

ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

Bachelor Thesis

Economie en bedrijfseconomie

The effect of corporate income tax changes on foreign direct investment.

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Date final version: 7-7-2020

Abstract

This paper analyses the relationship between changes in corporate income tax rates and inward foreign direct investment. This is done by the use of panel data of 44 countries ranging from 2005-2018. A country fixed effects model including time fixed effects is estimated with several control variables. The results show insignificant effects of the corporate income tax rate on foreign direct investment.

The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

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I. Introduction

Taxes play significant role in a country's economy, where they for example have a major budgetary role for the government. One of these main taxes is the corporate income tax, which is for a lot of countries a substantial part of the tax revenue. The last decade corporate income taxes were around 9% of total tax revenues in the OECD countries on average (OECD, 2020). But this budgetary role might not be the only function corporate income tax has, it can function as an instrument for other economic targets. As an example Bénassy-Quéré, Fontagné & Lahreche-Révil show that tax differences play a significant role in foreign location decisions of corporations, therefore tax rates might be an instrument to attract foreign investment (2005).

The last decades a decreasing trend in corporate income tax rates was shown (figure 2). A lot of countries are moving towards a corporate tax rate which can best be described as a corridor between 17 and 25 percent corporate tax rate (EY, 2019). These tax rates are declining because of competition between different countries (Leibrecht & Hochgatterer, 2012). This competition is about attracting new firms, the investment of existing firms and for profits of a firm generated in one country but shifted to the other (Devereux, 2007). Instinctively new firms will be located where the after tax profit is the highest and therefore countries use the tax rate to compete for these new firms and investments.

This competition is a worldwide trend which also influences the biggest economies in the world. Countries like Canada, Japan and the United Kingdom have decreased their tax rates in the last decades. This is followed by the president of the USA, Donald Trump, who stated in 2017 that the USA decreases its corporate tax rate to 20% in order to protect the US economy from foreign competition (Trump, 2017).

This competition to attract foreign direct investment is interesting due to the positive impacts it can have on a country. An example of this is GDP-growth, Forte and Moura found that a growth in FDI can cause GDP growth when the host-country has the right domestic conditions (2013). One possible explanation is the introduction of new products and industries to the host-country and therefore the tighter link to the world trading system (Lipsey, 2004). Thereby a comparison between foreign owned and domestically owned companies show higher productivity and wages in foreign owned companies (Lipsey, 2004). These effects are of course interesting for governments.

These governments lower their tax rates to attract foreign direct investment, although

literature is inconclusive on this subject. The Global competitiveness report shows that there are a lot more factors having an effect on a country's competitiveness (Schwab & Sala-i-Martin, 2017). Think about infrastructure, macro-economic stability and political stability. A look at the top 50 countries in this competitive index shows that countries with relatively high corporate tax rates still score high on this index. Countries like France, USA and Japan have relatively high corporate tax rates (all exceeding 30%) but are still in the top 10 of competitiveness. Furthermore, research regarding corporate tax rate and FDI shows a variety of results of as well positive, negative as insignificant effects (Chakrabarti, 2001). Governments might therefore lower their tax rates without getting the effects they pursued. Therefore the main research question arises: "Does a lower corporate tax rate affect inward foreign direct investments (FDI) positively?".

Using data from OECD and World Bank Group for the years 2005-2018, a fixed effect regression is used. This regression consist of multiple control, time fixed effects and country fixed effects. This model is used with both FDI inflow as FDI inward stock as independent variable to find the effect of the corporate tax rate on FDI. These models show insignificant effects of corporate tax rate on foreign direct investment for both FDI inflow and FDI inward stock. Therefore a lower corporate income tax rate does not significantly attract FDI. Besides the corporate tax rate insignificant effects where found for most of the control variables, where only GDP, political stability and tax competition show significant effects.

The contribution of this paper is to extend prior knowledge on the determinants of FDI. Research in this field has been focussed on small specific country samples mainly. Whereas the decreasing trend of the corporate income tax rates has been seen worldwide. Therefore a wide sample of countries is used in this research to address the effects of the worldwide tax changes.

The remainder of this paper is as follows. The next section will provide an overview of existing literature regarding the determinants of FDI and hypothesis will be outlined. Section III provides the data, research design and descriptive statistics. Section IV presents the results of my analysis, where in section V the conclusion will be made, as well as limitations and possibilities of future research will be outlined.

II. Theoretical framework

To have a clear inside on FDI and its determinants I will start with a overview of the existing literature. I will present the main determinants and its economic mechanisms. From this overview I will provide a more detailed overview of the existing literature on corporate income tax rate as a determinant of FDI.

II. A. Determinants of Foreign direct investment

FDI, like many other economic variables, is a variable influenced by many other factors. There is a wide range of literature about various variables that influence FDI. This literature is not only extensive but controversial as well, which might be due to all the different methods that are used (Chakrabarti, 2001). Most of the literature uses cross-country regression analysis, next to this extreme bound analysis and panel gravity models where used, although the main differences are made in the use of control variables. The existing literature uses a broad set of different control variables which has an effect on the consistency of the findings. The use of a different set of control variables can lead to different outcomes on the explanatory variable of interest, which results in a wide range and contradicting evidence on the determinants of FDI. Although the different results might not be completely clear. The UNCTAD reports a various number of determinants of inward FDI, as shown in table 1 (2002; Moosa & Cardak, 2006).

