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The Impact of Globalization on Corporate Income Taxation

A quantitative study to the effect of globalization on the corporate income tax rate and tax revenue

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Abstract

With the use of a cross-country pooled time series regression, including 36 OECD countries between 1980 and 2018, the relation between globalization and the corporate income tax rate and the corporate income tax revenue is reassessed. To proxy for globalization, five different indicators are used, the trade openness indicator, KOF Globalization index, and three variations of an FDI indicator, instead of the trade openness indicator alone. The effect of these five indicators on corporate income tax rates and corporate income tax revenues is tested. It seems that, in line with existing evidence, there is no significant relationship between trade openness and corporate tax rates or revenues. However, there seems to be a significant negative relation of the KOF Globalization Index and FDI inflows on the corporate income tax rate and an ambiguous effect of these on the corporate income tax revenue. These results shed new light on the unclear source of the experienced decline in corporate tax rates and open new ways to investigate this phenomenon further. The slightly significant relation between globalization and corporate tax revenue is a reason to investigate this relationship further, to create more evidence and create ways to maintaining the welfare state.

Keywords: globalization, openness, corporate tax rate, corporate tax revenue

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1.   Introduction

Globalisation has been present in our world since the time that hunter-gatherers discovered new villages to trade with. But the modern wave of accelerated globalisation started around 1980 and has been a hotly debated topic ever since.[1] Although the extent of globalization has fluctuated over the years, the general tendency has been that there is a growing interdependence of nations, and this interdependence has proponents and opponents. Globalization has led to increased output, more productive nations, more jobs, lower prices, and higher wages but at the same time, the lower prices of products and the increased mobility of capital and goods led to losers of globalization.[2] These losers are primarily unskilled labourers, as these jobs are easy to be outsourced to a low wage country, and those who are dependent on the welfare state, as the welfare state is pressured more due to globalisation and low-income households, and globalisation is said to increase income inequality (Dehesa, 2008). In recent years, these losers from globalization have increased in power as more and more countries show anti-globalisation sentiments, like the trade war initiated by President Donald Trump. Worldwide, there are sentiments parallel to previous periods of deglobalization, like "rising political tensions, financial imbalances, rising inequalities, ecological concerns, and growing populism".[3]

Globalization has led to offshoring by multinationals, moving business activities to lower wage or lower tax countries, and the loss of control of governments on their tax systems, as they become increasingly dependent on tax competition, which becomes a risk to the budgetary stability of governments when they lose tax revenue. This risk of budgetary instability is a worldwide problem, as multinationals exploit the growing interdependence between nations by paying fewer taxes than to which they are obliged and therewith avoid their social responsibility worldwide.[4] One of the problems is the existence of small states with very low corporate income tax rates, called tax havens, that provide the possibility of tax avoidance. Another problem is the increase in tax competition by countries, in order to attract multinationals and foreign direct investment, which is investment from a company in one country in a company in another country, enough to gain some form of control over that

[1] C.R. (2013). 'When did globalization start? Global market integration is almost as old as humanity'. https://www.economist.com/free-exchange/2013/09/23/when-did-globalisation-start (retrieved June 18, 2019).
[2] Gopinath, G. (2019). 'An economist explains the pros and cons of globalization'. https://www.weforum.org/agenda/2019/04/an-economist-explains-the-pros-and-cons-of-globalization-b2f0f4ae76/ (retrieved May 29, 2019).
[3] Girod, S.J.G. (2016). 'Part 1: The end of globalization?'. https://www.imd.org/research-knowledge/articles/part-1-the-end-of-globalization/ (retrieved May 29, 2019)
[4] Stiglitz, J. (2017). 'Globalization isn't just about profits. It's about taxes too'. https://www.theguardian.com/commentisfree/2013/may/27/globalisation-is-about-taxes-too (retrieved May 29, 2019)

company. The latter has led to decreasing corporate tax rates, although Devereux, Lockwood and Redoano (2008) and Overesch and Rincke (2011) show that evidence that this decline stems from tax competition is not convincing.

This decline in corporate tax rates has been a popular field of research because of the significant impact it has on governments and therewith on its citizens, as several scholars have warned that globalization could be a threat to the welfare state as we know today (e.g. Genschel, 2002). Furthermore, the interest of researchers has always been the corporate tax rate itself, in different measurements, but the real impact of globalization on a country has more to do with tax revenue collection than the statutory corporate tax rate itself, because the revenue collected by imposing a corporate income tax rate is used to pay for public goods and welfare payments. Some, especially right-wing politicians, say that a decline in the corporate tax rate should have a positive impact on the tax revenue, as a country becomes more attractive for companies to settle, but the evidence is not that convincing (Avi-Yonah, 2000, p. 1600). Thereby, tax revenue is an important income source for the governments to maintain the welfare state which is an argument by opponents of the tax rate declines, for example, corporate tax revenue in The Netherlands is 8.3% of the total government revenue in 2019.[5] This percentage is in line with an average of 9% among all OECD countries (OECD, 2019). These opponents of the tax rate decline state that a decline in corporate tax rates and revenues lead to a shift in tax revenue to more immobile factors, such as labour, which is confirmed by Onaran and Boesch (2013).

It seems, for instance, that the recent tax cut in the United States is more beneficial for companies than for everyone else in their economy.[6] This tax cut in the United States was initiated by President Trump, one of the leaders in the anti-globalization movement, to make it attractive for American companies to repatriate their retained earnings, profits that are made and stored in another country. Since Donald Trump came into office, the United States withdrew itself more and more from the rest of the world and became more focused on 'America First', which led to more countries retaliating against the trade restrictions imposed by the United States. [7] This protectionist view is why globalization is nowadays stagnating or, when looked at foreign direct investment flows, already in decline.[8]

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[5] Kamerstukken II, 2018/19, 35 000, no. 1, p. 8
[6] Gandel, S. (2019). 'Tax Cut Is Better (for Companies) and Worse (for Everyone Else)'. https://www.bloomberg.com/opinion/articles/2019-01-14/trump-tax-cut-turns-out-both-better-and-worse (retrieved May 29, 2019)
[7] Cherkaoui, M. (2018). 'Why Trump Remains Anti-Globalist Even Inside the United Nations?'. http://studies.aljazeera.net/en/reports/2018/10/trump-remains-anti-globalist-united-nations-181001102544114.html (retrieved May 31, 2019)
[8] Ghemawat, P. & S.A. Altman (2019). 'The State of Globalization in 2019, and What It Means for Strategists'. https://hbr.org/2019/02/the-state-of-globalization-in-2019-and-what-it-means-for-strategists (retrieved June 18, 2019)

Despite corporate tax rates being a popular field of research, there is little evidence of globalization being the main driver of the decline in corporate tax rates or the change in tax revenues by governments. The problem with globalization as a concept is the broadness of the term, as it is used as an umbrella term for, among others, increased international trade in goods and services, increased financial interdependence and increased migration of workers. One of the reasons for the lack of evidence could be the fact that researchers use the trade openness indicator (imports plus exports divided by GDP) as a proxy for globalization, despite the insignificant results of this trade openness indicator, while the term globalisation covers a wide range of effects and events. Because of the broadness of the term, it is striking that most of the recent researchers, like Slemrod (2004) and Devereux et al. (2008), still use the trade openness indicator alone to account for the effects of globalization. Recent research by Gräbner, Heimberger, Kapeller and Springholz (2018) tested several indicators for globalization to look for a relationship between globalization and economic growth, and they found that several indicators were more significant estimators than the trade openness indicator. Five of the most relevant and best indicators, according to Gräbner et al. (2018) are used in this thesis.

Something else notable is the fact that it is common for the OECD (2015) and journalists to express the level of globalization with the use of indicators for foreign direct investment, while this is not used in the empirical literature.[9] Several researchers tried to test whether countries try to attract foreign direct investment by decreasing their corporate tax rates, which seem to be the case, but the reversed effect is not commonly tested for (Cassou, 1997; Gropp & Kostial, 2000).

The fact that there is little variation in indicators of globalisation used in the research to the impact of globalization on the corporate tax rate, despite the broadness and vagueness of the term globalisation, plus the fact that there lacks convincing evidence of the impact of globalization on the tax revenue and the source of this revenue, means that there is a gap in existing literature. To complement and enhance existing literature, the research question in this thesis is:

What is the impact of globalization on corporate income taxation?

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[9] Ghemawat, P. & S.A. Altman (2019). 'The State of Globalization in 2019, and What It Means for Strategists'. https://hbr.org/2019/02/the-state-of-globalization-in-2019-and-what-it-means-for-strategists (retrieved June 18, 2019)

The remainder of this thesis discusses the extensive theoretical and empirical background on the concepts used in this thesis, and this contributes to three testable hypotheses. After that, the relationship between globalization and the corporate income tax rate and tax revenue will be tested for with several cross-country pooled time-series regressions including 36 countries over 39 years in order to try to answer the research question.

2.   Literature review

2.1   Theoretical Literature

Several theories indicate a relationship between globalization and the aspects of corporate income taxation that are discussed in this thesis. In the following sections, first, the concepts taxation and globalization are presented. After that, the different theoretical backgrounds for relationships between globalization and the corporate income tax rate, corporate income tax revenue, and the possible shift in tax bases will be discussed. After that, previous literature that researched the possible relationship will be discussed to support the hypotheses where the research in this thesis is based on.

2.1.1   The views on taxation

Taxation is an essential part of the welfare state as known in this day and age. Where taxes were initially used more for warfare, now healthcare, education, and infrastructure became of more importance. For example, in The Netherlands, social welfare, healthcare, and education form the most substantial part of government expenses, 27.7%, 27% and 13.1% respectively which sums up to €200 billion of the total expenses of €295 billion in 2019.[10] The type of taxation that is discussed in this thesis is the corporate income tax, which is a percentage companies pay on their profits and represents on average 9% of the revenue of the government in OECD countries (OECD, 2019).

There are opposing views on taxation by right- and left-wing politicians. The liberal view on taxation is that it is a market restraint that cripples companies. Taxation is justified, as long as it is a repayment to something the government provides or something that is beneficial to the society and not a robbery of rent (Smith, 1776, p. 630). Opposing this view is the socialist view; according to this view, the government should own all means of production and redistribute these equally in order to achieve the most public welfare. Although this socialist view is often seen as a radical ideology when it comes close to the communist view, the underlying concept of a government that collects means of productions to provide basic necessities is closer to the welfare state than the liberal view.

Opposing to the tax competition experienced today, Porter (1990) described that a healthy government should not compete with institutions, like taxation, to gain a competitive advantage, but the government should create a healthy environment for companies to gain a

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[10] Kamerstukken II, 2018/19, 35 000, no. 1, p. 8

competitive advantage, an environment that goes beyond tax alone and includes other institutions, like politics and infrastructure.

2.1.2 The concept of globalization

The term globalization is often used as an umbrella term for the increase in international trade and capital mobility that is observed in the modern economy. In the last three decades, international interdependence has grown due to decreasing transportation and communication costs, together with decreasing trade barriers and more liberal financial regimes. This has led to a sharp increase in foreign direct investment (Hall & Soskice, 2001, p. 55). Hall & Soskice (2001, p. 55) explain globalization as:

"the developments that have made it easier for companies to locate operations abroad, including the liberalization of trade, the deregulation, and expansion of international financial markets, the new accessibility and expansion of markets in what was the communist world, and declining transportation or communication costs."

Although the term globalization is a broad term, this description relates well to what is meant with globalization in this thesis. Later on, specific proxies for this term will be discussed and explained, in order to answer the research question proposed in the previous section.

2.1.3 Globalization and the corporate income tax rate

Since the 1980s, the statutory corporate income tax rates have declined in most countries. In the OECD countries, the corporate income tax rate has steadily declined from an average of 47.1% in 1980 to an average all-time low of 23.7% in 2017 (OECD, 2019). During the same period, globalization has increased across the globe, as multinational activity rose steadily and tariffs declined, leading to more open economies. With this increase of multinational activity, foreign direct investment increased, as more companies gained control in a foreign company or a foreign affiliate (Kind, Midelfart, & Schjelderup, 2005).

