee Compensation	0.023***	-0.016*
	(0.007)	(0.009)
GDP per capita	0.121***	0.188***
	(0.012)	(0.016)
Revenue	0.671***	0.661***
	(0.006)	(0.008)
C	3.933***	3.032***
	(0.767)	(0.958)
Revenue : C	-0.250***	-0.198***
	(0.046)	(0.057)
Constant	-1.593***	
	(0.149)	
Industry Fixed Effects	Yes	No
Year Fixed Effects	Yes	Yes
Observations	47,767	47,767
R^2	0.667	0.503
Adjusted R^2	0.667	0.416
Residual Std. Error	1.195 (df = 47734)	
F Statistic	2,993.835*** (df = 32; 47734)	6,858.697*** (df = 6; 40624)
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 5. Regression of log of before-tax profits on log of fixed assets, log of employee compensation, log of GDP per capita, log of revenue, composite tax variable C and interaction between log of revenue and C. OLS regression accounts for industry and year specific effects, FE regression accounts for company and year specific effects. Table created by the authors

6.2. Robustness check

6.2.1. Comparing results in two time frames

To check for robustness, we divide the data into two time periods, 2012-2016 and 2017-2020. This is done to check if different data samples will still lead to the same results as the full dataset. From Appendix B, we see that the data is divided equally as we have 24633 entries for the 2012-2016 period and 23134 for the 2017-2020 period. First, we look at the coefficients for fixed assets, employee compensation and GDP per capita and we can see that they are very similar for both periods. This indicates that the data for 2012-2016 and 2017-2020 are very similar when explaining the 'real' generated profits. Then we look at the variable C, which is -0.813 for the first period and -0.628 for the second, and both are significant at a 1% confidence level. This indicates that the previous results are robust, and the effects are the same during the different time periods. Further, we run a regression with a dummy variable, which is 1 for the years 2017-2020 and 0 otherwise, to check if the difference between years is significant. As could have been predicted due to the minor difference in C coefficients, the difference between years is not significant, thus we can make no conclusions about how profit shifting has changed during our time frame 2012-2020.

Next, we check the differences in profit shifting activities by dividing the data by different countries. We decided to do this in two ways; by dividing all the EU countries into Eurozone countries (countries that use Euro as currency) and non-Eurozone countries, and by dividing them in half based on their Corruption level based on World Bank Data (DataBank.WorldBank, n.d.). We divide the countries into high corruption countries and low corruption countries.

6.2.2. Comparing profit shifting for Eurozone and non-Eurozone countries

First, we run two regressions, one for countries in the Eurozone and one for countries outside the Eurozone. The number of observations for both groups is not too similar as we have 30,408 observations for companies from Eurozone countries and 17,359 for companies from non-Eurozone countries. The first difference that can be seen in Appendix C is the difference in coefficients for GDP per capita. In the Eurozone, the coefficient is positive, meaning that higher profits will be generated (and reported) in countries with higher GDP, whereas for non-Eurozone countries the coefficient is negative. For both groups, they are statistically significant. If we take

a step back to the methodology, the GDP is a proxy for country-specific productivity factors used by companies to generate profits and is expected to have positive relations with reported profits. Our results suggest that in non-Eurozone countries, higher GDP leads to lower reported profits, which is contradictory to the literature. Huizinga & Laeven (2008) find for all of their regressions negative relation between GDP per capita and before-tax to be negative. According to Huizinga & Laeven (2008), the negative relationship can be explained by the expectations of a higher return to capital in poorer countries due to the possible exploitation of low-developed legislation. Nevertheless, the argument that operating in richer countries will lead to higher profit due to the higher productivity and more advanced technology, is the superior argument according to the majority of our results.

