

Charles University in Prague

Faculty of Social Sciences
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MASTER THESIS

Economic Globalization and Tax Systems

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Declaration of Authorship

The author hereby declares that he compiled this thesis independently, using only the listed resources and literature, and the thesis has not been used to obtain a different or the same degree.

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Prague, July 24, 2014

Signature

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Abstract

In this thesis on the effect of globalization on corporate income tax policies, we try to provide evidence that given the globalization-induced increased tax competition, countries are forced to lower their level of corporate income tax burden down to unsustainable levels or that they at least converge in their policies and levels of tax burden in order to attract international corporations through transparency. We find that no evidence to support such hypotheses is present in the OECD panel data of the last four decades with descriptive analysis, the general method of moments and the fixed effects estimation and we even find local evidence of an increase in the corporate income tax burden. Moreover, the OECD countries do not exhibit stronger convergence in their corporate income tax policies. Apart from the analysis of the general development of the corporate income tax burden, we find evidence that the level of tax burden is affected by the ratio of exports in the economy and correlated with the government indebtedness, outward FDI and the occurrence of the recent financial crisis.

JEL Classification

F23, F62, H25, H71, H87

Keywords

globalization, corporate income tax, tax burden, tax competition, economic policy

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Abstrakt

V této práci o vlivu globalizace na stanovení daně z příjmů právnických osob se snažíme poskytnout důkazy o tom, že z důvodu zvýšené daňové soutěže způsobené tímto vlivem, jsou země nuceny snižovat výši daňové zátěže daní z příjmů právnických osob až na dlouhodobě neudržitelnou úroveň, nebo že alespoň konvergují ve své daňové politice a výši daňové zátěže, aby tak mezinárodní korporace nalákali díky transparentnímu přístupu. Na panelových datech OECD posledních čtyř desetiletí jsme nenalezli žádné důkazy pro podporu takových hypotéz s pomocí deskriptivní analýzy, odhadů zobecněné metody momentů a modelu s fixními efekty a dokonce jsme objevili i lokální projevy nárůstu daňové zátěže daní z příjmů právnických osob. Země OECD navíc nevykazují významnou konvergenci v předpisech vztahujících se k dani z příjmů právnických osob. Kromě analýzy obecného vývoje daňové zátěže daní z příjmů právnických osob jsme také našli důkazy, že výše daňové zátěže je ovlivněna poměrem exportů v ekonomice a koreluje se státním dluhem, odchozími přímými zahraničními investicemi a výskytem nedávné finanční krize.

Klasifikace

F23, F62, H25, H71, H87

Klíčová slova

globalizace, daň z příjmů právnických osob,
daňová zátěž, daňová soutěž, hospodářská
politika

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Acronyms

APA	Advanced Pricing Agreement
BEPS	Base Erosion and Profit Shifting
CCCTB	Common Consolidated Tax Base
CIT	Corporate Income Tax
CV	Coefficient of Variation
CITGDP	Aggregate Tax Burden = CIT / GDP
CITGTR	Aggregate Tax Burden = CIT / GTR
CPI	Consumer Price Index
DTT	Double Taxation Treaty
EATR	Effective Average Tax Rate
EBT	Earnings before Taxes
ECJ	European Court of Justice
EMTR	Effective Marginal Tax Rate
EU	European Union
FDI	Foreign Direct Investment
FE	Fixed Effects
GDP	Gross Domestic Product
GTR	Total Government Tax Revenues
GMM	Generalized Method of Moments
IRS	Internal Revenue Service
ITR	Implicit Tax Rate
OECD	Organization for Economic Cooperation and Development
PIT	Personal Income Tax
R&D	Research & Development
VAT	Value Added Tax
WHT	Withholding Tax
WTO	World Trade Organization

Master Thesis Proposal

Author:	Bc. Václav Toman
Supervisor:	Doc. M.Phil. Ondřej Schneider, PhD.
Defense Planned:	June 2014

Proposed Topic:

Economic Globalization and Tax Systems
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Topic Characteristics:

Due to economic globalization, countries and their governments have been forced compete in much larger markets and this has lead to changes in laws, regulations and most importantly – taxes. When it comes to taxes, there are basically two main sides of the argument about the globalization's effect on them.

One side of the argument takes a stance of “the race to the bottom”, i.e. that the globalization has been forcing countries to lower their level of taxation further and further down to unsustainable levels that, together with increased need for social benefits and aging population, lead to unprecedented indebtedness. The idea is based on an expected outcome of a prisoner's dilemma game. Advocates of such stance call for a global authority that would limit the bottom limit of the level of taxation and coordinate government policies.

The second group argues that there is no real evidence of “the race to the bottom” and that lowering of tax rates has been largely offset by broadening of the tax base.

Economists of this group think that globalization should be let to run its course, at least when it comes to taxation, and that there is no need for global authorities to take action.

Recent global financial crisis and recession has lead to many turbulent changes in policies and that is why this debate can have completely new resolution.

In my thesis, I would like to provide new evidence to help resolve the ongoing debate. First, I will assess the problem quantitatively, i.e. I will use the up to date publicly available data from OECD Factbook and the World Bank DataBank to answer the questions first assessed by Stewart & Webb (2006). Moreover I will try to find determinants of tax level convergence and of the speed of convergence.

Second, with the help of publicly available information from tax professionals' companies, I will assess qualitative aspects of the problem, i.e. convergence in certain important tax policies, such as carry-backs, carry-forwards, statutory tax rates, etc.

Hypotheses:

The first two hypotheses are similar to those of Stewart & Webb (2006). These should be accepted or rejected both for before and after the crisis broke out. The remaining two are my original hypotheses.

1. There has been a systematic decline in tax burdens across countries.
2. The tax burdens are converging.
3. Convergence in tax burdens is correlated with nations' economic and social factors.
4. There has been convergence in tax policies, not only in tax burdens.

Methodology:

On the OECD member states, I will use an appropriate measure of actual taxes paid.
--

Stewart & Webb (2006) argue that such measure is one that captures the ratio “average tax rates”/”aggregate tax burden” and offer two candidates – “corporate income tax”/”GDP” (CITGDP) and “corporate income tax”/”total government tax revenues” (CITGTR). I will subject these variables to univariate analysis, so that my results are comparable to those of the original paper.

Moreover I will introduce my own econometric model. For the first two hypotheses, the explained variables will be: 1) “tax burden level” and 2) “tax burden – regional / OECD / world average”

The explanatory variables will consist of a time trend, FDI flows, international trade (imports, exports), labour costs, income distribution, a “post-crisis” binary variable and an appropriate amount of lags of the explained variable. Explanatory variables will be GDP-standardized when appropriate. More explanatory variables might be added in order to properly and widely accept or reject the third hypothesis. The key to answer the hypotheses will be the statistical significance and a direction of a time trend effect on the explained variable. Other variables are important proxies of trade openness and social factors and their significance will also provide partial answers to the 3rd hypothesis.

To accept or reject the 4th hypothesis, I will analyze recent international efforts to standardize taxes (e.g. transfer pricing rules and base setting) and their successfulness. Moreover I will compare data on tax rates and tax policies of the examined countries and summarize whether they have reached a similar position or not.

Outline:

Introduction
Literature Review
Quantitative Analysis
 Data
 Methodology
 Results
 Discussion
Qualitative Analysis
 Motivation
 Summary
Conclusion

Core Bibliography:

Auerbach, Alan J., Devereux, Michael P. And Simpson, Helen, 2007. Taxing corporate income. *CESifo Working Paper*, No. 2139.

Avi-Yonah, Reuven S, 2000. Globalization, tax competition, and the fiscal crisis of the welfare state. *Harvard Law Review*, 1573-1676

Cai, Hongbin and Treisman, Daniel, 2005. Does Competition for Capital Discipline Governments? Decentralization, Globalization, and Public Policy. *The American Economic Review*, Vol. 95, No. 3, 817-830.

Genschel, Philipp and Seelkopf, Laura, 2012. Did the Competition State Rise? Globalization, International Tax Competition, and National Welfare. Available at SSRN: <http://ssrn.com/abstract=2138848>

Graham, John R. and Smith, Clifford W., Jr., 1999. Tax Incentives to Hedge. *The Journal of Finance*, Vol. 54, No. 6, 2241-2262.

Onaran, Ozlem, Boesch, Valerie and Leibrecht, Markus, 2012. How does globalization affect the implicit tax rates on labor income, capital income, and consumption in the European Union?. *Economic inquiry*, Vol. 50, No. 4, 880-904.

Stewart, Kenneth and Webb, Michael, 2006. International competition in corporate taxation: evidence from the OECD time series. *Economic Policy*, Vol. 21, Issue 45, 153-201.

Tanzi, Vito, 1996. Globalization, Tax Competition and the Future of Tax Systems. *IMF Working Paper* 96/141.

Author

Supervisor

1 Introduction

In the last few decades, the world has become substantially more connected or “globalized”. Economic decisions made in one country can have significant impact on the economic development at the opposite side of the globe on the very same day.

The right of taxation is one of the main signs of a country’s sovereignty and it is one of the few cases of widely accepted violations of the basic democratic rights – the right of ownership. It has evolved from the ruler’s right enforced by violence in the beginning of civilization into a consensually agreed procedure of keeping the state and especially the welfare state working. Taxation has even evolved into a mean of driving nation’s consumption and desires (e.g. through high excise tax on cigarettes and lower tax on gasoline with a share of bio-ethanol). Globalization and international trade openness has made it significantly more difficult for governments to impose taxes entirely based on their own situation and needs. On the local scale, high excise tax or value added tax (VAT) on a certain product cause inhabitants living close to borders to buy this product in the nearby foreign country if the effect is not offset by an additional levy. High personal and corporate income tax (PIT, CIT) can cause a migration on the global scale as people, entire companies and most importantly – capital, can migrate to countries with a lower level of income taxation.

The OECD (2013) states that *“These developments have opened up opportunities for MNEs to greatly minimise their tax burden. This has led to a tense situation in which citizens have become more sensitive to tax fairness issues. It has become a critical issue for all parties.”* The recent increase in governments’ deficits has led some economists (see e.g. Genschel & Seelkopf, 2012; Scharpf & Schmidt, 2000; Cerny, 2010; Avi-Yonah, 2000) to believe that governments and companies engage into a repeated game (see e.g. Mas-Colell et al., 1995) known as the “race to the bottom” when countries have to set their taxation unreasonably low in order to attract investors and to keep labor and capital in their jurisdiction. Other economists on the other hand believe that this effect is only minor and that it cannot outperform the benefits of globalization (e.g. Nicodème, 2007; Tanzi (1996); Hong & Smart, 2010). Resolving this debate is essential, as the governments’ budgets are being challenged with high deficits after the financial crisis of 2007 and 2008 and the Great Recession and the final resolution would improve the discussion about the effect of globalization on the crisis of the welfare state. Globalization may also lead to

convergence in tax burdens and tax policies. Such convergence may be viewed as positive since it provides more certainty to the globalized taxpayer, but also as negative since it leaves government less flexible to the market developments and their own needs.

The objective of this thesis is to contribute to literature on the ongoing debate quantitatively using a GDP-weighted and general tax revenue (GTR) -weighted CIT government income with recent data and with both our original and already established (by Stewart & Webb, 2006) methodology. Apart from quantitative assessment, we will also review recent legislative development across countries and development in international CIT-related initiatives.

The four main hypotheses that we seek to accept or reject are:

- (i) There has been a systematic decline in tax burdens over time.
- (ii) The tax burdens are converging across countries.
- (iii) The convergence in tax burdens is correlated with nations' economic and social factors.
- (iv) There has been a convergence of tax policies across countries.

The thesis is structured as follows: Chapter 2 provides a literature review of academic literature regarding the discussion on the "race to the bottom". Chapter 3 is dedicated to the quantitative assessment of the first three proposed hypotheses with the use of OECD dataset. Chapter 4 assesses the fourth hypothesis through analysis of data and information provided by professional tax advisers from the respective countries. Chapter 5 discusses the future of corporate income taxation and Chapter 6 is a conclusion of the findings of the thesis.

2 Literature Review

2.1 Effect of taxation on individuals

Microeconomic theory believes that the main purpose of a corporation is creation of profits for the owners and the best method of how to achieve that is profit maximization. In real markets, we could say that the main purpose of a corporation is creation of net profits and the best method of doing so is profits maximization, which can be also achieved through evasion of taxation.