To understand how the increase in multinational activity affects the corporate income tax rate, the relationship between these two has to be discussed. Multinational corporations are known for shifting their profits to low tax countries in order to pay as less as possible in corporate income taxation (Grubert & Mutti, 1991, p. 293). It is possible for multinationals to take advantage of this shift of profits because the differences in corporate tax systems in countries provide this opportunity. The opportunity arises from the corporate tax system that most of the OECD countries use, separate accounting, or a territorial tax system (Kind et al.,

2005). This system calculates the income of multinationals as the value of transactions between their affiliates as if it were separate corporations, based on arm's length pricing. This makes shifting profits with the use of transfer pricing possible; in other words, companies can price their intermediates, and they can set either high or low prices on intracompany transactions, to minimize the effects of taxes on global profits. How the tax rates influence the choice of a high, or a low transfer price is illustrated later on. This system is opposed to the formula apportionment, where all taxable income of the corporation is aggregated and then apportioned to a country based on a formula. In the formula apportionment system, the profits of a multinational company are allocated to the different countries where a multinational is active, based on sales. If this would be the case, a multinational will have to pay corporate income taxes in the United States on the portion of sales it makes in the United States and pay corporate income taxes in The Netherlands on the portion of sales it makes in The Netherlands. In principle, this would lead to a fairer distribution of corporate tax payments. However, it is expected that multinationals will find ways to avoid taxes under the formula apportionment system, and such a system requires a common accounting base, which is not present yet.[11]

To illustrate the use of the separate accounting system and the influence of a tax rate and transfer pricing on the location choice, a simplified model of the model described by Bowen, Hollander and Viaene (2012) is used. In this model, a multinational corporation can choose whether to locate their plant in the home country (A) and export to their affiliate in the foreign country (B), a plant in the foreign country and export to the home country. This results in two profit functions, for a plant in country A, equation (1), and a plant in country B, equation (2), where T is the tax rate in country A, T^* is the tax rate in country B, τ and τ^* are the tariff rates (or trade costs) and R and R^* are the transfer costs for country A and B respectively which could be either a maximum transfer price or a minimum, R_{max} or R_{min}.

$$(1)\ \Pi_A = (1 - T)[(p - c)q + (R - c)q^* - F] + (1 - T^*)[p^* - R(1 + \tau^*)]q^*$$

$$(2)\ \Pi_B = (1 - T)[p - R^*(1 + \tau)]q + (1 - T^*)[(p^* - c)q^* + (R^* - c)q - F^*]$$

The domestic profit for the multinational in country A exists of the mark-up *(p-c)* times the quantity sold domestically *(q)* plus the transfer price minus the marginal costs *(R-c)* times the quantity sold in country B *(q*)*. The foreign profit exists of the foreign price minus the transfer

price paid, which is multiplied by (1+ τ*) to illustrate the tariff costs paid when a product is exported, *(p*-R)* times the quantity sold in country B *(q*)*. This shows that the profits made in country B are minimalized and the profits in the home country are maximized, when the transfer price R is set high, the tariff cost decreases the profit made in the foreign country because it increases the cost for the affiliate in country B. For the multinational with the plant in country B and the affiliate in country A, the elements of the profit function are the same, but the other way around.

Optimization with respect to *R* and *R** gives the following two partial derivatives:

(3) $\frac{\partial \Pi_A}{\partial R} = [(1-T) - (1-T^*)(1+\tau^*)]q^*$

(4) $\frac{\partial \Pi_B}{\partial R^*} = [(1-T^*) - (1-T)(1+\tau)]q$

To illustrate the influence of the tax rate, tariff costs are assumed to be zero to match a perfect open economy, which will eliminate τ and τ* out of the equation. The multinational in country A will set a high transfer price R_{max} when equation (3) is larger than zero, which is the case when $T < T^*$. In that case, the after-tax revenue is larger in country A than the after-tax revenue in country B, because the affiliate in country B has to pay a high transfer price. The opposite happens when $T > T^*$, in that case, a low transfer price R_{min} is optimal to increase the after-tax revenue abroad. When trade costs are considered, equation (3) shows that due to the multiplication with (1+τ*), the difference between the tax rate in home and foreign becomes smaller when $T < T^*$. This indicates that profit shifting with the use of transfer pricing becomes less profitable for the company in country A. This is intuitive, as a high transfer price results in more tariffs that have to be paid, which pressures the total profit. For a multinational located in country B, the opposite of the mechanisms described above counts. As described earlier, this model shows that the tax rate of a country influences where a company will make its profits, as long as it is able to influence the location of the profits with the use of transfer pricing. According to Kind et al. (2005, p. 13-15), when a separate accounting system is used, more economic integration and lower trade cost lead to more profit shifting, due to the presence of open economies, and thus a higher tax sensitivity for countries, as illustrated in the model above. The use of a formula apportionment system has the opposite reaction and makes the use of profit shifting less profitable because of the lower tax sensitivity; taxes have to be paid based on a formula instead of the reported profits that can be manipulated.

Although countries do not favour this behaviour by multinational corporations, it is still possible. This is why the OECD has set up a project called 'Base Erosion and Profit Shifting' (BEPS), in order to reduce the possibility for tax planning and profit shifting.[12] Because more economic integration tends to increase the profit shifting of multinationals, it is especially of importance in more integrated economic areas, such as the European Union. The European Commission tries to implement a set of rules to calculate taxable profits in separate European Countries, called the 'Common Consolidated Corporate Tax Base', which is based on the formula apportionment system as discussed by Kind et al. (2005).[13] But as described earlier, the formula apportionment system knows its flaws and multinationals are expected to find new ways to avoid taxes, for example by setting up new entities abroad instead of affiliates, in that way there will be no aggregated worldwide sales to allocate to different countries, but there will only be sales directly allocated to a (low tax) country.[14] Another problem would be the lobby against the use of the formula apportionment system, as it would have some negative effects on certain industries that make use of the separate accounting system and on governments that profit from the shifting of profit to their country (Avi-Yonah, 2010). These new obstacles make the implementation of a formula apportionment system a time-consuming process.

2.1.4 Globalization and corporate income tax revenue

Accompanying to the relation globalization has with the corporate income tax rate, is the relation of globalization with the corporate income tax revenue, the revenue resulting from the tax imposed on corporate income. The argument made by governments to lower their corporate income tax rate is the fact that, as described in the previous section, multinational decision making is partly based on the corporate income tax rate. The idea is that this decrease in the corporate income tax rate attracts more capital from multinationals, in order to increase the tax revenue from corporate income. This idea is based on the Laffer curve theory.

The Laffer curve is a simple curve, created by Arthur Laffer and first described by Wanniski (1978), that illustrates two effects of the tax rate on the tax revenue, as seen in Figure 1. There is the arithmetic effect, which means that the revenues from taxes will be lower when the tax rate is lowered. And the economic effect, which is the more interesting effect and shows

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[12] OECD. (2019). 'About the Inclusive Framework on BEPS'. https://www.oecd.org/tax/beps/beps-about.htm/ (retrieved May 1, 2019)

[13] European Commission. (2015). 'Questions and Answers on the CCCTB re-launch'. http://europa.eu/rapid/press-release_MEMO-15-5174_en.htm (retrieved May 1, 2019)

[14] Tax Policy Center (2019). 'How would formula apportionment work?'. https://www.taxpolicycenter.org/briefing-book/how-would-formulary-apportionment-work (retrieved June 18, 2019)

that there could be a positive effect of lowering taxes because it leads to more activity, as described before (Wanniski, 1978). Although the Laffer curve shows that there is a point of an optimal tax rate, one that results in the most revenue, the Laffer curve itself does not provide this optimal rate. The reasoning of governments is based on the fact that they suppose that the corporate income tax rate is in the prohibitive range, the upper half, if that is true, a tax rate cut will lead to more tax revenue. Another argument from Laffer (2004, p. 2) is that because of the corporate income tax cut, there is an increase in output, employment, and production. This increase in output would lead to an increase in tax revenue, as there is more output to be taxed, and a decrease in government expenditure on social welfare programs because of the increase in employment.
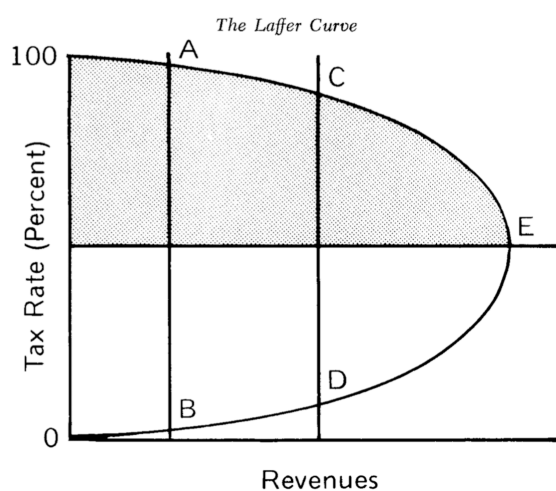
Figure 1. Laffer Curve. Reprinted from "Taxes, Revenues, and the Laffer Curve" by Wanniski, J. (1978). *The Public Interest.* 50(4). p. 4.

This last argument is opposed by Rodrik (1997), who predicts that an increase in openness decreases social spending and government consumption, but not because of the reasons mentioned by Laffer (2004). According to Rodrik (1997, p. 53), "globalization […] results in increased demands on the state to provide social insurance while reducing the ability of the state to perform that role effectively". He argues that globalization is a threat to social and political stability, if not handled correctly, as the state is no longer able to support citizens that rely on welfare payments. This will be a threat to the social and political support of free trade, as citizens and therewith the politicians will demand a more nationalistic and sovereign state (Rodrik, 1997, p. 53).

This view is accompanied by Tanzi (2001), who states that it not unthinkable that globalization will be a problem for the ability of governments to collect taxes. Tanzi (2001, p. 1263) calls the threat "fiscal termites busily gnawing at the foundations of the tax systems". These fiscal termites are consequences of globalization that form a threat to taxation. One of

them is the increase in intracompany trade, which relates to the use of transfer pricing, by setting a high transfer price on intermediates to shift profits from high tax rate countries to low tax rate countries to minimize the taxes paid in a high tax country. Another problem of globalization is the fact that more companies use off-shore financial centres and tax havens because it becomes easier to transfer money and knowledge. With the use of these centres, money-laundering and tax evasion become easier as companies can use a variety of constructions to stall large amounts of profit in so-called letterbox, or shell, companies in countries where there is no corporate income tax.[15] Although there is much attention from international organizations, like the International Consortium of Investigative Journalists and the European Commission, to diminish these possibilities, it still contributes to a decline in tax revenues in the countries where the original income is earned (Tanzi, 2001, p. 1271).[16] Due to these fiscal termites, it is likely that the tax revenue (as a percentage of GDP) declines in many developed countries.

As described, in order for governments to be able to collect income from taxes, a stable government is necessary, as a stable political climate with a government that provides public goods is necessary to justify the imposition of taxation. A problem of globalization is that increased competitive pressure is a threat to the stability of institutions. Hall and Soskice (2001, pp. 54–56) answer the question of whether the deregulation due to globalization leads to a common market model in all economies. In the model of Hall and Soskice (2001), where firms are equal across nations and competitiveness of firms is based on unit labour costs, and thus the minimization of these costs, governments will try to withhold firms from exiting the market by changing their regulatory frameworks. This is visible in lowering labour costs, reducing the tax rates, and deregulation of the internal market. Furthermore, the model predicts a shift from power from labour to capital, as increasing international interdependence has led to more opportunities for capital to settle in another country (Hall & Soskice, 2001). This model not only predicts convergence in terms of corporate tax rates but predicts a convergence to a common market, as well as a convergence of economic institutions.

2.1.5   A shift of the tax burden

There are contrasting theories on the effect of a change in the tax rate, whether on labour or on corporate income, on the allocation of the tax burden. The theory by Laffer (2004) suggests

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[15] International Consortium of Investigative Journalists (2019). 'The Panama Papers: Exposing the Rogue Offshore Finance Industry'. https://www.icij.org/investigations/panama-papers/ (retrieved June 18, 2019).
[16] European Commission (2019). 'Role of the EU'. https://ec.europa.eu/taxation_customs/fight-against-tax-fraud-tax-evasion/role-eu_en (retrieved June 18, 2019).

that, as long as the current tax rate is in the prohibitive range, a decline in the tax rate could lead to an increase in tax revenue. Devereux (2006, p. 9) describes the same mechanism. Without strategic changes by multinationals, an increase in the corporate tax rate would lead to an increase in tax revenue and host country welfare, the incidence of the tax rate increase would then be levied on the capital owners. However, because of profit shifting and migration, it could be that because of a tax rate increase, the tax revenue decreases. In that case, the tax incidence is shifted onto residents of the country, and a tax rate increase leads to a decrease in welfare and a shift from capital taxation to labour taxation. The problem with this theory is that a government is unknowing whether the tax rate is indeed in the prohibitive range or not. A decline in the tax rate could even so lead to a decrease in the retrieved tax revenue. This leads to the problem discussed by inter alia Rodrik (1997), that there will be more reliance on, but less ability from the government to secure social security.