Next, we take a look at the variable C and compare it for Eurozone and non-Eurozone countries. The coefficient for Eurozone countries is -0.630. As it is negative, we can say that if there is an opportunity to shift profits in order to pay lower taxes, companies will use it to reduce their payable taxes by shifting profits to their affiliates in countries with lower taxes. As for the non-Eurozone countries, the coefficient is statistically insignificant and thus we cannot conclude anything about the engagement in profit shifting for non-Eurozone countries. One possible cause for the insignificant results for non-Eurozone countries may be the number of observations as there are almost twice as many observations for Eurozone countries compared to non-Eurozone. From these results, we can conclude that companies more often shift profits between countries that are in the Eurozone instead of shifting from Eurozone country to non-Eurozone country. One reason for this could be the common currency as it will reduce the difficulty to engage in profit shifting. The second reason could be the exposure to foreign exchange rate risks.

6.2.3. Comparing countries with above- and below-average corruption index

Next, to see possible differences between country groups we split them into two groups - high-corruption countries and low corruption countries - by comparing the average country corruption index for the years 2012-2020 and comparing it to the average for all countries in our dataset (the distribution of the countries can be seen in Appendix D). It is done using data from the World Bank database (DataBank.WorldBank, n.d.). From Appendix E we can see that coefficients for fixed assets and employee compensation are similar for both groups whereas the coefficient for GDP per capita is negative for high corruption countries and positive for low

corruption countries. By interpreting the negative sign, we can claim that in high corruption countries, companies will report lower before-tax profits in countries with higher GDP per capita. If we take a look at the previous robustness test, the coefficient for GDP per capita similarly to high corruption countries, was also negative for non-Eurozone countries. This suggests that there is a hidden variable for both groups that cause the relation between before-tax profit and GDP per capita to be negative.

Next, we look at the coefficients for C. For low corruption countries, the coefficient is -0.58. It is negative and statistically significant; thus we can say that companies that have something to gain, will engage in profit shifting and report higher before-tax profits in companies located in a country with lower tax rate than the countries of their affiliates. For high corruption countries the coefficient is positive and not significant, which once again resembles the results of the non-eurozone countries.

6.2.4. Is the manufacturing industry a better example of profit shifting

Huizinga & Laeven (2008) suggest using only manufacturing companies for the regression as the methodology for real generated profits is assuming that labour and capital are used to generate a company's profits, which suits better for manufacturing companies than other industries, such as service companies, which do not use fixed assets to generate profit.

To explore this assumption and whether it would affect our results, we start by filtering companies operating in the manufacturing industry and include only them in regression. Then we also introduce a dummy variable which is 1 for manufacturing companies and 0 otherwise. The results of our regressions are compacted in Appendix F.

First, we take a look at the results from the filtered data column in Appendix F. The total number of observations is 12109 which is significantly less than for other regressions, but that is logical as we are using only a partial dataset. The logarithm of fixed assets and employee compensation is significant, whereas GDP per capita and C are insignificant. From these results, as the correlation between C and before-tax profits is insignificant, it doesn't matter what level of variable C companies have, the profits will not be affected, thus we can conclude that manufacturing companies do not engage in profit shifting.

Next, we introduce a dummy variable for the manufacturing industry and explore the interaction between C and the dummy variable. Results for this regression are summarised in

Appendix F column “Dummy”. The coefficient for C is -0.904, whereas the interaction between dummy and C is 0.576, both of the variables are significant. This means that companies from all industries besides manufacturing have before-tax profit semi-elasticity to C of 0.904, whereas for manufacturing companies it is 0.328 (0.904-0.576). To put this into perspective, we can say that manufacturing companies engage in profit shifting less than companies from other industries.

