Tax Competition in the European Union: Theory and Evidence from Panel Data

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Abstract

This paper uses a panel of 34 countries from 1981 – 2010 and finds that the enactment of the European Union by means of the treaty of Maastricht in 1992 has had a negative impact on the CIT rate. By using a panel of 20 countries from 1981 – 2010 this paper finds no evidence that the lower CIT rates have led to an increase in FDI inflows in the European Union. These results mean that whilst tax competition is present is does not lead to a significant increase in FDI inflows. This indicates that tax competition is an economically harmful situation to be in if it pushes CIT rates to levels that are too low.

Key words: Tax Competition, European Union, FDI Inflows

Preface

The master thesis serves as the final project before finishing the master's program Economics at Tilburg University. One year ago I wrote my bachelor thesis about tax competition in Ireland and how tax competition can do harm to an economy. During this thesis I got interested in tax competition in the European Union and the possible problems relating to this. I wanted to know if it was really the enactment of the European Union that triggered tax competition and whether and how we should remedy tax competition in the European Union.

During the course Taxation and Trade I got to know more about tax competition and its nature. It surprised me that there was relatively little empirical work done concerning tax competition in the European Union. The work that has already been done focused mainly on globalization and tax competition in the OECD. Due to this I started to research the position of the European Union within the OECD in terms of tax competition.

Writing the master thesis has not been without problems and I have experienced most of the time writing this thesis as quite a big challenge. During my thesis I have used several complicated econometric methods which were only briefly explained to us in a short course at the start of the year. Having to work with these methods makes you understand the way they work a lot better and I have experienced this as a difficult but also interesting task during the past 4 months.

I could not have written this master's thesis alone and therefore I would like to thank a few people.

First of all I would like to thank my supervisor, Professor Dr. H.A.A. Verbon, for providing me with useful comments and ideas during the past 4 months.

Second I would like to thank my girlfriend, Lindy Gielens, for always being supportive and helpful during the whole period.

I would also like to thank my parents and my brother. Even though the past year has been a very tough year for my family they have never stopped supporting me during my studies, something I really appreciate.

Last but not least I would like to thank my friends whom have also been working on their master theses during the last 4 months. The coffee breaks were always more than welcome while writing this thesis.

Contents

3

Section 1 Introduction

Countries engage in tax competition by strategically using their tax policy to attract mobile production factors such as capital. Theory predicts a "race to the bottom" in tax rates on mobile production factors. Within the European Union tax competition has been an important issue for quite some time now as indicated by the large and growing literature. Figure 1 shows the evolution of the corporate income tax rate (henceforth CIT rate) over the last 30 years. The CIT rate in the European Union has decreased from about 45 percent to a mere 25 percent today. The CIT rate is also dropping at a faster pace as compared to the CIT rate in OECD countries that are not in the European Union. On the basis of figure 1 it is not possible to reject the theory, which has fuelled debates concerning remedying tax competition within the European Union. The Ruding Committee (1992) was the first to point to the presence of tax competition within Europe and proposed to install a minimum CIT rate. In 2011 the European Commission proposed for a new directive, a Common Consolidated Corporate Tax Base (henceforth CCCTB). This directive stated that there will be a single way how companies, operating within the EU, can calculate their taxable profits. The directive reduces tax competition because it reduces the mobility of the tax base and there is less scope for tax planning by firms. On the other hand one might argue that this directive increases tax competition due to the creation of a more transparent environment and a level playing field for all countries within the European Union.

Figure 1   Evolution of CIT Rate in the European Union and the OECD
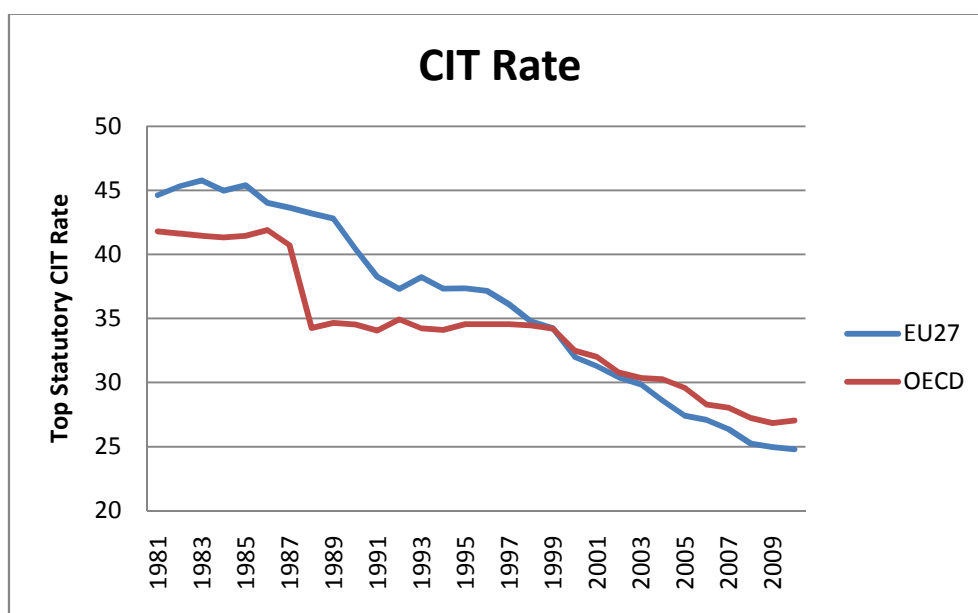
Source: OECD Tax Database

To judge whether there should be a remedy against tax competition one should investigate what drives the downward trend in CIT rates. This paper will focus on the way the establishment of the European Union in 1992 has influenced taxation and will empirically test this using a panel of 34 OECD countries over the time period 1981-2010. This thesis will answer two research questions of which the first is as follows:

Are corporate income tax rates lower in the European Union as compared to the corporate income tax rates in countries outside the European Union?

The second question is concerned with FDI inflows. This thesis will empirically investigate whether the presumed drop in CIT rates has initiated FDI inflows. In case the CIT rate drives FDI inflows one can draw a conclusion about possible misallocation of production factors in the OECD. In case no relationship is found this might indicate that countries attract paper profits rather than real investment by lowering their CIT rate. The accompanying research question to this part is as follows:

Does FDI flow to countries with a corporate income tax rate lower than the average in the European Union?

This paper contributes to the literature by using a wide variety of countries over a long and recent time span to investigate tax competition. The enactment of the Maastricht treaty will be used to see whether the countries within the European Union have lower CIT rates than other countries in the OECD. Furthermore it is investigated whether the drop in CIT rates has had any effect on FDI inflows.

The remainder of this thesis is organized as follows. Section 2 shortly describes the evolution of capital mobility in the European Union. In Section 3 a short introduction in the theory of tax competition is provided and the testable propositions are mentioned. Section 4 will summarize the results from the bulk of literature in the field of tax competition. In section 5 the theory and evidence in the literature that has investigated the effects of tax competition on FDI flows is discussed. Section 6 describes the data used for the empirical analysis. Section 7 explains the econometric specifications used for the investigation. Section 8 presents and discusses the results from the analysis of capital mobility and the European Union and its effect on the CIT rate. In section 9 the results from the analysis of the effect of tax completion on FDI inflows are presented and discussed. In section 10 FDI flows of the European Union as a whole are investigated. Finally section 11 will conclude upon the results and will provide the policy implications that arise due to the findings in this thesis.

Section 2 Restrictions on Capital Mobility in the European Union

The history of the European Union starts as the World War II finished. After having had two bloody wars within Europe the common believe rose that the European countries should unite to overcome such catastrophes in the future. In 1951 this resulted in the forming of the European Coal and Steel Community (henceforth ECSC) as declared in the Treaty of Paris. The initiation of the ECSC effectively created a common market for coal and steel among the signing partners. There were six European countries that signed the Treaty of Paris, namely: France, Italy, West Germany, Belgium, Luxembourg and the Netherlands. This group of countries will be referred to as the EU6 in this thesis.

In 1957 the Treaty of Rome was signed by the EU6 which extended the agreements made in the Treaty of Paris. The Treaty of Rome created the European Economic Community (EEC) which had as a goal to create a common market for labor, capital, goods and services within the EEC member states. To create a common market for capital a lot of transition was still needed because most countries had capital controls at that time. Full capital mobility was to be achieved by abolishing these capital restrictions and the extent of abolishment was defined such that it ensured a proper functioning of the common market. Initially the member countries booked a lot of progress, but from the 1960's onwards many member states started to use safeguard measures against each other. Financial operations were subject to exchange controls which in turn deterred full capital mobility.

In response to these problems the European Council adopted the capital liberalization directive in 1988 which had as its goal to remove all exchange controls. In 1992 12 countries signed the Treaty of Maastricht which effectively created the European Union.[1] With the Treaty of Maastricht the mobility of capital became as important as the other freedoms of the internal market.[2] In Appendix 2 the subsequent expansions of the European Union are shown graphically.

Figure 2 shows how trade as a percentage of GDP has evolved over time. As can be seen from the graph; trade as a percentage of GDP had been approximately unchanged until the early 1990's. After that trade increased rapidly in the EU6 and EU12[3], but also in non-EU countries in the OECD. The drop in trade around the year 2000 is due to the internet bubble and the drop in trade in 2008 is due to the financial crisis the world is recently recovering off. It seems that the creation of the European Union has spurred trade because trade increased faster within the European Union as compared to countries outside the European Union. The trade increase in countries outside the European Union might be due to positive spillover effects of the creation of the European Union. What is also notable from the graph is that there is more trade in the European Union before the enactment of the Maastricht treaty, this might indicate that the European Union was already more open before the establishment of the European Union. This would be consistent with the reduction in capital restrictions as initiated by the Treaty of Rome.

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[1] Appendix 1 shows information about whether and when the countries in the dataset signed the Maastricht Treaty.
[2] A common market for labor, goods and services.
[3] The EU12 countries in the graph consist of the EU12 countries without the EU6 countries (so Denmark, Greece, Ireland, Portugal, Spain and the United Kingdom).

Figure 2　　　Openness as Measured by Total Trade
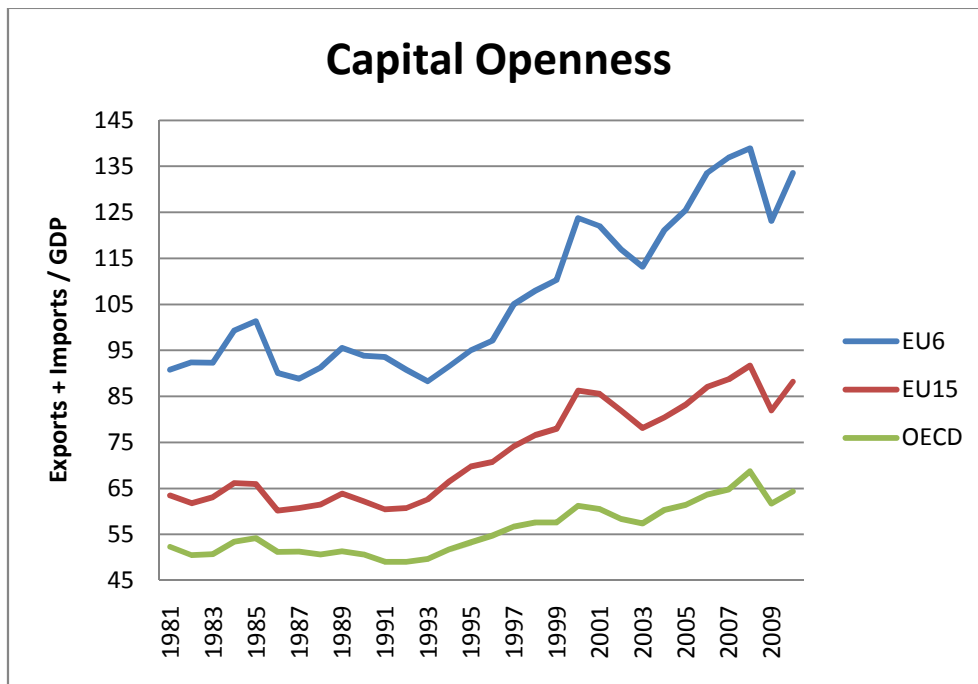
Source: Own calculations; see data Appendix 4.

Section 3 Tax Competition: Theory

Tax competition is a situation in which two countries strategically use their fiscal policy to attract mobile production factors. In this thesis the emphasis is on tax competition concerning capital. By offering a low CIT rate countries hope to attract economic activity which will boost wellbeing in that country. Bradford and Oates (1971) were the first to mention tax competition and its effect on the provision of public goods. In their paper they state that fiscal externalities due to tax competition lead to inefficiently low levels of public goods. Zodrow and Mieszkowski (1986) were the first to formalize a tax competition model concerning small open economies. These small open economies are assumed to be identical and cannot influence the world interest rate. By deciding upon their tax rate on the mobile production factor capital a country can extract capital from other countries. Since both countries act in the same way the tax rate is driven down to zero, which is referred to as the "race to the bottom" in CIT rates (Razin and Sadka, 1991).

Wildasin (1988) and Hoyt (1991) question the "race to the bottom" hypothesis and describe a model with a restricted number of countries. By restricting the number of countries in the model they show that the tax rate is higher than zero because countries have market power over the firms in their country. Due to the market power the country can set a positive tax rate on capital, even though there are no restrictions on capital mobility.

Persson and Tabellini (1992) analyzed the effects of economic integration on tax competition. In their model an increase in economic integration makes the underlying production factor, mobile capital, more responsive to a changing tax rate. Economic integration thus opens up the possibility for tax competition because the mobility of capital has increased and its location decision can thus more easily be altered. In this model the tax rate is being set by the median voter, which will shift to the "left" in case tax rates are lowered due to tax competition. This change in location of the median voter dampens the effect of tax competition to a certain extent.