Classic theory about optimal taxation involves long and elaborate equations that will not be discussed in this thesis as understanding the background is not necessary to understand the mechanism. To show how a shift in the tax burden can be explained, the inverse elasticity rule will be explained (Jacobs, 2018, p. 168). In a hypothetical world with two commodities that can be taxed (good x and c, which could be corporate income and labour), without redistribution concerns for the government, the optimization of long equations on the optimal tax rates boil down to equations (5), where t_c is the tax on good c, t_x is the tax on good x and (1-b > 0) is a measure of the benefits of tax revenue (Jacobs, 2018, p. 168) . If, for simplicity, there is no cross-elasticity assumed (ϵ_{ct_x} and ϵ_{xt_c} = 0) which means that the demand of the two goods is not dependent of each other, equations (5) transform to equations (6) and we can see that the tax rate depends inversely on the elasticities ϵ_{ct_c} and ϵ_{xt_x} of the commodities.

$$(5)\ \frac{t_c}{1+t_c}\epsilon_{ct_c} + \frac{t_x}{1+t_x}\epsilon_{ct_x} = 1 - b\ \text{and} \qquad \frac{t_c}{1+t_c}\epsilon_{xt_c} + \frac{t_x}{1+t_x}\epsilon_{xt_x} = 1 - b$$

$$(6)\ \frac{t_c}{1+t_c} = \frac{1-b}{\epsilon_{ct_c}} \qquad \text{and} \qquad \frac{t_x}{1+t_x} = \frac{1-b}{\epsilon_{xt_x}}$$

In other words, high taxes should be imposed on inelastic products, and low taxes should be imposed on elastic products, as avoidance is easier when a product is more elastic. The problem with increased capital mobility, and thus the increased elasticity of capital, is that the burden will shift to less elastic tax sources such as landowners and immobile labour (Sinn, 1990, pp. 501–502). This can be seen as a threat to redistribution and the insurance state.

2.2   Empirical Literature

Next to the theoretical background discussed in the previous section, previous research has been done to the effects of globalization on the different aspects of taxation discussed in this thesis, the corporate income tax rate and the revenue made by taxing this income. First, previous research to the declining corporate income tax rates will be presented, and after that, empirical evidence for changing behaviour of multinationals and the link between these two phenomena. In the second part, evidence for the implications for governments due to the changes in taxation is discussed.

2.2.1   Declining corporate income tax rates

Much research has been done to the direction of corporate income tax rates and the existence of a 'race to the bottom' in particular. Slemrod (2004, pp. 54–55) describes the trend in the statutory corporate income tax rate and the average effective tax rate and detects a steady decline between 1985 and 1995. The average effective tax rate is the corporate tax revenue divided by the national income of a country, the gross domestic product (GDP). This measure is used to control for extraneous aspects, like certain specific tax benefits or exemptions. Of course, this is an arbitrary measurement because not all of the national income is produced by the taxpaying corporations, however, this makes the average effective tax rate comparable across countries. To empirically test for a convergence of corporate income tax rates, Slemrod (2004) used pooled cross-country regressions and fixed-effect regressions; this ensures that the regressions are controlled for time and country fixed effects to try to capture the desired causal effect. It appears that there is no significant effect of time on the convergence of the statutory tax rate nor on the average effective tax rate, in other words, there is a driving force behind the convergence other than time alone. Next to time dummies, control variables were used, such as the trade openness indicator. The coefficient for this openness indicator is negative for both tax rates, but insignificant as well. Slemrod (2004) concludes that there is intriguing evidence for a relation between international competitive pressure and the corporate income tax rate, although there is no significance in his results. Furthermore, it appears that countries that trade more have a higher corporate tax revenue level, which would suggest a positive relationship between globalization and the tax revenue. Similar research on tax competition as a tool for investment attraction has been done by Devereux et al. (2008), who find similar results as Slemrod (2004). They show that countries use the statutory corporate tax rate in order to attract profits, and there is strategic interaction among countries, as a one percentage point decrease in the average statutory rate of other countries leads to a decrease of 0.7 percentage points in the home country (Devereux et al., 2008, p. 1212). As with the research of Slemrod (2004), the

openness of a country is used as a control variable, measured by the trade openness indicator. However, contrasting to the results of Slemrod (2004), Devereux et al. (2008) find a small positive result for the trade openness indicator on the statutory corporate tax rate, although it is insignificant as well.

Other research has been done by Grubert (2001), he examined whether a government uses tax exemptions or benefits in order to compete for foreign investment. Foreign companies, controlled by companies from the home country, that were established less than five years ago, had a significantly lower effective average tax rate in 1984 than companies that were already active. This could indicate that countries compete for foreign investment with the use of, for example, accelerated depreciation or tax holidays. However, the fact that the difference was almost the same in 1992 indicates that there is no evidence for increased tax competition by governments.

More recent research by Kumar & Quinn (2012) has some hypotheses other than the general tendency in literature as they hypothesize that countries change their corporate tax rate based on the United States acting as a Stackelberg leader, instead of initiated by competitive pressure of other countries. Secondly, they hypothesize that increased openness is associated with decreasing corporate tax rates. They test a cross-country panel data set with differing timespans until 2009. Kumar & Quinn (2012) find evidence that The United States acts as a Stackelberg leader, it appears that instead of a race to the bottom, corporate tax rates converge to the rate in The United States. The evidence on the cause of the decline of corporate tax rates is ambiguous, as they find that financial globalization has a positive correlation with the corporate tax rate and revenue, but overall globalization has a negative correlation with the corporate tax rate.

2.2.2   *Changing behaviour of multinational corporations*

The idea that increasing globalization influences the corporate income tax rates is based on the theory that multinationals change their behaviour based on these tax rates. Grubert (2001) researched this proposed relationship and found some evidence for a change in behaviour. This research covers United States companies in 1984 and 1992 and looks at their behaviour in these two years. It appears that companies that pay low foreign taxes experienced a larger decline in effective tax rate than the average company in the United States. Furthermore, companies that are active in a mobile sector, such as finance, have overall a lower average effective tax rate, which could indicate that these companies conduct in profit shifting, assigning profits to affiliates in low tax countries, more than others. There is more evidence for profit shifting from high tax countries to low tax countries as well, as it appears that companies that already had a

low average tax in 1984 had the largest decline in foreign tax rates paid as it is assumed that these companies already shifted profits due to mobile operations (Grubert, 2001). Other research by Grubert and Mutti (1991) on the relationship between reported profits and the corporate income tax rate shows that statutory corporate income tax rates are a highly significant determinant of reported profits. They show furthermore that the corporate income tax rate is a strong determinant of investments in a country by United States multinationals, a decrease in the tax rate from 20% to 10% is associated with an increase of 65% in investments (Grubert & Mutti, 1991, p. 290). More evidence of a relationship with the openness of a country is found by Devereux (2006), who found that the more open an economy is, the easier it is for companies to adjust their investments. Furthermore, an increase in the corporate tax rate leads to an outflow of net capital and a lower aggregate capital stock (Devereux, 2006).

Not just the statutory corporate tax rates are of importance for the decision making of multinationals, as proven by Dischinger and Riedel (2011), who delivered the first empirical evidence that the allocation of intangible assets was higher in low-tax countries. It appears that companies use countries where low taxes on royalties are present, to minimize the globally paid taxes. This opportunity for tax avoidance arises since intangible assets become of more importance in the production process (Dischinger & Riedel, 2011, p. 691). Following the reasoning of Dischinger and Riedel (2011), this growing importance of intangible assets leads to new ways of profit shifting by multinationals and increases the incentives for governments to compete with corporate tax rates for foreign direct investments. This increased incentive is shown by Dudar, Spengel and Voget (2015, p. 26), who show that "a one percentage point decrease in the net tax rate on royalty payments from one country to another leads to a 6.0% increase in their bilateral royalty flows". Dudar et al. (2011, p. 27) conclude that the earlier mentioned BEPS program by the OECD could limit the bilateral flows of intangible assets, which could limit the use of intangible assets to shift profits to low-tax countries.

2.2.3 *Implications for the government*

Certain implications are forthcoming from the declining corporate tax rates and changing behaviour of multinationals. According to Rodrik (1997), globalization has led to increased reliance on the government in terms of social security, but at the same time, to a decreased ability for the government to fulfil this role. Rodrik (1997) shows a positive correlation between openness and the size of the government, measured in government expenditure as a percentage of GDP, although cross-country evidence shows that this positive correlation is caused by increased exposure to external risk due to the increased openness, as it is more likely that the government has to intervene when citizens in a country are more exposed to the whims

of global markets (Rodrik, 1997, p. 53). When controlled for country and year fixed effects, there seems to be a negative relationship between openness and social spending and government consumption, and the effect increases when capital mobility is less restricted (Rodrik, 1997).

Other research finds a different relation, positive results after lowering the corporate tax rate, as proposed by Laffer (2004). Research by Clausing (2007) explains that the influence of the corporate tax rate on the tax revenue is ambiguous, because a higher corporate rate would increase the corporate tax revenue, but leads to more incentive to avoid taxes. This explanation is based on the general idea of Laffer (2004). The empirical research shows that there is indeed a parabolic relation between the corporate income tax rate and corporate income tax revenues when measured on OECD level, with a maximizing corporate income tax rate of 33%, which is higher than the current OECD average of 23.7% (Clausing, 2007; OECD, 2019). Clausing (2007) further indicates that this maximizing corporate income tax rate cannot be used as a guideline for countries, as it is dependent on several country-specific factors. Comparable research is performed by Devereux (2007), who finds the same non-linear relation between the corporate tax rate and corporate tax revenue. Following this research, the optimal corporate income tax rate would range from 18% to 28%, which would make the current rate more suitable (Devereux, 2007, p. 22). However, after including more control variables, Devereux (2007) concludes that it could be that there is no systematic effect of the tax rate on the tax revenue, at least not following his methodology, which could stem from the differences between countries, as mentioned by Clausing (2007). This shows the difficulty for governments to set an optimal corporate tax rate (Devereux, 2007, p. 25).

In a report by the Tax Foundation, an independent tax policy non-profit organisation, ten benefits of lowering the United States corporate tax rate are summed up (Hodge, 2011). Although some of these benefits, like higher long-term economic growth and increased competitiveness, could hypothetically lead to increased tax revenue, the latter is not explicitly stated as one of the benefits. What the Tax Foundation concludes, is that decreasing the corporate tax rate lowers the burden on low-income taxpayers, something which is opposed by others such as Genschel (2002). Although it has to be mentioned that these statements by the Tax Foundation are not empirically tested for by the Tax Foundation itself, and it is not clear how objective the Tax Foundation is, as there is some objection on their methodology.[17]

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[17] Krugman, P. (2017). 'The Tax Foundation Has Some Explaining To Do'. https://krugman.blogs.nytimes.com/2017/11/11/the-tax-foundation-has-some-explaining-to-do/ (retrieved June 24, 2019).

Genschel (2002) tested the relation between tax competition and the possible shift of the tax burden from mobile tax bases to immobile bases, such as labour, as proposed by Sinn (1990). It appears that tax revenue has risen since the 1970s, but due to the expansion of the welfare state during the same years, public expenditure has risen more than the tax revenue. Furthermore, the effective tax on labour has increased in recent years, which could indicate a shift in the tax burden from corporations to workers. There seems to be compelling evidence that taxes on labour increase unemployment through higher pre-tax wages (Genschel, 2002, p. 18). The increased taxes on labour result in more unemployment, inequality, and even more erosion of the labour tax base, which could lead to even higher labour tax rates.