Li (2006) shows that countries with weaker rule of law tend to offer more investment tax incentives than those with stronger rule of law and that the effect is stronger in the more democratic countries, while Kinoshita & Campos (2003) report that higher rule of law causes a higher volume of inward foreign direct investments (FDI). These findings point to the idea that the countries that are open to international trade use the effect of low taxation to offset the negative effect of weak rule of law. Hibbs & Piculescu (2010) then propose a model showing that subject to thresholds of toleration, companies' incentives not to report all their taxable profits depends on the quality of governance in the host country.

Neumann, Holman & Alm, J. (2009) find that taxed production factors move to lower taxation jurisdictions and with increasing mobility, the government revenues deteriorate. Nevertheless this deterioration is only of minor size and governments are still able to collect a similar volume of taxes. Nicodème (2007) supports such view with observations of European Union, where statutory tax rates decrease, but revenues collected from taxation are fairly stable.

Genschel & Seelkopf (2012) state that multinational companies are much more likely to structure their international profits, and to review their current cross-border transactions. We can say that that is one of the reasons why corporate income tax is much more sensitive to globalization than personal income tax.

2.2 Run to the bottom

Establishment of global cross-border markets brings many potential problems for the tax collectors. There are measures designed to encourage residents to properly report all their taxable income, but the application of these measures is limited. One of the

main tools of anti – tax avoidance is preventing double taxation of properly reported income. Double taxation can occur in two main forms: Either as a taxation of the same income executed twice within the same country (e.g. taxation of company income and then a tax on personal income on dividends) or as a taxation of the same income in two countries – in the country that represents the source of income and in the country that represents the recipient of income (usually the country of residency of the profit generating company or person). The latter is usually being prevented by a double taxation treaty (DTT) or conventions on income and on capital signed by the two affected countries. OECD has had a major role in creating standards of rules of double taxation prevention and guidelines on how to follow them with its Model Tax Convention on Income and on Capital. *“It has been used as a basic document of reference in negotiations between member and non-member countries and even between non-member countries, as well as in the work of other worldwide or regional international organizations in the field of double taxation and related problems.”* (OECD, 2012).

Tanzi (1996) states that contemporary tax systems are largely a product of a period around the World War II, when capital mobility was very low, and finds contemporary evidence that the process of globalization has affected the structure of tax systems but not the tax total revenue.

Avi-Yonah (2000) finds evidence that increased degree of openness on an economy in OECD member countries leads to lowering of taxes on capital and an increase in taxes on labor. He states that if developed countries cannot tax the capital and other taxes are not feasible, the country can only cut on its social policies. The author also calls for a multilateral solution to face the tax competition problem. He believes that OECD could help solve the problem in the short run, but deeper and more global cooperation will be needed later and World Trade Organization (WTO) could become an appropriate platform. Picciotto (2007) supports this view and calls for an International Tax Organization, claiming that the UN Committee of Tax Experts is without resources and that there is a lot of work already prepared by the OECD to build on.

In his work, Scharf (2001) postulates that establishment of foreign tax credit against the domestic income tax mitigates the volume of tax evasion. On the other hand, he believes that rational pure capital exporter and pure capital importer can never establish such double taxation treaty (DTT) without a direct compensation to the exporter.

Original view of effects of globalization is provided by Cai & Treisman (2005). They argue that other papers largely and wrongly assume that affected countries are homogeneous and offer a new model based on an original level of endowment with characteristics attractive to investors (natural resources, geographical circumstances, human capital). In their model well-endowed countries have stronger will and incentives to attract foreign capital, whereas worse-endowed countries end up losing more capital than they would lose had their capital been immobile. That way multiple equilibria will exist making the worse-endowed countries even worse-off. Empirical evidence is also provided on the example of Russia and liberalization of its internal capital flows, where capital flowed from poor regions (Altai, Tyva, Kalmyk Republics) to rich (Moscow, St. Petersburg, Samara), making the inequality even higher.

Other federations and confederations with a certain amount of independence in setting of the tax rates given to the states might work as a potential model of possible future development in the global tax competition. Indeed even if we do not believe that the world has become a “global village”, we probably can accept that a modern federation with a central government provides a good parallel to globalization. Feld & Reulier (2009) report that Swiss taxpayers generally reside in the states with lower level of taxation, analyze data on Swiss cantons and find that the income tax rates are lower if the income tax rates of neighbour cantons are lower.

Ruiz & Gerard (2008) claim that the EU-15 countries set their taxes independently both in terms of their statutory tax rates and in the terms of income tax burdens. They are also believed to suffer from common external shocks to their tax income.

When discussing the spending side of the governments' budgets, Romer & Romer (2009) find that tax cutting does not lead to a decrease in government spending. In fact their results suggest that government spending is usually increased following the decrease in the tax burden. Therefore when pressured into tax cutting, countries cannot count on their leaders to offset the effect with a decrease on the output side of the government budget. On the other hand they find that exogenous tax policy changes have a strong effect on real GDP (Romer & Romer, 2010). Görg, Molana, & Montagna (2009) then view the problem of effects of taxation in a globalized environment from a different angle and find with a dataset of 18 OECD countries that higher corporate income tax does not necessarily lead to a decrease in the inward FDI and that multinational enterprises value the level of social security expenses as a government's commitment to improve the operating environment. They

believe that higher provision of public goods might mitigate the effect of higher corporate taxes even in globalized environment. Bénassy-Quéré, Goyalraja & Trannoy (2007) support this view but they also point out that countries beginning in equilibrium with low taxation and low level of public inputs may not attain higher values unless the households strongly prefer the public inputs.

Discussing the topic of countries' integration, Karkalakos & Makris (2008) find that economic integration (a EU dummy variable) surprisingly has an increasing effect on tax burden, while monetary integration (a Euro dummy variable) has a decreasing effect. They only offer limited explanation of these effects by an increase in technological quality and lower transaction costs. Genschel & Seelkopf (2012) then propose that the problem is far more nuanced and that the effect of globalization is on one hand lowering the welfare state capacity in big poorly governed countries and increasing it in well-governed small ones. Small countries have stronger incentive to undershoot foreign tax rates as they have more taxable income to gain than to lose. This finding is more elaborated on in Genschel & Schwarz (2012). They also report that OECD member states are far less affected by the international tax competition than non-OECD states. Ivanyina (2007) provides the opposite explanation for the same finding (backed by both theory and empirical results) – the countries that are relatively more efficient in turning their revenues into public goods always set their taxes higher than the ones that are less efficient.

Theoretical work on tax competition is offered by Hong & Smart (2010), who evaluate effects of tax planning and tax base erosion in a simple general equilibrium model and find that *“...if tax rates are not too high, an increase in tax planning activity causes a rise in optimal corporate tax rates, and a decline in multinational investment. Thus fears of a race to the bottom in corporate tax rates may be misplaced.”* Unfortunately, they do not offer any empirical evidence of the statement. Another theoretical paper is provided by Kotsogiannis & Serfes (2010), who offer an original use of a theoretical model of a two-sided market, where companies are shoppers looking for the best deal and countries are sellers competing for the highest profit. Solving this model means finding non-cooperative equilibrium. They find the equilibrium inefficient, but also find that an increase in interaction between the two sides might decrease the inefficiency. Imposing a minimum tax rate into their model proves useful in the case of low interaction.

Onaran,, Boesch & Leibrecht (2012) analyze effect of globalization on implicit tax rates (ITR) in the EU15 countries and in the Central Eastern European countries. Implicit tax rates are calculated as a ratio of total tax revenue from capital

income, labor income or consumption and the pre-tax income of the production factor (e.g. the corporate income tax revenues and the gross operating surplus). They find evidence that globalization has led to an increase in ITR on labor but do not find evidence of a decrease in ITR on capital in the EU15 countries. They also report that ITR on consumption is lowering in the above average countries.

2.3 Cointegration

Our main inspiration, Stewart & Webb (2006) did not find any strong evidence that there is a convergence of the level of taxation among OECD or European countries. They did however find some convergence among a few northern European countries. Perhaps the biggest contribution of their work lies in the proposition of two simple variables that determine the level of “tax burden”.

3 Quantitative Analysis

3.1 Data

The data used for our quantitative analysis is a panel data from OECD Revenue Statistics available at the Statistics database (stats.oecd.org). The same source of data was used by Stewart & Webb (2006). We will use similar methodology in order to be able to compare our results with their results, but we will also provide an original one. Stewart & Webb (2006) have tested their hypotheses on most of the past OECD countries – Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, United Kingdom and the United States of America. The Czech Republic, Greece, Hungary, Iceland, South Korea, Luxembourg, Mexico, Poland, Portugal, the Slovak Republic and Turkey were excluded for lack of data. We will also include the new OECD countries – Estonia, Israel and Slovenia. Exclusion of Mexico and Chile from the quantitative analysis is necessary, as there are no observations of the explained variable.

As stated by Hicks & Swank (1992), OECD countries are heterogeneous with different types of capitalism, different welfare regimes and different political arrangements. Genschel & Seelkopf (2012) add that they also have a lot in common – they are democratic, rich, well-governed and they have large welfare states.

The variables proposed by Stewart & Webb (2006) to explain the effect of globalization on corporate taxation are the tax burden variables:

$$CITGDP = \frac{\text{Corporate income tax revenues}}{\text{Gross domestic product}} \quad (3.1)$$

$$CITGTR = \frac{\text{Corporate income tax revenues}}{\text{Total government tax revenues}} \quad (3.2)$$

Source: Stewart & Webb (2006)

As Stewart & Webb (2006) mention, the basic shortcomings of such measures is that corporate income tax revenues and total government tax revenues are not only affected by the level of taxation but also by the volume of corporate income.

Moreover both corporate income tax revenues and GDP are strongly affected by business cycle and this can cause problems with interpretation of the results.

We choose to use these variables as the subject of our analysis mostly because we believe that the tax revenues provide a good measure of all the hidden effects of country-specific legislation. Just comparing the statutory tax rates can be valuable from the viewpoint of assessment of whether the countries have chosen a similar way of showing their level of taxation to the potential investors, but it provides no evidence of the quantitative impacts of globalization on corporate income tax. Governments also have the possibility to keep their effective tax rate hidden through narrowing of the tax base (with the so-called “*tax-cut-cum-base-broadening reforms*”), e.g. by extending the tax loss carry-forward or by applying various investment incentives to preferred companies. Trying to capture all these effects at once is generally much more difficult.

The inconsistency between the statutory tax rates and the actual level of tax burden is demonstrated in the Figure 3.1.

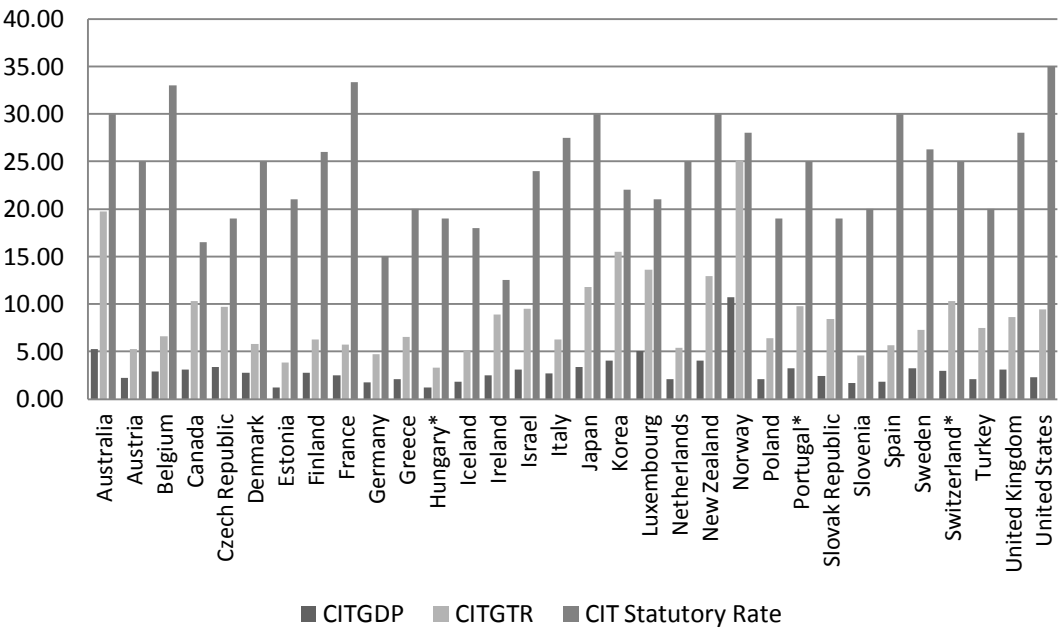


Figure 3.1: 2011 tax burden and the statutory tax rate comparison, %

Source: Ernst & Young: The 2011 worldwide corporate tax guide, OECD, author’s computations.