Proposition 1: An increase in capital mobility leads to lower corporate income tax rates.

Proposition 2: Since capital is fully mobile in the European Union the corporate income tax rate in the European Union should be lower as compared to the corporate income tax rate in countries outside the European Union.

Bucovetsky (1991) and Wilson (1991) relax the assumption that countries are symmetric and show that smaller countries tend to have lower tax rates as compared to larger countries. A large country faces a lower elasticity of capital supply and thus should have a higher tax rate accordingly. Intuitively one can think of this in the sense that a small country has much to gain from tax competition, because there is less loss in tax revenues and more capital enters the country in per capita terms. If a large country decreases its tax rate it loses a lot of tax revenues since there is already a big stock of capital present in the country. Relative to this stock there will also be a smaller inflow of capital into a large country.

By taking into account the benefits of tax competition for small countries, Bucovetsky and Wilson (1991) show that a small country should solely tax immobile labor and should not tax capital at all. This finding hinges on the assumption that the supply of capital is perfectly elastic.

Proposition 3: Small countries have lower corporate income tax rates as compared to large countries.

More recent studies have focused on location-specific rents. Baldwin and Krugman (2004) focused on two possible equilibria, either there is an agglomeration of economic activity or there is not. The existence of an agglomeration creates rents and dependency among firms, the existence of such rents creates market power for the countries in setting their tax rate. Baldwin and Krugman (2004) state that tax rates on capital are higher when an agglomeration is present. This finding indicates that economic integration does not necessarily have to lead to a "race to the bottom" in tax rates. Tax competition still leads to inefficiently low CIT rates in their model.

Section 4 Tax Competition: Empirical Evidence

Empirical Evidence

<u>Economic Integration</u>

The Ruding Committee (1992) finds that statutory CIT rates are gradually decreasing over time. The tax base is broadening over time which results in an increase in corporate tax revenues. These trends are interpreted as evidence of tax competition and the committee proposes a minimum statutory CIT rate within the European Union to overcome the problem of a "race to the bottom" in the near future. Sinn (1997) goes one step further in suggesting that taxes should be harmonized to prevent a "race to the bottom".

The first empirical studies performed by Garret (1995) and Quinn (1997) showed a positive relationship between financial liberalization and corporate tax revenues as a percentage of GDP. Garret (1995) uses openness as measured by international trade as a proxy for financial liberalization. Quinn (1997) looks at a broader set of countries over a longer time span and also finds a positive relationship between liberalization and corporate tax revenues, these findings are robust to a wide variety of model specifications. Swank (1998) uses different measures of capital mobility and finds that all measures positively influence the CIT rate.

Bretschger and Hettich (2002) questioned the method of Garret (1995), Quinn (1997) and Swank (1998) since it does not take into account changes in the tax base. Tax revenues depend on the level of the tax rate as well as the size of the tax base. The net effect on total tax revenues depends on the position of a certain country on the Laffer curve (see Appendix 3). When a country is at the right of T^* a reduction in the tax rate leads to more tax revenues. By using effective average tax rates as a proxy for capital taxation, Bretschger and Hettich (2002) found that globalization actually leads to a decrease in CIT rates. Later on, Winner (2005) used a broader set of 23 OECD countries over the time period 1965-2000 to investigate the same question. This analysis also shows that capital mobility has a negative impact on the capital tax burden. Slemrod (2004) concluded that the government expenditures, measured as a percentage of GDP, had no influence on the CIT rate. This suggests that the decision of a country on a certain CIT rate is not driven by revenue needs and this can be taken as suggestive evidence that competitive pressures induce a decline in CIT rates.

There is also ambiguity concerning the presence of economic integration. By using saving and investment correlations, Feldstein and Horioka (1980) find that the world is far from being perfectly mobile in terms of capital. Most of the savings done remain in the country of origin even though it could have been more productive elsewhere. More recently this method has been applied by Obstfeld and Rogoff (2000) and they have found similar results for a sample of 24 OECD countries between 1990 and 1997. These findings have been called the "Feldstein-Horioka Puzzle" since other measures of capital mobility seem to find high and increasing capital mobility in the world.

<u>Growth</u>

Investigating the presence of tax competition is a different field of research than investigating whether it is economically wasteful. Bretschger (2010) found that openness is good for growth through its negative impact on capital taxation. A lower capital income tax rate is found to spur growth; an explanation for this might be that the government revenues were too high initially and that tax competition has brought these revenues down to socially desirable levels.

<u>Country Size</u>

As indicated by Wilson (1991) and also Bucovetsky (1991) a smaller country should have a lower tax rate as compared to larger countries. Winner (2005) indeed finds a positive correlation between the country size and the CIT rate. Also Bretschger and Hettich (2002) find a positive relationship between these variables. Murphy (1984) used saving and investment correlations to determine the degree of capital mobility and found that small countries have lower saving investment correlations as compared to large countries. Riedl and Rocha-Akis (2007) find that the tax base in small countries is responding more heavily to changes in the domestic CIT rate as compared to the tax base of large countries. They find opposite results for changes in the foreign CIT rate, since the tax rate of large countries is found to respond more heavily now. This finding does not confirm the theory as proposed by Wilson (1991) and Bucovetsky (1991) and raises the question whether there is a difference between small and large countries in this respect.

<u>Labor Taxes</u>

When countries are forced to lower their CIT rates due to economic integration they might levy a higher labor tax rate to make up for the loss in tax revenues. Empirically this can be investigated by looking at the corporate-labor tax ratio. Schwarz (2007) did so and finds that the corporate-labor tax ratio decreased as capital mobility increased. Also Winner (2005) investigated this effect and he also finds a positive effect of capital mobility on labor taxes. Capital mobility negatively influences taxes on capital and thus the corporate-labor tax ratio is negatively responding to an increase in capital mobility.

Summary

Past empirical evidence concerning economic integration has shown mixed findings. There are papers that find a positive relationship between economic integration and corporate taxation. Other papers find a negative relationship.

Box 1 *Ireland: "The Celtic Tiger"*

Ireland has the lowest CIT rate in the European Union and is thought to be one of the main tax competitors in the European Union. When one talks about tax competition in the European Union one should have had a look at the Irish strategy, which is often taken as suggestive evidence of tax competition.

Figure 3   The Corporate Income Tax Rate in Ireland
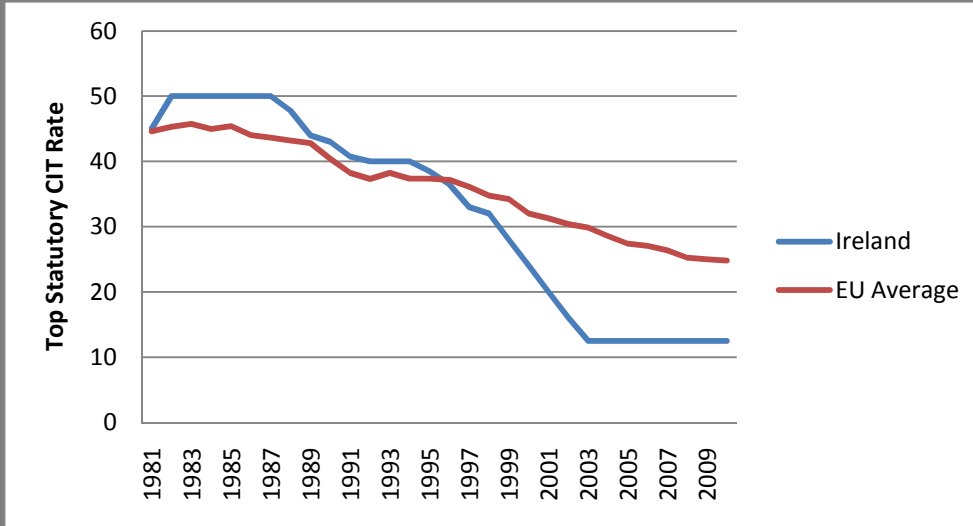
Source: Own calculations

As figure 3 indicates, the average CIT rate in the European Union is twice as large as the CIT rate in Ireland today. Ireland is one of the 12 countries that joined the European Union already in 1992. As once can see the CIT rate starts to drop significantly from 1989 onwards, which could point to anticipatory behavior of the Irish government.

Ireland has been a country with low growth rates for a long time, but it managed to reverse this pattern from the mid-ninetees until the recent financial crisis. It became known as "the Celtic Tiger" and this period eventually led to a GDP per capita that was the second largest in the European Union (only Luxembourg had a higher GDP per capita). This is apparent since it had one of the lowest GDP per capita in 1981 when it is compared to the countries that joined the European Union until now.

(Continued)

Box 1 (continued)

Figure 4   Growth Rates in Ireland
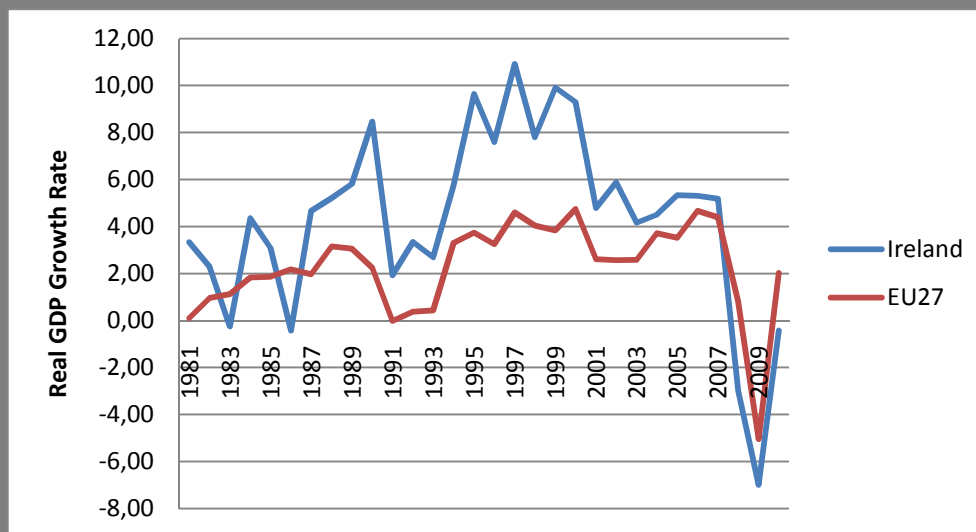
Source: Own calculations

As figure 4 shows us, growth rates in Ireland have exceeded the average growth rate in the European Union since 1987. This seems to go hand in hand with the reduction in the CIT rate in Ireland, but causality is hard to define from one graph solely.

Conclusion

Ireland is one of the major players in the tax competing environment in the European Union and is maybe also an example of a success story driven by tax competition. The success story reversed from 2007 onwards, due to the economic downturn Ireland has encountered in the recent financial crisis. Killian (2006) already pointed out a problem arising due to tax competion. According to Killian (2006), tax competition might lead to an increasingly fragile economic environment when a country becomes too much depending on foreign investors.

Section 5 Tax Competition and FDI: Empirical Evidence

Increasing integration within the European Union has triggered a decline in CIT rates as we have seen in the previous section. To understand what the effects of such a decline in CIT rates are one should look at the influence on FDI flows.

In a world with full capital mobility FDI flows do not necessarily have to be fully sensitive to tax differentials. This is due to the presence of trade costs and this will induce multinationals to locate in countries where they trade most instead of in countries where the tax rate is lowest. This will lead multinationals to locate in larger countries while smaller countries often have lower CIT rates. Larger countries can sustain higher tax rates without losing attractiveness (Benassy-Quere et al. (2003)). This can be seen as an additional reason why smaller countries should have lower CIT rates as compared to larger countries.

It is important to note that making the location decision dependent on the trade costs is welfare improving while making this decision based on the tax rate is not. Trade costs are costs which reduce the total surplus for everybody, a dead weight loss. Decisions based on the tax rate distort location decisions and might increase the dead weight loss without improving total efficiency; this might be due to an unintended increase in trade costs.

The Ruding Committee (1992) first indicated the fear of tax competition. Tax competition can lead to government revenues that are too low. Conesa et al. (2009) indicate that it is socially optimal to have a positive tax rate on capital. They find that a tax rate on capital of 36% is optimal.[4] Taxes are needed to finance government expenditures, which are needed because some tasks are best performed by the government from a social point of view. When tax differentials are present it might be that investment responds to this by moving towards countries where the tax rate is lowest. If this is the case it induces other countries to lower their tax rate to attract investment as well. Reinforcing the problem that taxation of capital might be too low.

In case investment is not responding to tax differentials it seems that countries are not attracting anything by engaging in tax competition. This does not necessarily have to be the case; multinationals make use of the lower CIT rate in a country by means of profit shifting (Bartelsman and Beetsma (2003)). Profit shifting induces an increase in tax revenues in the recipient country (the country with the low CIT rate), but tax revenues in the world go down due to profit shifting which can be undesirable for reasons already pointed out.

When countries do attract investment via their low CIT rate this could point to a misallocation of capital, which thus induces allocation inefficiencies. One ideally wants capital to locate in the country where it would have located in case of equal CIT rates for every country.

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[4] This finding is clearly due to the assumptions they make in their paper. The size of the tax rate they find can, however, still serve as an indication to which extent the CIT rate should be positive.