7. Discussion

7.1. Discussion of results

First, our results suggest that our sample is relevant and significant and is a useful indicator of any findings regarding profit shifting, and the sample also presents the basic idea, that companies report higher profits in countries with lower tax rates. Comparing our findings with previous research, we can conclude that overall practices have been maintained through the years, and different countries and companies, as the coefficient before variable C is significant and negative, indicating that EU corporations engage in profit shifting. However, a case could be made that perhaps the incentives to engage in profit shifting have decreased over the years. We cannot say that conclusively, however, Huizinga & Laeven (2008) overall record much larger effects of variable C on profits than we do. Comparing our base regressions, their coefficient is -1.017, while ours is -0.715. Admittedly, this could be purely due to a different sample dataset, perhaps companies in their sample had more profits to shift, and the fact that they only use manufacturing firms, however, it could be due to exogenous reasons, e.g., policies. This could be the case as it would be logical if governments were constantly trying to act on making the profit shifting more difficult as it is directly ‘stealing’ from the country's budget. As an example, that there are new policies implemented, OECD/G20 is currently working on their framework that would, by implementing domestic and international rules, help governments address tax avoidance so that companies would get taxed correctly; where profit is generated, and value is created. Furthermore, we have also mentioned the work by Beer & Loeprick (2014) where they found that two years after some mandatory documentation was introduced, profits decreased by 52%. Thus, it might be the case that, compared to 1999, which is the year Huizinga & Laeven researched, the amounts of profits that are shifted have decreased. When looking at other newer papers, for example, Barrios & d'Andria (2019) who use data from 2004-2013, they also show a value of C that is overall lower

than that of Huizinga & Laeven (2008), thus, accepting the idea that incentives to shift profits might have decreased. However, when dividing our sample period into halves, we see no significant decreases in profit shifting between the two time samples.

When grouping countries, we also find that companies are more likely to shift profits across Eurozone countries, which makes sense considering the transparency companies gain by operating in the same currency, while companies in non-Eurozone countries face foreign exchange rate risks. We also observe that companies engage in profit shifting in low corruption countries, while we see no effects in high corruption countries. We believe that there is a high correlation between countries with high corruption levels and non-Eurozone countries as 6 out of the 8 countries from the non-Eurozone group are also in the high-corruption group. This could imply that there is another unobserved underlying reason that causes companies to not shift profits in countries from those groups.

One of the most important aspects of profit shifting is also the size of the company. Our results suggest that the larger the company, the more profits they will shift. Overall, we can say that approximately 75% of the companies in the sample engage in profit shifting and the correlation between company size and profit shifting is positive. Therefore, we can confirm what Wier & Reynolds (2018, p.24) suggest - that "profit shifting responses are largest in the largest firms", confirming, this trend exists in EU countries too.

Consequently, we can answer our RQ - the nature and dynamics of MNCs that engage in profit shifting in the EU are that those are companies with operating revenue of at least $4-6 million p.a. The companies tend to report significantly more of their profits in countries with the Euro as the currency, or in countries with low corruption levels. This suggests that companies are perhaps more likely to engage in profit shifting in countries where it can be considerably easier to do so, as perhaps the complexity with foreign currency or troubles with corrupt governments might hinder their operations and affect their profit shifting activities. And, as mentioned, the larger the company, the more they shift their profits.

Our research is important, because we have looked at the direct interaction between the composite tax variable C and the size of the company, and we have presented the main dynamics of profit shifting in the European Union during the previous decade. As the topic of profit shifting is relevant and a real issue for governments, the information we obtain in our paper can help policymakers, tax institutions, and governments to look into the dynamics and nature of the

companies, as well as any trends and changes, if they compare it to previous research. For example, in our paper we have observed the average company size from which companies start engaging in profit shifting, similarly, our work shows that, if some institution or government wanted to tackle the issue of profit shifting, they could see that they should focus on the biggest corporations, as they use the incentive to shift profits the most, thus, likely incurring the biggest losses to governments in both relative and absolute terms. Some institutions that might find such research useful include the already-mentioned OECD/G20 with their framework, any other financial institutions and governments, to name a few. It has to be noted, however, that everything we have found is not as simple, as there are plenty of complex details and factors that are hard to observe and account for, therefore, almost all findings regarding profit shifting should be taken with a grain of salt, especially when trying to work on policies.