* Hungary, Portugal and Switzerland had more than one corporate income tax rate in 2011. We report the highest of the respective tax rates.

Empirical counterparts to these variables that we use in the analysis are “corporate tax revenue as percentage of GDP” and the ratio of “corporate tax revenue as percentage of GDP” and “total tax revenue as percentage of GDP” for CITGDP and CITGTR respectively. The reported values are again in the form of percentage. The source variables come from OECD Member Countries Revenue Statistics.

Using ITR for our analysis, as it is used by Onaran,, Boesch & Leibrecht (2012), seems inadequate, as it basically faces the same challenges as the level of tax burden, the data may be harder to collect and interpret and we are not particularly interested in taxation of labour, capital or consumption, but just the taxation of corporate income.

Another rejected possibilities of explained variable for our analysis are the effective marginal tax rate (EMTR) and the effective average tax rate (EATR) as explained e.g. by Deveroux and Sørensen (2006). EMTR is related to marginal cost of capital, while EATR is related to the extent to which the pre-tax profit is reduced by taxation. Both these measures are usually used for measuring the impact of taxation on companies’ decisions. As mentioned above, we are interested in the lawmakers’ decisions and the risk these might pose to the national budgets and not in the direct impact that these decisions have on the decisions of the corporations. These measures therefore do not seem as appropriate as the tax burden variables.

3.2 Model

We try to assess the hypotheses in two ways: First, we apply the methodology of the analysis of a single-variable behavior used by Stewart & Webb (2006). Second, we try to assess the problem with the help of an econometric modeling, explaining the behavior of the tax burden variable by certain economic factors affecting the countries of interest.

Since such analysis will likely suffer from problems with endogeneity of the explanatory variables without the presence of proper instrumental variables, where possible, we also apply the technique of generalized method of moments (GMM) with the lagged explanatory variables used as instrumental variables. GMM has already applied in related empirical papers, e.g. Feld & Reulier (2009) or Dreher (2006).

3.3 Decrease in Tax Burdens

In this part of the thesis, we assess the first hypothesis: “*There has been a systematic decline in tax burdens over time.*”

3.3.1 Descriptive Analysis

To see whether there has been a systematic deterioration in tax burdens, we first use a simple average of CITGDP. Using the simple average is simple and it provides us with a wide range of data, however the numbers themselves are ambiguous as the tax burden level in Luxembourg has the same impact on the average as the tax burden level in the USA.

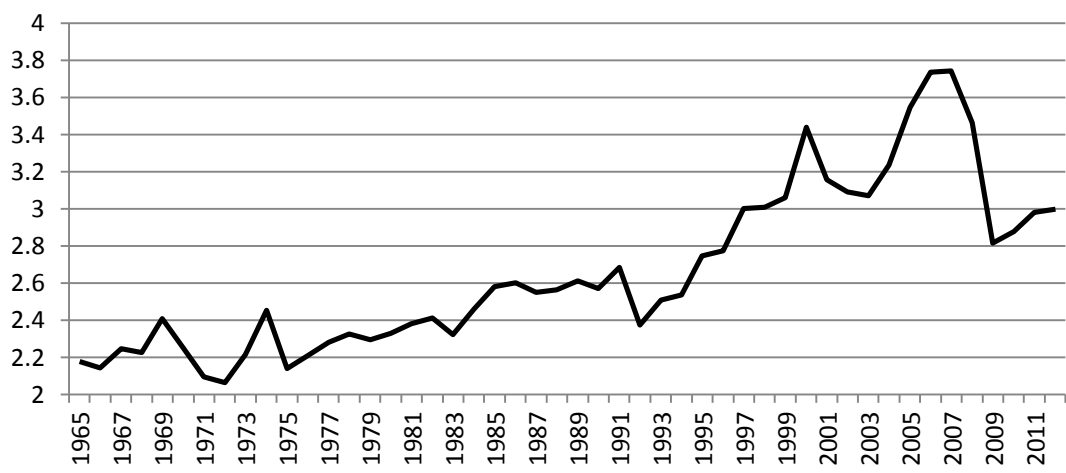


Figure 3.2: CITGDP %, simple average

Source: OECD, author’s computations.

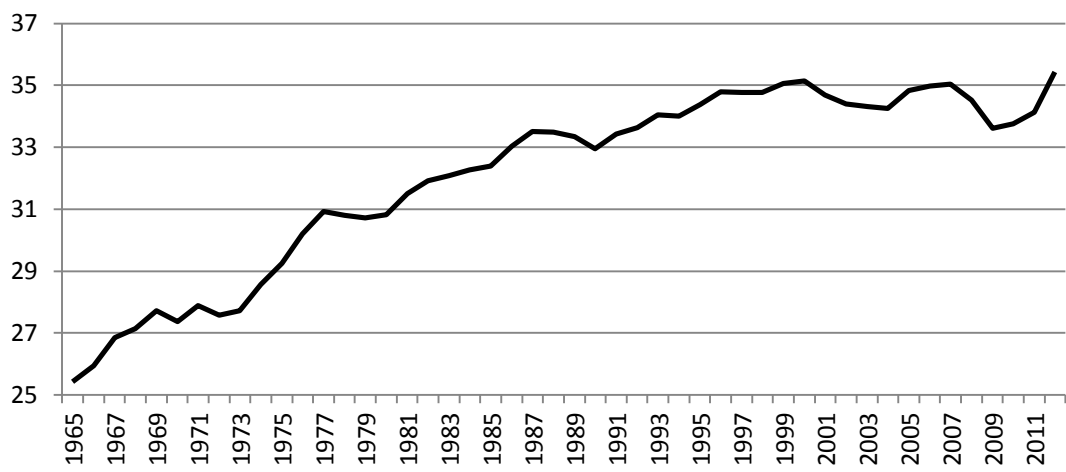


Figure 3.3: CITGTR %, simple average

Source: OECD, author’s computations.

As we can see, the figures of simple averages do not indicate a decrease in the tax burden. If anything, they indicate the exact opposite. These results are similar to those of Stewart & Webb (2006), except for that their data did not indicate an increasing trend. As is apparent namely in CITGDP, the figures also indicate a fall in the tax burden during the recent financial crisis. This phenomenon shows that domestic production has decreased at a much slower pace than domestic taxable income. This is justifiable from the microeconomic point of view – by a decrease of production by e.g. 10%, a company can shift from generating taxable income to generating tax loss.

Apart from the simple average, we can also use a GDP-weighted average. The weighted average provides us with results with simple interpretation. The downside of the weighted average is that the dataset is limited due to computational reasons. We use the output GDP in USD, current prices and exchange rates as a weight and we only use observations for years 1972 to 2010 for Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Spain, Sweden, Turkey, the United Kingdom and the USA.

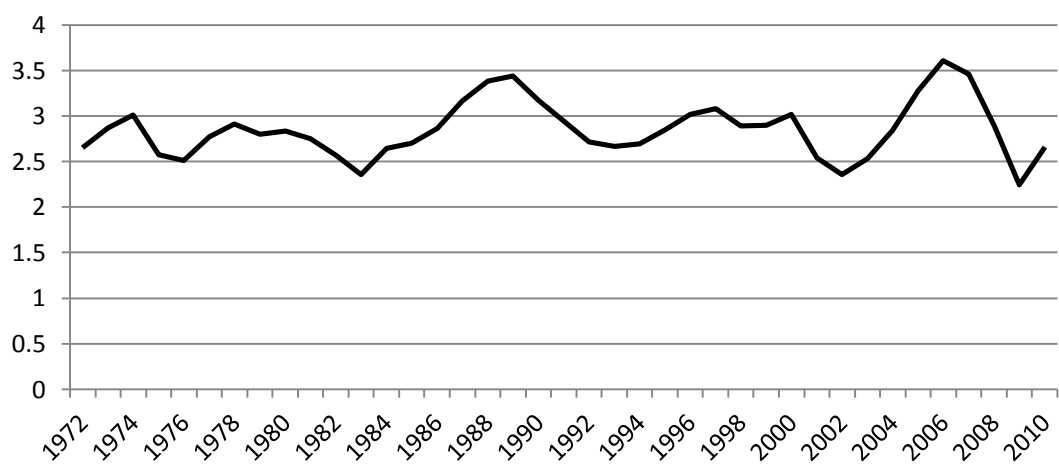


Figure 3.4: CITGDP %, weighted average

Source: OECD, author's computations.

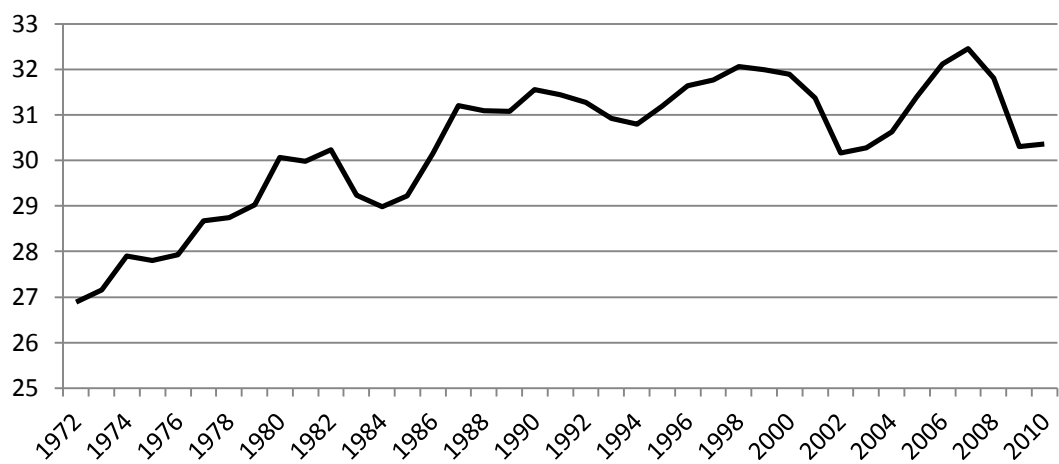


Figure 3.5: CITGTR %, weighted average

Source: OECD, author’s computations.

The figures of weighted averages do not indicate any strong trend in the tax burden. The figure of CITGTR indicates a slight increasing trend. The observable volatility can be credited to the business cycles as these affect both CITGDP and CITGTR. Weighted averages again indicate plummeting of the tax burden during the recent financial crisis.

3.3.2 Drift Tests

Following the methods of Stewart & Webb (2006), we try to support the descriptive analysis with a series of drift tests. According to the stated hypothesis, the tax burden should be decreasing, which means that the average difference between a one year’s value and the previous year’s value being negative, i.e.

$$tax\ burden_t - tax\ burden_{t-1} < 0 \tag{3.3}$$

When we take the first differences and perform a single-sample t-test on them with H_0 : difference = 0 and H_A : difference < 0, we fail to reject the null hypothesis at any reasonable significance level with p-values being 0.53 and 0.48 for CITGDP and CITGTR respectively.

In the Table 3.1., we report the p-values of a one-tailed t-test for significance of differences run on time series data of each country separately, i.e. the test described in the previous paragraph being performed country-by-country.

Table 3.1: P-values of one-tailed t-test for significance of differences

Country	CITGDP	CITGTR
Australia	0.7043	0.6276
Austria	0.5929	0.4910
Belgium	0.6802	0.6535
Canada	0.4723	0.5928
Czech Republic	0.1227	0.1228
Denmark	0.4416	0.3223
Estonia	0.3074	0.3417
Finland	0.5679	0.5205
France	0.5561	0.5421
Germany	0.3670	0.4482
Greece	0.5440	0.5929
Hungary	0.1098	0.1302
Iceland	0.6019	0.6235
Ireland	0.5919	0.6815
Israel	0.4462	0.5299
Italy	0.5046	0.3435
Japan	0.5536	0.6011
Korea	0.8640	0.6483
Luxembourg	0.5803	0.4635
Netherlands	0.4038	0.3209
New Zealand	0.4503	0.2376
Norway	0.7408	0.6945
Poland	0.0574	0.0671
Portugal	0.7886	0.7486
Slovak Republic	0.0450	0.1186
Slovenia	0.6788	0.6881
Spain	0.6314	0.6355
Sweden	0.6199	0.5150
Switzerland	0.4725	0.7864
Turkey	0.3837	0.3934
United Kingdom	0.5754	0.5235
United States	0.4620	0.5813

Source: author's computations.