Figure 5   **FDI Inflows[5]**

Evolution of FDI Inflows
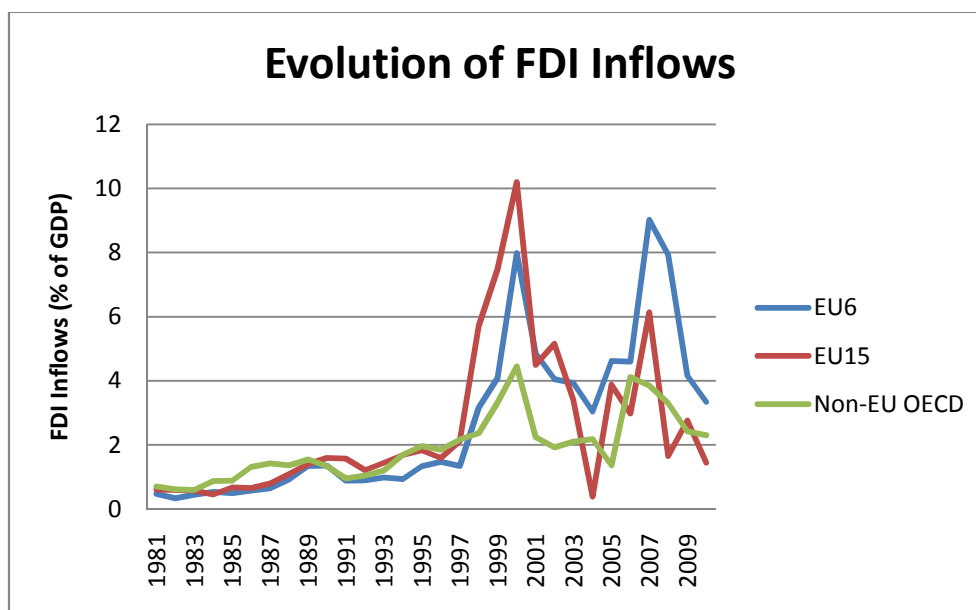
Source: Own calculations; see data Appendix 4

Figure 5 shows the evolution of FDI inflows over time. Three things are apparent from the graph. First, FDI inflows gained in importance from the middle 1990's. Second, FDI inflows are very volatile. Third FDI inflows did increase in non-EU OECD countries as well, but not to the same extent as it did in the European Union. This might be due to positive spillover effects of the European Union.

Smith and Venables (1988) indicate that it is expected that the establishment of the European Union will attract FDI from countries outside the European Union. This is due to the presence of an enlarged common market in the European Union. Multinationals in Non-EU countries can establish a subsidiary in the European Union to profit from the common market or keep exporting their products and pay tariffs. The establishment of a subsidiary in a union is called tariff-jumping and might explain why there is an increasing level of FDI inflows in the European Union as a whole as compared to non-EU countries. Section 10 will elaborate further on this possibility.

Andersson and Forslid (1999) indicate that agglomeration forces reduce the elasticity between FDI inflows and the CIT rate. A company might get locked in a certain industry and a relatively small decrease in the CIT rate in a foreign country might therefore not alter location decisions.

Baldwin and Krugman (2004) also investigate this matter and find that tax differentials can exist even in an economy with full capital mobility. Theory would expect a race to the bottom in tax rates and would therefore eliminate the possibility of tax differentials in the long run. The tax differentials can be sustained since agglomeration forces create rents for the multinationals and a country can tax these rents.

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[5] Luxembourg and Iceland are excluded as these countries are outliers in FDI inflows.

Kammas (2011) looks at strategic fiscal interactions among OECD countries and finds that, by lowering the tax rate, countries attract FDI inflows. Furthermore Kammas (2011) looks at the effect of using public investments on FDI inflows and finds that FDI inflows react negatively to an increase in public investments in neighboring countries.

Bellak and Leibrecht (2009) investigate semi-elasticities of FDI with respect to corporate taxes in Central- and East European Countries (CEECs). They find that FDI is negatively related to the corporate tax burden and find higher elasticities between FDI and corporate taxes as compared to previous studies that have investigated the CEECs (Cassou (1997) and Billington (1999)).

Benassy-Quere et al. (2003) investigate bilateral FDI flows across 11 OECD countries over the period 1984-2000 and show that high relative CIT rates discourage FDI inflows. Furthermore they indicate that market potential also plays an important role in explaining the direction of FDI. When market potential effects are controlled for the CIT rate differentials still explain a significant part of the direction of FDI flows.

Riedl and Rocha-Akis (2007) focus on 14 western European countries between the period 1982 and 2004 and finds that CIT bases respond to differences in CIT rates between countries. This indicates that investment does react to changes in the CIT rate. However, they find that taxable corporate income is inelastically responding to changes in CIT rates in the foreign country. This might indicate that part of the domestic business is immobile.

Head et al. (1999) finds a negligible relationship between CIT rates and FDI flows after agglomeration effects are controlled for. Hubert et al. (2002) does not find a robust relationship between FDI flows and CIT rates for German multinationals in the European Union. They also claim that this is due to agglomeration forces that primarily drive the direction of FDI.

Summary

Past empirical research mainly finds a negative relationship between FDI inflows and the CIT rate. Sometimes this effect is found to be negligible (Head et al. (1999)) but the relationship is never found to be positive.

Section 6 Data Description[6]

Section 6.1   Main Variables

Section 6.1.1   Corporate Income Taxation

Previous studies often used total tax revenues as a proxy of the tax burden on factor incomes (Quinn (1997) and Garrett (1995) for example). This measure is, however, influenced through the tax rate and the tax base. An increase in the tax revenues can be solely due to an increase in the tax base while the tax rate was left unchanged. Since we want to look at strategic fiscal interactions between countries we are mainly interested in changes in the tax rate which cannot be extracted with full confidence from this measure.

To overcome this problem the statutory CIT rate became a more popular measure to use. Devereux et al. (2004) indicate that the statutory CIT rate influences the location of profits rather than the location of real economic activity. This means that if countries compete over statutory CIT rates they are effectively competing over mobile profit rather than pure investment.

More recent research has used the effective average tax rate (henceforth EATR) as a proxy for the tax burden (Bretschger and Hettich (2002) and Overesch and Rincke (2011). The EATR includes deductions, exemptions and other tax credits provided by a country next to the statutory tax rate. This measure thus provides more information about what tax is actually paid by a firm. For that reason the EATR is the tax rate on which investors base their investment and thus also the location decision. Devereux and Griffith (1998) also indicate that the EATR is the measure one should use in case one wants to look at the effect of tax competition on the location decision of multinationals.

The Statutory Tax Rate versus The Effective Average Tax Rate

If one wants to see whether countries are competing for real investment one should in principle use the EATRs as a measure for the tax burden on factor incomes. However, for the calculations of the EATR a number of assumptions are needed. For example one has to assume for which type of investment the EATR applies (financial assets, real estate etc.) and the way the investment is financed (through debt or equity). For a complete description of all assumptions that are necessary to calculate the EATR I refer to King and Fullerton (1984) which were the first to use the methodology for calculating EATRs. The EATR in this thesis is based on the assumption an investment has a 20% pre-tax return and that there is an inflation rate of 2%.[7] As can be seen from appendix 4 the assumption concerning the inflation rate is not close to reality since the inflation rate is quite volatile over time. Overesch (2005) argues that the main source of differences in EATR between countries is the difference in statutory CIT rates. This means that, although the EATR is the most appropriate measure to use, it might be better to use the statutory CIT rate to overcome problems due to the assumptions necessary to calculate EATRs.

Figure 6 shows the evolution of both the EATR and the top statutory CIT rates. Both measures have fallen by approximately 20 percentage points over the 25 year time span.

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[6] Appendix 4 provides a full description of all the data used in the analysis.
[7] I want to thank Professor Overesch from the University of Frankfurt for providing a complete dataset on effective average tax rates in the European Union.

The data concerning the EATR is constructed in the same fashion as proposed by Mendoza et al. (1994). The graph provides us with a rough indication of the presence of tax competition in both top statutory tax rates and EATR. The EATR is lower than the statutory tax rate since the EATR incorporates information about exemptions and deductions which reduces the total tax base and thus the total tax burden for multinationals.

Figure 6   **EATR and Top Statutory Tax Rates[8]**

Different Tax Measures
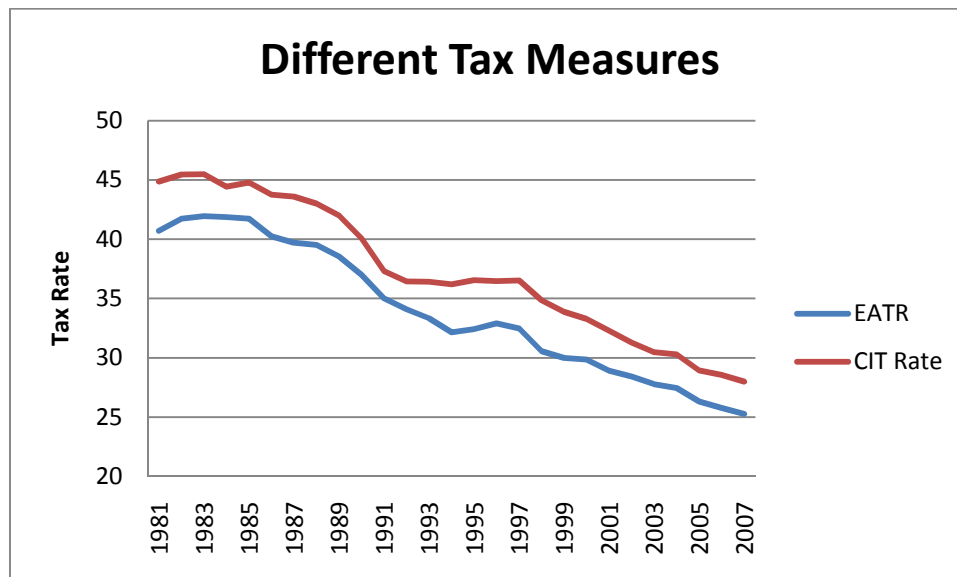
Source: Own calculations; see data Appendix 4

Section 6.1.2   Capital Mobility

To estimate the effect of capital mobility on tax competition behavior a good measure of capital mobility is needed. Capital mobility has proven to be very difficult to measure. Capital mobility is referred to as the possibility that capital can move freely, so full capital mobility is the state in which there are no restrictions on the movement of capital cross borders.

Most research in the field of tax competition has focused on total trade as a percentage of GDP (Bretschger and Hettich (2002), Overesch (2009) etc.). As figure 2 shows, the amount of trade has increased over the time span but there are also periods for which trade was declining. This pattern is expected for trade, since trade responds to the economic situation in a country, but it is an unexpected pattern for capital mobility. Trade might collapse in times of a recession where the level of capital mobility was left unchanged. If one was to use the level of trade as an indicator for capital mobility the results might be blurred. Trade is expected to be correlated with capital mobility though, as trade is not deterred by any restrictions in a world of full capital mobility. Additionally one has to control for possible effects of the country size on total trade, since smaller countries usually have more trade. This thesis will clean the trade data from any effects of the country size in the way proposed by Bretschger and Hettich (2002). Bretschger and Hettich (2002) performed the following regression:

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[8] Only countries for which EATR data was available over the whole time span are included in the graph.

$$TradeGDP = \beta_0 + \beta_1 CountrySize + \varepsilon$$

The residuals from this regression are regarded to be proper indicators of capital mobility throughout the remainder of this text. The regression is performed for three different measures of country size. The residuals from the regressions are mentioned as the variables openness1, openness2 and openness3 throughout the remainder of this text. For the variable openness1 the variable RelGDP is used as the measure of country size. To generate the variables openness2 and openness3 the variables RelSize and RelPopSize respectively are used as the measure of country size. Appendix 5 shows the results from performing the regression.

Since total trade as a percentage of GDP has some drawbacks when it is used as a measure of capital mobility it is important to note that there is another strand of literature that started using another proxy for capital mobility. This strand of literature focuses on the savings and investment correlations to measure capital mobility. Feldstein and Horioka (1980) were the first to use this method and they note that an increase in domestic savings should lead to an equally large increase in investment if an economy is closed. In an open economy with full capital mobility savings and investment should be uncorrelated within the domestic economy. This is due to the fact that savings spread around the world to maximize after-tax returns. In this situation domestic investment is financed through the supply of capital in the world instead of through domestic savings. Saving and investment correlations are found to be high and a possible explanation for this might be that investors prefer to keep their investment at home even though capital is highly mobile. This result is referred to as the "Feldstein-Horioka Puzzle" in the literature. If these results are true it is not the level of capital mobility that is measured but rather the behavior of investors, which is not only influenced by the level of capital mobility. Again it is expected that saving and investment correlations are positively correlated with the level of capital mobility.

Total Trade versus Saving Investment Correlations

Trade reacts to the state of the economy which makes its use as a measure of capital mobility debatable. Saving and investment correlations are also expected to react to a bust or boom, because the home bias that is driving savings to stay in the domestic country is expected to be reinforced in a bust cycle. Arguably the home bias in trade is less severe than the home bias in savings and therefore the change in total trade reflects more of the change in capital mobility. Therefore this thesis will use total trade as a percentage of GDP, cleaned from country size effects, as the measure of capital mobility while it keeps in mind its limitations.

Section 6.1.3   The Maastricht Treaty

Since our primary interest is in investigating whether countries in the European Union have lower CIT rates as compared to non-EU countries in the OECD a dummy for membership of the European Union is used. This dummy takes on the value 1 if the country has signed the Maastricht treaty and 0 otherwise.[9]

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[9] On 7 February 1992 the Maastricht treaty was signed by the EU12. Over time also other countries joined the European Union. Appendix 1 provides information about whether and when the countries in the dataset joined the European Union.

Article 3 (c) of the Maastricht treaty states:

The activities of the Community shall include, as provided in this Treaty and in accordance with the time-table set out therein: an internal market characterized by the abolition, as between Member States, of obstacles to the free movement of goods, persons, services and capital

From the moment the Maastricht treaty was signed there were no restrictions on capital movement within the group of countries that signed the treaty. This means that the dummy is expected to be correlated with capital mobility. If one wants to separate these effects one should also add a variable for capital mobility into the specification. In this case the dummy for the Maastricht treaty tells us whether countries in the European Union have different tax rates as compared to non-EU countries in the OECD. This difference is not due to a difference in capital mobility in that case.