7.2. Limitations

There are a number of limitations that make our results not fully reliable and, thus, should be taken with a grain of salt. First, as it typically is, it is not easy to work with company level data. First, when retrieving data, we could not add all of the relevant filters in Orbis, thus we had to manually exclude some companies, which had the global ultimate owner listed as, governments, government-owned companies, individuals etc. in the sample, which again might lead to some human error, which could be present in results. However, due to the large data sample, it is unlikely that, even if there was a human error, it would massively impact the results. Furthermore, when inspecting our data, we noticed that in some cases not all variables were reported which lead to us not having the necessary data for the company, thus, we also excluded them from our sample. Overall, some of company data is not always correctly entered, it does get somewhat messy, thus, some companies in Orbis are not registered under the same GUO, while they might very much be under the same corporation (the GUO name might be written differently, extra comma, dot, space, etc.). Due to previously mentioned reasons, our data sample is not fully ideal. And adding the fact that there are nowhere near all the European Union's MNCs reported in Orbis, this data sample does not fully represent all the EU companies. Furthermore, according to Barrios & d'Andria (2019), the Orbis dataset is known to be biased against smaller firms and to better cover larger countries, therefore, even though we excluded the very small corporations with less than 5 companies under the same GUO, this fact should be taken into account when looking at the results.

We can also add the fact that some companies will have affiliates outside of the EU, thus, even though it does not directly affect profit shifting between EU countries, it might have an overall effect, a company with affiliates in and outside of the EU can shift profit to non-EU country and that would not be accounted for in our dataset.

Lastly, it is hard to confidently compare our results to other papers, as each sample is different, and includes different companies, sometimes even specific industries, countries, etc. We can, of course, do some comparisons, and analyse some trends and differences, however, we have to always consider that any trends might just be restricted to different, unique datasets.

8. Conclusions

In our paper, we take a look at multinational companies located in the EU and how or if they engage in profit shifting to face favourable tax rates, and what is the nature of this practice. We start by introducing a research question: **What is the extent and nature of profit shifting among the EU multinationals?** Then we start the research part by concentrating on the composite tax variable C which is calculated using the weighted differences between home and affiliate countries' statutory tax rates. Variable C demonstrates the potential incentive and gains for companies that engage in profit shifting. By regressing before-tax profits on C (besides other variables), we find whether multinational companies use the possible gain of profit shifting by reporting higher profits in companies located in countries with favourable taxes.

We find that companies indeed engage in profit shifting with company size being an important factor for profit shifting. Additionally, the results correspond closely to what has been found previously on research in profit shifting. It has to be noted, that the semi-elasticity is lower than in previous works such as Huizinga & Laeven (2008), but we cannot conclusively comment on the significance of the change.

To find the dynamics and nature of the companies, we look more into other factors affecting company profit shifting. First of all, the larger the revenue, the more likely they are to shift profits, in simple terms meaning larger companies engage in profit shifting more. When splitting the dataset into groups, we see that companies located in Eurozone countries engage in profit shifting more, whereas, as our sample suggests, companies in high corruption countries do not engage in profit shifting, or at least not to a significant extent. When comparing industries, companies operating in the manufacturing industry shift profits significantly less than companies from other

industries. Having all this information, we can find the nature and dynamics of an average theoretical ‘company’ from our sample which would be most likely to engage in profit shifting in the EU. The nature of this company is: a company of large magnitude, located in a low corruption eurozone country and is operating outside the manufacturing industry.

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10. Appendices

Appendix A. Observation distribution by years and industries.

Industry	Observations
A - Agriculture, forestry and fishing	161
B - Mining and quarrying	107
C - Manufacturing	12109
D - Electricity, gas, steam and air conditioning supply	305
E - Water supply; sewerage, waste management and remediation activities	135
F - Construction	1122
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	19535
H - Transportation and storage	2133
I - Accommodation and food service activities	162
J - Information and communication	2930
K - Financial and insurance activities	1429
L - Real estate activities	369
M - Professional, scientific and technical activities	4426
N - Administrative and support service activities	2345
O - Public administration and defence; compulsory social security	15
P - Education	27
Q - Human health and social work activities	224
R - Arts, entertainment and recreation	60
S - Other service activities	173

Year	Observations
2012	4327
2013	4436
2014	4649
2015	4780
2016	6441
2017	6066
2018	6105
2019	5937
2020	5026

Observation distribution by industries and years. Table created by the authors

Appendix B. Regression results by time split in half (2012-2016 & 2017-2020)