2.3   Hypotheses

The theories described in the theoretical framework show some proposed relations between globalization and the corporate tax rate, the corporate tax revenue, and the allocation of the tax burden, though previous research does not always show compelling evidence for these relations. Based on the increased multinational activity in recent years and the importance of the corporate tax rate for multinational decision making it is reasonable to think that this increased multinational activity acts as a catalysator for tax competition and thus for a decline in corporate tax rates (Devereux, 2006; Grubert, 2001; Grubert & Mutti, 1991). Although the empirical literature showed that there are different variants of taxation that impact this decision making, like the royalty tax and tariffs, the focus of this research will be on the corporate income tax as this is the most usable form of taxation, due to data availability and the scope of this thesis. The combination of the theoretical and empirical literature, as discussed in the previous section, led to the following hypothesis:

H0: Globalization has no relationship with the corporate income tax rate.
H1: Globalization decreases the corporate income tax rate.

Next to the effect of globalization on the tax rate itself, the theory proposed a relation between globalization and the tax revenue, based on inter alia the Laffer curve (Laffer, 2004). However, there seems to be no compelling evidence for either the existence of the Laffer curve nor the effect of globalization on the tax revenue collected by governments (Clausing, 2007; Devereux, 2007). Because the proposed positive effect of the decline in corporate tax rates and the increase in tax revenue is often used as a political argument, it is important to test whether this

claim holds based on empirical data.[18] Due to the theory, as discussed in the previous section, and the contradicting empirical evidence, the second hypothesis in this thesis is as follows:

H0: Globalization has no relationship with the corporate income tax revenue.

H2: Globalization increases corporate income tax revenue.

The third hypothesis in this thesis is more about the policy implications based on the first two. An important goal of the European Commission is to lighten the burden on labour, but classic economic theory suggests that, based on the inverse elasticity rule, the opposite happens (Genschel, 2002; Jacobs, 2018). Due to increasing globalization, mobile factors like capital become more elastic, which would mean that it is less efficient to tax these mobile factors and more efficient to tax more immobile factors, such as labour. As scholars have warned for the shift of the tax burden from capital to labour, it is important to test whether it is true that the corporate tax revenue as a percentage of total taxation indeed declines. The third hypothesis is therefore stated as follows:

H0: Globalization has no relationship with the corporate income tax revenue as a percentage of total taxation.

H3: Globalization decreases the corporate income tax revenue as a percentage of total taxation.

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[18] Tax Foundation. (2018). 'The Benefits of Cutting the Corporate Tax Rate'. https://taxfoundation.org/benefits-cutting-corporate-income-tax-rate/ (Retrieved May 13, 2019).

3.   Methodology

3.1   Data description

In this section, the data used in this thesis are discussed and explained. In Appendix I, all variables are listed, including references and methodology on the different indicators used. After the presentation of the data, five models will be introduced that are used to test for a relationship between globalization and corporate income taxation.

3.1.1   The statutory corporate income tax rate

In order to test the hypotheses in this thesis, a measure for the corporate income tax rate is necessary. A problem that arises with the corporate income tax rate is that countries have different tax systems. Where some countries have one statutory rate that is levied on all corporations, such as Austria, other countries make a distinction between large corporations and small and medium enterprises, such as the Netherlands where the rates are 20% for small and medium enterprises and 25% for large enterprises, prior to 2019. Another distinction is made in the United States, where there is a distinction between central and sub-central taxation, the taxes that have to be paid to the federal government. In order to achieve one measure for the corporate income tax rate, the combined corporate income tax rate, as stated by the OECD (2019) is used, which is a weighted average of the corporate income taxes. As can be seen in Figure 2, the average statutory corporate income tax declined steadily between 1981 and 2017.
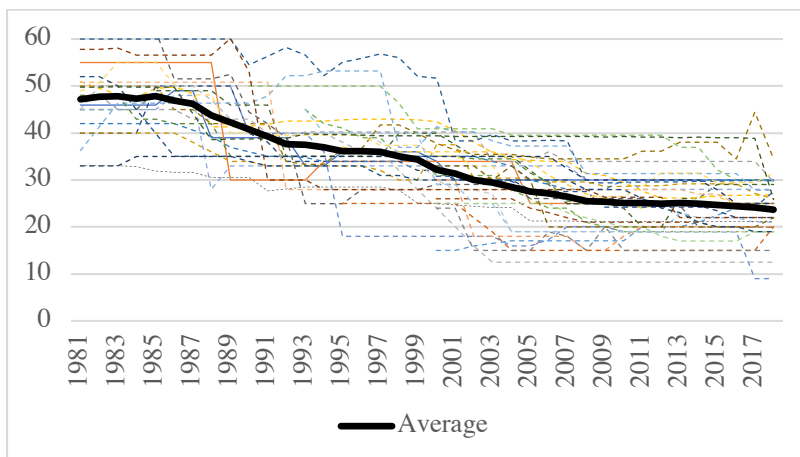
Figure 2. Corporate income tax rates in OECD countries

3.1.2   The average effective corporate tax rate

Although the statutory corporate income tax rate is the most basic measure, it is not the basis for the investment decisions made by multinationals (Slemrod, 2004). The statutory corporate

income tax rate does not include special tax deductions or exemptions that are mostly used by multinationals to shift their profits. In order to overcome this problem, several previous authors used the average effective corporate tax rate, which is defined as the corporate tax revenue divided by some measure of income, the most general being the gross domestic product (GDP). This variable is the same as the tax revenue variable, which is defined as the tax revenue from corporate taxes as a percentage of GDP, to give a comparable general measure (OECD, 2019).
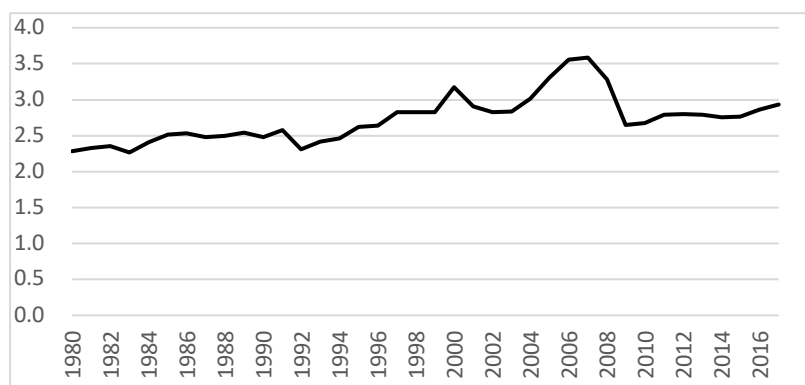
Figure 3. Average effective corporate tax rate

3.1.3   Corporate income tax revenue

Two measures of the corporate income tax revenue are used in this thesis. One is corporate tax revenue as a percentage of GDP, which is calculated with the same method as the average effective corporate tax rate. In Figure 3, the average effective corporate tax rate is shown, which is equal to the corporate tax revenue as a percentage of GDP. The Figure shows that there is little variation in this measure. To test the third hypothesis, another measure of the corporate income tax revenue is necessary, which is the corporate income tax revenue as a percentage of total taxation, as seen in Figure 4 (OECD, 2019). As with the average effective corporate tax rate, this Figure shows little variation and looks like the average effective corporate tax rate in Figure 3.
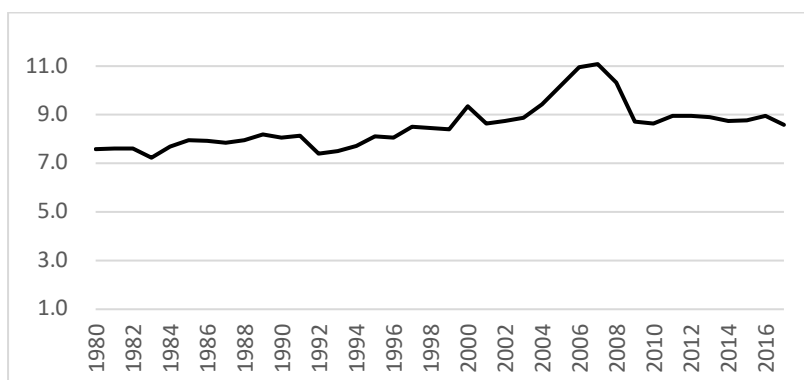
Figure 4. Average corporate tax revenue as a percentage of total taxation

3.1.4 Independent variables

This thesis tries to test for a relationship between globalization and the corporate income tax. As discussed in the theoretical framework, globalization is used as an umbrella term, which means that proxies for this term have to be used in order to test for a relationship. There are several ways to proxy for globalization, and some measures are stronger or better than others. Gräbner et al. (2018) have established a detailed description of existing methods, of which some are used in this thesis. A detailed index of openness is the KOF Globalization Index by the Swiss Economic Institute (KOF).[19] This measure focusses on economic openness, as well as other dimensions of globalization such as social, political, or cultural dimensions.

Another measure, which is mostly used to proxy for globalization, is the trade openness indicator, one of the World Development Indicators (The World Bank, 2019). This indicator is calculated as the sum of imports and exports of goods and services, as a share of gross domestic product and is one of the core measures as it is strictly related to globalization when looked at globalization as increased trade between countries.

Where the previous two measures relate to a general openness to trade, or "hybrid measures", there are certain ways to test for openness focussed on the movement of financial goods specifically as well (Gräbner et al., 2018). One way is the use of the shares of foreign direct investment inflows as a percentage of GDP, which shows the relative attractiveness of the economy to foreign direct investment. Only foreign direct investment inflows are used as they show the attractiveness of an economy, and the outflows show the attractiveness of other economies (Gräbner et al., 2018). The last two measures are foreign direct investment inward and outward stocks relative to GDP, these two measures show the extent of globalization of an economy (OECD, 2015). The foreign direct investment stocks differ from the flows, as the stocks represent the total level of foreign direct investment that is invested in a country, where the flows represent the investment made during a year (OECD, 2019). By looking at these three measures of foreign direct investment relative to GDP, changes in the openness to foreign direct investment can be interpreted.

One could hypothesise that there is a differentiated effect of globalization on corporate taxation, especially tax revenue, per industry as increased trade and foreign direct investment is differentiated as well. Based on the theory discussed in the previous chapter, it is thinkable that the disappearance of restrictions will have more impact on more mobile sectors, like the financial sector. Because of this, it would be interesting to study the effect of variation in

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[19] KOF. (2019). 'KOF Globalisation Index'. https://www.kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html (retrieved May 13, 2019)

different industries on corporate income taxation. However, because data on foreign direct investment flows per industry is available only for some countries, between 2010 and 2017, plus the fact that most variation in the corporate tax rate and revenue is experienced in the years before 2010, it is not expected that including these data will result in significant estimators.

3.1.5   Control variables

Following the previous literature, three control variables are added to control for omitted variable bias and size bias. The first control variable is *GDP*, to control for the productivity of a country as it is thinkable that the productivity of a country is related to both the dependent variable and the independent variable. However, the inclusion of GDP as a control variable to proxy for productivity could lead to endogeneity problems as GDP is used to normalize the independent variables as well. Furthermore, the fact that the openness indicators used are normalized using GDP ensures on the one hand that they are comparable across countries, but a problem that arises is size bias. This size bias comes from the fact that smaller economies have higher trade volumes as a percentage of GDP than large countries with a large GDP (Gräbner et al., 2018, pp. 6–7). To control for this specific size bias and omitted variable bias, the population of a country is added as a control variable for the size of a country. The third control variable used is *government*, the share of cabinet posts held by left-wing politicians in a country in a certain year, as it follows from the theoretical background that left-wing politicians promote higher corporate tax rates.

3.2   Descriptive statistics

Table 1 shows the descriptive statistics of the variables used in this thesis in order to create some perspective for the interpretation and to test for normality in the distribution of the variables. Kurtosis and skewness are measures of the thickness of the tail and the symmetry of the distribution and are used to test whether the variables follow a normal distribution (Wooldridge, 2016). Acceptable ranges are between -3 and 3 for the kurtosis and between -2 and 2 for the skewness. As can be seen in Table 1, five variables are outside of these acceptable ranges. For the variables *GDP* and *population*, this can be fixed by a logarithmic transformation. The high levels of kurtosis for tax revenue, trade openness, and the inward flow of FDI are due to outliers. Transformation of these variables will lead to an adjustment of data as the outliers will be transformed. Table A 2 shows the descriptive statistics after winsorization on the 1% and 99% level and skewness and kurtosis levels are closer to the acceptable ranges, but the data misses some extremes which will influence the outcome of the

tests. However, the fact that these outliers resulted from unusual, unique events makes the winsorized data still applicable.