We see that if the test is being run on each country separately, the results do not offer much evidence for the hypothesis either. The null hypothesis is only rejected for Poland (both CITGDP and CITGTR) and the Slovak Republic (only CITGDP) at the 10% significance level with Hungary and the Czech Republic close to the 10% border. These countries' data differ from most of the other countries by its scarcity. Only less than 20 observations are available for each one. However, this is also true for e.g. Portugal, so we should look for an economic reason, why these

countries show more signs of decreasing of the tax burden than the others. A likely explanation might be that these countries were all members of the eastern block of countries under the influence of the Soviet Union and begun their liberalization and membership in the globalized economy much later. The effect of deteriorating tax burden, which might be hidden in slow liberalization of the western countries, might be more visible in the fast liberalization of the eastern countries. As Stepanyan (2003) explains, the Soviet-type tax systems were characterized by a dominance of turnover and enterprise taxes, whereas the reformed tax systems reduced the dominance of CIT and introduced PIT, excises and VAT. Deacon (2000) also states that central eastern European countries suffered from tax evasion, poor tax collection, underfunding of tax administration in the 1990's, which could also have impacted the level of tax burden.

Another simple way of searching for a drift in the data is OLS regression of CITGDP and CITGTR on a time trend and the lagged explained variable as shown in equations 3.3 and 3.4.

$$CITGDP_{i,t} = \alpha + \beta_1 CITGDP_{i,t-1} + \beta_2 t + a_i + u_{i,t} \quad (3.4)$$

$$CITGTR_{i,t} = \alpha + \beta_1 CITGTR_{i,t-1} + \beta_2 t + a_i + u_{i,t} \quad (3.5)$$

where i is a cross-sectional index representing countries in the dataset, t is the year-representing index and a_i is the unobserved or fixed effect (FE).

After we estimate the equation by the FE estimation, then in the CITGDP case, we obtain an estimate of the time trend effect (β_2) of 0.0069 and its robust standard error 0.0017 resulting in a p-value of less than 0.001 and the effect is thus statistically significant at the 1% significance level. The overall R^2 of the regression is reasonably high: 0.8853. The CITGTR case results in an estimate of 0.0094 and related standard error of 0.0063 and p-value of 0.145 and thus we cannot reject the hypothesis that the effect of time trend on CITGTR is statistically different from zero even at a 10% significance level. The R^2 is even higher in this case: 0.8978. The estimated effect of the time trend on CITGDP indicates that there is an increasing trend in the level of tax burden, which is strong evidence against the race to the bottom hypothesis. The estimate of CITGTR shows that there is no statistically significant trend in the evolution of the level of tax burden.

When we estimate the equation by simple OLS for each country (thus effectively merging the fixed effect with the disturbance term), the resulting estimates

of β_2 , the p-value of the corresponding significance test and the R^2 of the regression are summarized in the table 3.2.

Table 3.2: OLS regression for each country

Country	CITGDP			CITGTR		
	Estimate	P-value	R-sq	Estimate	P-value	R-sq
Australia	0.020 ***	0.004	0.829	0.039 **	0.014	0.827
Austria	0.011 ***	0.000	0.674	0.016 ***	0.006	0.593
Belgium	0.006 **	0.041	0.786	0.003	0.580	0.745
Canada	-0.002	0.533	0.605	-0.026	0.301	0.565
Czech Republic	0.011	0.544	0.536	0.022	0.622	0.510
Denmark	0.035 ***	< 0.001	0.830	0.061 ***	< 0.001	0.782
Estonia	-0.002	0.939	0.191	-0.007	0.907	0.173
Finland	0.007	0.363	0.731	0.008	0.626	0.680
France	0.011 ***	0.002	0.519	0.007	0.474	0.268
Germany	-0.003	0.381	0.511	-0.017	0.176	0.577
Greece	0.022 *	0.052	0.901	0.054 **	0.040	0.887
Hungary	0.001	0.953	0.297	0.016	0.698	0.304
Iceland	0.023 ***	< 0.001	0.705	0.053 ***	0.001	0.621
Ireland	0.004	0.300	0.898	0.010	0.545	0.886
Israel	-0.011	0.560	0.305	0.011	0.805	0.320
Italy	0.008	0.178	0.794	0.001	0.915	0.597
Japan	-0.012 **	0.030	0.731	-0.197 ***	< 0.001	0.829
Korea	0.034 **	0.022	0.856	0.088 ***	0.008	0.532
Luxembourg	0.005	0.552	0.670	0.001	0.974	0.367
Netherlands	0.000	0.922	0.641	0.003	0.809	0.650
New Zealand	0.007	0.219	0.688	0.019	0.199	0.861
Norway	0.063 **	0.014	0.888	0.163 **	0.011	0.883
Poland	-0.015	0.210	0.799	-0.013	0.586	0.809
Portugal	0.007	0.994	0.458	0.000	0.994	0.458
Slovak Republic	-0.009	0.526	0.863	0.047	0.216	0.591
Slovenia	-0.031	0.135	0.783	-0.082	0.138	0.787
Spain	0.008	0.233	0.822	-0.003	0.830	0.564
Sweden	0.019 ***	< 0.001	0.787	0.027 ***	0.001	0.766
Switzerland	0.017 **	0.022	0.812	0.008	0.297	0.809
Turkey	0.026 ***	< 0.001	0.806	0.020	0.195	0.526
United Kingdom	0.005	0.425	0.529	0.019	0.253	0.433
United States	-0.007	0.289	0.675	-0.040	0.269	0.651

The reported estimates' p-values result from a heteroskedasticity-robust t test performed on the "year" variable in the above stated regression. The effect of lagged explained variable is statistically significant at the 5% level in every regression except for Estonia. Statistical significance is summarized as follows:

* - significance at 10% significance level; ** - 5% significance level; *** - 1% significance level

Source: author's computations

The decomposition of the regression into several regressions of respective countries' data does not provide strong evidence in support of the hypothesis either. Even the eastern European countries that seemed promising in the previous analysis now lack statistical significance of the effect of the time trend at the 10% significance level. Only supporting evidence for the hypothesis is provided by Japan with a negative estimate of the effect that is also statistically significant at the 5% and 1% significance level for CITGDP and CITGTR regressions respectively. Apart from the globalization hypothesis, the decrease in Japanese corporate income tax burden might also be connected to the effort to remain competitive in the face of the 90's recession or the recent fight against deflation or it may be the result of the Amakudari¹ practice.

Alternatively, we can also try to separate the effect of change in governments' tax burden setting policy following the recent financial crisis. For this purpose, we introduce two new variables into the FE regression – the crisis dummy variable, which equals 1 in the year 2008 and in the following years and an interaction term of the crisis dummy variable and the year variable. Introducing these two variables does not change the outcome of the original estimates significantly. In the CITGDP case, all the variables are statistically significant at the 1% significance level. The estimated effect of the year variable is larger: 0.01 and even larger during the crisis – the interaction term's estimate is 0.089. The crisis variable estimate is drastic: -179.20. In the CITGTR case, the statistical significance of the year variable is improved with the resulting p-value of the t-test of 0.03 and an estimated effect of 0.016. The variables crisis and the interaction term are both statistically significant at the 1% significance level with the respective estimates of -396.833 and 0.197. These results bring us to a conclusion that the crisis lead to a large drop in the effective taxation, but this drop was only of a discrete nature and did not lead to a change of a trend, only to an increase of its amplitude.

Stewart & Webb (2006) also analyze the drift through I(1) process estimation and test the null hypothesis of a zero drift. By repeating this procedure with our data, we receive no cases of a negative drift and therefore again conclude that there is no evidence of a deterioration of the tax burden.

¹ “A Japanese business practice in which senior politicians retire to executive or high-profile positions within the corporate realm. Meaning “descent from heaven,” amakudari as a practice shifts retired bureaucrats to industries related to the public sector work that they retired from, creating a strong bond between private and public sectors.” Source: Investopedia.com

3.3.3 Variables affecting the tax burden

We believe, that there are several more economic aspects that affect the level of aggregate tax burden, and not all of them may be fixed across time as assumed in the regressions in the previous section. These regressions therefore likely suffer from the omitted variable bias. In this part of the paper we assess the hypothesis through more complex regressions including various macroeconomic variables of the countries from our dataset.

Some of these other variables that might affect the level of average tax rate have been used in a similar analysis by Slemrod (2001). These variables are e.g. government expenditure, electricity usage, population, exports and imports and openness.

There is a strong reason to believe that these variables are endogenous in the regression (the direction of causality is uncertain), as e.g. unemployment or tax evasion do not only influence the level of tax burden, but they are also influenced by it. We partially address this problem by using the generalized method of moments with lagged explanatory variables used as instruments (see e.g. Wooldridge, 2010). The actual GMM estimator used in our regressions is the Arellano – Bond linear dynamic panel data GMM estimator introduced by Arellano and Bond (1991), which treats the estimated equation as a system of equations, one equation per each time period. Another important feature of linear dynamic models is that they provide consistent estimates under the presence of unobserved fixed or random effects.

As Roodman (2009a) explains, the Arellano – Bond estimator is originally designed for datasets with large N (number of individuals, i.e. countries in our case) and small T (time, i.e. years), which is not quite the case of our dataset. Higher number of years available for our analysis would have caused overfitting of the model with GMM-type instrumental variables. To deal with this problem, we use the collapsed version of the GMM-type instrumental variables and we thus only apply the number of instruments slightly lower than the total number of individuals as suggested by Roodman (2009b). Postestimation results (See Appendices A and B) however indicate that application of the Arellano – Bond estimator might still not be entirely valid. Although the Sargan² and Hansen tests for overidentifying restrictions indicate that the used instruments are exogenous, the results of the Arellano-Bond test

² The Sargan test is generally not valid for robust standard errors, but it is not affected by the increasing number of instruments used as is the Hansen test. We therefore report the results of both of the tests.

for autocorrelation in the idiosyncratic disturbance term indicate that some of the p-values of AR of order higher than 1 are dangerously close to the generally applied 10% rule-of-thumb³.

Roodman (2009a) suggests the use of fixed effects estimator for panels with large T, because the dynamic panel bias becomes insignificant and the method is much more straightforward. We thus choose to report and discuss both the GMM and the FE results of the estimations.

In our regression, we assume the following model. This assumption is based on several regressions from which this model has emerged as the most sensible one in the meaning of both theory and post-estimation.

$$\begin{aligned} \text{tax burden}_{i,t} = & \alpha + \beta_1 \text{tax burden}_{i,t-1} + \beta_2 \text{tax burden}_{i,t-2} \\ & + \beta_3 \text{average wage}_{i,t} + \beta_4 \text{unemployment}_{i,t} \\ & + \beta_5 \text{gross debt}_{i,t} + \beta_6 \text{net lending}_{i,t} \\ & + \beta_7 \text{outward FDI}_{i,t} + \beta_8 \text{inward FDI}_{i,t} + \mu_1 t \\ & + \mu_2 \text{crisis}_{i,t} + a_i + u_{i,t}, \end{aligned} \quad (3.6)$$

All the variables were exported from the OECD StatExtracts database. The data consist of an unbalanced panel of years up to 2012. The variables with beta coefficients in the equation 3.6 are treated as endogenous to the model in the GMM estimation. The explanatory variables are strongly correlated only in the case of inward and outward FDI and the year and the crisis dummy variable (please see the correlation matrix in the Table 3.3) and we therefore conclude that only minor multicollinearity is present amongst the explanatory variables.

³ Serial correlation in the first-differenced errors at an order higher than 1 would imply that the moment conditions used by the Arellano-Bond estimator are not valid.