Table 1: The UNCTAD's classification of FDI determinants (Moosa & Cardak, 2006)

Category variable	Examples
Policy variables	<i>Tax policy, trade policy, privatisation policy, macroeconomic policy</i>
Business variables	<i>Investment incentives</i>
Market-related economic variables	<i>Market size, market growth, market structure</i>
Resource-related economic determinants	<i>Raw materials, labour cost, technology</i>
Efficiency-related economic determinants	<i>Transport and communication costs, labour productivity</i>

Maybe the least questionable determinant of FDI is market size (Chakrabarti,2001). This effect is known as the market size hypothesis which upholds that a large market is necessary for efficient utilization of resources and exploitation of economies of scale (Chakrabarty,2001). Thereby larger markets have a higher demand for products and have

more resources, therefore it might be more interesting to invest in a larger developed market (Billington, 1999). This is confirmed by the majority of literature (Moosa & Cardak, 2006), where Billington for example compared different countries in Europe and found that a higher GDP significantly attracts more foreign direct investment. Thereby Chakrabarti found the same results for GDP per capita which is used in most literature as measurement for market size (2001). This market size hypothesis is also confirmed by Tsai who shows that the market size hypothesis receives stronger support than the growth hypothesis (1994). This growth hypothesis is about the positive effect of economic growth on FDI. Where economic growth might reflect the potential of a certain market. A growing market might be interesting for companies where they might be able to grow with its market. Therefore a growing market might have more potential than a steady developed market. In this the literature is more varied compared to the market size hypothesis. Although a lot of positive effects were found such as by Billington (1999), there are less convincing and insignificant results as well (Tsai, 1994).

Besides different theories on market size and economic growth, other market characteristics seem to matter as well. Where market size shows very convincing results, labor cost shows the opposite. Theoretically, labor costs might be an interesting factor for companies who want to invest in a country. Lower labor costs are interesting due to the potential higher profits, although these lower costs might indicate lower productivity as well. Maybe due to both of these effects literature found mixed effects of labor costs on FDI (Chakrabarti, 2001). In addition to labor cost there are more market characteristics. Openness to trade is one of these, investing companies might not only be interested in economic activities within the investing country. Therefore this openness might be an important determinant for investors who are in the tradable sector. This is confirmed by literature, where Lunn found that the height of trade barriers is one of the determinants of U.S. foreign direct investment (1980). Thereby countries with more liberal policies are successful in absorbing foreign capital inflows (Sin & Leung, 2001). This openness to trade of the economy has a fairly broad platform in literature.

Next to these economic effects governments of the host country play a significant role in the FDI decision process. A part of this is through implementing certain policies like taxes and trade barriers. But other non-economic variables matter as well. Next to market size, country risk is one of the most convincing determinants of FDI inflow (Moosa & Cardak, 2006). This country risk is mostly measured as threats of political instability, in the light of civil wars, illegal capital flight, financial market instability, and political corruption, etc (Ramcharran, 2008). From an economic view all of these factors of country risk tend to

discourage investors to invest in high risk countries. Most of these risks are uncertainties for investors which increase the risk of investing. Political instability could for example lead to policies which are completely unexpected and might have big economic effects on the investors. Next to this civil wars and terrorism can have disastrous effects on a countries economy. Therefore this country risk is an important determinant for investors which is confirmed by the literature, as Schneider and Frey concluded that political instability is an important determinant of FDI (1985). This instability might even be more important than some economic variables. A raise in corruption from the level of Singapore to Mexico would have the same negative effect as raising the corporate tax rate by 18 to 50 percentage points (Wei, 2000). Next to corruption, terrorism seems to be an important non-economic factor as well (Bandyopadhyay, Sandler & Younas, 2014). Countries which experience a lot of terrorism or threats of it see a negative affect on their FDI inflow.

The above showed that FDI inflow and its determinants have a complex structure. It is not completely clear what the determinants of FDI are. In general the literature describes that countries with large economies, a high degree of openness and a low country risk are likely to be more successful in attracting FDI (Moosa & Cardak, 2006). Although other determinants might still play a significant role as well.

II.B. Corporate tax rate

One of these other determinants might be the corporate tax rate. This rate can be used as an instrument to attract foreign investment. This instrument is directly controlled by the governments and might therefore be a interesting policy tool. Over the last years this tax rate has decreased in many countries. Although these statutory tax rates decreased the tax base was found to be stable or broadened over the years (Abbas & Klemm, 2013). In general tax revenues only declined in the short-run and held up well in the long-run. This could be because of higher revenues of domestic companies which therefore made the tax revenues increase. Next to this more foreign companies might have invested in the country which made the tax revenue increase.

This relationship between corporate tax rates and FDI is interesting for many governments. Because it is seen as an important instrument for making a country more competitive. The global competitiveness report shows a less clear relationship (Schwab & Sala-i-Martin, 2017). Where some countries with relatively high corporate tax rates, all exceeding 30 percent, are still amongst the most competitive countries. This is of course no evidence for the direct effect of corporate tax rate on FDI.

The large range of literature shows different effects. Swenson found that the higher corporate tax rate from the U.S. tax reform act has had a positive effect on FDI investment (1994). Swenson argued that this is due to the general equilibrium effects on assets return from Scholes and Wolfson (1990). They argue that assets with a lower tax rate increase in demand and therefore increase in price. Therefore it might be more interesting to invest in lower priced but higher taxed assets. This is shown by Swenson who used a cross-industry analysis in the U.S.(1994).

Kersan-Škabić found a positive and insignificant effect in an analysis of six south eastern European countries (2015). In his research multiple models were used, on a panel dataset, first a gravity model was used to look at the bilateral FDI inflows. In this model the main variable of interest is the tax difference between home and host country. Next to this different control variables such as GDP per capita and distance between the countries were used. The second model is a panel data regression with total FDI inflows as dependent variable, and corporate tax rate as main explanatory variable. Thereby several control variables were used such as GDP per capita and some institutional determinants. Next to these models a third model including total FDI stock instead of total FDI inflow is used. The last model is the only one which shows significant effects of the corporate tax rate on FDI, which is a positive effect. Therefore Kersan-Škabić concluded that lower tax rates are not sufficient by itself to attract foreign capital (2015).