Table 1. *Descriptive Statistics before transformation*

Variable	*N*	Mean	S.d.	Min	Max	Skewness	Kurtosis
Corporate tax rate	1155	32.43	10.55	9	61.75	0.43	2.80
Tax revenue (%GDP)	1200	2.77	1.47	0.26	12.59	2.04	10.33
Tax revenue (%Total)	1198	8.65	4.59	0.60	29.40	1.37	5.34
Trade openness	1258	80.55	49.62	16.02	423.99	2.40	12.55
KOF	1264	74.63	11.08	41.33	91.17	-0.83	2.89
FDI inward flow (%GDP)	1213	3.75	10.65	-58.30	252.30	12.46	259.17
FDI inward stock (%GDP)	1234	33.99	43.33	0.17	376.19	3.93	24.30
FDI outward stock (%GDP)	1220	27.10	44.47	0.00	392.42	4.04	24.20
GDP	1293	876866.4	1991787	2791.16	19485394	5.62	41.06
Population	1368	31852160	51551254	228138	325719178	3.31	15.89
Government	1056	33.99	36.37	0	100	0.67	2.03

3.2.1 Correlations

In this thesis, several indicators for globalization are used, which could lead to problems in the regressions due to collinearity. Because of this, it is important to test the empirical relationship between the different indicators, as it is not unthinkable that the different indicators measure the same effect of globalization on the corporate taxation, which would make it impossible to use them together. To test for the correlation between the independent variables that proxy for globalization, a Spearman rho test is performed. The control variable *GDP* is included as the use of *Trade* and *GDP* could lead to collinearity as well. It appears that *FDI_instock_gdp* and *FDI_outstock_gdp* both have high correlations with the other variables, which is why they cannot be used in the same regression with *KOF* and *Trade*. All the other proxies for globalization have a moderate correlation between 0.4 and 0.6, which is expected as they all proxy for the same phenomenon. As emphasized earlier, the inclusion of *GDP* together with *Trade* could lead to endogeneity problems due to the correlation between the two. *KOF* and *Trade* cannot be used together in one regression as well, as the trade indicator is one of the

indices of the KOF Globalization Index, which would lead to collinearity (Potrafke, 2015, p. 512).

Although the variance inflation factor, a measure for the level of multicollinearity, is not a holy grail of multicollinearity, and the conclusion of problematic values is still arbitrary, the generally used upper limit of the variance inflation factor is 10 (Wooldridge, 2016, p. 86). The test for multicollinearity shows very high VIF scores for the independent variables, as shown in Table A 5. The scores exceed the acceptable value of 10 even when no control variables are added, except for the FDI variable. These high values are due to the inclusion of country fixed effects, without country or time fixed effects, these values do not exceed 10, as seen in Table A 6.[20]

Table 2. *Correlation Between Variables*

	KOF	Trade	FDI_inflow_gdp	FDI_instock_gdp	FDI_outstock_gdp	GDP
KOF	1					
Trade	0.476	1				
FDI_inflow_gdp	0.343	0.417	1			
FDI_instock_gdp	0.596	0.601	0.635	1		
FDI_outstock_gdp	0.821	0.302	0.335	0.615	1	
GDP	0.207	-0.513	-0.109	-0.080	0.286	1

Note: all values are significant at the 1% level

3.3 Empirical model

To test for the effect of globalization on the corporate income taxation, a cross country pooled time series regression is used, existing of a strongly balanced data set of 36 OECD countries for the years 1980-2017. The high number of observations stems from the country and year pairs formed by the dataset, which results in 1404 country-pairs. Although the data set is strongly balanced as can be seen in Table A 7, the number of observations differs across variables, because of missing values, and ranges from 1056 to 1368, which is a large enough sample for this regression. OECD countries are used because of the wide availability of tax data for these countries. The number of countries and observations per country are specified in Appendix Table A5, which shows a near equal average number of observations per country. The first model is controlled for country fixed effects and a linear time trend T_t to check for the common time trend. The second model is controlled for country and time fixed effect in order

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[20] Including year fixed effects in the variance inflation factor test does not change this outcome.

to control for the unobservable country and time-specific factors. This results in the following specifications:

$$(1)\ Y_{i,t} = \beta_1 X_{i,t} + \beta_2 T_t + \eta_i + u_{i,t}$$

$$(2)\ Y_{i,t} = \beta_1 X_{i,t} + \eta_i + \theta_t + u_{i,t}$$

Here, $Y_{i,t}$ represents the dependent variable 'corporate tax rate', 'corporate tax revenue as a percentage of GDP' or 'corporate tax revenue as a percentage of total taxation' and $X_{i,t}$ represents a different indicator of globalization as described in the previous section. The subscripts i and t represent the country and year respectively, and the η_i shows the country fixed effects and the θ_t the year fixed effects. Due to the latter, this specification checks for the independent effect globalization has on the corporate tax rate of corporate tax revenue without the effect of time shocks or country-specific effects. Based on the hypotheses, the expected effect is negative for the corporate tax rate and corporate tax revenue as a percentage of taxation and positive for the corporate tax revenue as a percentage of GDP.

After the inclusion of the different control variables, this linear specification changes as seen in model 3. Though, due to the described problems with correlation, these variables cannot be included at the same time.

$$(3)\ Y_{i,t} = \beta_1 X_{i,t} + \beta_2 Government_{i,t} + \beta_3 LnGDP_{i,t} + \beta_4 LnPopulation_{i,t} + \eta_i + \theta_t + u_{i,t}$$

To make sure the fixed effects model is the correct model to use, a Hausman test is performed with model 3 and the corporate tax rate and the KOF Globalization Index as the dependent and independent variables respectively. The Hausman test has a χ^2 of 163.71 and is significant, which means that the null hypothesis that fixed and random effects estimators are equal is rejected and thus the fixed effects model ensures the most consistent and causal results.

Next to the previous regression, another regression is performed to account for the fact that there is some time between the change in an independent variable and the political decision making of changing the corporate tax rate (Overesch & Rincke, 2011, p. 10). To account for this, another regression model is estimated with lagged independent variables, measurements from previous years, one, two and three years, and this resulted in the following specification:[21]

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[21] Regressions with just the lagged independent variable of interest showed similar results as regressions with the lagged independent and control variables, therefore all variables on the right side of the equation are lagged.

$$(4) \ Y_{i,t+L} = \beta_1 X_{i,t} + \beta_2 Government_{i,t} + \beta_3 LnGDP_{i,t} + \beta_4 LnPopulation_{i,t} + \eta_i + \theta_t + u_{i,t}$$

Another problem that could arise with these methods of estimation is the reverse causality bias, which means that it could be that the model estimates the influence of globalization on the corporate tax rate, and the other way around as well, as there is evidence for this reversed relationship (e.g. Cassou, 1997). In order to overcome the problem of reversed causality, a model with lagged independent variables and a lag of the dependent variable is performed as well. This specification seems to provide better estimates than the Arellano-Bond estimator (Leszczensky & Wolbring, 2018). Leszczensky and Wolbring (2018) describe that using a contemporaneous and a lagged effect (one or two years) should provide good estimates of the effects, even when reverse causality is a bias in the first model. Inclusion of both the contemporaneous and the lagged independent variable should overcome problems due to misspecified temporal lags, but regressions with this sample do not show significant differences with or without the contemporaneous lag included. The specification used in this thesis therefore only uses the lagged independent variable. This specification seems to be the best fit for this sample as it is useful for samples with large observations, although a large number of periods could lead to high standard errors (Leszczensky & Wolbring, 2018, p. 29). Because of the large number of periods, causal estimates are plausible. The fact that the panel used is strongly balanced seems to overcome this problem, as these large standard errors are not visible in the regression results. This last regression is specified as follows:

$$(5) \ Y_{i,t+L} = \beta_1 Y_{i,t} + \beta_3 X_{i,t} + \beta_4 Government_{i,t} + \beta_5 LnGDP_{i,t} + \beta_6 LnPopulation_{i,t} + \eta_i + \theta_t + u_{i,t}$$

As stated, this specification should give causal estimates due to a large number of periods, but a commonly encountered problem of adding a lag of the dependent variable is a downwards bias of other independent variables. As a robustness check, an Arellano-Bond regression is performed. This specification is the same as model 5, but now a 2-year lag of the dependent variable is used as an instrumental variable.

4.   Results

The five different models used in this thesis led to a large number of regression results, which can be found in Appendix III. In this chapter, some of these results are highlighted and discussed. The general tendency is that there is no statistically significant effect of the trade indicator on the corporate tax rate or the corporate tax revenue, which is in line with previous research. However, the KOF Globalization Index and the FDI indicators, which are not used as frequently as the trade indicator, do show some results. The three different objects of research are discussed separately, per model. The five models are as follows; model 1 estimates the correlation between an indicator of taxation and an indicator of globalization with a time trend. Model 2 estimates the same relation, but with year fixed effects instead of a time trend. Model 3 includes the control variables used to make the estimation more robust against biases. The other two models are robustness checks; model 4 includes lagged variables and model 5 expands this model with a lagged dependent variable, in order to account for reversed causality. In the summarized tables, the most interesting results are shown; the most extended model, model 3, is displayed together with model 4 and model 5, both with a 1-year lag. If the other models show significant results, these are discussed in the text and shown in Appendix III.

4.1.1   The statutory corporate income tax rate

Based on the first hypothesis, a negative effect of globalization on the corporate tax rate is expected. From all regressions can be learned that the year trend effect is economically and statically significant, as it varies from -0.514 to -0.672. This means that each year, the average corporate income tax rate drops with more than 0.5%. It appears that the trade indicator, as well as the KOF Globalization Index, has no significant effect on the corporate income tax rate, although the reported non-significant effect is negative, this relates to the findings of Slemrod (2004), although he concluded that this does give evidence for a relationship between the openness of a country and the corporate tax rate. In Table A 10 can be seen that the KOF Globalization Index has a negative correlation with the corporate tax rate (-0.298**), but after including year fixed effects and control variables, the statistical significance is lost. The only indicator for globalization that is significant is the FDI inflow as a percentage of GDP. The estimator loses some power and significance after the control variables are included, but in model 3 the estimator is still -0.115 and indicates that a higher inflow of FDI leads to a lower corporate tax rate. Surprisingly, this effect stays after the independent variables are lagged, which indicates that the negative effect on the corporate tax rate is due to the higher FDI inflow. This result is in line with the empirical literature on the importance of taxation on investments

made by companies. Grubert and Mutti (1991) already showed that there is a strong relationship between the corporate tax rate and the investments made by United States multinationals. The significance of the FDI indicators, even in the lagged model, show that the foreign direct investment inflows indeed have a negative effect on the corporate income tax rate. The size of a country, represented by the population, shows a large significant estimated effect of close by 17, which means that when the population in a country is 1% larger, the average corporate tax rate is 0.17% higher.

When the lagged dependent variable is accounted for, in model 5, the estimated effect of the globalization indicators is greatly reduced, although the effect of the FDI inflow is still statistically significant (-0.0423***). Now, the FDI inward stock shows a significant positive indicator (0.0121**). Although very small, this effect points out that there is a positive relationship between the extent of globalization in a country and the corporate tax rate as well. As could be expected, the lagged corporate tax rate is highly significant. This shows that the current level of the corporate income tax rate is highly dependent on previous years. It appears that there is no significant estimated effect of the GDP on the corporate tax rate, although the estimator is large. An even larger estimator is estimated for the population of a country, which is significantly positive in all the regressions. This shows that larger countries have on average a higher statutory corporate tax rate. The reported adjusted R-squared varies from 0.663 to 0.910, which are very high numbers. These results imply that the variables in these models explain 66.3% to 91 % of the variation in this measure of the corporate tax rate.