Robustness by time split

	Dependent variable:		
	Before-tax profit		
	2012-2016	2017-2020	Dummy
Fixed Assets	0.267***	0.265***	0.266***
	(0.004)	(0.004)	(0.003)
Employee Compensation	0.531***	0.517***	0.524***
	(0.007)	(0.007)	(0.005)
GDP per capita	0.128***	0.122***	0.126***
	(0.018)	(0.018)	(0.013)
C	-0.813***	-0.628***	-0.747***
	(0.143)	(0.139)	(0.133)
Period Dummy			0.087***
			(0.028)
C : Period Dummy			0.065
			(0.177)
Constant	0.601***	1.193***	0.860***
	(0.227)	(0.229)	(0.162)
Industry Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Observations	24,633	23,134	47,767
R^2	0.591	0.589	0.590
Adjusted R^2	0.590	0.589	0.590
Residual Std. Error	1.347 (df = 24606)	1.303 (df = 23108)	1.326 (df = 47735)
F Statistic	1,365.094*** (df = 26; 24606)	1,326.553*** (df = 25; 23108)	2,217.928*** (df = 31; 47735)

Note: *p<0.1; **p<0.05; ***p<0.01

Summary of three regression regarding time split. In first column regression of log of before-tax profits on log of fixed assets, log of employee compensation, log of GDP per capita, composite tax variable C for years 2012-2016, in second column the same regression for 2017-2020. Third column is the same regression with added dummy which equals 1 for period 2017-2020, to check for significant differences between periods. Table created by the authors.

Appendix C. Regression results by country split into Eurozone and non-Eurozone

Robustness by country split into Eurozone and non-Eurozone

	Dependent variable:	
	Before-tax profit	
	Eurozone	Non-Eurozone
Fixed Assets	0.281***	0.226***
	(0.004)	(0.005)
Employee Compensation	0.492***	0.588***
	(0.006)	(0.009)
GDP per capita	0.390***	-0.047**
	(0.026)	(0.018)
C	-0.630***	0.093
	(0.128)	(0.213)
Constant	-1.576***	2.415***
	(0.284)	(0.245)
Industry Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Observations	30,408	17,359
R^2	0.592	0.568
Adjusted R^2	0.592	0.568
Residual Std. Error	1.341 (df = 30377)	1.282 (df = 17328)
F Statistic	1,472.036*** (df = 30; 30377)	760.570*** (df = 30; 17328)
Note:		*p<0.1; **p<0.05; ***p<0.01

Regression of log of before-tax profits on log of fixed assets, log of employee compensation, log of GDP per capita and composite tax variable C. First column is for companies located in Eurozone, second column for companies located in non-Eurozone. Both regressions accounted for industry and year specific effects. Table created by the authors