On the contrary, the majority of literature shows negative relationships between the tax rate and FDI inflow (Chakrabart, 2001; Moosa & Cardak, 2006). Companies and its stakeholders are interested in profits. A(n) decrease (increase) in the tax rate will increase (decrease) the after tax profit. Therefore, companies are encouraged (discouraged) by a lower (higher) tax rate to invest in that country due to the higher (lower) after tax profits. This negative effect is shown by Billington who used a country and time fixed effects model within seven industrialized western European countries (1999). This model includes multiple possible determinants of FDI such as GDP and labor costs. With this model he shows a negative effect of higher tax rates on the inflow of FDI. The same result is found for central and eastern European countries (Bellak & Leibrecht, 2009). In their research they use fifty six bilateral country relationships including seven EU countries and the U.S. and eight central east European host countries of FDI. A panel gravity model, including time fixed effects, is used to estimate the role of taxation on FDI inflow. Where they show that tax lowering strategies have an important impact on the foreign firm location decision in CEEC countries. Besides these European effects this negative effect has been shown on 50 emerging and

developing countries in a regression analysis (Abbas & Klemm, 2013). This analysis is based on the possible race to the bottom of corporate tax rates. It is found that there is no difference in this decrease in tax rates between developed and developing countries. The use of a country and time fixed effects regression shows the negative impact of a higher tax rate on foreign direct investment.

As mentioned above, the literature is inconclusive on the impact of corporate tax rates on foreign direct investment. Due to the possible mechanism where companies will be triggered by the higher after tax profits due to the lower tax rate. Consistent with the majority of literature, I propose a negative effect of higher tax rates on foreign direct investment.

III. Data and Methodology

III. A. Sample selection

To estimate the effect of corporate income tax rate on inward FDI a panel dataset will be used. This dataset consists of 44 countries for the years 2005-2018. Of these 44 countries 36 are OECD and 8 are non-OECD. The OECD members are spread all around the world but are mostly concentrated in Europe. To add some external validity , 8 countries spread around the world, where added from which OECD has data as well. Table 2 shows the summary of countries used in this research. To obtain this dataset multiple data sources were used. The main variables corporate tax rate and inward FDI are obtained from the OECD databases (OECD, 2020a ; OECD, 2020b). Several control variables are obtained as well. GDP and GDP per capita are obtained from the OECD database as well (OECD, 2020c). The other control variables are from World Bank Group (2020a ; 2020b). These variables are shown in table 1A which shows a description of the dataset including all variables and their sources.

Table 2: Countries sorted by continent

Africa	Asia	Europe		North America	Oceania	South America
South Africa	Israel	Austria	Luxembourg	Canada	Australia	Chile
	Japan	Belgium	Netherlands	Mexico	New zealand	Argentina*
	Korea	Czech	Norway	United states		Brazil*
	China*	Republik	Poland			
	India*	Denmark	Portugal			
	Indonesia*	Estonia	Slovak Republik			
	Saudi Arabia*	Finland	Slovenia			
		France	Spain			
		Germany	Sweden			
		Greece	Switzerland			
		Hungary	Turkey			
		Iceland	United Kingdom			
		Ireland	Russian			
		Latvia	Federation*			
		Lithuania				

*Non OECD

The entire dataset consists of 616 observations. After according for missing observations and outliers the dataset consists of 609 (544) observations for both FDI inflow (Stock) and corporate tax rate and 595 (530) observations after including the control variables.

III. B. Relevant variables and descriptive statistics

III.B.1. Foreign Direct investment

There are multiple ways to measure foreign direct investment in literature. FDI can be identified as an investment by a resident entity with the objective of obtaining a lasting interest in an enterprise in that economy (OECD, 2010). A basic criterion that is used is that the investor should at least have 10% of the voting power to call it FDI. Within FDI differences can be made between inward stock FDI and FDI inflow. Where inward stocks are all direct investments held by non-residents in the reporting economy at a given point of time. FDI inflows record the value of cross-border transactions related to FDI during a given period of time. These transactions consist of equity transactions, reinvestment of earning and intercompany debt transactions. FDI inflows are more volatile and provide more information on recent economic developments (Eurostat, 2010) . Whereas FDI stocks is a very slow moving variable which might allow a more structural analyses of FDI. Devereux and Griffith argue that FDI inflows reflect financial flows only and therefore it might be more interesting to look at capital stock for policy purposes (2003). Kersan-Škabić found that CTR only has a significant effect on FDI stock (2015), whereas Billington shows effects on FDI inflow (1999). Therefore both measurements will be used in this paper. Both are measured in US dollars where in some papers the use FDI/GDP is applied. An increase in both FDI and GDP could result in a constant or even decreasing FDI/GDP although FDI is increasing. Therefore FDI stock and inflow are measured in millions of US dollars. In the models the natural logarithm, of FDI measurements described above, is used due to a better interpretation of the coefficients. Due to this FDI Inflow loses some observation and has 561 observation when the natural logarithm is used.

Figure 2 shows this difference in volatility, where FDI stock shows an increasing trend FDI inflow shows a more volatile and trend. This FDI trend could have unit root problems therefore Table A3 shows the results of a fisher-type unit root test. Due to missing data other possibly better tests are not possible, where this test uses a null hypothesis which states that all panels contain unit roots. This hypothesis is rejected and therefore not all panels contain unit roots. Although, there could possibly still be unit roots in some panels which I can not check. Table 3 shows the big differences within the sample where countries like U.S. and China show very high FDI statistics and countries like Luxembourg and Iceland show lower statistics. This seems to logical due to the different sizes of countries and markets which will be accounted for in the methodology.