Table 3. *Regression results with corporate tax rate as the dependent variable.*

	(1) Model 3	(2) Model 3	(3) Model 3	(4) Model 4 L=1	(5) Model 5 L=1
Corporate tax rate					0.836***
					(0.0223)
KOF	-0.142				
	(0.238)				
Trade indicator		-0.0275			
		(0.0420)			
FDI inflow			-0.115*	-0.138**	-0.0423***
			(0.0583)	(0.0559)	(0.0134)
FDI inward stock			-0.00920	0.00455	0.0121**
			(0.0478)	(0.0425)	(0.00589)
FDI outward stock			0.00820	0.00191	-0.00295
			(0.0404)	(0.0352)	(0.00424)
Government	0.00329	0.00303	0.00291	0.00448	0.00232
	(0.00722)	(0.00680)	(0.00720)	(0.00776)	(0.00299)
GDP	-4.637		-5.354	-4.078	0.312
	(7.815)		(7.535)	(7.333)	(1.474)
Population	17.96**	17.35*	16.95*	16.78*	3.022*
	(8.015)	(10.03)	(8.830)	(8.495)	(1.483)
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
N	972	969	905	925	905
adj. R^2	0.670	0.666	0.663	0.663	0.910

Standard errors (robust to heteroscedasticity and serial correlation) in parentheses. L denotes the years the dependent variable is lagged. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.1.2 Tax revenue as a percentage of GDP

The second dependent variable that is tested is the tax revenue as a percentage of GDP. This indicates both the average effective corporate tax rate and how much tax revenue a country collects. Table 4 shows a summary of the regression results reported in Appendix III. As with the corporate tax rate, the trade indicator never has a significant estimator, and the non-significant effect is very small. The same applies to the KOF Globalization Index and the FDI indicators, for the first three models. It appears that there is a very small significant negative effect of FDI inflow in the fourth model (-0.0131*), which indicates that an increase of 1 per cent FDI inflow (as a percentage of GDP), results in a 0.0131% lower average effective tax rate of tax revenue, which is an economically insignificant result. This negative effect goes against the hypothesized positive effect of globalization on the tax revenue, but in model 5 there is a significant positive effect of the KOF Globalization Index on the tax revenue, both for the 1-year lag as for the 2-year lag (0.0136**, 0.0215*). This means that a higher KOF Globalization Index is correlated with higher tax revenue as a percentage of GDP. Next to this effect, Table A 15 shows a similar positive significant effect of FDI inward stock on the tax

revenue for both lagged years, although this result is very small (0.00243*, 0.00401*). In the empirical literature, the changes in tax revenue are tried to be explained by the changes in the corporate tax rate, as with the research by Clausing (2007) and Devereux (2007). They showed a non-linear relationship between the corporate tax rate and corporate tax revenue. The fact that there a no clear significant result of the relationship between globalization indicators and the corporate tax revenue as a percentage of GDP suggests that this relationship works through the corporate tax rate, although Table 3 showed that this relationship is not as strong as theory would suggest. As with the previous dependent variable, the lag of tax revenue as a percentage of GDP is highly statistically significant.

In Table 4 can furthermore be seen that, in contrast to the previous dependent variable, neither GDP nor the population has a significant effect on the tax revenue as a percentage of GDP. The adjusted R-squared varies from 0.079 to 0.205 for the first four models. This implies that these four different models explain 7.9% to 20.5% of the variation in the tax revenue, which is not much. In contrast, the fifth model reports an R-squared of around 0.757, which means that this model explains 75.7% of the variation in the tax revenue. This jump can be explained by the inclusion of the lagged dependent variable as the lag of the dependent variable, the measurement of the dependent variable in a previous year, explains a lot of the variation in the dependent variable.

It appears that the direction of the estimator of FDI inflow is the same as for the statutory corporate tax rate, although the effect is much smaller for the average effective tax rate, which could be partially explained by the smaller variation in this indicator. Interestingly, the estimator for the KOF Globalization Index switched sign for the average effective tax rate and is now significantly positive, although small.

Due to these small estimators, there is no convincing evidence of the effect of globalization on the average effective tax rate or the tax revenue as a percentage of GDP, however, the significant positive effect of the KOF Globalization Index leaves room for further research.

Table 4. *Regression results with tax revenue (%GDP) as the dependent variable.*

	(3)	(6)	(9)	(7)	(5)
	Model 3	*Model 3*	*Model 3*	*Model 4* $L=1$	*Model 5* $L=1$
Tax revenue					0.811***
					(0.0383)
KOF	-0.0358				0.0136***
	(0.0396)				(0.00640)
Trade indicator		-0.00596			
		(0.00497)			
FDI inflow			-0.0127	-0.0131*	
			(0.00753)	(0.00712)	
FDI inward stock			-0.00574	-0.00302	
			(0.00660)	(0.00545)	
FDI outward stock			0.00393	0.00300	
			(0.00675)	(0.00574)	
Government	-0.000663	-0.000193	-0.000392	-0.000767	-0.000536
	(0.00106)	(0.000965)	(0.00105)	(0.00113)	(0.000472)
GDP	1.227		2.050*	1.861*	0.103
	(1.107)		(1.187)	(1.034)	(0.111)
Population	0.944	1.794	1.971	1.698	0.6285
	(1.501)	(1.201)	(1.274)	(1.215)	(0.333)
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
N	1028	1024	949	949	1026
adj. R^2	0.187	0.187	0.200	0.205	0.757

Standard errors (robust to heteroscedasticity and serial correlation) in parentheses. L denotes the years the dependent variable is lagged. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.1.3   Tax revenue as a percentage of total taxation

The last dependent variable that is tested is the tax revenue as a percentage of total taxation, in order to test for a significant shift in tax bases. Table 5 shows a summary of the regression results reported in Appendix III. As with the tax revenue as a percentage of GDP, it appears that there is a small significant negative effect of FDI inflows on the dependent variable. This effect is the same in model 3 and model 4 and becomes stronger and more significant when a 2- and 3-year lag is applied (-0.0453**, -0.0463*), as seen in Table A 13. This negative effect, although very small, is in line with the third hypothesis in this thesis, stating that increased globalization leads to a smaller tax contribution from corporate income tax. However, model 5 shows a significant positive effect of the KOF Globalization Index (0.0323*), indicating that there is a positive effect of globalization on the corporate income tax base as well. In contrast to the tax revenue as a percentage of GDP, the GDP and population variable do show some significant results. It appears that there is a significant positive effect of the GDP on the tax revenue as a percentage of total taxation, which is a logical result as in more productive

countries, companies contribute more to the total taxation of a country, percentage-wise, than in less productive countries. The same significant positive effect is seen for the population, indicating that in larger countries, corporations contribute more to the total taxation than in smaller countries. The R-squared values are comparable to the previous dependent variable as it varies from 0.064 to 0.266 for the first four models, which implies that these models explain 6.4% to 26.6% of the variation in the tax revenue as a percentage of total taxation. These numbers are again higher for the fifth model due to the inclusion of a lag of the dependent variable and vary from 0.575 to 0.774. The fifth model therefore explains between 57.5% and 77.4% of the variation in the tax revenue.

Overall, the results for the third dependent variable are comparable to the results of the tax revenue as a percentage of GDP. Due to the ambiguous effect of the different globalization indicators, there is no evincive reason to reject the third null hypothesis.

Table 5. *Regression results with tax revenue (% total taxation) as the dependent variable.*

	(3)	(6)	(9)	(7)	(5)
	Model 3	*Model 3*	*Model 3*	*Model 4* L=1	*Model 5* L=1
Tax revenue					0.820***
					(0.0345)
KOF	-0.0989				0.0323*
	(0.0985)				(0.019)
Trade indicator		-0.0141			
		(0.0192)			
FDI inflow			-0.0326*	-0.0327*	
			(0.0178)	(0.0186)	
FDI inward stock			-0.00631	-0.000266	
			(0.0167)	(0.0134)	
FDI outward stock			0.00632	0.00528	
			(0.0185)	(0.0151)	
Government	-0.000851	0.000535	0.0000742	-0.00117	-0.00143
	(0.00273)	(0.00242)	(0.00259)	(0.00284)	(0.00115)
GDP	4.894		7.484**	6.970***	0.555
	(3.101)		(2.748)	(2.370)	(0.440)
Population	4.396	7.474*	8.257*	7.605*	0.621
	(4.808)	(4.226)	(4.105)	(4.026)	(0.979)
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
N	1028	1024	949	948	1025
adj. R^2	0.211	0.181	0.256	0.266	0.772

Standard errors (robust to heteroscedasticity and serial correlation) in parentheses. L denotes the years the dependent variable is lagged. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.1.4   Robustness checks

As stated in the methodology, an Arellano-Bond estimator is estimated as a robustness check for the previous regressions. Usually, this estimator is appropriate when the panel data has a small number of periods, when the number of periods is large enough the models as displayed in the previous sections should be enough. Table A 17 shows a significant negative effect only for the FDI inflows as a percentage of GDP on the corporate income tax rate (-0.039***). Overall, the results from the Arellano-Bond estimations support the previous results, but they lose all of their statistical significance and are therefore not significantly different from zero.

5.   Discussion

In this thesis, different statistical models were used to estimate the relationship between globalization and the corporate income tax rate and revenue. Based on the results in the models with fixed effects, the null hypotheses one, two, and three cannot be rejected. Which means that this thesis cannot answer the research question, what the effect of globalization on the corporate tax rate and corporate tax revenue is. This result contradicts the various theoretical attempts to explain this relationship but complies to previous empirical research of this relationship. Although statistical significance is lacking in the larger part of the regressions, the estimated effects are mostly in compliance with the hypothesized effect.

5.1.1   Limitations of this research

The inconclusive results of this research can be partially explained. Firstly, due to the sample selection in this research. The large number of variables used made it impossible to collect data for a large number of countries, because of the unavailability of data. Most of the data is gathered with the use of the OECD database, and this limits the number of countries to the 36 OECD countries.

Another problem could be the empirical model used in this thesis. Although an empirical model with unobserved country and time fixed effects is the preferred model when estimating a cross-country pooled time series regression, in order to control for unobserved effects, Devereux (2007) already admits that introducing these fixed effects removes a lot of the cross-country variation. Due to the use of these fixed effects, the relationship between globalization indicators and the corporate income tax rate or the corporate tax revenue has to be discovered based on variation in the latter two variables in a country alone. Unfortunately, as the data description showed, there is often little variation in these variables. This lack of variation could have contributed to the small and insignificant results (Devereux, 2007, p. 20).

Thirdly, the scope of this research could be a reason for the inconclusive results, as the independent variable of interest, globalization, is not measured easily. Because globalization is an umbrella term, certain proxies had to be used. Although this thesis used five different proxies for globalization, based on extensive research by Gräbner et al. (2018), the use of proxies always introduces the danger of not grasping the desired effect completely. As the term globalization is an umbrella term for different effects, different indicators have to be used to try to explain the effect of globalization. Because of this, it is only possible to conclude something about the effect of the individual proxies on the corporate income tax rate and tax revenue, instead of the effect of globalization. This is more of a general problem, which is

present in previous theoretical and empirical literature as well, as many researchers use globalization as a research object because of the popularity of the tern. However, because globalization is a popular term to describe a variety of effects, it would be better to split up this term and focus more on particular individual effects and mechanisms behind changes in the global economy.

A fourth possible problem could be a problem due to definition. Because the data used in this thesis is merged from different data sources, which use different methodologies for their data gathering, possible errors because of different definitions used, could not be excluded. These different possibilities for errors in the data could be the reason for the insignificant results in this thesis.

Problems discussed in the methodology, such as omitted variable bias, size bias, and reverse causality seem to be handled with the use of control variables and the extended models, including lagged variables of the independent and dependent variables. The robustness checks in Appendix III seem to confirm this.

5.1.2 *Policy implications*

One of the motives for researching the relationship between globalization and corporate income taxation in this thesis was the changing view on globalization after a long period of increased globalization. The rise of populism among governments and the increased trade barriers that are imposed suggest that governments turn away from their positive position on globalization. This movement of deglobalization takes on different forms, such as protectionism. Another argument made by several scholars and politicians is the fact that globalization could be a threat to the welfare or insurance state, as it leads to lower corporate tax rates which erode the bases for tax revenue (Genschel, 2002). This last argument has been a hotly debated topic among politicians, as they cannot find consensus. The results from this research show that the effect of globalization on corporate tax rates and revenues is not as big as some argue and especially the effect on tax revenue is ambiguous. It seems that an increase in globalization does not necessarily lead to a decrease in tax revenue collected by the government, as could already be seen in Figure 3, as the corporate tax revenue as a percentage of GDP is somewhat stable over the years. This contradicts the argument that globalization is a threat to the welfare state, at least at the revenue level. On the other hand, the effect of globalization on tax revenue is not strictly positive either, which invalidates the argument used by politicians. As with other macroeconomic analyses, it is hard to justify the results without a good control group, in other words, this research cannot claim what would have been the tax revenue without globalization.

Well-balanced policy implications can therefore not easily be derived from this research, as it merely gives evidence for a small relationship between globalization and corporate income taxation.