I expect the CIT rates to be lower in the European Union even after controlling for capital mobility. Economics is a complex science in which expectations about the (near) future should not be underestimated as a determinant of behavior. One can argue that the establishment of the European Union creates political stability and trust among the member countries. The investors in the European Union are more inclined to invest abroad because they do not expect that trade barriers will be reinstalled in the near future. Political and economic stability is also important, as indicated by Schneider and Frey (1985), since it takes away some uncertainty about the future. The European Union has installed the Stability and Growth Pact to ensure that governments keep their balance within certain boundaries. In this way the establishment of the European Union creates a more stable environment for investors to invest internationally. Countries react to this by lowering their CIT rate to attract this increasingly mobile pool of investors.

Section 6.1.4   FDI Inflows

If one wants to measure whether an increase in tax competition has resulted in relocating capital one needs a variable that captures the movement of capital. As it is expected that a lower CIT rate attracts capital it is expected that capital movement will rise accordingly.

The question remaining is whether FDI inflows really capture capital movements. Marin and Schnitzer (2006) investigate this issue by generating a theoretical model and find that FDI inflows mainly result in capital movement. This thesis will use FDI inflows as a proxy for capital movements, while it is aware of its limitations.

Section 6.2   Economic Controls

GDP

The level of GDP both affects the level of the tax revenues and the tax base and is therefore an important control variable. Both the tax revenues and the tax base increase when GDP increases since there is more economic activity. As Bucovetsky (1991) and Wilson (1991) already indicated a bigger country can sustain higher tax rates. As the level of GDP increases the size of a country increases which will make it possible for that country to sustain a higher tax rate. It is therefore expected that GDP has a positive impact on the CIT rate.

Unemployment

An increase in unemployment makes a government search for employment opportunities. If an inflow of capital has a positive effect on employment a government has an incentive to lower its CIT rate (Haaparanta, 1996). On the other hand an increase in unemployment has a negative impact on total tax revenues which puts pressure on the governments' balance. This pressure might result in an increasing CIT rate when unemployment increases. The expected sign of unemployment is thus ambiguous.

Government Spending

As government expenditures increase a government needs funds to finance these expenditures. These funds are raised through taxes and therefore it is expected that government spending has a positive impact on capital taxation.

Government Debt

An increase in government debt puts pressure on the government to reduce its debt ratio since an increase in debt has negative economic consequences (e.g. higher interest rate and higher interest payments). This urges the need for more government revenues which are raised through taxes; therefore a positive effect of government debt on capital taxation is expected.

Relative Size

As explained by Bucovetsky (1991) and Wilson (1991) a smaller country should have a lower tax rate as compared to larger countries. Bretschger and Hettich (2002) find a positive impact of the relative size on the tax rate which corresponds to the theory. In my opinion it is not possible to draw this inference when using panel estimation, since panel estimation focuses on the change in the variables over time. To see whether the theory of Bucovetsky (1991) and Wilson (1991) is true a cross-sectional analysis has been done for a few years of the dataset and these regressions are shown in Appendix 6. The results show that country size is positively correlated with the CIT rate, which is evidence that supports the theory.

Relative size is still added as a control variable in the panel estimation since it measures the relative growth of a country. In an economic upturn the interest rate rises and this leads to capital imports. In an economic downturn the opposite is experienced. With a government striving for balanced budget it is expected that the government will lower taxes during an economic upturn and increase them during an economic downturn (Adam and Kammas (2007)). A country that experience more growth than others will see its relative size increase which is thus expected to have a negative impact on capital taxation.

FDI Stock

The stock of FDI that is already present in a country is a good predictor for FDI inflows. A big stock of FDI indicates that investors have opportunities in a certain country and this is unlikely to change from year to year. To draw inference on whether the tax rate influences FDI inflows it is necessary to control for the size of the FDI stock.

Unit Labor Cost

The unit labor costs are the average costs of labor per unit of output. This indicates how expensive and productive the labor force in a specific country is. A low unit labor cost is expected to attract FDI since investment is expected to be more profitable in countries with a low unit labor cost.

CreditGDP

This measure indicates the level of financial development in a country. A higher level of financial development is expected to be associated with a higher FDI inflow since financial transactions are expected to be safer in that case.

Section 7 Empirical Specification

Section 7.1 Method

The impact of the establishment of the European Union on capital taxation is estimated using fixed and random effects models that control for country and time specific effects (Baltagi (2001) and Hsiao (2003)). Hausman (1978) proposes a test whether fixed or random effects should be used in the panel estimation. The fixed effects model always gives consistent estimates but is less efficient than random effects in case random effects are present. The random effects model, on the other hand, is inconsistent in case the data generating process is not random. The Hausman test tests whether the estimates from the random and fixed effects model differ much. In case they do, this points to possible inconsistency of the random effects model and the fixed effects model should be used. In case they do not; random effects is an appropriate simplification and can thus be used as it is a more efficient method.

The fixed effects model is generally more appropriate when analyzing macro data. In a macro panel it is often the case that all countries of interest are included in the dataset. This means that the countries in the dataset are often not randomly drawn from a pool of countries. In this thesis our interest is in the European Union, but not all countries of the European Union are in the dataset. Therefore this thesis will follow the approach as proposed by Hausman (1978) and uses the Hausman-test as a guideline to determine which results are tabulated. The test-outcomes are shown in the tables.

The use of panel data makes it possible to control for country and time-specific effects which is favorable when using macro data. Controlling for country specific effects captures the country specific determinants that do not change over time but are influencing the dependent variable (e.g. country location). Time specific effects are necessary because one wants to control for circumstances that change over time but are affecting all countries in the dataset (e.g. oil price shocks).

Section 7.2 The Corporate Income Tax Rate and the Maastricht Treaty

$$(1) \quad Statc_{it} = \beta_0 + \beta_1 Mtr_{it} + \beta_2 Openness1_{it} + \beta_3 GDP_{i,t-1} + \beta_4 Unempl_{it}$$
$$+ \beta_5 Govsp_{it} + \beta_6 Gdebt_{it} + \beta_7 RelSize_{it} + \beta_8 RelPopSize_{it} + \alpha_i + \varphi_t + \varepsilon_{it}$$

In this equation *i* denotes the country and *t* denotes the time period. The variable $GDP_{i,t-1}$ shows that GDP enters the equation with a one-period lag as it is expected that the level of GDP influences the tax rate only in the next period. In this way possible endogeneity in this variable is avoided since GDP is treated as a variable that is predetermined. Country and time specific effects are captured by α_i and φ_t respectively. ε_{it} is the usual error term that captures the remaining part. In this specification heteroskedastic robust standard errors are used to make sure that possible heteroskedasticity is not biasing the results.

Section 7.3   FDI Inflows and the Corporate Income Tax Rate

To test whether the changing statutory CIT rate has led to any capital movements a similar model as in equation (1) is used.

(2) $$FDIinflow = \beta_0 + \beta_1 FDIStock_{it} + \beta_2 STATC1_{it} + \beta_3 GDP_{i,t-1} + \beta_4 Unempl_{it}$$ $$+\beta_5 Govsp_{it} + \beta_6 Unlab_{it} + \beta_7 CreditGDP_{it} + \alpha_i + \varphi_t + \varepsilon_{it}$$

The variables FDIinflow and STATC1 are expected to be endogeneous. An increase in the CIT rate is expected to negatively influence FDI inflows, since these flows are taxed more heavily. On the other hand, an increase in FDI inflows increases the tax base and makes it possible to lower the CIT rate. This thesis tries to solve this endogeneity problem by using the method of instrumental variables and by using a lagged-model concerning the variable STATC1.

Using instrumental variables can solve the endogeneity problem if the instrument has the following properties:

   (i)   The instrument is uncorrelated with the error term
   (ii)   The instrument is correlated with the independent variable (STATC1)
   (iii)   The instrument influences the dependent variable (FDIinflow) only through the independent variable (STATC1)

Property (ii) can be tested, but the other properties should be covered by economic reasoning.

Instrument: Personal Income Tax Rate

One can reason that the personal income tax (henceforth PIT) rate is correlated with STATC1. Both variables are tax rates that contribute to the revenues of the government. It is possible that a country with a CIT rate below the average CIT rate in the EU has a higher PIT rate, since the reduction in the CIT rate might have a negative effect on the government revenues. These government revenues are acquainted via an increase in the PIT rate. The opposite is also possible, since a reduction in the CIT rate might lead to more government revenues.[10] In this case the government can also reduce its PIT rate to acquire the same government revenues as before. Appendix 12 shows the results from the regression with this instrumental variable and also shows the results from an F-test between the variables PIT and STATC1.

The tricky part of using an instrumental variable is property (iii). FDI inflows react on changes in the profitability of the investment. The CIT rate is obviously influencing the net profitability of this investment, since it taxes the investment itself. The PIT rate, however, taxes income from wages rather than the investment and does therefore not alter the profitability of the investment. One can therefore say that the PIT rate does not influence the dependent variable other than through the CIT rate.

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[10] See Appendix 3: The Laffer Curve.

Section 8 Results: The Corporate Income Tax Rate and the Maastricht Treaty

Results

An unbalanced panel dataset is used for this analysis. The dataset is unbalanced since the length of the time series varies for some variables and countries. In total at least 674 observations are used in the regression. Table 1 provides the results from the static fixed effects model. Appendix 13 shows the results from the static random effects model.

Table 1   **Static Fixed Effects Model**

Endogenous Variable: STATC

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	30.57***	30.33***	25.85***	25.04***	25.60***	26.27**
	(7.61)	(6.67)	(7.93)	(7.12)	(7.11)	(11.51)
Mtr	-3.29*	-3.28*	-4.51*	-4.48*	-3.68*	-3.19*
	(1.89)	(1.87)	(2.27)	(2.24)	(2.01)	(1.87)
Openness1	-0.12***	-0.12***				-0.12***
	(0.04)	(0.04)				(0.04)
GDP						0.01
						(0.01)
GDP (lagged)	0.01	0.01	0.01	0.01	0.01*	
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
Unempl	-0.31	-0.31	-0.34	-0.34		-0.31
	(0.28)	(0.28)	(0.28)	(0.28)		(0.29)
Govsp	0.43	0.44	0.74**	0.75**	0.60*	0.47
	(0.36)	(0.35)	(0.34)	(0.34)	(0.33)	(0.38)
Gdebt	0.11**	0.11**	0.12**	0.12**	0.10	0.13**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)
RelSize	-0.00		-0.01			
	(0.03)		(0.03)			
RelGDP						0.49
						(0.78)
Observations	674	674	674	674	701	682
Countries	34	34	34	34	34	34
R^2						
Within	0.6223	0.6223	0.6019	0.6017	0.5916	0.6268
Between	0.1988	0.2111	0.3336	0.3880	0.4710	0.3288
Overall	0.3523	0.3633	0.4264	0.4611	0.5192	0.3356
Hausman Test	0.0135	0.0090	1.0000	0.9809	0.9857	0.0000

Heteroskedastic robust standard errors are shown in parentheses.
* indicates significance at the 90% level (two-tailed test)
** indicates significance at the 95% level (two-tailed test)
*** indicates significance at the 99% level (two-tailed test)

Explanation

As expected the Maastricht treaty has a negative impact on the CIT rates. Joining the European Union thus gives a negative impulse to the CIT rates of the member states. The coefficient is also economically significant and indicates that the countries in the European Union have, on average, a CIT rate that is at least 3.19 percentage points lower than the countries that were and are not in the European Union.

Openness1 has a negative and significant impact on the CIT rate in the static fixed effects model specification, which is the expected result. A one percentage point increase in the variable openness1 reduces the CIT rate by 0.12 percentage points, which is a substantial effect. When openness1 is taken from the regression the Maastricht treaty dummy is becoming more significant and the coefficient is bigger (regression (3)). This is due to the fact that signing the Maastricht treaty is correlated with an increase in capital mobility. As openness1 is the measure for capital mobility this is an expected finding.

It is expected that GDP enters positively in the regression, and it does. It is, however, only significant in regression (5). Unemployment has a negative but insignificant impact on the CIT rate. As indicated in the data description the sign of this variable was ambiguous, so it is not unsurprising that the variable is insignificant here.

Government spending has a positive and sometimes significant impact on the CIT rate. This is expected as government spending is financed through taxes. According to the coefficients, a one percentage point increase in government spending leads to half a percentage point increase in the CIT rate. This indicates that a substantial part of the increase in spending is financed through corporate tax revenues.

Government debt has a positive and significant impact, which is also expected since countries with more debt need more government revenues to reduce this debt. Relative size has a negative, but insignificant impact on the CIT rate. Relative size in a static fixed effects model design does not tell us something about the effect of country size on the CIT rate. One can see the size of a country as a fixed effect, or at least a variable that has little variation over a short time span. To see whether smaller countries have lower tax rates, as proposed by Bucovetsky (1991) and Wilson (1991), one needs to do a cross-sectional analysis. Appendix 5 provides several cross-sectional regressions to test this hypothesis.

As one can see, the Hausman test shows mixed results. In Appendix 7 one can find the results from the static random effects model. Specification (3) till (5) should be estimated using a random effects model according to the Hausman test. The main difference between the two models is that the variable Openness1 enters insignificantly in the static random effects model. Openness1 is only included in specification (1), (2) and (6), for these specifications the Hausman test tells us to use a fixed effects model. In these specifications the variable enters significantly, so one may conclude that openness1 has a negative impact on the CIT rate.