Table 3: Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
FDI Stocks	544	440.929	842.792	4.689	7.844.202
FDI Inflow	609	29.120,2	57.251,6	-70.573,5	486.022
Corporate tax rate	616	24,105	7,986	0	48,3
GDP per capita	602	36.535,8	17.484,9	3.479	107.766
GDP	614	1.900.099	3.559.979	13.307	24.169.084
Political stability	616	0,470	0,758	-2,009	1,596
Trade	616	90,141	57,858	22,106	408,362
CTR Competition	616	24,103	0,962	22,086	26,665

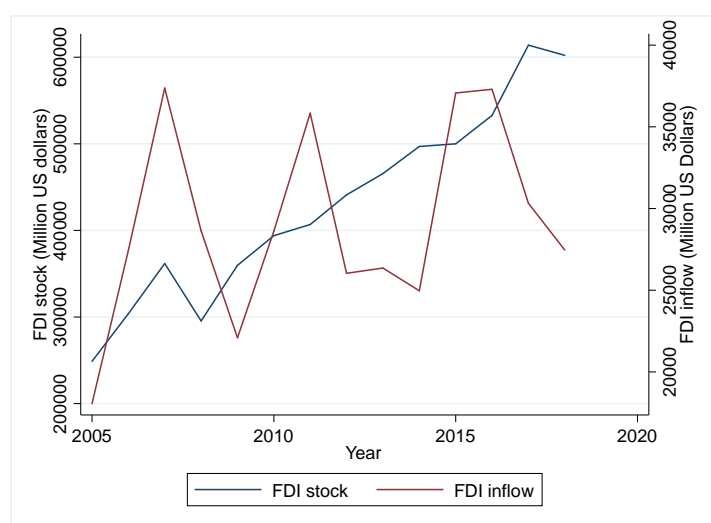


Figure 1: FDI trends

III.B.2. Corporate tax rate

The corporate income tax rate is measured as the statutory tax rate of a country per year. As already mentioned before, this tax rate shows a decreasing trend over the past decade. This is shown in figure 2 which shows the decreasing trend in this sample. As can be seen in table 3 there are big differences between the countries. One of these differences is the corporate tax rate where the minimum is 0 percent in Saudi Arabia and the maximum is 48,3 percent in India. For the OECD countries this is 8,5 percent in Switzerland and 44,4 in France.

The corporate income tax rate has declined on average in the sample period. Where most of the countries had a corporate tax rate reduction or no change in the corporate tax rate. Only some countries had an increase in tax rate. For example Chile went from a 20 percent tax rate to a 25 percent tax rate and Portugal went from 25 percent in 2005 to 30 percent in 2018. Other countries had a decrease and increase in tax rate. Such as Iceland which started a decrease from 18 percent in 2005 to 15 percent in 2008 and then went to 20 percent in 2018. There are more countries with temporary increases and decreases such as Russia which shifts

from 20 percent to 24 percent several times. Despite these countries the average corporate income tax rate has declined from 26,06 percent in 2005 to 22,68 percent in 2018. The biggest part of this decrease is from 2005 to 2008 as can be seen in table A2. These different trends might contain unit roots, therefore table A3 shows the results of a Levin Lin Chu unit root test. These results show that the different trend contain no unit roots.

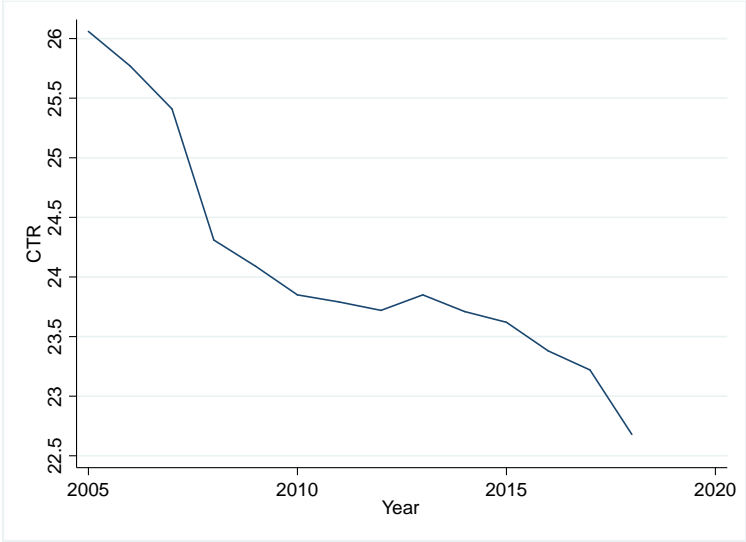


Figure 2: Decreasing trend of the corporate tax rate

III.B.3. Control variables

Besides the main variables described above the dataset consist of multiple control variable. One of these variables is GDP, this GDP is measured in millions US dollars. It is used as a measurement for market size whereas in literature this market size is the most convincing determinant of FDI. Literature uses GDP per capita as well as a measurement for market size (Chakrabarti, 2001) ,where in my opinion this represents the development of the market more than the size of it. This market size might influence the corporate tax rate as well where we see some smaller countries like Luxembourg, Switzerland and the Netherland being identified as tax havens (Mansour, 2019). Therefore GDP might influence both CTR and FDI and can be identified as an omitted variable. Other possible omitted variables are describes below.

The first is GDP per capita, where GDP per capita is used in literature as measurement for market size in my opinion it measures the development and prosperity of a country. This development could both influence FDI and CTR, where more developed countries might attract more FDI and less developed countries try to attract it by lowering their tax rate.

Besides, trade might influence both FDI and CTR as well. As can be seen in literature openness to trade influences FDI (Lunn, 1980), whereas trade could also influence CTR.

Countries might change their CTR because they want to increase their trade. A CTR decrease might lead to more trade due to lower tax costs and therefore possible lower prices which increases competition with other countries. This trade is measured as in export plus import as a percentage of GDP which is most common in prior literature (Chakrabarti, 2001). In the models the natural logarithm of GDP and GDP per capita will be used due to a better interpretation of the coefficients. This has no effect on the number of observations.