5.1.3 *Recommendations for further research*

Like previous research, this research does not show a clear relationship between the indicators for globalization and the different aspects of corporate income taxation discussed in this thesis. An interesting result, however, is the significant estimator for the foreign direct investment inflows. This suggests that more specific research to the effects of foreign direct investment, instead of general research, including the trade openness indicator or the KOF Globalization Index, could give new insights to the proposed relationship. In their research to the relationship between globalization and economic growth. Gräbner et al. (2018) used other more specific indicators for globalization, which could be of interest for further research as well. This relates to the problem discussed in the limitations of this research, as the popular term globalization may not be the best object for empirical research, due to its broadness.

Another interesting aspect for further research could be the industry-specific foreign direct investments, which could not be researched at this point, due to unavailability of enough data. Better measurements in coming years or new calculations of previous years could provide better usable data to research the relationship between foreign direct investment inflows and corporate income taxation on an industry-specific level.

6.   Conclusion

Corporate tax rates have been on a decline since the 1980s', and much research has been done to find evidence for the reason of this decline. Several theories, from tax competition to globalization have been developed and tested, but convincing evidence is still lacking. The purpose of this thesis was to find new evidence of the relationship between globalization and corporate taxation by combining previous research with new indicators. Although there are a lot of different indicators that can be used to proxy for globalization, the trade indicator is one of the most commonly used, despite the insignificant results. Gräbner et al. (2018) reviewed different indicators of openness and globalization, of which five are used in this thesis to complement existing literature. In this research, 36 countries have been analysed for the period between 1980 and 2017. With the use of different indicators of corporate income tax, different proxies for globalization, and different statistical models, several regressions are performed to find evidence for a relationship.

In line with previous research by inter alia Slemrod (2004) Devereux et al. (2008) and Kumar and Quinn (2012), there is no clear evidence on the role of trade openness, measured by the trade indicator, in the decline of corporate tax rates or on the corporate tax revenue. New is that there is some evidence for a negative relationship between the KOF Globalization Index and corporate tax rates and a positive relationship on the corporate tax revenue. These results support hypothesis 1 and 2, but it appears that the effect loses significance when year fixed effects and control variables are added, as discussed in the previous section.

The most surprising result is the consistent significant effect of the FDI inflow on the corporate tax rate and corporate tax revenue. FDI inflow is used as a measure of the attractiveness of a country and thus the investments made by foreign companies. It appears that there is a significant negative result of FDI inflow on all three of the corporate tax indicators, even when lags up until three years are used. This result is complementary to previous literature, as the focus of research mostly has been on the reverse effect, of the corporate tax rate on FDI inflow.

Due to the design of this research and the ambiguous effects of globalization indicators on the dependent variables, there is no convincing answer to the research question and the hypotheses possible. Overall, there is a negative relationship between globalization and the corporate tax, which is significant only for the FDI inflows. There is an ambiguous effect of globalization on the tax revenue as a percentage of GDP, as the KOF Globalization Index, and the FDI inward stock shows a positive relation, but the FDI inflows show a negative relation. The same applies

to tax revenue as a percentage of total taxation, as the KOF Globalization and the FDI inwards stock shows a very weak positive relationship, and the FDI inflows a negative relation. These results are summarized in Table 6.

Table 6. *Summary of the relationship between globalization and corporate taxation.*

	Corporate Tax Rate	Tax Revenue (%GDP)	Tax Revenue (%Taxation)
KOF	-	+	+
Trade indicator	X	X	X
FDI inflows	-	-	-
FDI inward stock	X	X	X
FDI outward stock	X	-	+
Overall	-	+/-	+/-

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Appendices

Appendix I: Data

Table A 1. *Variable description*

Variable	Description	Source
corprate	Statutory corporate income tax rate.	(OECD, 2019)
rev_gdp	Corporate tax revenue as a percentage of GDP.	(OECD, 2019)
rev_tax	Corporate tax revenue as a percentage of total taxation revenue.	(OECD, 2019)
trade	A proxy for trade, or trade indicator. Calculated by (import+export)/GDP.	(The World Bank, 2019)
kof	KOF Globalisation Index by the Swiss Economic Institute	(Dreher, 2006)
fdi_inflow_gdp	FDI inward flow as a percentage of GDP	(The World Bank, 2019)
fdi_instock_gdp	FDI inward stock as a percentage of GDP	(UNCTAD, 2019)
fdi_outstock_gdp	FDI outward stock as a percentage of GDP	(UNCTAD, 2019)
gdp	Gross Domestic Product (in millions USD, current PPP) as a proxy for productivity.	(OECD, 2019)
pop	Population (in thousands) as a proxy for size.	(The World Bank, 2019)
government	Share of cabinet posts held by a left-wing or socialist party.	(Armingeon et al., 2018)

Table A 2. *Descriptive Statistics after transformation*

Variable	*N*	Mean	S.d.	Min	Max	Skewness	Kurtosis
Corporate tax rate	1155	32.43	10.55	9	61.75	0.43	2.80
Tax revenue (%GDP)	1200	2.77	1.47	0.26	12.59	2.04	10.33
Tax revenue (%Total)	1198	8.65	4.59	0.60	29.40	1.37	5.34
Trade openness	1258	80.01	46.63	17.92	295.97	1.82	7.68
KOF	1264	74.63	11.08	41.33	91.17	-0.83	2.89
FDI inward flow (%GDP)	1213	3.38	7.48	-4.70	47.4	3.59	18.40
FDI inward stock (%GDP)	1234	33.44	39.68	0.36	263.69	3.17	16.10
FDI outward stock (%GDP)	1220	26.36	39.82	0.10	239.99	3.17	14.69
GDP	1293	12.49	1.59	7.93	16.79	-0.09	2.95
Population	1368	16.28	1.52	12.34	19.60	-0.23	2.90
Government	1056	33.99	36.37	0	100	0.67	2.03

Table A 3. *Skewness/Kurtosis test for normality before transformation.*

Variable	N	Pr(skewness)	Pr(Kurtosis)	Adj. Chi2	Prob > Chi2
corporate	1155	0.0000	0.1537	30.35	0.0000
rev_gdp	1200	0.0000	0.0000	.	0.0000
rev_tax	1198	0.0000	0.0000	.	0.0000
trade	1258	0.0000	0.0000	.	0.0000
kof	1264	0.0000	0.0000	.	0.0000
fdi_inflow_gdp	1213	0.0000	0.0000	.	0.0000
fdi_instock_gdp	1234	0.0000	0.0000	.	0.0000
fdi_outstock_gdp	1220	0.0000	0.0000	.	0.0000
gdp	1293	0.0000	0.0000	.	0.0000
pop	1368	0.0000	0.0000	.	0.0000
government	1056	0.0000	0.0000	.	0.0000

Table A 4. *Skewness/Kurtosis test for normality after transformation.*

Variable	N	Pr(skewness)	Pr(Kurtosis)	Adj. Chi2	Prob > Chi2
corporate	1155	0.0000	0.1537	30.35	0.0000
rev_gdp	1200	0.0000	0.0000	.	0.0000
rev_tax	1198	0.0000	0.0000	.	0.0000
trade	1258	0.0000	0.0000	.	0.0000
kof	1264	0.0000	0.0000	.	0.0000
fdi_inflow_gdp	1213	0.0000	0.0000	.	0.0000
fdi_instock_gdp	1234	0.0000	0.0000	.	0.0000
fdi_outstock_gdp	1220	0.0000	0.0000	.	0.0000
gdp	1293	0.1945	0.7944	1.75	0.4166
pop	1368	0.0006	0.4973	11.54	0.0031
government	1056	0.0000	0.0000	.	0.0000

Table A 5. *Variance Inflation Factors with fixed effects.*

Variable	VIF	Tolerance
kof	15.92	0.063
trade	28.49	0.035
fdi_inflow_gdp	2.35	0.426
fdi_instock_gdp	19.82	0.050
fdi_outstock_gdp	16.12	0.062
lngdp	311.17	0.003
lnpop	1091.18	0.000
government	1.37	0.728

Table A 6. *Variance Inflation Factors without fixed effects.*

Variable	VIF	Tolerance
kof	1.81	0.551
trade	4.83	0.207
fdi_inflow_gdp	1.79	0.559
fdi_instock_gdp	7.01	0.143
fdi_outstock_gdp	4.46	0.224
lngdp	3.38	0.296
lnpop	2.97	0.337
government	1.04	0.959

Appendix II: Sample selection

Table A 7. *The average number of observations per country per variable.*

Country	Observations	Country	Observations
Australia	38	Korea	33
Austria	38	Latvia	26
Belgium	35	Lithuania	25
Canada	38	Luxembourg	32
Chile	29	Mexico	28
Czech Republic	27	Netherlands	38
Denmark	38	New Zealand	38
Estonia	25	Norway	38
Finland	38	Poland	30
France	38	Portugal	35
Germany	36	Slovak Republic	26
Greece	37	Slovenia	25
Hungary	29	Spain	38
Iceland	36	Sweden	38
Ireland	37	Switzerland	37
Israel	29	Turkey	32
Italy	38	United Kingdom	38
Japan	37	United States	38
		Total	1218

Appendix III: Regression results

Table A 8. *Model 1, 2 & 3 - Corporate Tax Rate as the dependent variable*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year trend	-0.514*** (0.109)			-0.654*** (0.0674)			-0.672*** (0.0687)		
KOF	-0.298* (0.172)	-0.224 (0.222)	-0.142 (0.238)						
Trade indicator				-0.00363 (0.0374)	-0.0199 (0.0467)	-0.0275 (0.0420)			
FDI inflow							-0.153** (0.0622)	-0.106* (0.0614)	-0.115* (0.0583)
FDI inward stock							0.00299 (0.0410)	-0.0115 (0.0413)	-0.00920 (0.0478)
FDI outward stock							0.00802 (0.0361)	0.0105 (0.0402)	0.00820 (0.0404)
Government			0.00329 (0.00722)			0.00303 (0.00680)			0.00291 (0.00720)
GDP			-4.637 (7.815)						-5.354 (7.535)
Population			17.96** (8.015)			17.35* (10.03)			16.95* (8.830)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
N	1083	1083	972	1110	1110	969	1050	1050	905
adj. R^2	0.638	0.653	0.670	0.627	0.653	0.666	0.625	0.647	0.663

Standard errors (robust to heteroscedasticity and serial correlation) in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A 9. *Model 1, 2 & 3 - Tax revenue (% GDP) as the dependent variable*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year trend	0.0138 (0.0147)			0.0330*** (0.00994)			0.0273** (0.0121)		
KOF	0.0219 (0.0229)	-0.00669 (0.0313)	-0.0358 (0.0396)						
Trade indicator				-0.00485 (0.00328)	-0.00569 (0.00384)	-0.00596 (0.00497)			
FDI inflow							0.0139 (0.00865)	-0.00552 (0.00834)	-0.0127 (0.00753)
FDI inward stock							-0.00342 (0.00506)	-0.00288 (0.00516)	-0.00574 (0.00660)
FDI outward stock							0.000964 (0.00497)	0.00286 (0.00454)	0.00393 (0.00675)
Government			-0.000663 (0.00106)			-0.000193 (0.000965)			-0.000392 (0.00105)
GDP			1.227 (1.107)						2.050* (1.187)
Population			0.944 (1.501)			1.794 (1.201)			1.971 (1.274)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
N	1166	1166	1028	1192	1192	1024	1116	1116	949
adj. R^2	0.091	0.159	0.187	0.101	0.185	0.187	0.079	0.147	0.200

Standard errors (robust to heteroscedasticity and serial correlation) in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A 10. *Model 1, 2 & 3 - Tax revenue (% total taxation) as the dependent variable*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year trend	0.0369 (0.0419)			0.0775** (0.0340)			0.0499 (0.0406)		
KOF	0.0463 (0.0693)	-0.0253 (0.0903)	-0.0989 (0.0985)						
Trade indicator				-0.0103 (0.0134)	-0.0143 (0.0148)	-0.0141 (0.0192)			
FDI inflow							0.0373 (0.0243)	-0.0115 (0.0251)	-0.0326* (0.0178)
FDI inward stock							0.00529 (0.0138)	0.00476 (0.0141)	-0.00631 (0.0167)
FDI outward stock							0.00135 (0.0122)	0.00652 (0.0120)	0.00632 (0.0185)
Government			-0.000851 (0.00273)			0.000535 (0.00242)			0.0000742 (0.00259)
GDP			4.894 (3.101)						7.484** (2.748)
Population			4.396 (4.808)			7.474* (4.226)			8.257* (4.105)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
N	1166	1166	1028	1191	1191	1024	1114	1114	949
adj. R^2	0.065	0.120	0.211	0.072	0.141	0.181	0.064	0.122	0.256