Appendix D. Corruption index for EU countries, 2012 – 2020

Country Name	High/Low	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average
Denmark	Low	100.00	100.00	100.00	98.56	99.52	99.04	99.52	99.52	100.00	99.57
Finland		98.10	98.10	98.56	99.52	99.04	98.56	100.00	98.56	99.52	98.88
Sweden		99.05	98.58	97.60	98.08	98.08	98.08	98.08	98.08	98.08	98.19
Luxembourg		96.68	97.16	96.63	97.12	97.60	96.15	97.12	97.60	96.63	96.97
Netherlands		96.21	96.21	95.67	94.23	94.71	92.79	95.19	95.67	96.15	95.20
Germany		94.31	94.31	93.75	93.27	93.75	94.23	95.67	95.19	95.19	94.41
Ireland		90.05	92.42	92.79	92.79	92.79	91.83	90.87	90.38	91.35	91.69
Austria		89.57	90.52	90.38	90.87	91.35	90.87	91.35	90.87	90.87	90.74
Belgium		91.00	91.00	91.35	91.35	92.31	89.90	89.90	89.90	89.90	90.73
France		90.52	87.68	87.98	87.98	89.90	87.50	87.98	88.94	84.62	88.12
Estonia		81.99	83.41	88.46	88.46	88.94	87.02	90.38	91.35	92.31	88.04
Portugal		80.57	78.67	79.33	79.33	79.81	80.77	80.29	77.40	76.92	79.23
Slovenia	High	76.78	74.41	74.52	76.44	77.40	79.33	80.77	80.77	79.33	77.75
Spain		83.89	79.62	74.04	73.08	70.19	69.71	74.52	74.52	76.44	75.11
Poland		72.99	72.51	73.56	75.48	76.92	76.44	75.00	73.08	73.08	74.34
Lithuania		68.25	68.25	70.67	70.19	75.00	70.19	68.75	74.04	79.81	71.68
Czech Republic		66.35	65.40	67.79	67.79	69.71	71.15	70.19	70.67	71.15	68.91
Latvia		64.45	66.82	67.31	67.31	66.83	69.23	64.90	68.27	75.48	67.85
Italy		62.56	60.66	57.69	59.13	60.58	62.02	62.50	62.98	69.23	61.93
Slovak Republic		60.66	59.72	59.62	61.54	62.50	60.58	62.98	61.54	66.35	61.72
Hungary		65.40	64.93	60.58	62.02	60.10	60.10	60.10	59.13	60.58	61.44
Croatia		59.72	62.09	62.02	63.94	63.46	59.62	59.62	60.10	61.54	61.34
Romania		46.45	49.29	52.88	55.29	54.33	55.29	50.96	50.48	54.81	52.20
Bulgaria		49.29	46.92	49.04	48.08	50.48	51.44	51.92	50.96	46.15	49.37

Country distribution based on corruption levels (Cyprus, Greece and Malta excluded due to no records in our sample). Data retrieved from World Bank Data. Table created by the authors.

Appendix E. Regression results by country split in half based on corruption index

Robustness by country split based on corruption index

	Dependent variable:	
	Before-tax profit	
	High corruption	Low corruption
Fixed Assets	0.250***	0.280***
	(0.004)	(0.004)
Employee Compensation	0.564***	0.465***
	(0.007)	(0.008)
GDP per capita	-0.042*	0.291***
	(0.022)	(0.030)
C	-0.134	-0.580***
	(0.172)	(0.148)
Constant	2.073***	0.347
	(0.240)	(0.416)
Industry Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Observations	29,403	18,364
R^2	0.599	0.558
Adjusted R^2	0.598	0.557
Residual Std. Error	1.303 (df = 29372)	1.350 (df = 18333)
F Statistic	1,460.210*** (df = 30; 29372)	770.427*** (df = 30; 18333)
Note:		*p<0.1; **p<0.05; ***p<0.01

Regression of log of before-tax profits on log of fixed assets, log of employee compensation, log of GDP per capita and composite tax variable C. First column is for companies located in higher-than-average corrupted countries, second column for companies located in lower-than-average corrupted countries. Both regression account for fixed year and industry effects. Table created by the authors.

Appendix F. Regression results by using manufacturing companies

Robustness by regressing manufacturing companies

	Dependent variable:	
	Before-tax profit	
	Filtered	Dummy
Fixed Assets	0.241***	0.283***
	(0.007)	(0.003)
Employee Compensation	0.630***	0.494***
	(0.012)	(0.005)
GDP per capita	0.031	0.162***
	(0.025)	(0.013)
C	-0.281	-0.904***
	(0.196)	(0.112)
Manufacturing Dummy		-0.057***
		(0.015)
C : Manufacturing Dummy		0.576***
		(0.210)
Constant	0.665***	0.846***
	(0.251)	(0.124)
Year Fixed Effects	Yes	Yes
Observations	12,109	47,767
R^2	0.595	0.579
Adjusted R^2	0.594	0.579
Residual Std. Error	1.241 (df = 12096)	1.343 (df = 47760)
F Statistic	1,480.080*** (df = 12; 12096)	10,967.610*** (df = 6; 47760)
Note:		*p<0.1; **p<0.05; ***p<0.01

Regressions of log of before-tax profits on log of fixed assets, log of employee compensations, log of GDP per capita and composite tax variable C. Regression in first column is done for companies only working in manufacturing industry. Regression in second column includes dummy variable for manufacturing industry. Both regressions account for fixed year effects. Table created by the authors.