Robustness Checks

As already indicated, openness1 is the residual from a regression of Trade as a percentage of GDP on size. This residual might react to the use of other measures of country size. In Appendix 6 these different measures are used to generate different measures of openness. Whether the results in table 1 change when another measure of openness is used is tested in Appendix 8. As one can see, the results are similar to the results found in table 2, which tells us that the results are robust to the use of different measures of country size.

Furthermore, as one can see in figure 2, Trade as a percentage of GDP drops in a response to a crisis. It is unlikely though that capital mobility has also gone down in every crisis. Since trade as a percentage of GDP is our variable of capital openness this might blur the results. In Appendix 9 a similar regression as in table 1 is performed, but the years 2008-2010 are left out due to the financial crisis. Again the results seem robust to this, since they remained somewhat similar.

Figure 1 shows that the CIT rate started to drop a few years before 1992, when the Maastricht treaty was signed. This might indicate that countries anticipated the enactment of the European Union and started to lower their CIT rate already in advance. This possibility is tested in Appendix 10. It is assumed that every country that signed the Maastricht treaty did the signing two years earlier. As one can see, the results indeed indicate anticipatory behavior. The coefficients of the Maastricht treaty is approximately 1 percentage point higher as compared to the coefficients in table 1. The other results are similar to the results in table 1.

Magnitude of the Effect

If one assumes all other variables do not change (ceteris paribus) one can provide an indication of the economic magnitude of a one percentage point decrease in the CIT rate. The CIT rate taxes the corporate tax base. As a proxy for the corporate tax base the gross operating surplus is used, this variable is provided by the OECD. By dividing this number by the level of GDP for each country one can put this number in perspective. Over the time span 1992 – 2007 the tax base as a percentage of GDP has been 39.57 percent on average. One knows that the corporate tax revenues are given by:

Corporate tax revenues = CIT rate * Tax base

Thus a one percentage point decrease in the CIT rate lowers the corporate tax revenues by 0.3957 percentage point in terms of GDP (ceteris paribus).

Summary

The data analysis confirms that CIT rates are lower in countries in the European Union as compared to countries that are not in the European Union. Different specifications and several robustness checks are used. These analyses provide similar conclusions; this indicates that the results are robust to all kinds of different specifications and different measures.

Box 2 *Illustration: The 2004 Expansion*

In 2004 ten countries joined the European Union. While this expansion has been the largest expansion in number of countries it has not been an equally large expansion in terms of GDP and population. Most of the countries that joined the European Union in 2004 are relatively small countries. In this thesis it has been shown that smaller countries have lower CIT rates and therefore it is interesting to see how this group of countries has changed their CIT rate since they joined the European Union. It is interesting to look at this group of countries and the timing of their drop in the CIT rate. The fact that relatively small countries are concerned should mean that these countries have a CIT rate that is lower than the EU average before and after entering the European Union.

Looking at the timing of the drop in the CIT rate in these countries can strengthen the evidence that it is indeed the establishment of the European Union that has induced countries to lower their CIT rate. Since only 6 of the 10 countries that joined the European Union in 2004 are a member of the OECD this text will focus on these 6 countries.

Appendix 12 provides us with additional information on this group of countries. It shows the country size relative to the average country size in the European Union. It also provides information on when each country started negotiating to become a member of the European Union. Furthermore the evolution of the tax rate is shown in numbers, something which will also be shown graphically later on.

5 of the 6 countries are small relative to the average level of GDP and population size of the European Union. According to theory of Bucovetsky and Wilson (1991) their CIT rate should be lower than the average CIT rate in the European Union.

The Corporate Income Tax Rate

Appendix 12 shows the evolution of the CIT rate and also shows the evolution of the average tax rate in the European Union as a whole. As one can see, the average corporate tax rate in the European Union is lower as compared to the corporate tax rate in the Czech Republic, Hungary and the Slovak Republic in 1993. In 2010 all 6 countries that are included in the 2004 expansion have a lower corporate tax rate when it is compared to the average in the European Union. This points to tax competition that is being triggered by membership of the European Union.

(Continued)

Figure 7 and figure 8 show the evolution of the statutory CIT rate in the 6 countries graphically. In all countries the CIT rate has dropped significantly. What is most apparent is that most change in the tax rate can be identified before the 2004 accession. Only Estonia and Slovenia started decreasing their CIT rate after 2004. Furthermore it is notable that the CIT rate is approximately the same in the six countries in 2010. This might indicate that they are primarily competing with each other over their CIT rates.

Figure 7   Evolution of the Tax Rate
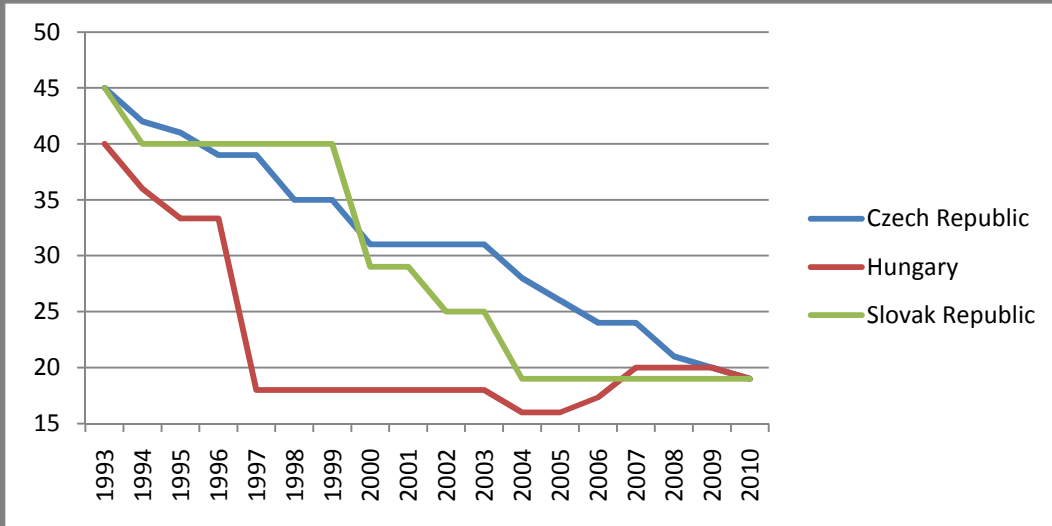
Source: Own calculations

Figure 8   Evolution of the Tax Rate
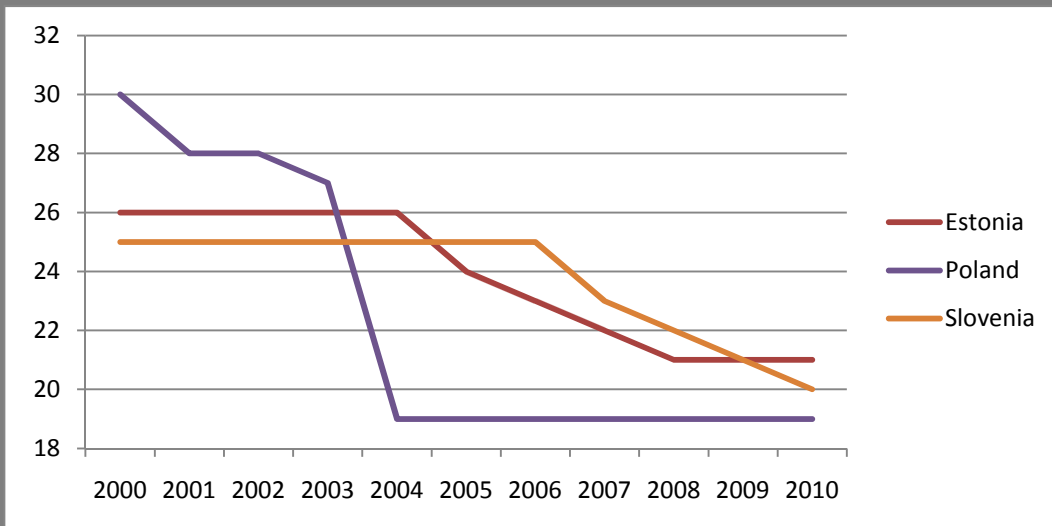
Source: Own calculations

Section 9 Results: FDI Inflows and the Corporate Income Tax Rate

Table 2　　　　　**Static Random Effects Model**

Endogenous Variable: FDIinflGDP[11]

Variable	(1) (RE)	(2) (RE)	(3) (RE)	(4) (RE)	(5) (RE)	(6) (RE)
Constant	-1.28	-0.32	1.03	1.84	-1.91	-0.80
	(2.22)	(2.86)	(3.84)	(1.44)	(2.35)	(1.97)
FDIstock	0.07***	0.07***	0.07***	0.07***	0.07***	0.07***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
STATC – STATCavg	-0.08*	-0.07*	-0.07***	-0.06	-0.07*	-0.07*
	(0.05)	(0.04)	(0.03)	(0.05)	(0.04)	(0.03)
GDP	-0.00					
	(0.00)					
GDP (lagged)		-0.00		-0.00	-0.00	-0.00
		(0.00)		(0.00)	(0.00)	(0.00)
Unlab	-0.02	-0.02	-0.01	-0.02	-0.01	
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	
Unempl	-0.05	-0.06	-0.06	-0.09		
	(0.06)	(0.07)	(0.08)	(0.06)		
CreditGDP						-0.00
						(0.01)
Govsp	0.14	0.08	0.02		0.09	0.03
	(0.10)	(0.11)	(0.13)		(0.10)	(0.10)
Observations	402	397	402	397	413	439
Countries	19	19	19	19	19	20
R^2						
Within	0.2124	0.2130	0.2169	0.2147	0.2142	0.2081
Between	0.7438	0.7262	0.7156	0.7116	0.7036	0.6876
Overall	0.3069	0.3030	0.3012	0.3004	0.3020	0.2937
Hausman Test	1.0000	1.0000	1.0000	1.0000	1.0000	0.9891

Heteroskedastic robust standard errors are shown in parentheses.

* indicates significance at the 90% level (two-tailed test)

** indicates significance at the 95% level (two-tailed test)

*** indicates significance at the 99% level (two-tailed test)

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[11] Only countries that are currently in the European Union are included. Luxembourg is excluded as it is an outlier in FDI inflows.

Explanation

Table 2 provides the results from the static random effects model without instrumental variable. The stock of FDI present in the country has a positive and significant impact on FDI inflows. This means that FDI flows to countries where there was already some FDI present. This is expected since FDI flows to where it can yield the highest return and this is expected to be somewhat the same today as compared to yesterday.

The CIT rate minus the average CIT Rate in the European Union has a negative and, almost everywhere, a significant impact on FDI inflows. Countries that lower their tax rate experience an increase in FDI inflows which is expected. This results points to a possible misallocation of capital, since capital flows react to changes in the tax rate rather than changes in variables that influence the productivity of capital.

GDP enters insignificantly and with an unexpected sign, as it is expected that an increase in GDP has a positive impact on FDI inflows as a percentage of GDP. It might be the case that GDP has a positive impact on FDI inflows but that FDI inflows do not increase to the same extent as GDP.

An increase in the unit labor costs is expected to reduce the amount of FDI inflows, since capital is less productive in that case. The sign of the variable is correct but the variable enters insignificantly. Unemployment also enters the equation insignificantly but with the correct sign. Financial development as measured by credit as a percentage of GDP should have a positive impact on FDI inflows but the sign is incorrect and the variable enters insignificantly. It might be that a certain level of financial development is demanded by investors and that financial development beyond this threshold does not alter an investors' location decision. Since financial development is already relatively high in all OECD countries this could be a reason why the coefficient enters insignificantly.

Government spending enters positive and sometimes significant. This is expected as an increase in government spending creates a better environment for investment. This attracts investors and thus FDI inflows.

As argued before, there is a possible endogeneity problem between the CIT rate and FDI inflows. Two solutions to this problem are used; the use of an instrumental variable and the use of lagged exogenous variables. In table 3 the results from the regression with an instrumental variable is shown. The results from the regression with the lagged exogenous variables can be found in Appendix 11. One can see from Appendix 11 that the results are not robust to lagging the exogenous variable of interest, STATC1. The variable is only significant in specification (3), while it was significant in all 5 of the 6 specifications in table 2. The other results are similar to the results in table 2.

Table 3   Instrumental Variables Estimation (Baltagi's 2SLS)

Endogenous Variable: FDIinflGDP[12]
Instrument for STATC1: PITRATE

Variable	(1) (RE)	(2) (RE)	(3) (RE)	(4) (RE)	(5) (RE)	(6) (RE)
Constant	-1.91	-1.60	11.44	2.04	14.47	5.67
	(3.68)	(3.90)	(9.19)	(2.89)	(9.49)	(4.99)
FDIstock	0.07***	0.07***	0.06***	0.07***	0.05***	0.06***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)
STATC1	-0.14*	-0.13	0.03	-0.08	0.12	-0.07
	(0.07)	(0.08)	(0.22)	(0.08)	(0.21)	(0.13)
GDP	0.00					
	(0.01)					
GDP (lagged)		0.00		-0.00	-0.05	-0.01
		(0.01)		(0.01)	(0.04)	(0.02)
Unlab	-0.02	-0.02	-0.00	-0.02	-0.01	
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	
Unempl	-0.05	-0.06	-0.00	-0.10		
	(0.07)	(0.08)	(0.11)	(0.07)		
CreditGDP						0.00
						(0.01)
Govsp	0.17*	0.14	-0.51		-0.61*	-0.26
	(0.10)	(0.11)	(0.44)		(0.34)	(0.21)
Observations	402	397	402	397	413	439
Countries	19	19	19	19	19	20
R^2						
Within	0.2071	0.2074	0.2208	0.2124	0.2126	0.2171
Between	0.7200	0.7180	0.2632	0.6984	0.2704	0.4474
Overall	0.2992	0.2981	0.1882	0.2957	0.1725	0.2474
First Stage[13] (F-test)	6.54	2.77	7.47	2.20	6.66	3.43

Standard errors are shown in parentheses.