Next to these economic variables political variables could play a role as well. Literature shows that political instability and terrorism play an major role in FDI decisions (Schneider & Frey, 1985 ; Bandyopadhyay, Sandler & Younas, 2014). These political variables such as political instability increase the unknown factors for investors. At the moment the governmental policies might have a positive effect on investment but a governmental change might change these policies and effects. In the same way political instability might lead to unexpected policy changes and therefore political instability affects CTR as well. This political stability and absence of violence/terrorism is measured on a scale from -2,5 to 2,5, where 2,5 is a strong governance. It is measured as the perception of the likelihood of political instability and/or politically-motivated violence, including terrorism, where a score is given in units of a standard distribution.

The last possible omitted variable is the corporate tax rate competition. This variable is measured as the average corporate tax rate of all other countries in the sample. The CTR of other countries may influence a countries corporate tax rate through competition. And it might influence FDI, where investors have a choice between different countries and might choose the country with the lowest tax rate.

III.B.4 Descriptive statistics

Table A2 shows the trends in corporate tax rate and FDI and the trend of the control variables. Both GDP per capita and GDP show an increasing trend over the sample period. As can be said for trade which shows an increasing trend over the sample period. Political stability is relatively stable with some small downward and upward movements. And at last the corporate tax rate competition shows the same decreasing trend as the corporate tax rate.

Table 4 shows the different correlation coefficients between the variables. The first column shows the correlations with respect to FDI stock. The first unexpected outcome is the positive correlation between the corporate tax rate and FDI stock. Thereby Political instability, trade and tax competition show unexpected negative effects. GDP and GDP per capita show the expected positive correlations. These same results are found regarding FDI

inflow where the corporate tax rate shows a positive correlation and the control variables show unexpected negative correlations.

Table 4: Correlation coefficients

	1.	2.	3.	4.	5.	6.	7.	8.
1. FDI Stock								
2. FDI Inflow	0,767*							
3. CTR	0,239*	0,266*						
4. GDP per capita	0,269*	0,035	-0,173*					
5. GDP	0,794*	0,695*	0,427*	-0,096*				
6. Political instability	-0,168*	-0,331*	-0,278*	0,600*	-0,479*			
7. Trade	-0,347*	-0,419*	-0,621*	0,280*	-0,684*	0,460*		
8. CTR competition	-0,234*	-0,067	-0,130*	-0,078	-0,162*	0,103*	0,092*	

*p<0,05

III.C. Methodology

To estimate the effect of corporate income tax rates on inward foreign direct investment a regression model with country and time fixed effects will be used. The use of country fixed effects makes it possible to take time invariant country specific effects into account. Every country is different and has unobserved variables that do not vary over time but might influence FDI, examples might be political systems or land size. Whereas, time fixed effects are able to control for unobserved variables that are constant across countries but vary over time. For example, global influences as the ‘great recession’ which influences all countries but varies over time. The model including these fixed effects has the following specification:

$$(1). FDI_{i,t} = \gamma_i + \lambda_t + \beta CTR_{i,t} + \varepsilon_{i,t}$$

The main variables of interest are $FDI_{i,t}$ and $CTR_{i,t}$. Where CTR is the corporate income tax rate and FDI is the Natural logarithm of FDI stock or FDI inflow which will both be used as independent variable. This natural logarithm will be used to decrease possible issues of outliers and to simplify the interpretation of the coefficients. Further i and t are the country and year indicates which makes γ_i the country fixed-effect, λ_t the time fixed-effect and $\varepsilon_{i,t}$ is the error term. This simple model might be subject to a endogeneity bias. A part of this bias might be due to omitted variable bias which means that there are variables that both influence CTR and FDI. To reduce this risk of having such a bias several control variables, discussed in the variables section, are included. Including these variables gives the following equation:

$$(2). FDI_{i,t} = \gamma_i + \lambda_t + \beta_1 CTR_{i,t} + \beta_2 GDP_{i,t} + \beta_3 GDP/CAP_{i,t} + \beta_4 Political\ stability_{i,t} + \beta_5 Trade_{i,t} + \beta_6 CTR_Competition_{i,t} + \varepsilon_{i,t}$$

In this model β_1 is the main coefficient of interest. The other variables are control variables, where GDP is the natural logarithm of the Gross domestic product of a country and GDP/CAP is the natural logarithm of GDP per capita. Thereby political stability is the political stability and absence of violence/terrorism. Trade is included as a measurement of a countries degree of openness to international trade, and CTR competition is the average corporate tax rate of the other countries. These variables and their method of measurement are described in the relevant variables section and definitions are shown in table 1A.

In the section above I have shown the economic explanation of the model used. To test the model described above several tests will be applied. The Hausman test will be used to see if the fixed effects model is appropriate or if a random effects model suits better. This random effects model assumes that the observed variables are uncorrelated with the unobserved variables. Whereas, the fixed effects model allows the observed variables to have any association with the unobserved variables. In this case the assumption of the fixed effects model seems to be more credible. Therefore, a Hausman test will be shown but the main model will be the fixed effects model. Besides the question whether fixed effects or random effects is the most appropriate. The use of time fixed effects is tested by testing if these year dummies significantly defer from 0. The null hypothesis in this test is that the different year coefficients are jointly equal to zero. The equations below show the random effects model (equation 3) and the OLS model without country fixed effects and time fixed effects (equation 4).

$$(3). FDI_{i,t} = \lambda_t + \beta_1 CT_{i,t} + \beta_2 GDP_{i,t} + \beta_3 GDP/CAP_{i,t} + \beta_4 Political\ stability_{i,t} + \beta_5 Trade_{i,t} + \beta_6 CTR_Competition_{i,t} + u_i + \varepsilon_{i,t}$$

$$(4). FDI_{i,t} = \beta_0 + \beta_1 CT_{i,t} + \beta_2 GDP_{i,t} + \beta_3 GDP/CAP_{i,t} + \beta_4 Political\ stability_{i,t} + \beta_5 Trade_{i,t} + \beta_6 CTR_Competition_{i,t} + \varepsilon_{i,t}$$

The models described above with model 2 as main model try to account for possible endogeneity issues as good as possible. The use of control variables and fixed effects estimates account for a possible omitted variable bias. Although these instruments are used there could still be an omitted variable bias of time variant variables, where the fixed effects account for the time invariant variables. Next to the issue of possible omitted variables there could be reverse causality or simultaneity between the corporate tax rate and FDI. Where it

might be possible that FDI influences the corporate tax rate. Although, in this case this might not be a direct problem. Usually tax rate changes are adjustments which cannot occur from day to day. Such changes have to be made by the government and must be announced before the new rates are being implemented. Therefore, it seems not logical that FDI in a certain year affects the corporate tax rate in that same year. FDI might still affect the corporate tax rate but it is more logical that the lags of FDI create this affect. Therefore, without introducing the lagged form of FDI it is not to be expected a bias due to reverse causality or simultaneity occurs.