Table 3.3: Correlation matrix

	year	crisis	FDI in	FDI out	unem.	wage	lend.	exp.	debt
year	1.00								
crisis	0.76	1.00							
FDI inward	0.07	0.01	1.00						
FDI outward	0.10	0.04	0.64	1.00					
unemployment	-0.09	0.03	-0.04	-0.19	1.00				
average wage	0.20	0.17	0.12	0.39	-0.38	1.00			
net lending	-0.04	-0.21	0.06	0.22	-0.43	0.14	1.00		
exports	0.22	0.16	0.67	0.43	-0.05	-0.05	0.09	1.00	
gross debt	0.09	0.16	-0.20	-0.05	0.19	0.22	-0.36	-0.30	1.00

Source: author’s computations

Please see the Table 3.4 for a summary of the GMM and FE results for both CITGDP and CITGTR regression results. Please also refer to the Appendices A,B and C for the complete results, detailed information, and postestimation results. The reported standard errors are robust to heteroskedasticity.

Table 3.4: Tax burden estimates summary

	CITGDP GMM			CITGDP FE			CITGTR GMM			CITGTR FE	
	Coeff.	P-value		Coeff.	P-value		Coeff.	P-value		Coeff.	P-value
tax burden_L1	1.0696	0.004 ***		0.5842	< 0.001 ***		1.0868	<0.001 ***		0.6120	< 0.001 ***
tax burden_L2	-0.3579	0.077 *		0.0062	0.902		-0.1479	0.449		-0.0140	0.821
year	-0.0095	0.692		-0.0022	0.877		0.0358	0.367		-0.0091	0.798
crisis	-0.1562	0.443		-0.3250	0.004 ***		-0.8094	0.077 *		-0.7515	0.006 ***
average wage	0.0001	0.197		0.0000	0.148		0.0000	0.198		0.0001	0.110
unemployment	-0.0066	0.868		-0.0025	0.877		0.0297	0.631		-0.0231	0.524
gross debt	-0.0040	0.598		0.0105	0.019 **		-0.0065	0.646		0.0190	0.097 *
net lending	0.0099	0.811		0.0673	0.066 *		-0.0639	0.409		0.1387	0.104
FDI inward	0.0195	0.187		-0.0056	0.252		0.0777	0.102		-0.0014	0.907
FDI outward	-0.0327	0.138		0.0294	0.009 ***		-0.0493	0.507		0.0566	0.023 **
exports	-0.0088	0.018 **		-0.0038	0.587		-0.0246	0.028 **		-0.0037	0.834
_cons	18.4983	0.693		3.9541	0.887		-71.5019	0.366		17.0907	0.805

Source: author’s computations

The results again do not indicate any systematic decrease in the tax burden, while holding other above described factors fixed. The effect of the year variable is not statistically significant in any of the regressions even at the 10% significance level. We were thus not able to find evidence to reject the hypothesis that there is zero effect of the time trend on the aggregate level of tax burden. The estimated effect of the crisis dummy variable shows a ceteris paribus decrease in the tax burden

during the crisis. The crisis dummy variable is statistically significant at the 1% significance level in both cases of fixed effects estimation and at the 10% level in the case of CITGTR GMM estimation.

Together with the analysis from previous chapters, we conclude that we were not able to find any significant evidence supporting our first hypothesis: “*There has been a systematic decline in tax burdens over time.*” In the case of GMM and FE regressions, we reject this hypothesis at the 10% significance level.

Another interesting finding is the persistence in the tax burden. The lagged effect of the explained variable (the tax burden) is statistically significant across all the four regressions at the 1% significance level and the estimated effect on the tax burden is 58.42% (CITGDP) and 61.20% (CITGTR) in the fixed effects estimation, which could be interpreted as that about 60% of the previous year tax burden continues directly into the next year holding other factors fixed. The result for the GMM estimation could have a far more interesting interpretation as it ranges from 106.96% to 108.68% in the CITGDP and CITGTR cases respectively. Even if the statistically insignificant effect of year variable had been taken into account, the results would indicate that the tax burden has been gradually increasing over the years holding other factors fixed. We were thus not only able to find some evidence against our first hypothesis, but we were also able to find some evidence of the exact opposite.

The inward FDI flows have not been found statistically significant at the 10% significance level in any of the regressions. The outward FDI flows have been found statistically significant at the 1% and 5% significance level only in the case of the FE estimation. The estimated effect on the tax burden is positive, which seems a bit confusing. In this case we certainly expected that the governments might be trying to attract the fleeing investments with lower tax burden. The estimated effect might thus be one of the shortcomings of the FE estimation – it does not provide consistent estimates when the explanatory variables are endogenous. The estimated effect is likely due to a reverse causality - the higher is the tax burden, the higher should the appetite of investors for foreign capital be. Although countries usually tax all the global revenues of their tax residents, various double tax treaties can assist investors in lowering of the tax rate on interest, dividends, license fees or capital income⁴.

⁴ Compare e.g. tax rate on dividends of 15% in Art. 36 of Czech Income Tax Act and maximum 10% tax rate on dividends according to Art. 10 of the Czech – Dutch Double Tax Treaty (signed March 3, 1974 in Prague)

Gross debt of general government denominated in percentage of GDP has been estimated to increase the level of tax burden only in the FE estimation in both the CITGDP and the CITGTR case. The estimated effect is statistically significant at the 5% and 10% significance level in the CITGDP and CITGTR case respectively. These results indicate that governments that are pressured by higher debt tend to increase the level of tax burden.

Such interpretation is slightly contradicted by the estimated effect of the “net lending” variable (net lending/borrowing of general government as a percentage of GDP) in the FE case. The values of the “net lending” variable go from negative in the case of net borrowing to positive in the case of net lending. The estimated effect is statistically significant only at the 10% significance level in the CITGDP case and is even slightly above the 10% significance level in the CITGTR case. The positive effect can be interpreted as that when a government borrows more money, it also decreases the level of tax burden. The above mentioned shortcoming of FE estimation might have thus again taken place as there might be opposite or no causality.

The only variable that exhibits statistical significance at the 5% level in the GMM regression apart from the lagged dependent variable is the “exports” variable (exports of goods and services denoted as percentage of GDP). The results are however not significant in the FE regression. The estimated effect is negative, which could be interpreted as that higher exports lead to lower tax burden or better as that lower exports lead to a higher tax burden. Konya (2006) found predictive causality between the exports and the GDP in several OECD countries. In the case of a decrease in GDP, governments might feel pressured into increasing the taxes in order to keep their income stable. Another explanation may be the effect of income tax transfer pricing rules and creation of a permanent establishment, which both force the exporting company to tax a substantial part of its income in the foreign jurisdiction. Most of the tax paid in the foreign jurisdiction can be credited against the domestic tax liability in the OECD countries. Under some treaties on avoidance of double taxation, the income from foreign jurisdictions might even be exempt from the domestic tax base.

In this part of analysis, we have found a few results supporting our third hypothesis: “*Convergence in tax burdens is correlated with nations’ economic and social factors.*” Government indebtedness, ratio of outward FDI and the ratio of exports in the economy seem to be the identified factors and we can thus accept the third hypothesis at the previously respective levels of significance. The fact that these results are not robust across the GMM and FE framework brings a certain level of

doubt as to interpretation of these results. Government indebtedness and outward FDI might suffer from endogeneity bias while the exports significance might result from the use of barely valid instruments.

Moreover, we have not found any evidence in support of the first hypothesis: “*There has been a systematic decline in tax burdens over time.*” The GMM regression results even indicate that the opposite might in fact be the case.

3.4 Convergence in Tax Burdens

Although the aggregate tax burden levels might not be decreasing and approaching zero, they might still converge to a single equilibrium or multiple equilibria. In this part of the thesis, we assess the second hypothesis: “*The tax burdens are converging across countries.*” Convergence by itself does not pose such a threat to nations’ budgets as does the “race to the bottom”, but it is an interesting possible impact of globalization and liberalization of trade. Such phenomenon might even be viewed as generally positive. In a homogenous policy environment, the economic agents’ actions would be driven entirely by economic fundamentals and not by governments’ best competitive offer.

3.4.1 Coefficient of Variation

For the convergence analysis, Stewart & Webb (2006) propose using the coefficient of variation (CV): “*The CV at time t is the ratio of the standard deviation of country tax burdens to their average. (Dividing by the mean adjusts the standard deviation for changes in the magnitude of the data over time, an adjustment that uses the same units of measure in the numerator and denominator. ... Since, as we have seen, there is little trend in these averages, this scaling is minor. Thus in essence we are examining the evolution of the standard deviation over time.)*” Since we have already reported both simple and GDP-weighted average in the chapter 3.3.1, we now again report both simple and GDP-weighted CV calculated using GDP-weighted standard deviation.

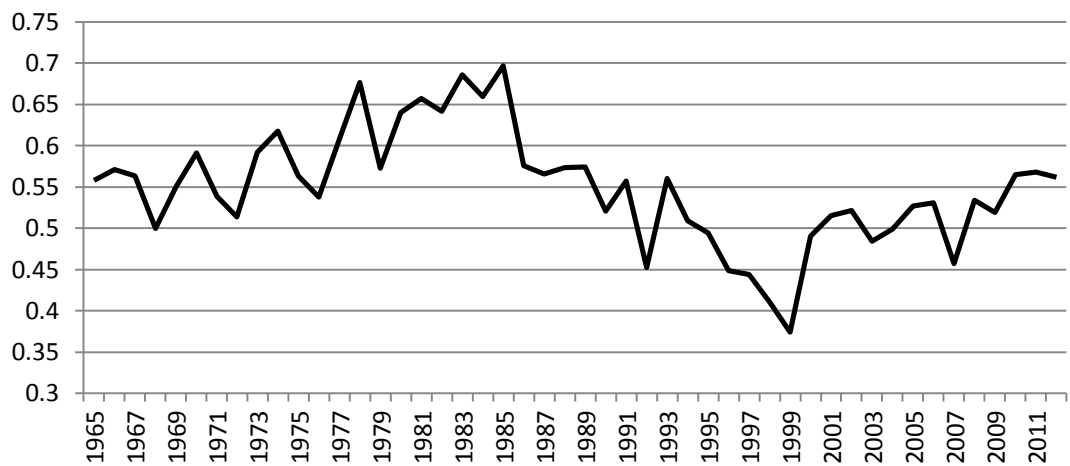


Figure 3.6: CITGDP CV, based on simple average

Source: OECD, author’s computations.

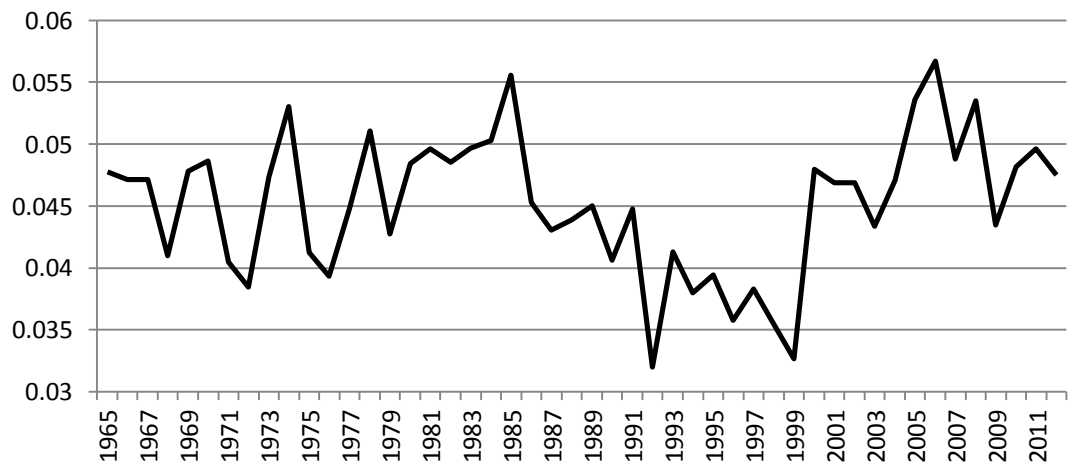


Figure 3.7: CITGTR CV, based on simple average

Source: OECD, author’s computations.

In the above figures, convergence would be manifested as a steady decline in CV, while a steady increase would be a sign of divergence. We can thus conclude from figures 3.6 and 3.7 that there has been a period of volatile convergence amongst the OECD countries in the late 80s and 90s again followed by divergence. Let us now have a look at GDP-standardized data.