Standard errors (robust to heteroscedasticity and serial correlation) in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A 11. *Model 4 - Corporate Tax Rate lagged as the dependent variable*

	(1) L=1	(2) L=2	(3) L=3	(4) L=1	(5) L=2	(6) L=3	(7) L=1	(8) L=2	(9) L=3
KOF	-0.0736 (0.223)	-0.0386 (0.212)	-0.00537 (0.203)						
Trade indicator				-0.0216 (0.0397)	-0.0187 (0.0380)	-0.0166 (0.0389)			
FDI inflow							-0.138** (0.0559)	-0.126** (0.0581)	-0.110* (0.0613)
FDI inward stock							0.00455 (0.0425)	0.0190 (0.0384)	0.0365 (0.0363)
FDI outward stock							0.00191 (0.0352)	-0.00652 (0.0309)	-0.0164 (0.0270)
Government	0.00487 (0.00780)	0.00706 (0.00854)	0.00826 (0.00914)	0.00419 (0.00740)	0.00619 (0.00813)	0.00700 (0.00867)	0.00448 (0.00776)	0.00659 (0.00833)	0.00825 (0.00870)
GDP	-3.958 (7.797)	-3.156 (7.873)	-2.785 (8.038)				-4.078 (7.333)	-3.017 (7.185)	-2.635 (7.127)
Population	18.05** (7.702)	17.53** (7.238)	18.10** (7.171)	17.16* (9.413)	16.70* (8.825)	17.21* (8.889)	16.78* (8.495)	16.02** (7.798)	16.38** (7.525)
N	1000	1005	979	997	1004	980	925	930	904
Adj. R^2	0.672	0.674	0.668	0.669	0.672	0.666	0.663	0.662	0.655

Standard errors (robust to heteroscedasticity and serial correlation) in parentheses. L denotes the years the dependent variable is lagged. All regressions are including year and country fixed effects.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A 12. *Model 4 - Tax revenue (% GDP) lagged as the dependent variable*

	(1) L=1	(2) L=2	(3) L=3	(4) L=1	(5) L=2	(6) L=3	(7) L=1	(8) L=2	(9) L=3
KOF	-0.0196 (0.0359)	-0.00998 (0.0345)	0.00276 (0.0336)						
Trade indicator				-0.00400 (0.00500)	-0.00325 (0.00538)	-0.00333 (0.00591)			
FDI inflow							-0.0131* (0.00712)	-0.0187** (0.00712)	-0.0174** (0.00654)
FDI inward stock							-0.00302 (0.00545)	-0.000974 (0.00506)	0.00224 (0.00476)
FDI outward stock							0.00300 (0.00574)	0.00404 (0.00532)	0.00189 (0.00442)
Government	-0.00106 (0.00115)	-0.00141 (0.00135)	-0.00117 (0.00136)	-0.000806 (0.00104)	-0.00131 (0.00125)	-0.00126 (0.00130)	-0.000767 (0.00113)	-0.00131 (0.00136)	-0.00118 (0.00141)
GDP	1.050 (0.997)	0.780 (0.946)	0.597 (0.977)				1.861* (1.034)	1.540 (0.972)	1.347 (1.007)
Population	0.828 (1.491)	0.927 (1.514)	0.975 (1.537)	1.494 (1.213)	1.362 (1.277)	1.267 (1.317)	1.698 (1.215)	1.577 (1.221)	1.459 (1.244)
N	1031	1004	974	1025	997	969	949	920	890
Adj. R^2	0.187	0.182	0.183	0.180	0.175	0.169	0.205	0.200	0.197

Standard errors (robust to heteroscedasticity and serial correlation) in parentheses. L denotes the years the dependent variable is lagged. All regressions are including year and country fixed effects.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A 13. *Model 4 - Tax revenue (% total taxation) lagged as the dependent variable*

	(1) L=1	(2) L=2	(3) L=3	(4) L=1	(5) L=2	(6) L=3	(7) L=1	(8) L=2	(9) L=3
KOF	-0.0537 (0.0902)	-0.0265 (0.0865)	0.00287 (0.0852)						
Trade indicator				-0.00928 (0.0202)	-0.00720 (0.0214)	-0.00764 (0.0228)			
FDI inflow							-0.0327* (0.0186)	-0.0453** (0.0189)	-0.0463** (0.0178)
FDI inward stock							-0.000266 (0.0134)	0.00404 (0.0119)	0.0107 (0.0118)
FDI outward stock							0.00528 (0.0151)	0.00892 (0.0129)	0.00580 (0.0106)
Government	-0.00202 (0.00297)	-0.00285 (0.00326)	-0.00228 (0.00322)	-0.00120 (0.00270)	-0.00240 (0.00302)	-0.00235 (0.00308)	-0.00117 (0.00284)	-0.00261 (0.00318)	-0.00246 (0.00322)
GDP	4.401 (2.910)	3.545 (2.820)	2.811 (2.911)				6.970*** (2.370)	6.018** (2.223)	5.314** (2.321)
Population	4.173 (4.768)	4.548 (4.853)	4.811 (4.904)	6.754 (4.303)	6.423 (4.539)	6.183 (4.661)	7.605* (4.026)	7.373* (4.165)	7.192 (4.287)
N	1030	1003	973	1024	996	968	948	919	889
Adj. R^2	0.209	0.196	0.187	0.176	0.172	0.166	0.266	0.250	0.237

Standard errors (robust to heteroscedasticity and serial correlation) in parentheses. L denotes the years the dependent variable is lagged. All regressions are including year and country fixed effects.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A 14. *Model 5 - Corporate Tax Rate as the dependent variable*

	(1) L=1	(2) L=2	(3) L=1	(4) L=2	(5) L=1	(6) L=2
Corporate tax rate	0.846*** (0.0252)	0.689*** (0.0454)	0.843*** (0.0265)	0.685*** (0.0473)	0.836*** (0.0223)	0.674*** (0.0387)
KOF	0.0158 (0.0381)	0.0282 (0.0719)				
Trade indicator			-0.000557 (0.00680)	0.000822 (0.0121)		
FDI inflow					-0.0423*** (0.0134)	-0.0462** (0.0221)
FDI inward stock					0.0121** (0.00589)	0.0254** (0.0118)
FDI outward stock					-0.00295 (0.00424)	-0.0102 (0.00869)
Government	0.00242 (0.00300)	0.00567 (0.00548)	0.00245 (0.00291)	0.00569 (0.00533)	0.00232 (0.00299)	0.00544 (0.00534)
GDP	-0.0236 (1.577)	0.126 (2.836)			0.312 (1.474)	0.438 (2.732)
Population	3.278** (1.376)	5.476** (2.541)	2.959* (1.695)	4.951 (3.225)	3.022* (1.483)	4.794* (2.699)
N	972	972	969	969	905	905
adj. R^2	0.915	0.839	0.914	0.837	0.910	0.829

Standard errors (robust to heteroscedasticity and serial correlation) in parentheses. L denotes the years the dependent variable is lagged. All regressions are including year and country fixed effects.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A 15. *Model 5 - Tax Revenue (% GDP) as the dependent variable*

	(1) L=1	(2) L=2	(3) L=1	(4) L=2	(5) L=1	(6) L=2
Tax revenue (%GDP)	0.811*** (0.0383)	0.656*** (0.0498)	0.821*** (0.0370)	0.660*** (0.0510)	0.797*** (0.0434)	0.625*** (0.0589)
KOF	0.0136** (0.00640)	0.0215* (0.0109)				
Trade indicator			0.00122 (0.00160)	0.00142 (0.00285)		
FDI inflow					-0.00274 (0.00231)	-0.00934* (0.00491)
FDI inward stock					0.00243* (0.00122)	0.00401* (0.00222)
FDI outward stock					-0.000900 (0.00111)	0.000101 (0.00213)
Government	-0.000536 (0.000472)	-0.000878 (0.000843)	-0.000580 (0.000478)	-0.000930 (0.000843)	-0.000401 (0.000509)	-0.000819 (0.000870)
GDP	0.103 (0.111)	-0.00620 (0.208)			0.258 (0.175)	0.268 (0.288)
Population	0.0628 (0.333)	0.159 (0.619)	-0.0500 (0.350)	-0.0627 (0.640)	0.0945 (0.358)	0.190 (0.644)
N	1026	995	1022	991	947	916
adj. R^2	0.757	0.557	0.757	0.553	0.755	0.547

Standard errors (robust to heteroscedasticity and serial correlation) in parentheses. L denotes the years the dependent variable is lagged. All regressions are including year and country fixed effects.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A 16. *Model 5 - Tax revenue (% total taxation) as the dependent variable*

	(1) L=1	(2) L=2	(3) L=1	(4) L=2	(5) L=1	(6) L=2
Tax revenue (%taxation)	0.820***	0.674***	0.841***	0.691***	0.792***	0.621***
	(0.0345)	(0.0508)	(0.0286)	(0.0467)	(0.0406)	(0.0597)
KOF	0.0323*	0.0523				
	(0.0190)	(0.0315)				
Trade indicator			0.00371	0.00454		
			(0.00526)	(0.00947)		
FDI inflow					-0.00668	-0.0218
					(0.00660)	(0.0129)
FDI inward stock					0.00687*	0.0108
					(0.00373)	(0.00678)
FDI outward stock					-0.00143	0.00234
					(0.00284)	(0.00540)
Government	-0.00143	-0.00216	-0.00158	-0.00233	-0.00115	-0.00216
	(0.00115)	(0.00195)	(0.00113)	(0.00192)	(0.00124)	(0.00199)
GDP	0.555	0.358			1.164**	1.424*
	(0.440)	(0.794)			(0.472)	(0.750)
Population	0.621	1.147	0.446	0.744	1.043	1.774
	(0.979)	(1.773)	(1.032)	(1.886)	(1.084)	(1.925)
N	1025	994	1021	990	946	915
Adj. R^2	0.772	0.575	0.774	0.576	0.770	0.568

Standard errors (robust to heteroscedasticity and serial correlation) in parentheses. L denotes the years the dependent variable is lagged. All regressions are including year and country fixed effects.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A 17. *Regression results for Arellano-Bond estimation*

	(1) Corporate Tax Rate	(2) Corporate Tax Rate	(3) Corporate Tax Rate	(4) Tax Revenue (%GDP)	(5) Tax Revenue (%GDP)	(6) Tax Revenue (%GDP)	(7) Tax Revenue (%taxation)	(8) Tax Revenue (%taxation)	(9) Tax Revenue (%taxation)
Corporate tax rate	0.865*** (0.022)	0.861*** (0.020)	0.858*** (0.021)						
Tax revenue (%GDP)				0.799*** (0.049)	0.810*** (0.051)	0.784*** (0.054)			
Tax revenue (% taxation)							0.803*** (0.044)	0.825*** (0.039)	0.771*** (0.052)
KOF	0.040 (0.051)			0.011 (0.009)			0.032 (0.027)		
Trade indicator		0.002 (0.010)			0.001 (0.001)			0.003 (0.004)	
FDI inflow			-0.039*** (0.014)			-0.002 (0.002)			-0.004 (0.006)
FDI inward stock			0.007 (0.006)			0.002 (0.001)			0.005 (0.004)
FDI outward stock			0.005 (0.005)			-0.001 (0.001)			-0.001 (0.003)
Government	0.002 (0.003)	0.002 (0.003)	0.001 (0.003)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.002 (0.001)	-0.002 (0.002)	-0.001 (0.002)
GDP	-0.362 (1.578)		-0.374 (1.300)	0.108 (0.177)		0.420* (0.219)	0.443 (0.561)		1.563*** (0.558)
Population	0.979 (1.879)	-0.120 (1.494)	-0.999 (1.769)	-0.345 (0.379)	-0.488 (0.325)	0.046 (0.360)	-0.455 (1.164)	-0.794 (1.059)	0.851 (1.095)
N	941	938	873	995	991	915	994	990	914

Standard errors (robust to heteroscedasticity and serial correlation) in parentheses. All regressions are including year and country fixed effects.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$