IV. Results

To answer the main question “Does a lower corporate tax rate affect inward foreign direct investments (FDI) positively?” several regression models are used as described in the last section. The results of these models are shown below where a difference is made between FDI inward stock and FDI inflow.

IV. A. FDI Inflow

Table 5 shows the results of the different models used to answer the main question with respect to FDI inflow. Model 1 shows a significant positive effect of the corporate income tax rate on FDI Inflow, an increase of the tax rate by 1 results in a 4.88 percentage increase of FDI inflow. Model 2 includes a set of control variables as described in the methodology section. Including these control variables lowers the effect of the corporate tax rate but it still shows a significant positive effect, where an increase of the tax rate by 1 results in a 1.88 percentage increase of FDI inflow. The control variables show significant effects as well, where all variables show effects that can be expected from literature except for political stability. Model 3 includes the time and country fixed effects but does not include the control variables. This model shows an insignificant coefficient of the corporate income tax rate. Model 4 includes the control variables which makes it the main model which is described in the methodology section. Including these control variables in model 4 does not change the insignificance of the corporate tax rate. The only significant coefficient is political stability, where A 1 point increase of political stability increase FDI inflow by 36.4 percent. Including the fixed effects changes the result of the corporate tax rate. A parameter test as described in the methodology section confirms the use of time fixed effects (Table A4). The Hausman test which is used as an helpful tool to decide between the use of random effects or fixed effects shows a preference towards a random effects model (Table A5). Therefore, model 5 shows this random effects model which shows the same insignificant effect of the corporate tax rate on FDI inflow.

Table 5: FDI Inflow regression models

VARIABLES	(1). ln FDI Inflow	(2). ln FDI Inflow	(3). ln FDI Inflow	(4). ln FDI Inflow	(5). ln FDI Inflow
CTR	0.0488*** (0.00812)	0.0188*** (0.00554)	0.0138 (0.0201)	0.0144 (0.0193)	0.0121 (0.0113)
ln GDP		0.910*** (0.0385)		1.372 (1.384)	0.899*** (0.0870)
ln GDP/CAP		0.713*** (0.0865)		-0.617 (1.401)	0.455*** (0.166)
Trade		0.00788*** (0.000970)		0.00177 (0.00433)	0.00641** (0.00253)
Political stability		-0.152** (0.0665)		0.364** (0.177)	0.0993 (0.123)
CTR competition		0.156*** (0.0422)		0.0133 (0.0833)	0.0677 (0.0544)
Constant	8.136*** (0.208)	-15.11*** (1.408)	8.801*** (0.569)	-3.756 (8.740)	-10.07*** (2.615)
Observations	561	547	561	547	547
R-squared	0.061	0.609	0.065	0.082	
Number of country			44	44	44
Country FE			Yes	Yes	No
Year FE			Yes	Yes	Yes
Country RE					Yes

Standard errors in parentheses

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

IV.B. Inward FDI stock

Table 6 shows the results of the different models used to answer the main question with respect to inward FDI stock. Model 1 shows a significant effect of the corporate tax rate on inward FDI stock, an increase of the tax rate by 1 increases FDI with 4.26 percent. Model 2 includes the different control variables. Including these control variables decreases the coefficient and the significance of the corporate tax rate on inward FDI stock, an increase of the tax rate by one increases FDI with 0.618 percent. The control variables show the expected significant effects, except for tax competition which shows a negative effect. Model 3 includes the time and country fixed effects but does not include the control variables. This model shows an insignificant coefficient of the corporate tax rate on FDI. Model 4 includes the control variables which makes it the main model as described in the methodology section. This model shows a insignificant coefficient of the corporate tax rate on FDI, where only GDP and tax competition show significant coefficients. GDP shows an expected positive coefficient, where a 1 percent increase of GDP increases FDI by 1.696 percent. Tax competition shows an unexpected negative effect, where an increase of the average tax rate of the other countries by 1 decreases FDI with 10.9 percent. As can be seen, including fixed

effects changes the significance of the coefficient of the corporate tax rate. A parameter test as described in the methodology section confirms the use of time fixed effects (Table A4). The Hausman test which is used as an helpful tool to decide between the use of random effects or fixed effects shows a preference towards a random effects model (Table A5). Therefore, model 5 is included which shows a insignificant coefficient of the corporate tax rate.