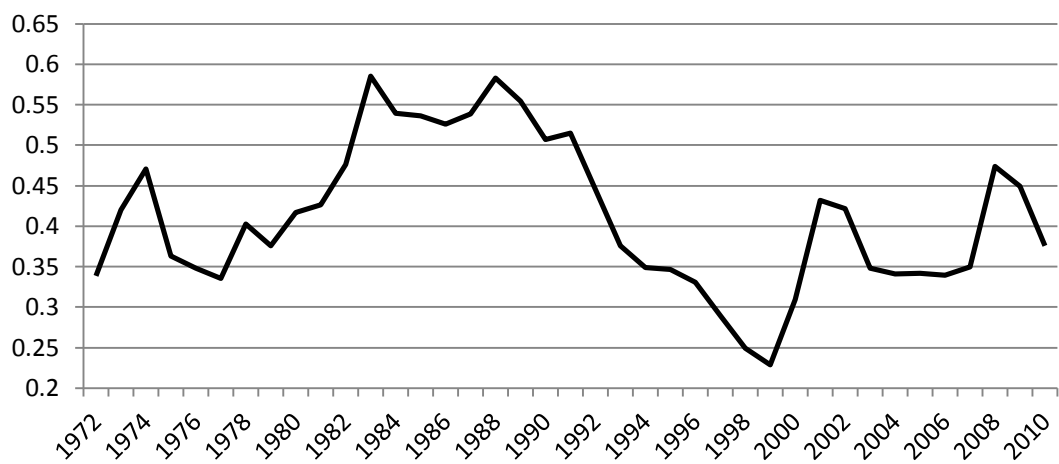


Figure 3.8: CITGDP CV, based on weighted average

Source: OECD, author’s computations.

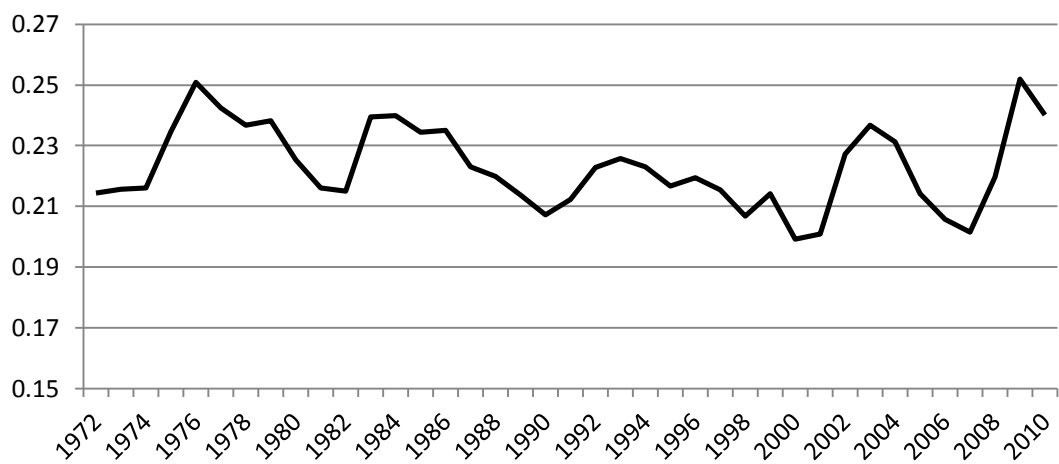


Figure 3.9: CITGTR CV, based on weighted average

Source: OECD, author’s computations.

Figure 3.8 provides a stronger evidence for the late 80s and 90s period of convergence, while Figure 3.9 does not provide any evidence of convergence or divergence. GDP standardization indicates that the development is less volatile than the simple average method.

3.4.2 Long-term correlation

While the levels of countries’ aggregate tax burden might not be steadily decreasing or moving together in the short-run, they might still be moving towards a similar target or multiple future targets. Possible way of capturing such effect of

globalization is to estimate this target and then regress the difference between the target and the actual value at time t on a similar set of regressors as in the part 3.3.3.

Crucial part of the analysis is choosing the right target. Two candidates are at hand – a weighted average across the dataset at time t or – with the benefit of hindsight – a weighted average across the dataset in the year 2011 (2012). Grouping the countries into geographically and economically similar bundles might also be possible, but we already stated that OECD countries are economically similar, at least when compared to the rest of the world. This similarity is strengthened by the fact that we are omitting Mexico and Chile. Grouping therefore seems both redundant and too nonrandom to base a statistical analysis upon.

Due to feasibility and data compatibility reasons, we choose the 2010 weighted average, where GDP has been used as weight. We then take the absolute values of the differences of actual values and the 2010 weighted average (the difference variable) and regress it on a time trend and another variables that we believe might affect the correlation. Generally, estimated negative effect on the explained variable means pressure towards convergence and vice versa. As opposed to the Section 3.3, in this analysis we only apply the FE regression and not the GMM one. There are two reasons: First, theoretically, the problem with endogeneity is much smaller than in the previous analysis. The difference of the tax burden from the 2010 weighted average has little or no effect on the explanatory variables. Second reason is purely practical – we were not able to receive any sensible results when we applied the GMM regression. If we also consider that the Arellano-Bond estimator is generally designed for datasets with small T and large N , FE estimation seems to be the only logical choice. Please see the Table 3.5 for the estimates summary and Appendix E for the detailed regressions results. The reported standard errors are robust to heteroskedasticity.

Table 3.5: Long-term correlation estimates summary

	CITGDP			CITGTR	
	FE			FE	
	Coeff.	p-value		Coeff.	p-value
difference from 2010					
weighted average_L1	0.6237	0.0245 ***		0.6533	< 0.001 ***
year	-0.0053	0.0150		-0.0155	0.633
crisis	-0.0903	0.0893		0.3303	0.166
average_wage	0.0000	0.0000 *		0.0001	0.134
unemployment	0.0202	0.0105 *		0.0467	0.144
debt_gross	0.0046	0.0035		0.0013	0.901
net_lending	0.0622	0.0270 **		0.1087	0.113
FDI_in	N/A	N/A		-0.0423	0.043 **
FDI_out	N/A	N/A		0.0214	0.078 *
_cons	9.2721	29.3317		28.7817	0.649

Source: author’s computations

At the first glance, it is apparent that a certain level of persistence is present in the difference variable. 62.37% of values in the CITGDP and 65.33% in the CITGTR case transfer directly into the next year values provided that other factors are fixed and these results are statistically significant at the 1% significance level in both cases.

In the CITGDP regression, more variables have been estimated to be statistically significant at the 10% significance level than in the CITGTR one. These are average wage (average annual wages in 2012 USD PPPs and 2012 constant prices), unemployment (rate of unemployment as % of civilian labor force) and net lending. Net lending effect estimate is even significant at the 5% significance level. In the CITGTR case, only outward and inward FDI flows (as percentage of GDP) proved statistically significant.

The estimates show that higher wages and unemployment may push CITGDP away from convergence. Wages can be viewed as a proxy to overall development of the job market and thus of the economy as a whole. More developed countries might *ceteris paribus* have the tendency to diverge in their level of tax burdens. Higher unemployment may force the governments to apply discretionary tax policies that disrupt the convergence of the tax burdens across countries. The estimated effect of net lending indicates that governments that borrow more money also converge in their level of tax burdens holding other factors fixed.

The FDI flows were not included in the CITGDP regression as they did not improve it in any way. The results of the CITGTR regression indicate that higher inward FDI push governments towards convergence at the 5% significance level

while outward FDI do the opposite at the 10% significance level. The governments with higher FDI inflows thus *ceteris paribus* seem to be more disciplined in the terms of tax burden convergence than governments with higher FDI outflows.

The center point of this part of our analysis is to estimate the *ceteris paribus* effect the time trend has on the tax burden convergence. In both our regressions, we failed to reject the null hypothesis that the effect of the time trend variable is 0 at the 10% significance level. The effect of the crisis binary variable was also not statistically significant at the 10% significance level. It seems that the crisis has caused a decrease in the corporate tax burden but not convergence or divergence.

In the section 3.4, we were not able to find any supporting evidence for our second hypothesis: “*The tax burdens are converging across countries.*” We were not able to find any evidence of both the short-term and the long-term convergence. Regarding our third hypothesis, “*Convergence in tax burdens is correlated with nations’ economic and social factors.*” the identified economic and social factors are average wage, unemployment, net lending (or rather net borrowing) and the FDI flows. The link, however, seems to be more of a weak nature and none of the estimated effects are robust to changes of the tax burden variable. Moreover, the “difference from the 2010 weighted average” variable is set on a discretionary basis and it is not considered to be a generally applied measure of convergence. The results of this part of our analysis should therefore be interpreted with caution.

4 Qualitative Analysis

In this part of the thesis, we will try to accept or reject our fourth hypothesis: “*There has been a convergence of tax policies across countries.*” To do so, we will need to analyze various laws, rules other legislation related to assessment and collection of the corporate income tax.

4.1 Efforts towards uniformity of CIT

Two main international organizations are sources of international rules, pieces of legislation and their interpretation. The first is the European Union (EU) and the latter is the OECD. The EU acts both as a supranational lawmaker through the European Parliament and the Council of EU and as the interpreter of the law through the European Court of Justice. The main tax domain of the EU is the VAT and tariffs, but it has also issued directives directly or indirectly related to the corporate income tax. 21 of the 34 countries in our dataset (OECD countries) are EU member states and EU legislation thus has a strong impact on the dataset. This EU legislation related to CIT includes namely the Parents-Subsidiary Directive⁵ which allows distribution of dividends from a subsidiary to a parent company to be exempt from withholding tax, the Mergers Directive⁶, the Interest and Royalties Directive⁷ and the Transfer Pricing and the Arbitration Convention⁸. But the impact of the EU on CIT is not limited only to secondary law. Article 107 of the Treaty on the Functioning of the European Union (Lisbon consolidated version) states that any aid granted through State resources

⁵ Council Directive 90/435/EEC of 23 July 1990 on the common system of taxation applicable in the case of parent companies and subsidiaries of different Member States, later amended by Council Directive 2003/123/EC of 22 December 2003

⁶ Council Directive 90/434/EEC of 23 July 1990 on the common system of taxation applicable to mergers, divisions, transfers of assets and exchanges of shares concerning companies of different Member States

⁷ Council Directive 2003/49/EC of 3 June 2003 on a common system of taxation applicable to interest and royalty payments made between associated companies of different Member States

⁸ Convention 90/436/EWG on the elimination of double taxation in connection with the adjustment of transfer of profits between associated undertakings

“...in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings ... shall ... be incompatible with the internal market.”

This article amongst other things prohibits countries from exempting selected companies from the corporate income tax or from artificially and selectively lowering the companies' tax rate or tax base.

The European policies and legislation are interpreted by the European Court of Justice (ECJ). Laule and Weber (2011) provide a list of corporate income tax-relevant cases. Based on their overview, the main rulings of ECJ relate to conformity of country-specific legislation with the basic freedoms of the single market of the EU (free movement of goods, freedom of movement for workers, right of establishment and freedom to provide services and free movement of capital). These freedoms are interpreted widely by the ECJ as free movement of workers may be achieved through similar tax treatment of all workers – nationals or foreigners, residents or non-residents (e.g. ECJ Judgement of 8.5.1990, C175/88 – Biehl or ECJ Judgement of 14.2.1995, C-279/93 – Schumacker) and right of establishment and free movement of capital should manifest in the same taxation rules applied to both domestic and foreign companies and their permanent establishments (e.g. ECJ Judgement of 28.1.1986, 270/83 – Avoir Fiscal or ECJ Judgement of 13.7.1993, C-330/91 – Commerzbank).

OECD on the other hand serves more as a discussion platform and an advisor in corporate taxation. It has published various commentaries and manuals relevant not only to OECD member states, but also to other countries. These include e.g. OECD Manual on Assistance in the Collection of Taxes, OECD Model Tax Convention on Income and on Capital, Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations or the Frascati Manual⁹.

4.2 Selected CIT policies

There are a few tax policies that can be viewed as canonical to the modern countries. These can be divided into two groups – the policies related to the setting of the statutory tax rate and the ones determining the tax base (i.e. the taxable income). In an accountants' perfect world, the corporate income tax base would equal to the accounting earnings before taxes (EBT), the generally accepted accounting principles would be the same across the globe and there would be no exemptions, tax reliefs and discretionary tax rates. Unfortunately, that is never the case. In this part of the thesis

⁹ Proposed Standard Practice for Surveys on Research and Experimental Development

we try to analyze the differences and the possible patterns in differences in the tax rates and the tax base.