* indicates significance at the 90% level (two-tailed test)

** indicates significance at the 95% level (two-tailed test)

*** indicates significance at the 99% level (two-tailed test)

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[12] Only countries that are currently in the European Union are included. Luxembourg is excluded as it is an outlier in FDI inflows.

[13] This indicates the strength of the correlation between the variables STATC1 and PITRATE.

Explanation

Baltagi (1981) proposed a method to estimate a random effects model with an instrumental variable. This estimator is on the basis of 2SLS and is appropriate in this analysis, therefore this method is used.

As a rule of thumb an F-score of 10 or higher is often demanded in order to state that the instrument used is strong. This is not the case in all the specifications, so the results should be taken with caution, but they can still serve as a proper robustness check.

The FDI stock still has a positive and significant effect on FDI inflows, as expected. The CIT rate minus the average CIT rate in the European Union shows mixed results now. It is negative in 4 out of the 6 specifications, which is the expected result, but it is only significant in 1 specification. In specification (3) and (5) the variable has a positive, but highly insignificant sign. This is an unexpected finding, but the R-squared from these regressions already shows that these specifications are underspecified. If one compares the R-squared from specification (2) with the R-squared from specification (3) one sees that dropping GDP as an independent variable reduces the R-squared by 0.1099 which is a substantial part in this regression. The same goes for dropping the unemployment rate from the regression.

The results concerning GDP are also mixed, but they are insignificant in all regressions. The unit labor cost has a negative but insignificant sign in all regressions, which is the same result as in table 2. Unemployment also has a negative but insignificant sign; this is also the same result as in table 2. Government spending is sometimes significant, but the results are also mixed. A positive coefficient is expected, but in 3 specifications a negative coefficient is obtained. These regressions might be underspecified, since the R-squared in these specifications are relatively low. Still the results do not point to a steady positive effect of government spending on FDI inflows.

Summary

Initially it seemed that a negative correlation between STATC1 and FDI inflows as a percentage of GDP was found. When several robustness checks are used to check whether the results found were plausible it is found that the results were not really robust to these tests. This indicates that a negative link might be present between STATC1 and FDI inflows as a percentage of GDP but that this link is not is not strong enough to bring about significant results. These results suggest that the CIT rate is not a main determinant of FDI inflows.

Section 10   FDI Inflows into the European Union

FDI Flows

As we have seen tax competition can be undesirable from a welfare point of view. Tax competition can, however, be beneficial for a subgroup of countries while it is still harmful for the world's welfare as a whole. This paragraph investigates whether tax competition has been beneficial for the European Union. Tax competition leads to a misallocation of capital, but when the low CIT rates attract capital from outside the European Union it might still be welfare improving for the European Union. By looking at FDI inflows and outflows one can provide an indication of the amount of capital that is entering or leaving the European Union.

Data on the total FDI inflows and outflows of each country is available. FDI inflows in Germany can come from all countries in the world and FDI outflows from Germany can go to all countries in the world. The data still provides us with enough information to see whether or not the European Union is a net-receiver of FDI as will now be explained.

Figure 9   FDI Flows in the World
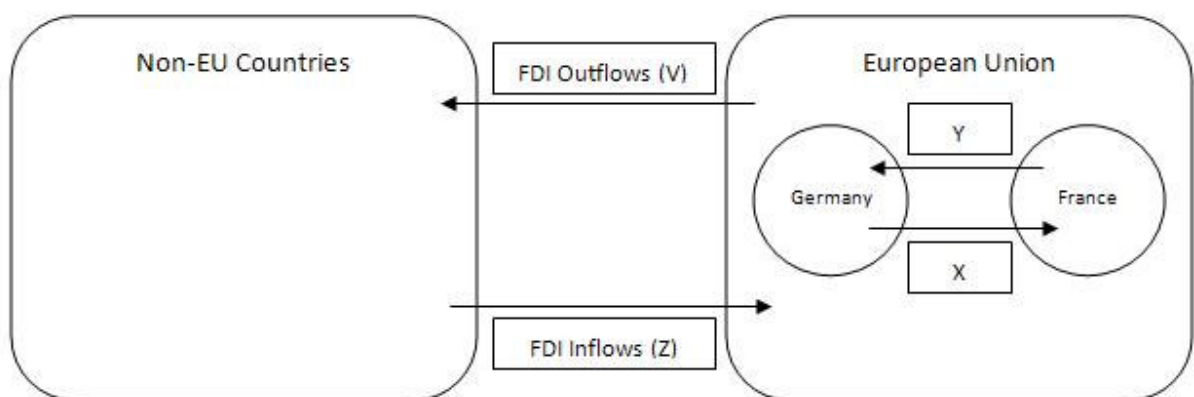
Image the European Union as a 2 country economy with Germany and France. In Figure 9 X and Y are FDI flows between France and Germany. X is FDI inflow for France but FDI outflow for Germany. Y is FDI inflow for Germany but FDI outflow for France. The following data is available:

FDI Inflows (European Union)	=	$Z + X + Y$
FDI Outflows (European Union)	=	$\underline{V + X + Y}$
FDI Inflows – FDI Outflows	=	$Z - V$

Thus if FDI inflows of the European Union exceed FDI outflows one can say that the European Union is a net-receiver of FDI from countries outside the European Union.

Figure 10 shows us how this number has evolved over time. Outflows exceed inflows every year except for one year. As one can see, the gap has increased over time. This might indicate that the establishment of the European Union has not attracted FDI but rather the opposite.

Figure 10   FDI Inflows (EU) – FDI Outflows (EU)
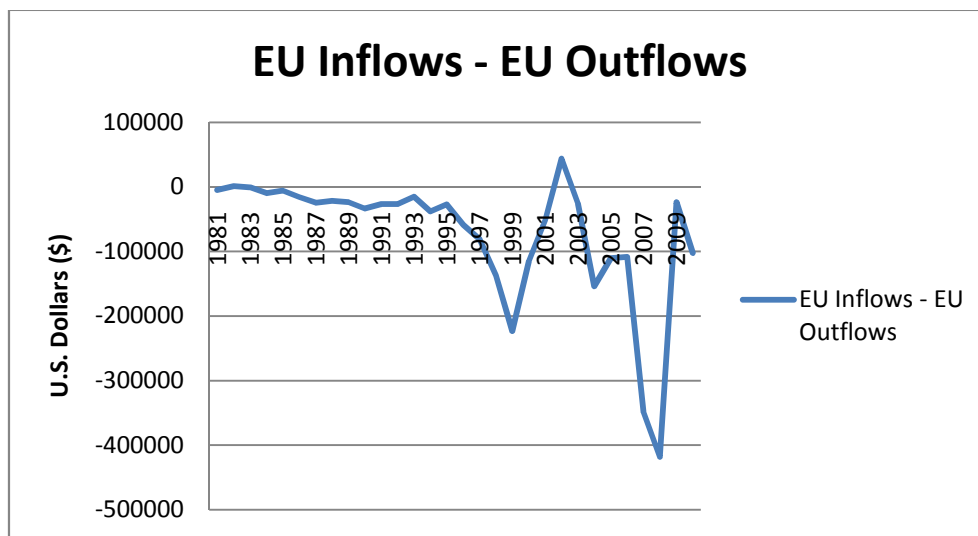
Source: OECD Statistics

The data is provided in millions of U.S. Dollars. The inflows minus outflows in 1995 are as large as 0.32% of the total GDP in the European Union. In 2005 this value is as large as 0.84% of the total GDP in the European Union.

Where past empirical evidence mainly finds that low CIT rates attract FDI this is not found in the data. The European Union is known for its low CIT rates and therefore past empirical evidence would suggest a flow of FDI into the European Union. Whether the pattern is caused by tax competition cannot be extracted from the data, since causality is hard to define from one graph solely. However one can still say that the low CIT rates in the European Union have not led to an increased capital stock in the European Union that is created by investment from outside the European Union.

Chowdhury and Mavrotas (2005) investigate the relationship between FDI and growth and found that high growth rates attract FDI. This might explain why the European Union experiences more FDI outflows as compared to FDI inflows, since growth rates are higher in developing countries as predicted by simple growth theory. However, other research finds that it is not economic growth that attracts FDI but rather FDI that spurs economic growth (Li and Liu (2005), Choe (2003)).

In the last paragraph we have shown that a lower tax rate has a positive impact on FDI inflows. It seems that the low tax rates have only induced movements of capital within the European Union rather than capital movements into the European Union. This means that some countries might be better off by engaging in tax competition but that it is not beneficial for the European Union as a whole.

Section 11   Conclusion and Recommendations

Conclusion

Theoretical models predict a race to the bottom in CIT rates in response to economic integration. Past empirical evidence has shown mixed results concerning this matter, but the more recent empirical evidence (Bretschger and Hettich (2002); Winner (2005)) find a negative relationship between capital mobility and the CIT rate.

Using a panel of 34 countries between 1981 and 2010 this paper has examined whether the enactment of the European Union has led to lower CIT rates. This paper confirms the more recent literature since it also finds a negative relationship between capital mobility and the CIT rate. This paper contributes to the literature by showing that the Maastricht treaty has had a negative impact on the CIT rate, even after controlling for capital mobility. This indicates that economic integration brings about an additional negative effect on the CIT rate, next to the effect of the increased capital mobility.

In the second part of this paper a panel of 20 countries between 1981 and 2010 is used to examine whether the drop in CIT rate has led to FDI inflows in the countries with lower CIT rates. The results show a negative relationship between the CIT rate relative to the average CIT rate in the European Union and the FDI inflows. This relationship is not found to be robust to lagging the main exogenous variable and the use of an instrumental variable. This indicates that, although there might be a negative relationship, the relationship is not found to be strong. Past empirical research has mainly found a negative relationship, but sometimes it has found a negligible or insignificant relationship. The findings in this thesis add to the literature that does not find a significant relationship.

Combining these results one can say that the enactment of the European Union has had a negative impact on the CIT rate. This negative impact on the CIT rate in turn has not led to a significant increase in FDI inflows. This does not mean that there is not an effect FDI inflows; it might be that there was a relatively small effect on FDI inflows that was too small to be significant.

In case CIT rates are too low for the governments in terms of government revenues and the low CIT rates have not lead to an inflow of investment from outside the Union one can say that tax competition is costly. The results in this paper indicate that tax competition is and has been a costly situation.

Policy Recommendation

From figure 1 it can be seen that the CIT rate in the European Union has dropped from 45% in 1981 to 25% in 2010. With such a drop present it is hard to believe that the CIT rate is not too low in the European Union.

Tax competition can be eliminated by installing a common tax rate in the European Union. In this way capital will be allocated properly within the European Union and also profit shifting is prevented. Such a policy is preferred if the group of countries is relatively homogenous, because it eliminates some inefficiencies while it is not costly for society. In this way the only problem is determining what should be the appropriate level of the common CIT rate.

The problem is that the European Union is a pretty heterogeneous group of countries. Because of this it is not only hard to determine what the level of the common tax rate should be, but it can also economically costly to install a common CIT rate. This is costly since some countries would prefer a higher CIT rate than others because their public sector is bigger than other and vice versa.

By not installing a common CIT rate it seems that the CIT rate will drop even further. This will drive up the costs of tax competition over time. Policy should be headed at determining whether the costs of tax competition outweigh the costs of installing a common CIT rate.

This paper recommends installing a common CIT rate in the European Union, since the costs of tax competition are growing over time. If one wants to stop these costs from rising one should remedy tax competition and the only way to do so is by installing a common CIT rate in the European Union.

Recommendations for Future Research

Future research should investigate whether the same conclusion concerning the enactment of the European Union holds if EATR data is used. For this research to be possible a proper dataset with EATR data is needed that covers the whole European Union for a similar time span as used in this paper.

Future research should also pay more attention to strategic fiscal interactions. This means that one looks at the CIT rate of a country relative to the CIT rate of the neighboring countries. It is possible that countries change their CIT rate in response to the change of the CIT rate in one of their neighbor countries. This would provide additional evidence of countries competing over their tax rates.