Table 6: Inward FDI stock regression models

VARIABLES	(1). ln FDI Stock	(2). ln FDI Stock	(3). ln FDI Stock	(4). ln FDI Stock	(5). ln FDI Stock
CTR	0.0426*** (0.00774)	0.00618* (0.00366)	0.00912 (0.00962)	0.00309 (0.00627)	0.00252 (0.00605)
ln GDP		0.927*** (0.0211)		1.696** (0.683)	0.883*** (0.0893)
ln GDP/CAP		0.696*** (0.0493)		-0.214 (0.649)	0.652*** (0.137)
Trade		0.00547*** (0.000551)		0.00342 (0.00324)	0.00300 (0.00270)
Political stability		0.174*** (0.0489)		0.117 (0.0886)	0.142* (0.0801)
CTR competition		-0.124*** (0.0281)		-0.109*** (0.0339)	-0.125*** (0.0231)
Constant	11.00*** (0.209)	-5.306*** (0.990)	11.19*** (0.261)	-6.373 (4.321)	-4.015 (2.547)
Observations	544	530	544	530	530
R-squared	0.054	0.844	0.560	0.723	
Number of country			44	44	44
Country FE			Yes	Yes	No
Year FE			Yes	Yes	Yes
Country RE					Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

IV.C. Robustness checks

The results above are performed show the results with the assumption that FDI reacts on a tax rate change immediately in the year this change is implemented. Although there could possibly be a delay in this effect. Therefore, table 7 shows results obtained with the first and second lag of CTR. Models 1 and 2 show these lagged effects with respect to FDI inflow. As can be seen, that the coefficient of the first lag and the second lag shows a negative sign and the coefficient of the second lag is significant (p<0.10). This is something different than what we have seen in our main results, where the results where insignificant with positive coefficients. Models 3 and 4 show the effects of the lagged corporate tax rates on inward FDI stock. In this case we observe the same positive insignificant coefficients as in our main results. Because of the change in the sign of the coefficient and the significant change in the

second lag of the corporate tax rate with respect to FDI inflow, it might be interesting for further research to explain these possible different effects.

Besides the possible delay of the reactions of FDI on the changed corporate tax rate, there could be differences in effects between countries. Literature has shown significant effects of tax changes on FDI in central eastern Europe and south eastern Europe (Bellak & Leibrecht, 2009; Kersan-Škabić, 2015). Therefore, a variable is added which is the corporate tax rate of eastern European countries. The countries included in the interaction term are Czech republic, Greece, Hungary, Slovak republic, Slovenia and Poland. Therefore the interaction term indicates the difference between these countries and the other countries in the sample. Table 7 models 5 and 6 show the results including the interaction term. Model 5 shows a insignificant coefficient which indicates that there is no significant difference between the entire sample and east European countries regarding FDI inflow and corporate tax rate. The same results are found in model 6 where there is no significant regarding inward FDI stock and corporate tax rate. Therefore no significant differences are found on the effect of corporate tax rate on FDI between east European countries and the entire sample.

Table 7: Lagged CTR and SEEC robustness check

VARIABLES	(1). ln FDI Inflow	(2). ln FDI Inflow	(3). ln FDI stock	(4). ln FDI stock	(5). ln FDI Inflow	(6). ln FDI stock
CTR					0.0212 (0.0208)	0.00196 (0.00703)
CTR EEC					-0.0335 (0.0385)	0.00517 (0.0110)
L1_CTR	-0.0267 (0.0238)		0.00734 (0.00752)			
L2_CTR		-0.0424* (0.0227)		0.00657 (0.00925)		
ln GDP/CAP	(1.516) -0.305 (1.578)	(1.756) 0.406 (1.824)	(0.691) -0.323 (0.661)	(0.668) -0.391 (0.634)	(1.399) -0.664 (1.408)	(0.683) -0.212 (0.649)
Trade	0.00351 (0.00429)	0.00401 (0.00406)	0.00374 (0.00338)	0.00327 (0.00316)	0.00143 (0.00442)	0.00347 (0.00326)
Political stability	0.461** (0.198)	0.379 (0.228)	0.153* (0.0870)	0.169* (0.0869)	0.370** (0.178)	0.117 (0.0884)
CTR competition	-1.298 (1.064)	-1.269 (0.969)	0.0303 (0.279)	0.000905 (0.314)	0.0101 (0.0845)	-0.109*** (0.0342)
Constant	31.98 (30.51)	35.97 (28.29)	-10.11 (8.155)	-8.903 (8.509)	-3.821 (8.868)	-6.368 (4.326)
Observations	508	468	497	464	547	530
R-squared	0.086	0.086	0.631	0.557	0.083	0.723
Number of country	44	44	44	44	44	44
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

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

IV.D. Endogeneity

The models used in the section above might have endogeneity issues which could bias the results. As described in the methodology section the chance of reversed causality or simultaneity is small, due to the way a change in tax rate has to be made. Therefore, the tax rate might be affected by FDI but it is more logical that the tax rate in a certain year is affected by the lagged term of FDI.

There is a larger possibility for omitted variable bias. The models used in this paper tries to prevent for as much of such a bias as possible. The control variables are all included to reduce this possible bias. Besides the control variables the fixed effects try to control for unobserved but possible omitted variables, where the country fixed effects are able to control for the time-invariant omitted variables. Although, these fixed effects and control variables might reduce the risk of omitted variable bias, the risk is still there. Possible unobserved time-variant factors which the fixed effects can not control for, might play a role. In this case one could think about economic variables such as labor costs, exchange rates, economic growth rates, governance debts and other tax rates. It is difficult to predict in which direction the bias effects the outcome, due the possible variables that might all effect the corporate tax rate in a different way. Therefore, this possible omitted variable bias lowers the internal validity of this paper.

Besides the possible biases described above, there might be some measurement errors. Including corporate tax rate competition might reduce the omitted variable bias since it seems logical that this competition effects both FDI and corporate tax rate. Although, in this paper tax competition is measured as the average corporate tax rate of all other countries, whereas it maybe should be measured in a way that neighbour countries or powerful economic competitors should be more important in this tax competition estimate.

V. Conclusion

In this paper I tried to answer the research question ‘Does a lower corporate tax rate affect foreign direct investments (FDI) positively?’. This question is relevant because of the decreasing trend in corporate tax rates due to competition for attracting foreign direct investment. This paper’s contribution to literature is that I attempt to research the effects at a more worldwide level. Most of the papers regarding determinants of FDI researched a smaller number of countries in specific areas. By the use of panel data ranging from 2005-2018 and extracted from OECD and World Bank Group, I answered the main question. The results of several models have shown no significant coefficients for the corporate tax rate on FDI. As well in the main model with inward FDI stock as dependent variable as in model with FDI inflow as dependent variable corporate tax rate shows an insignificant effect on FDI.