4.2.1 Corporate income tax rates

The corporate income tax rate is the center-point of any CIT legislation and it is also usually the subject of the first question of representatives of a company that wishes to expand its operations to different jurisdictions. To make things a little bit more complicated, corporations are usually not only subject to a single income tax rate. In some jurisdictions, progressive tax rates are in place and in most jurisdictions, withholding tax (WHT) rates on dividends, interest and royalties differ from the CIT tax rate. The 2013 corporate income tax rates and the WHT rates on dividends, interest and royalties in the OECD countries are summarized in the table 4.1 below.

Table 4.1: 2013 OECD CIT tax rates comparison

Country	CIT rate	Capital gains	Dividends WHT	Interest WHT	Royalties WHT
Australia	30%	30%	30/0%	10/5/0%	30%
Austria	25%	25%	25%	25/0%	20%
Belgium	33%	33/25/0.4%	25/15/10%	25/15%	25%
Canada	15%	7.5%	25%	25/0%	25%
Chile	20%	35/20%	35%	35%	30/20/15/0%
Czech Republic	19%	19/0%	35/15/0%	35/15/0%	35/15/0%
Denmark	25%	25%	27%	25%	25%
Estonia	21%	21/0%	0%	21/0%	21/10/0%
Finland	24.5%	24.5%	24.5/18.38/0%	24.5%	24.5%
France	33%	33/15/0%	55/30%	50/0%	50/33%
Germany	15%	15%	25%	0%	15%
Greece	26%	20%	10%	33/20/15%	25%
Hungary	19/10%	19/10%	16/0%	16/0%	0%
Iceland	20%	20%	20/18%	20/10%	20%
Ireland	12.5%	33%	20%	20%	20%
Israel	25%	25%	30/25/15/0%	25/15%	25%
Italy	27.5%	27.5/1.375%	20/1.375/0%	20/12.5/20%	30/22.5/0%
Japan	25.5%	25.5%	20%	20/15%	20%
Korea	22%	22%	0%	14%	0%
Luxembourg	21%	21%	15/0%	15/0%	0%
Mexico	30%	30%	0%	30/21/15/10%	30/25/5/0%
Netherlands	25%	25%	15%	0%	0%
New Zealand	28%	0%	30%	15%	15%
Norway	28%	28%	25%	0%	0%
Poland	19%	19%	19%	20%	20%

Portugal	25+1.5+5/3% ¹⁰	25%	25%	25%	25%
Slovak Republic	23%	23%	0%	19%	19%
Slovenia	17%	17%	15%	15%	15%
Spain	30%	30%	21/19%	21/19%	24.75/24%
Sweden	22%	22%	30%	0%	0%
Switzerland	24 to 12%	N/A	35%	35/0%	0%
Turkey	20%	20%	15%	15/10/7/3/0%	20%
United Kingdom	24%	24%	0%	20%	20%
United States	35%	35%	30%	30%	30%

Source: Ernst & Young Worldwide corporate tax guide 2013

One brief look at the tax rates summary gives the impression that there is virtually no convergence in the tax rates. The CIT rates range from 12% in certain Swiss cantons to 35% in the United States. The withholding tax rates differ even more than the CIT rates as there are often various rates for the same type of income and the same country but e.g. a different residency of the receiving entity or different type of the underlying asset from which the income is derived. One interesting fact arising from the summary is that the biggest economies in the dataset except for France, i.e. the United States, Japan, Germany, the United Kingdom, South Korea or Canada seem to have a relatively simple framework of tax rates with lower number of rates and exceptions.

Another interesting fact is that the biggest economy in the world – the USA has the highest corporate income tax rate of 35%. The same rate is applied in e.g. Czech Republic only as a “punishment WHT” on payments to tax havens and countries that do not participate in the intra-governmental exchange of information.

4.2.2 Double taxation treaties

The corporate income tax rate and the withholding income tax rate may also be affected by the treaties on the avoidance of double taxation (the double taxation treaties – DTTs). Through these treaties, the sovereign countries set up new rates divided into different types of income (dividends, interest, royalties), but more importantly, they also set up rules which country is allowed to tax a certain type of income (e.g. income from air transport or income of artists and sportsmen) and which one is not. A typical section of a DTT reads as follows:

¹⁰ Portuguese CIT rate consists of general CIT rate, municipal surcharge of 1.5% and state surcharge of 5% or 3%

“Profits from the operation of ships or aircraft in international traffic shall be taxable only in the Contracting State in which the place of effective management of the enterprise is situated.” (OECD, 2012)

It becomes apparent that signing such treaty may become profitable for one of the contracting countries (in this example a country, in which the effective management of an aircraft operating enterprise is situated), while being completely disadvantageous for the other country (in this example a country with lots of international air traffic, in which no place of effective management of an aircraft operating enterprise is situated). The second country in this example might have various reasons to sign this treaty anyway: Either it believes that the place of effective management of aircraft enterprise may move to a more favorable location, or it believes that signing a DTT will attract investors or it simply engages in a trade-off as it believes that profit from a different provision of the DTT will exceed the loss caused by this provision. Sauvant & Sachs (2009) discovered that in the group of middle and not low-income developing countries, DTTs were effective in attracting of the FDI.

The table 4.2 below provides a summary of the number of DTTs signed between the countries in the dataset (maximum of 33). Moreover, we also provide information whether the country is an EU member state, which effectively forces it to follow the Parents-Subsidiary Directive, the Mergers Directive, the Interest and Royalties Directive and the Transfer Pricing and the Arbitration Convention. For an overview of country-by-country treaties please refer to the Appendix F.

Table 4.2: 2013 number of DTTs summary

Country	Number of DTTs	EU member
Australia	26	no
Austria	31	yes
Belgium	33	yes
Canada	33	no
Chile	16	no
Czech Republic	32	yes
Denmark	32	yes
Estonia	28	yes
Finland	32	yes
France	33	yes
Germany	31	yes
Greece	28	yes
Hungary	31	yes
Iceland	25	no

Ireland	33	yes
Israel	29	no
Italy	32	yes
Japan	26	no
Korea	33	no
Luxembourg	30	yes
Mexico	30	no
Netherlands	32	yes
New Zealand	24	no
Norway	32	no
Poland	33	yes
Portugal	30	yes
Slovak Republic	26	yes
Slovenia	27	yes
Spain	33	yes
Sweden	33	yes
Switzerland	33	no
Turkey	30	no
United Kingdom	33	yes
United States	32	no

Source: Ernst & Young Worldwide corporate tax guide 2013

The above summary and the Appendix F show that the OECD countries are very well connected with the exception of Chile. As of 2013, Chile has only signed DTTs with 16, i.e. less than a half of the OECD countries. What makes Chile unique as compared to the rest of the dataset is its geographic location. Chile is the only South American country that we have analyzed. Chilean culture in connection to the geographic location, perhaps also in relation to its recent joining of the OECD, may be the reason for such a low level of integration with the rest of the OECD countries.

On the other hand, Belgium, Canada, France, Ireland, Korea, Poland, Spain, Sweden, Switzerland and the United Kingdom have signed double taxation treaties with all the remaining OECD countries and the Czech Republic, Denmark, Finland, Italy, Netherlands, Norway and the United States have signed the DTT with all but one of the other OECD countries (the one being mostly Chile). These two groups together represent 17 countries, i.e. an exact half of the dataset. We thus conclude that the cointegration of the OECD countries through DTTs is high with the exception of Chile. Number of DTTs does not seem to be correlated with country's geographical location as countries with both the highest and lowest number of DTTs are located in Europe, Asia and Americas.

4.2.3 Tax loss credit

A company's business during a fiscal year can either result in profit or loss. After these results are adjusted for non-taxable income, tax non-deductible expenses and other discrepancies, they are referred to as the tax base - taxable income or tax loss. The tax loss or negative tax base results in zero effective tax for the respective fiscal year. Such approach is discriminatory for companies engaging in long-term investments, e.g. building a nuclear power plant or researching and testing a new drug.

The reason for such discrimination is simple – the companies' incurred expenses do not have any respective income to offset, while in the future, there will be no expenses to offset the soaring income. Such expense / income mismatching is partially mitigated with accounting methods – release of expenses for fixed assets through depreciation and creation of accruals for future fiscal years. Given the specific nature of the setting of the tax base and its difference from the accounting profit or loss, mismatching can still occur. It is thus plausible to allow companies to carry their tax loss forward to subsequent fiscal years. The tax loss is then credited against the tax base of the respective year. Such practice is usually called the tax loss “carry-forward” and falls within the scope of tax policies affecting the tax base.

Some countries even offer the companies to transfer the tax loss to the previous fiscal year. In that case the previous fiscal year's tax base is adjusted and the resulting difference in tax is returned back to the company. This practice is referred to as the tax loss “carry-back”.

These tax policies are very favorable to the companies and very hazardous for the governments. The effect of business cycles and crises on government budgets is amplified as the governments applying these policies either do not receive the full available income in the good years or lose even more in the bad years. The number of years for which the tax loss can be carried forward can thus differ from country to country. For a summary of application of tax loss credit please refer to the following table.

Table 4.3: 2013 OECD tax loss credit comparison

Country	Carry-back	Carry-forward
Australia	1	Unlimited
Austria	0	Unlimited
Belgium	0	Unlimited
Canada	3	20
Chile	Unlimited	Unlimited
Czech Republic	0	5
Denmark	0	Unlimited
Estonia	0	0
Finland	0	10
France	1	Unlimited
Germany	1	Unlimited
Greece	0	5
Hungary	0	Unlimited
Iceland	0	10
Ireland	1	Unlimited
Israel	0	Unlimited
Italy	0	Unlimited
Japan	1	9
Korea	1	10
Luxembourg	0	Unlimited
Mexico	0	10
Netherlands	1	9
New Zealand	0	Unlimited
Norway	0	Unlimited
Poland	0	5
Portugal	0	5
Slovak Republic	0	7
Slovenia	0	Unlimited
Spain	0	18
Sweden	0	Unlimited
Switzerland	0	7
Turkey	0	5
United Kingdom	1	Unlimited
United States	2	20

Source: Ernst & Young Worldwide corporate tax guide 2013, PwC Taxes at A Glance 2013

From the summary, we can see that the carry-backs are much less common than carry-forwards in the OECD. Interestingly, the carry-backs are a common feature in the most developed countries. 6 out of 7 G7 members present in the dataset – Canada, France, Germany, Japan, the United Kingdom and the USA chose to apply this policy. The remaining countries allowing the carry-backs are Australia, Chile, Ireland, Korea and Netherlands. Only three countries allow companies to carry the

losses back for more than one year – Canada, Chile and the USA. Two possible reasons for allowing of the carry-backs are at hand – either the countries feel economically strong enough to withstand the amplified turbulences or they believe that this policy attracts investors and business.

The carry-forwards are a completely different case. From our dataset, only Estonia has not applied the policy and about the half of our dataset has allowed for unlimited carry-forwards. This policy thus seems preferred by the OECD countries as opposed to the carry-backs and the main reason might simply be government budgeting. A country adopting carry-backs effectively offers to give back funds that it has already received, while in case of carry-forwards, it only limits its future income. Such setting might eventually result in governments giving back more than they receive from the taxpayers (e.g. in a case of crisis affecting most of the nation's companies). Most governments' behavior resembles the "endowment effect" documented in humans and animals (see e.g. Kahneman et al., 1991). The fact that they prefer carry-forwards to carry-backs indicates that they value the income, which they already have at their disposal, more than they value the possible future income.

Similarly to previous chapter, we can thus see a slightly similar approach of the most developed countries, but as opposed to the previous chapter, we have discovered a tax policy that is applied in all but one country in the dataset.

Estonia is considered a pioneer of corporate taxation in both the OECD and Europe. As Funke and Strulik (2006) summarize, in the 2000 Estonian Income Tax Act, Estonia abolished the taxation of corporate income and instead started taxing distribution of profits, i.e. dividends, employee benefits, gifts and donations, expenses on representation and expenses unrelated to business. This effectively means that no retained earnings are taxed. The setting makes many of the generally applied corporate income tax policies obsolete and unnecessary. In the Estonian tax system, there is e.g. no need for depreciation of assets and the uniqueness of the policies goes as far as that the tax period is not one year, as in every other country, but one month (Ernst & Young, 2013). The tax loss carry-forwards and carry-backs are obsolete, because the companies usually pay for their losses from their retained earnings or future retained earnings. The fact that Estonia did not establish these policies thus does not mean that it is opposed to the policies *per se*, but that it chose to adopt a completely different tax regime.