Appendix

Appendix 1 The European Union

Country	EU Member	Year of Entry
Australia	No	
Austria	Yes	1995
Belgium	Yes	1952
Canada	No	
Chile	No	
Czech Republik	Yes	2004
Denmark	Yes	1973
Estonia	Yes	2004
Finland	Yes	1995
France	Yes	1952
Germany	Yes	1952
Greece	Yes	1981
Hungary	Yes	2004
Iceland	No	
Ireland	Yes	1973
Israel	No	
Italy	Yes	1952
Japan	No	
Korea	No	
Luxembourg	Yes	1952
Mexico	No	
The Netherlands	Yes	1952
New Zealand	No	
Norway	No	
Poland	Yes	2004
Portugal	Yes	1986
Slovak Republic	Yes	2004
Slovenia	Yes	2004
Spain	Yes	1986
Sweden	Yes	1995
Switzerland	No	
Turkey	No	
The United Kingdom	Yes	1973
The United States	No	

Source: http://europa.eu/about-eu/countries/index_en.htm

Appendix 2 EU Expansions

Source: http://geoknow.net/pages/eu.html
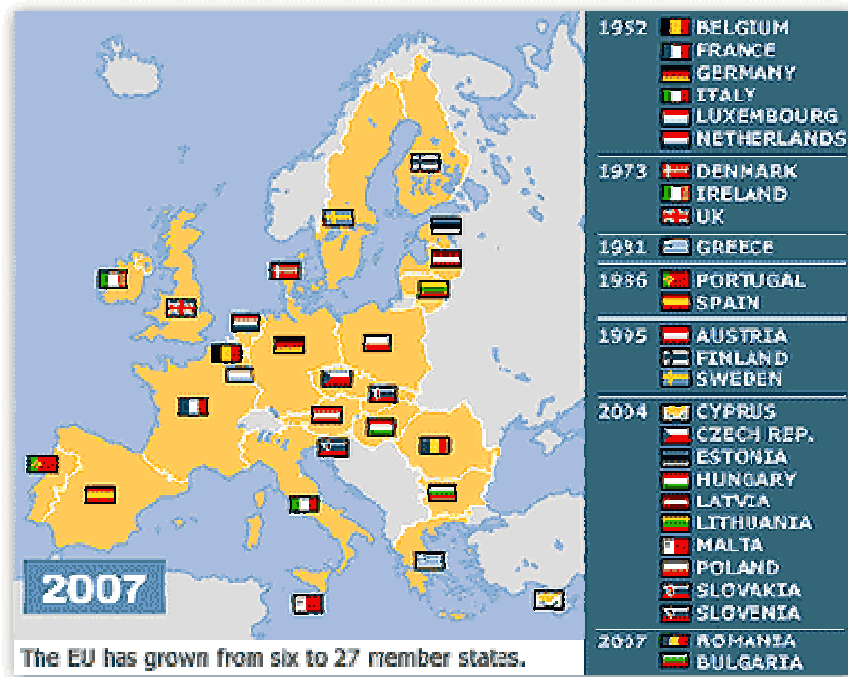
Appendix 3   The Laffer Curve
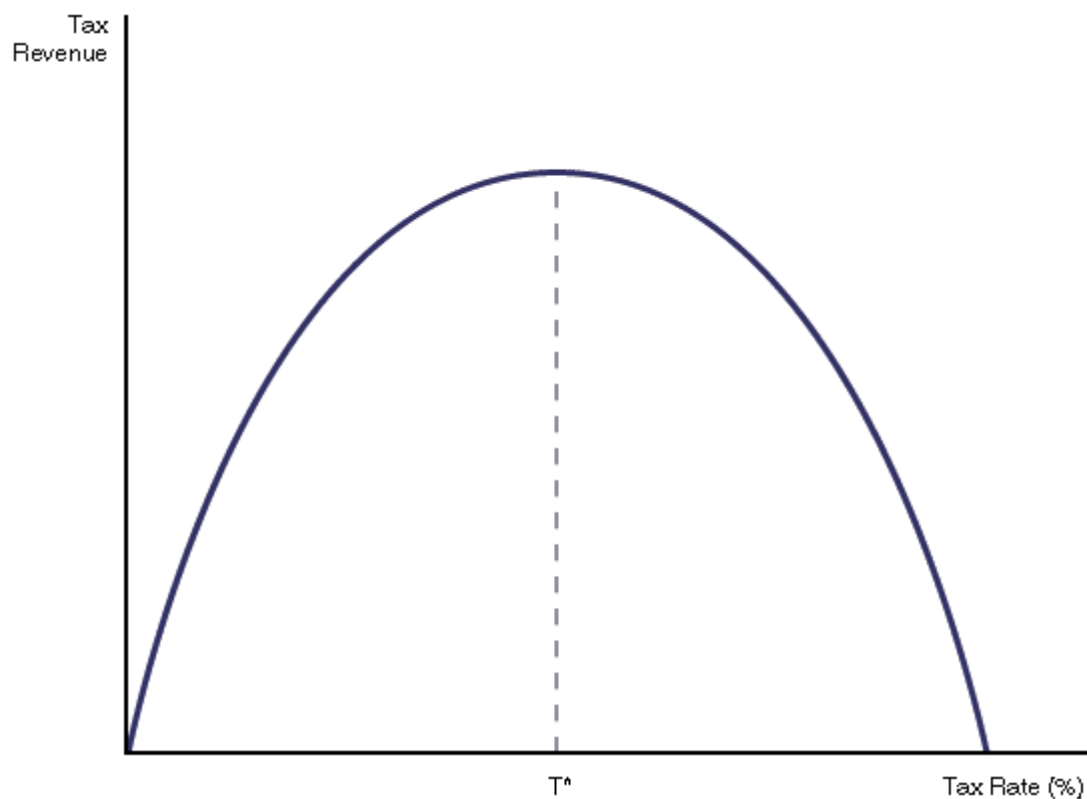
Appendix 4 Data Description

	Description	Obs.	Mean	Std. Dev.	Min	Max	Sources
Gdebt	Government Debt (as a % of GDP)	823	45.86	30.08	0.82	183.53	World Bank Indicators
STATC	Top Statutory CIT Rate	768	33.93	8.94	12.50	60.10	OECD Tax Database
GDP	GDP Expenditure Approach[14]	955	86.47	178.60	0.52	1314.44	OECD Statistics
RelGDP	GDP relative to US GDP	955	9.09	18.15	0.07	100	Own Calculations
TradeGDP	(Imports + Exports) / GDP	976	77.99	44.87	16	320	World Bank Indicators
Unempl	Unemployment	892	7.41	3.89	0.60	23.90	World Bank Indicators
Govsp	Government Spending (as a % of GDP)	983	18.93	4.88	7.52	41.48	World Bank Indicators
Mtr	Maastricht Treaty Dummy	1020			0	1	Own Calculations
Unlab	Unit Labor Costs	758	82.56	24.71	0	153	OECD Statistics
PopSize	Population Size (x 1000)	1020	32690.62	50911.25	231	309051	OECD Statistics
RelSize	GDP relative to average GDP in the OECD	955	99.99	200.67	1	1212	Own Calculations
EATR	Effective Average Tax Rate[15]	542	31.72	8.60	14.03	59.10	Overesch and Rincke (2011)
GDPgr	Real GDP Growth Rate	1020	2.64	3.04	-14.26	12.28	OECD Statistics
RelPopSize	Population Relative to US Population	1020	12.23	18.94	0.10	100	Own Calculations
PITrate	PIT Rate	481	37.34	21.09	0	85	OECD Statistics
CreditGDP	Private Credit (as a % of GDP)	955	102.17	56.58	10.15	328.41	World Bank Indicators

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[14] In 10 billions of U.S. Dollar
[15] I want to thank Professor Overesch for providing this data

	Description	Obs.	Mean	Std. Dev.	Min	Max	Sources
FDIinflGDP	FDI Inflows (as a % of GDP)	935	8.31	44.12	-32.87	564.92	World Bank Indicators
FDIStock	FDI Stock	954	27.01	30.51	0	208.99	World Bank Indicators
Unlab	Unit Labor Costs	758	82.55	24.71	0.01	153.29	OECD Statistics
STATCavg	Average CIT Rate Per Year	600[16]	35.90	7.05	24.59	45.77	Own Calculations
STATC1	STATC Minus STATCavg	481[17]	0.00	6.02	-18.11	17.29	Own Calculations
Inflation	Inflation	922	9.90	29.70	-10	555	World Bank Indicators
TBaseGDP	Gross Operating Surplus (as a % of GDP)	867	40.52	7.41	22.46	64.62	OECD Statistics

[16] This variable is only generated for the 20 countries that are used in the regression in Table 2.
[17] This variable is only generated for the 20 countries that are used in the regression in Table 2.

Appendix 5 Trade and Country Size Effects

To make sure the country size is not biasing our results, it is necessary to clean the trade data from any country size effect. This is done by performing the following regression:

$$TradeGDP = \beta_0 + \beta_1 CountrySize + \varepsilon$$

Country size can be measured in various ways; this is why this regression is performed multiple times for different proxy's of the country size. The residuals from the resulting regressions are assumed to be a proper measure of capital openness.

Table 4

Dependent Variable: TradeGDP

Variable	(1)[18]	(2)[19]	(3)[20]
Constant	87.06***	86.85***	91.67***
	(1.61)	(1.61)	(1.72)
RelGDP	-0.98***		
	(0.06)		
RelSize		-0.09***	
		(0.01)	
RelPopSize			-1.09***
			(0.07)
Observations	955	955	976
R^2	0.1536	0.1478	0.2181

Heteroskedastic robust standard errors are shown in parentheses.
* indicates significance at the 90% level (two-tailed test)
** indicates significance at the 95% level (two-tailed test)
*** indicates significance at the 99% level (two-tailed test)

[18] Residuals from this regression are referred to as the variable Openness1
[19] Residuals from this regression are referred to as the variable Openness2
[20] Residuals from this regression are referred to as the variable Openness3

Appendix 6 Country Size and Tax Competition

As already indicated earlier in this thesis one has to do a cross-sectional analysis to test the hypothesis of Bucovetsky (1991) and Wilson (1991) that small countries have lower CIT rates. To see whether this is the case a cross-sectional analysis has been performed for the years 2000 and 2005 as can be seen in table 4.

Table 5

Dependent Variable: STATC

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Year	**2000**	**2000**	**2000**	**2005**	**2005**	**2005**
Constant	23.83***	26.37***	26.37***	20.11***	22.87***	22.87***
	(5.54)	(5.38)	(5.38)	(4.88)	(4.81)	(4.81)
PopSize	0.00**			0.00***		
	(0.00)			(0.00)		
RelGDP		0.13**			0.17***	
		(0.05)			(0.05)	
RelSize			0.01**			0.01***
			(0.00)			(0.00)
Gdebt	0.06***	0.07***	0.07***	0.06***	0.07***	0.07***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Govsp	0.27	0.15	0.15	0.28	0.14	0.14
	(0.27)	(0.26)	(0.26)	(0.21)	(0.21)	(0.21)
Unempl	-0.14	-0.13	-0.13	-0.25	-0.23	-0.23
	(0.15)	(0.16)	(0.16)	(0.33)	(0.34)	(0.34)
Observations	33	33	33	34	34	34
R^2	0.3169	0.3854	0.2854	0.4080	0.3778	0.3778

Heteroskedastic robust standard errors are shown in parentheses.
* indicates significance at the 90% level (two-tailed test)
** indicates significance at the 95% level (two-tailed test)
*** indicates significance at the 99% level (two-tailed test)

In all regressions the variables used to measure size are positive and significant, indicating that bigger countries have higher CIT rates. This finding confirms the hypothesis.
RelGDP indicates that if a country has a one percentage point increase relative to the United States its CIT rate is 0.13 percentage point higher.

The regressors all have expected signs although they are not always significant.

Appendix 7   Static Random Effects Model Concerning Regression 1

Table 6

Endogenous Variable: STATC

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	29.06***	29.06***	27.87***	27.82***	27.93***	30.46***
	(5.74)	(5.43)	(6.12)	(5.78)	(5.01)	(5.15)
Mtr	-3.10*	-3.11*	-3.74*	-3.74*	-3.13*	-2.94
	(1.87)	(1.86)	(2.02)	(1.99)	(1.80)	(1.88)
Openness1	-0.05	-0.05				-0.04
	(0.04)	(0.04)				(0.04)
GDP						0.01
						(0.01)
GDP (lagged)	0.01	0.01***	0.01	0.01***	0.01***	
	(0.01)	(0.00)	(0.01)	(0.00)	(0.00)	
Unempl	-0.23	-0.23	-0.24	-0.24		-0.21
	(0.28)	(0.28)	(0.27)	(0.27)		(0.28)
Govsp	0.51**	0.51**	0.59**	0.59**	0.48**	0.54**
	(0.24)	(0.24)	(0.23)	(0.23)	(0.22)	(0.23)
Gdebt	0.09**	0.09**	0.10**	0.10**	0.09*	0.09**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)
RelSize	0.00		-0.00			
	(0.01)		(0.01)			
RelGDP						0.03
						(0.08)
Observations	674	674	674	674	701	682
Countries	34	34	34	34	34	34
R^2						
Within	0.6131	0.6133	0.5992	0.5991	0.5902	0.6135
Between	0.3715	0.3682	0.4437	0.4466	0.5158	0.4129
Overall	0.4919	0.4901	0.5038	0.5049	0.5434	0.5162
Hausman Test	0.0135	0.0090	1.0000	0.9809	0.9857	0.0000

Heteroskedastic robust standard errors are shown in parentheses.
* indicates significance at the 90% level (two-tailed test)
** indicates significance at the 95% level (two-tailed test)
*** indicates significance at the 99% level (two-tailed test)

Explanation

The results concerning the Maastricht treaty dummy is quite similar when it compared to the fixed effects model. The variable openness is insignificant in the random effects however. The Hausman test tells us that a fixed effects model is preferred in the models including the variable openness; this might indicate that using a random effects model is inconsistent for these specifications. Government spending is always significant in this model, which was not the case when the fixed effects model was used.