Therefore, I can not reject the null hypothesis that corporate tax rates have no effect on FDI. This results in the answer to the research question that a decrease in corporate income tax rate does not significantly affect foreign direct investment positively. Besides the corporate income tax rate, most of the control variables show insignificant coefficients. Regarding FDI inflow only political stability shows a significant positive coefficient, which is something you would expect from the literature. Regarding inward FDI stock only GDP and tax competition show significant coefficients, where GDP is positive and in line with the market size hypothesis. Tax competition shows a negative effect, this would mean that an increase in the average tax rate of the other countries decreases inward FDI stock, which is unexpected.

V.1. Policy implication

The last years a decreasing trend in corporate income tax rates was observed. Governments are decreasing their tax rate to attract FDI and thereby try to strengthen their economy. According to my research a decrease in tax rate does not significantly attract more FDI and therefore governments might not have to decrease their tax rate to attract FDI. According to this research it is not beneficial to lower tax rates and thereby decrease revenue from taxes. Therefore governments might better target other possible determinants, such as market size or political stability to attract FDI.

V.2. Limitations and future research

FDI is a very complex variable which is possibly influenced by a lot of factors. Therefore this research might have endogeneity issues, which lower the internal validity. These possible

issues are described in the results section, where the main endogeneity problem might be omitted variable bias. Such a problem might be too complicated to be solved by including all possible omitted variables because it is easy to miss out on something. Therefore this problem could best be solved by using an instrumental variables approach.

Besides the omitted variables issue it might be interesting to do research on tax competition. Whereas, in this paper it is included as the simple average of all other countries corporate tax rate and shows an unexpected significant negative effect. Other measurements of tax competition could change these results or confirm them.

Future research might take these endogeneity problems into account to provide the effects of corporate tax rates on FDI, which of course might be very interesting for governments. Thereby corporate income tax rates are just a small part of a country's taxes. Other taxes like dividend taxes or tax regulations and exceptions might play an important role in attracting capital as well. Therefore further research should be done on the main factors that might attract FDI. This could play a major role in implementing certain policies, whereas at the moment there might be a race to the base of corporate income taxes without strong evidence for the effect of it on FDI.

VI. Literature

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VII. Appendix

Table A1: Variable definitions

Variables	Definition	Unit	Source
Corporate Tax Rate	Central government statutory corporate tax rate	Percentage	OECD, 2020B
FDI	The value of the stock of direct investments held at the end of the reference period. The change in direct investment positions from one period to the next is equal to the value of financial transactions recorded during the period plus other changes in prices, exchange rates, and volume.	Millions of Dollars	OECD, 2020A
FDI Inflow	Foreign Direct Investment (FDI) flows record the value of cross-border transactions related to direct investment during a given period of time. Financial flows consist of equity transactions, reinvestment of earnings, and intercompany debt transactions.	Millions of Dollars	OECD, 2020A
GDP per capita	Added value created through the production of goods and services in a country during a certain period. Divided by its total population.	Millions, US Dollars. Base year 2015	OECD, 2020C
GDP	Added value created through the production of goods and services in a country during a certain period.	Millions, US Dollars, Base year 2015	OECD, 2020C
Political stability	Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution.	Units of a standard distribution ranging from -2.5 to 2.5 approximately	Worldbank, 2020A
Tax Competition	The average tax rate in a certain year of all other countries except for the country of interest.	Percentage	OECD, 2020B
Trade	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	Percentage of GDP	Worldbank, 2020B

Table A2: Descriptive statistics, Average sorted by year

Year	FDI Stock	FDI Inflow	CTR	GDP per Capita	GDP	Trade	Political stability	CTR competition
2005	248828,7	18060,47	26,06	33.656,07	1.509.819	82,17	0,489	26,06
2006	303817,9	27434,93	25,77	34.853,67	1.586.892	86,25	0,521	25,77
2007	361738,9	37375,68	25,41	36.148,93	1.669.084	87,52	0,501	25,41
2008	295414,7	28633,2	24,31	36.143,47	1.711.976	90,23	0,482	24,31
2009	359670,5	22089,6	24,09	34.498,63	1.702.974	79,42	0,42	24,09
2010	393916,3	28613,26	23,85	35.227,86	1.792.559	86,82	0,456	23,85
2011	406846,2	35833,68	23,79	35.607,36	1.867.092	92,56	0,488	23,79
2012	441021,6	26034,54	23,72	35.676,68	1.925.695	94,14	0,494	23,7
2013	465627,4	26358,15	23,85	35.980,43	1.989.873	93,56	0,509	23,84
2014	496914,7	24964,93	23,71	36.581,32	2.060.367	94,28	0,488	23,71
2015	499982,8	37071,51	23,62	37.517,36	2.134.785	93,37	0,43	23,62
2016	532761,5	37296,99	23,38	38.096,66	2.202.762	91,78	0,42	23,38
2017	613958,2	30322,66	23,22	39.398,05	2.286.856	94,18	0,44	23,22
2018	602208,3	27461,47	22,68	42.917,21	2.174.112	95,69	0,44	22,68

Table A3: unit root test

Variable	Unit root test	P-value
FDI inward stock	Fisher type (based on dfuller)	0.000
FDI inflow	Fisher type (based on dfuller)	0.000
Corporate tax rate	Levin lin chu	0.000

Table A4: Time fixed effects parameter test

Model	p-value	Use of time fixed effects
FDI Inflow	0.0023	Yes
FDI Inward stock	0.0000	Yes

Table A5: Hausman test (H0: difference in coefficients not systematic)

Model	Chi2	p-value
FDI Inflow	7.66	0.2642
FDI Inward stock	8.58	0.1985