Appendix 8   Different Measures of Openness

Table 7

Endogenous Variable: STATC

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	29.68***	30.13***	30.71***	30.75***	30.46***	31.80***
	(7.56)	(6.69)	(7.69)	(7.56)	(6.63)	(7.72)
Mtr	-3.28*	-3.31*	-3.20*	-3.32*	-3.31*	-3.24*
	(1.89)	(1.86)	(1.88)	(1.89)	(1.87)	(1.87)
Openness2	-0.12***	-0.12***	-0.12***			
	(0.04)	(0.04)	(0.04)			
Openness3				-0.12***	-0.12***	-0.12***
				(0.04)	(0.04)	(0.04)
GDP			0.01			0.01
			(0.01)			(0.01)
GDP (lagged)	0.01	0.01*		0.00	0.01	
	(0.01)	(0.00)		(0.01)	(0.01)	
Unempl	-0.31	-0.32	-0.32	-0.31	-0.31	-0.31
	(0.28)	(0.28)	(0.28)	(0.28)	(0.28)	(0.28)
Govsp	0.42	0.42	0.48	0.42	0.43	0.48
	(0.36)	(0.36)	(0.37)	(0.36)	(0.35)	(0.37)
Gdebt	0.12**	0.11**	0.12**	0.11**	0.11**	0.12**
	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)	(0.04)
RelSize	0.01		0.00	-0.00		-0.00
	(0.03)		(0.03)	(0.03)		(0.03)
Observations	674	674	682	674	674	682
Countries	34	34	34	34	34	34
R^2						
Within	0.6230	0.6230	0.6261	0.6228	0.6227	0.6260
Between	0.2494	0.2307	0.2539	0.1845	0.1996	0.1865
Overall	0.3888	0.3785	0.3973	0.3387	0.3531	0.3407
Hausman Test	0.0094	0.0058	0.0000	0.0088	0.0050	0.0000

Heteroskedastic robust standard errors are shown in parentheses.
* indicates significance at the 90% level (two-tailed test)
** indicates significance at the 95% level (two-tailed test)
*** indicates significance at the 99% level (two-tailed test)

Explanation

In Appendix 6 there are 3 variables used to define country size. The resulting residuals are then defined as the variables indicating capital openness. The different measures of openness are put to the test here. The results are similar to the results using openness1 (as was performed in table 1), indicating that the results are robust to the use of different measures of country size. The Hausman test is clear in telling us to use a Fixed Effects Model, so therefore only results from the Fixed Effects Model are shown here.

Appendix 9   Estimation of Table 1 for the Years 1981-2007

Table 8   Static Fixed Effects Model

Endogenous Variable: STATC

Variable	(1) (FE)	(2) (FE)	(3) (FE)	(4) (FE)	(5) (FE)	(6) (FE)
Constant	29.69***	29.95***	23.83***	22.44***	22.76***	27.65**
	(8.45)	(7.67)	(8.96)	(8.42)	(8.32)	(12.59)
Mtr	-3.42*	-3.38*	-4.57**	-4.51**	-3.28*	-3.32*
	(1.83)	(1.81)	(2.19)	(2.17)	(1.95)	(1.81)
Openness1	-0.13***	-0.13***				-0.13***
	(0.04)	(0.04)				(0.04)
GDP						0.00
						(0.01)
GDP (lagged)	0.01	0.00	0.01	0.01	0.01	
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
Unempl	-0.51	-0.51	-0.55	-0.54		-0.51
	(0.35)	(0.35)	(0.34)	(0.35)		(0.36)
Govsp	0.52	0.52	0.88**	0.90**	0.71*	0.58
	(0.40)	(0.39)	(0.40)	(0.40)	(0.41)	(0.42)
Gdebt	0.15***	0.15***	0.16***	0.16***	0.11*	0.16**
	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)
RelSize	-0.01		-0.02			
	(0.03)		(0.03)			
RelGDP						0.19
						(0.83)
Observations	573	573	573	573	600	581
Countries	34	34	34	34	34	34
R^2						
Within	0.5937	0.5935	0.5719	0.5713	0.5433	0.5975
Between	0.1521	0.1828	0.2525	0.3340	0.4393	0.2651
Overall	0.2585	0.2951	0.2973	0.3657	0.4544	0.3586
Hausman Test	0.0001	0.0000	0.3195	0.3121	0.9513	0.0000

Heteroskedastic robust standard errors are shown in parentheses.

* indicates significance at the 90% level (two-tailed test)

** indicates significance at the 95% level (two-tailed test)

*** indicates significance at the 99% level (two-tailed test)

Table 9　　　　　**Static Random Effects Model**

Endogenous Variable: STATC

Variable	(1) (RE)	(2) (RE)	(3) (RE)	(4) (RE)	(5) (RE)	(6) (RE)
Constant	28.00***	27.98***	27.02***	26.93***	26.68***	29.41***
	(6.45)	(6.14)	(6.87)	(6.56)	(5.44)	(5.66)
Mtr	-3.03*	-3.03*	-3.54*	-3.55*	-2.72	-2.83
	(1.83)	(1.81)	(1.96)	(1.92)	(1.75)	(1.85)
Openness1	-0.05	-0.05				-0.04
	(0.04)	(0.04)				(0.04)
GDP						0.01
						(0.01)
GDP (lagged)	0.01	0.01***	0.01	0.01***	0.01**	
	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	
Unempl	-0.34	-0.34	-0.35	-0.35		-0.31
	(0.33)	(0.33)	(0.33)	(0.27)		(0.33)
Govsp	0.59**	0.59**	0.64**	0.65**	0.52**	0.60**
	(0.25)	(0.25)	(0.26)	(0.25)	(0.24)	(0.24)
Gdebt	0.12***	0.12***	0.12***	0.12***	0.10**	0.11***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)
RelSize	0.00		-0.00			
	(0.01)		(0.01)			
RelGDP						0.03
						(0.08)
Observations	573	573	573	573	600	581
Countries	34	34	34	34	34	34
R^2						
Within	0.5790	0.5791	0.5649	0.5648	0.5405	0.5786
Between	0.3471	0.3461	0.4045	0.4074	0.4953	0.3881
Overall	0.4322	0.4316	0.4343	0.4359	0.4920	0.4602
Hausman Test	0.0001	0.0000	0.3195	0.3121	0.9513	0.0000

Heteroskedastic robust standard errors are shown in parentheses.

* indicates significance at the 90% level (two-tailed test)

** indicates significance at the 95% level (two-tailed test)

*** indicates significance at the 99% level (two-tailed test)

Appendix 10   **If The Maastricht Treaty Was Signed 2 Years Earlier**

Table 10   **Static Fixed Effects Model**

Endogenous Variable: STATC

Variable	(1) (FE)	(2) (FE)	(3) (FE)	(4) (FE)	(5) (FE)	(6) (FE)
Constant	31.02***	30.68***	26.64***	25.75***	26.33***	25.36**
	(7.67)	(6.57)	(7.90)	(6.94)	(6.91)	(11.31)
Mtr (2-period lag)	-4.17**	-4.16**	-5.42**	-5.38**	-4.60**	-4.10*
	(2.05)	(2.05)	(2.40)	(2.40)	(2.16)	(2.07)
Openness1	-0.11**	-0.11**				-0.12***
	(0.04)	(0.04)				(0.04)
GDP						0.00
						(0.01)
GDP (lagged)	0.01	0.01	0.01	0.01	0.01*	
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
Unempl	-0.29	-0.29	-0.31	-0.30		-0.29
	(0.28)	(0.28)	(0.27)	(0.28)		(0.28)
Govsp	0.40	0.41	0.68**	0.70**	0.55*	0.44
	(0.36)	(0.35)	(0.33)	(0.33)	(0.32)	(0.37)
Gdebt	0.12**	0.12**	0.12**	0.12***	0.10*	0.13**
	(0.05)	(0.04)	(0.05)	(0.05)	(0.06)	(0.05)
RelSize	-0.00		-0.01			
	(0.03)		(0.03)			
RelGDP						0.61
						(0.76)
Observations	674	674	674	674	701	682
Countries	34	34	34	34	34	34
R^2						
Within	0.6275	0.6275	0.6089	0.6087	0.5987	0.6322
Between	0.1853	0.2021	0.3114	0.3717	0.4505	0.3205
Overall	0.3426	0.3582	0.4200	0.4597	0.5156	0.3043
Hausman Test	0.0145	0.0127	0.9796	0.9496	0.9494	0.0000

Heteroskedastic robust standard errors are shown in parentheses.

* indicates significance at the 90% level (two-tailed test)

** indicates significance at the 95% level (two-tailed test)

*** indicates significance at the 99% level (two-tailed test)

Explanation

The coefficient of the Maastricht treaty dummy becomes more significant and is bigger as compared to table 2. This indicates that the countries in the European Union anticipated entering the European Union and lowered their CIT rate already in advance. The other results are similar to the results in table 1.

Table 11 **Static Random Effects Model**

Endogenous Variable: STATC

Variable	(1) (RE)	(2) (RE)	(3) (RE)	(4) (RE)	(5) (RE)	(6) (RE)
Constant	29.04***	29.05***	27.92***	27.86***	28.03***	30.29***
	(5.62)	(5.31)	(5.98)	(5.64)	(4.93)	(5.07)
Mtr (2-period lag)	-3.84*	-3.85*	-4.50**	-4.50**	-3.86**	-3.62*
	(2.00)	(1.99)	(2.13)	(2.10)	(1.92)	(2.00)
Openness1	-0.05	-0.05				-0.04
	(0.04)	(0.04)				(0.04)
GDP						0.01
						(0.01)
GDP (lagged)	0.01	0.01**	0.01	0.01***	0.01***	
	(0.01)	(0.00)	(0.01)	(0.00)	(0.00)	
Unempl	-0.21	-0.21	-0.21	-0.21		-0.19
	(0.27)	(0.27)	(0.27)	(0.27)		(0.27)
Govsp	0.50**	0.50**	0.57**	0.57**	0.47**	0.53**
	(0.24)	(0.24)	(0.23)	(0.23)	(0.21)	(0.23)
Gdebt	0.09**	0.09**	0.10**	0.10**	0.09**	0.09**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)
RelSize	0.00		-0.00			
	(0.01)		(0.01)			
RelGDP						0.03
						(0.08)
Observations	674	674	674	674	701	682
Countries	34	34	34	34	34	34
R^2						
Within	0.6184	0.6187	0.6063	0.6062	0.5972	0.6185
Between	0.3598	0.3561	0.4251	0.4282	0.4962	0.4034
Overall	0.4875	0.4854	0.5003	0.5015	0.5394	0.5130
Hausman Test	0.0145	0.0127	0.9796	0.9496	0.9494	0.0000

Heteroskedastic robust standard errors are shown in parentheses.

* indicates significance at the 90% level (two-tailed test)

** indicates significance at the 95% level (two-tailed test)

*** indicates significance at the 99% level (two-tailed test)

Appendix 11   **FDI Inflows And The Lagged CIT Rate**

Table 12   **Static Random Effects Model**

Endogenous Variable: FDIinflGDP[21]

Variable	(1) (RE)	(2) (RE)	(3) (RE)	(4) (RE)	(5) (RE)	(6) (RE)
Constant	0.31	-0.84	0.54	-0.08	-1.29	-0.83
	(3.19)	(2.86)	(3.64)	(4.49)	(2.59)	(3.18)
FDIstock	0.07***	0.07***	0.07***	0.07***	0.06***	0.07***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
STATC1						
STATC1 (one-period lag)	-0.05		-0.06*		-0.05	
	(0.04)		(0.03)		(0.04)	
STATC1 (two-period lag)		-0.06		-0.07		-0.06
		(0.05)		(0.05)		(0.04)
GDP	-0.00	-0.00				
	(0.00)	(0.00)				
GDP (one-period lag)					-0.00	-0.01
					(0.00)	(0.00)
Unlab	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)
Unempl	-0.06	-0.06	-0.06	-0.06		
	(0.08)	(0.08)	(0.08)	(0.09)		
Govsp	0.07	0.07	0.05	0.04	0.08	0.06
	(0.11)	(0.12)	(0.12)	(0.14)	(0.11)	(0.12)
Observations	391	380	391	380	407	391
Countries	19	19	19	19	19	19
R^2						
Within	0.2138	0.2134	0.2137	0.2140	0.2150	0.2162
Between	0.7175	0.7153	0.7253	0.7181	0.6947	0.6947
Overall	0.2993	0.2974	0.2975	0.2947	0.2976	0.2980
Hausman Test	0.9936	0.9885	0.9997	0.9998	0.9029	0.9986

Heteroskedastic robust standard errors are shown in parentheses.

* indicates significance at the 90% level (two-tailed test)

** indicates significance at the 95% level (two-tailed test)

*** indicates significance at the 99% level (two-tailed test)

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[21] Only countries that are currently in the European Union are included. Luxembourg is excluded as it is an outlier in FDI inflows.

Appendix 12   Complementary Information on the EU 2004 Expansion

Country Size of the 2004 Expansion of the European Union

Country	GDP	Population (x 1000)	Relative GDP[22]	Relative Population[23]
Czech Republic	203891	10207	34,05%	47,45%
Estonia	20463	1349	3,42%	6,27%
Hungary	164694	10107	27,51%	46,98%
Poland	507714	38180	84,80%	177,48%
Slovak Republic	81697	5383	13,64%	25,02%
Slovenia	45153	1997	7,54%	9,29%
EU Average	598752	21512	100%	100%

Accession and Negotiation of the 2004 Expansion of the European Union

Country	Application for Membership	Start Accession Negotiations
Czech Republic	17 January 1996	31 March 1998
Estonia	24 November 1995	31 March 1998
Hungary	31 March 1994	31 March 1998
Poland	5 April 1994	31 March 1998
Slovak Republic	27 June 1995	15 February 2000
Slovenia	10 June 1996	31 March 1998

The Evolution of the Tax Rate of the 2004 Expansion of the European Union[24]

Country	Tax Rate 1993	Tax Rate 2000	Tax Rate 2010	Change 1993-2000	Change 2000-2010	Change 1993-2010
Czech Republic	45%	31%	19%	-14%	-12%	-26%
Estonia	N.A.	26%	21%	N.A.	-5%	N.A.
Hungary	40%	18%	19%	-22%	1%	-21%
Poland	N.A.	30%	19%	N.A.	-11%	N.A.
Slovak Republic	45%	29%	19%	-16%	-10%	-26%
Slovenia	N.A.	25%	20%	N.A.	-5%	N.A.
EU Average	38%	32%	25%	-6%	-7%	-13%

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[22] Relative to the EU average in 2004.
[23] Relative to the EU average in 2004.
[24] Data on the CIT rate for Estonia, Poland and Slovenia is only available since 2000.

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