4.2.4 Tax group consolidation

Closely related to the tax loss policies is the policy allowing for the possibility to consolidate the corporate income tax amongst a group of companies. This policy allows a parent company and its subsidiaries to be viewed as a single entity and to file a single tax return.

One company in a group of companies may have taxable income resulting in a tax liability while another one may be in tax loss. The second company may or may not be able to carry the losses back or forward for limited or unlimited number of years, but it may also never be able to offset the losses against a tax liability. We thus arrive at a setting where two exact same businesses operated through two different legal forms (e.g. a single company operating both transport and stocking services or two separate companies operating the respective businesses) have different tax liabilities and such setting may be viewed as unfair. Several countries have thus allowed the domestic companies that are connected through most of the capital or voting rights to file a single tax return. The policy may also be viewed as a logical counterpart to the Substance over Form Doctrine¹¹, which can generally help the tax authorities to assess a higher tax (Everhart, 2013) rather than allow companies to claim lower tax liability during the tax proceedings based on their economic and not their legal structure. The possibility to establish a tax group for corporate income tax purposes¹² amongst the OECD countries is summarized in the following table.

Table 4.4: 2013 OECD group tax consolidation

Country	Tax consolidation
Australia	Yes
Austria	Yes
Belgium	No
Canada	No
Chile	No
Czech Republic	No
Denmark	Yes (compulsory for Danish entities)
Estonia	No
Finland	No, with a possibility of deductible group contributions

¹¹ “Substance over Form Doctrine is the doctrine which allows the tax authorities to ignore the legal form of an arrangement and to look to its actual substance in order to prevent artificial structures from being used for tax avoidance purposes.” Source: definitions.uslegal.com

¹² A tax group may also be created for value added tax, transfer tax or other tax purposes. Our work solely concentrates on the corporate income tax groups.

France	Yes
Germany	Yes
Greece	No
Hungary	No
Iceland	Yes
Ireland	Yes (through group and consortium tax reliefs)
Israel	Yes
Italy	Yes (through group and consortium tax reliefs)
Japan	Yes
Korea	Yes
Luxembourg	Yes
Mexico	Yes
Netherlands	Yes
New Zealand	No, with a possibility of deductible group contributions
Norway	No, with a possibility of deductible group contributions
Poland	Yes
Portugal	Yes
Slovak Republic	No
Slovenia	No
Spain	Yes
Sweden	No, with a possibility of deductible group contributions
Switzerland	No
Turkey	No
United Kingdom	Yes (through group tax reliefs)
United States	Yes

Source: Ernst & Young Worldwide corporate tax guide 2013, PwC Taxes at A Glance 2013

The summary again shows that the OECD countries remain largely divided in the application of this policy. 19 out of the 34 countries in the dataset apply the policy, while the remaining 15 chose not to. 3 of the countries that apply group tax consolidation – Ireland, Italy and the United Kingdom – do so in the form of tax reliefs for the group member with a tax liability and not through the consolidated tax return. 4 of the countries not allowing the tax consolidation – Finland, New Zealand, Norway and Sweden – allow for the transfers between the group members to be tax deductible, provided that they are taxable for the receiving company. The companies have to actually carry out the transfer, book it and report it in their financial statements.

With the exception of Canada, all the G7 countries applied this policy in 2013. In 6 countries with a limited tax loss carry-forward, no group tax consolidation or deduction is possible, which makes them particularly hostile to loss-generating companies. These countries are Canada, the Czech Republic, Greece, the Slovak Republic, Switzerland and Turkey. Estonia is again a unique case. As stated above, it

only taxes capital payments and not all corporate income or profit (Ernst & Young, 2013), as do the other countries. The companies are never in “tax loss” in Estonia. They only either have enough money to pay or they do not and that makes the group consolidation obsolete. Norway, Finland and Sweden seem to have a similar approach to this policy. Denmark is the only country that has made group tax consolidation mandatory for certain domestic companies possibly for administrative purposes.

4.2.5 Research & development tax incentives

Research and development (R&D) is a key component of modern economies as it is also often considered to be the key to staying ahead of the curve. Governments thus have strong incentives to support R&D activities in their country in order to attract the R&D-oriented industries such as pharmaceuticals, energy or automotive and thus support their economies to become bigger, stronger and more efficient.

There are various possibilities of how to support research and development and one of the most widely applied ones are tax credits and/or allowances. (The two terms are sometimes being interchanged in the literature. The difference between a tax credit and a tax allowance, as reported in this thesis, is that the tax allowance is deducted from the tax base while the tax credit is deducted from the final tax. Both the tax allowances and tax credits are sometimes called “tax deductions”.) This policy usually allows companies engaging in R&D activities to deduct a certain amount of expenses related to those activities from their tax base or tax. In some applications, the R&D deduction can be carried forward for a limited number of subsequent taxable periods.

The main advantage of this tax base-related policy is that it is not purely discretionary and it can be established with only a general set of rules. On one hand, the fact that only companies that have achieved taxable income can benefit from the R&D deduction ensures that the incentives are distributed only to profitable companies and a certain level of market clearing is maintained. On the other hand, the respective fact also represents a main downside as the companies engaging in long-term R&D activities that do not directly turn into profit are substantially disadvantaged. The disadvantage can be mitigated with extended carry-forward or carry-back of the deduction. Examples of other R&D related tax support are accelerated depreciation for R&D capital, payroll tax credit, reduction in social security charges (SSC), etc. For a summary of R&D incentives policies of the OECD countries, please refer to the table 4.5 below.

Table 4.5: 2013 OECD R&D incentives summary

Country	Credit	Allowance	Carry-forward	Carry-back	Other
Australia	In force	Abolished	Indefinite	0	
Austria	In force	Abolished	0	0	
Belgium	In force	In force	5 / Indefinite	0	Acc. depr., payroll tax credit
Canada	In force	N/A	20	3	Acc. depr.
Chile	In force	N/A	Indefinite	0	Acc. depr.
Czech Republic	N/A	In force	3	0	
Denmark	Limited	N/A	0	0	Acc. depr.
Estonia	N/A	N/A	N/A	N/A	
Finland	N/A	In force	10	0	
France	In force	N/A	3	0	Acc. depr., SSC reduction
Germany	N/A	N/A	N/A	N/A	Cash grants
Greece	N/A	In force	0	0	
Hungary	In force	In force	0	0	SSC reduction
Iceland	N/A	In force	0	0	
Ireland	In force	N/A	Indefinite	1	
Israel	N/A	N/A	N/A	N/a	Cash grants and reduced tax rates
Italy	In force	N/A	0	0	
Japan	In force	N/A	1	0	
Korea	In force	N/A	5	0	
Luxembourg	N/A	N/A	N/A	N/A	
Mexico	Abolished	N/A	N/A	N/A	Acc. depr.
Netherlands	N/A	In force	9	1	SSC reduction, payroll tax credit
New Zealand	N/A	N/A	N/A	N/A	
Norway	In force	N/A	0	0	
Poland	N/A	Limited	5	0	Acc. depr.
Portugal	In force	N/A	8	0	
Slovak Republic	N/A	In force	3	0	
Slovenia	N/A	In force	5	0	
Spain	In force	N/A	18	0	
Sweden	N/A	N/A	N/A	N/A	
Switzerland	N/A	N/A	N/A	N/A	
Turkey	N/A	In force	Indefinite	0	SSC reduction
United Kingdom	In force	In force	Indefinite	0	Acc. depr.
United States	In force	N/A	20	1	

Source: Deloitte 2013 Global Survey of R&D Tax Incentives, OECD Summary Description of R&D Tax Incentive Schemes for OECD Countries and Selected Economies, 2013

The summary shows that R&D tax incentives are not a generally applied policy across the dataset. Once a tax credit or allowance policy is applied, then the

respective amounts can be carried forward to subsequent taxable periods in most of the OECD countries. Allowing for R&D incentives carry-back is very rare as only Canada, Ireland, Netherlands and the USA have done so. Countries that do not apply the tax R&D incentives, i.e. Estonia, Germany, Luxembourg, Mexico, New Zealand, Sweden and Switzerland represent a heterogeneous group where each member may have a different reason for not opting in. Corporate income is not subject to tax in Estonia, only the distribution of income is. (Ernst & Young, 2013) Germany and Mexico have chosen to support R&D through discretionary tax grants (Deloitte, 2013), etc. Of other R&D supporting tax policies, accelerated tax depreciation seems to be the most favored one.

The R&D tax incentives analysis has thus provided some evidence that countries in our dataset remain significantly divided when adopting some of the tax base policies.

4.2.6 Thin capitalization rules

Structure of company financing is not only important due to the leverage effect and an increase/decrease in the risk of bankruptcy, but also due to the effect that the structure has on taxation. *“The difference occurs because the IRS¹³ treats interest differently than it does earnings going to stockholders. Interest totally escapes corporate taxation, whereas earnings after interest but before corporate taxes (EBT) are taxed at the 35-percent rate.”* (Ross, Westerfield and Jaffe, 2002) The tax shield from debt has the following form:

$$T_c \times r_b \times B \quad (4.1)$$

Where T_c is the corporate tax rate and $r_b \times B$ is the amount of interest denominated in the respective currency.

Governments that are aware of the companies' possibility to use the tax shield from debt try and aim to limit the possibility of its creation. There are several possibilities on how to achieve this goal. Governments can either forbid any debt financing from the parent company to its subsidiary or limit the possibility by debt expense to capital expense ratio or by debt-to-equity ratios. These rules are generally called debt-to-equity rules or thin capitalization rules. Blouin et al. (2014) have found

¹³ Internal Revenue Service - the revenue service of the United States federal government – a US Tax authority

that “... *thin capitalization rules ... have a substantial effect on the capital structure within multinational firms, with implications for the firm’s market valuation.*”

As the interest income is generally taxable, the above becomes a true problem for the governments only if the parent companies of the companies being taxed have their tax domicile in a different country (usually with a significantly lower tax rate). That is why the countries almost always have a separate withholding tax rate for interest income. (Please refer back to the Table 4.1 for a summary of the applied interest income WHT rates.) But these rates are usually substantially lowered or even mitigated by the double taxation treaties. The following table summarizes the application of thin capitalization rules that aim at lowering of the debt shield across our dataset.

Table 4.6: 2013 Thin Capitalization Rules Summary

Country	Thin capitalization rules applied	Interest expense limit
Australia	Limited to foreign related-party debt. Exceptions may apply.	Debt-to-equity ratio 3:1, debt-to-total assets ratio of 75%
Austria	No special rules. Loans can be reclassified as profit distribution by the tax authorities.	
Belgium	Yes	Debt-to-equity ratio 5:1
Canada	Only to interest paid to foreign entities.	Debt-to-equity ratio 1.5:1
Chile	No thin capitalization limit <i>per se</i> . Interest exceeding the limit is taxed with 35% WHT.	Debt-to-equity ratio 3:1
Czech Republic	Yes	Debt-to-equity ratio 4:1 (6:1 for banks and insurance companies)
Denmark	Yes	Debt-to-equity ratio 4:1, asset and EBIT-based rules for groups of companies,
Estonia	No	
Finland	No (to be applied in 2014)	30% of EBIT
France	Yes	Debt-to-equity ratio 3:2, 25% of EBITDA, interest income threshold
Germany	Yes	30% of EBITDA (with the possibility of carryforward)
Greece	Yes	Debt-to-equity ratio 3:1
Hungary	Yes	Debt-to-equity ratio 3:1
Iceland	No	
Ireland	No special rules. Interest payments to nonresident companies may be reclassified as profit distribution.	
Israel	No special rules. Certain enterprises must be at least 30% equity-financed.	
Italy	Yes	30% of EBITDA (with the possibility of carryforward)

Japan	Limited to foreign related-party debt.	Debt-to-equity ratio 3:1
Korea	Limited to foreign related-party debt.	Debt-to-equity ratio 3:1 (6:1 for financial institutions)
Luxembourg	No special rules. Tax authorities may challenge expenses exceeding the limit as an abuse of law.	Debt-to-equity ratio 85:15
Mexico	Yes	Debt-to-equity ratio 3:1
Netherlands	No (abolished in 2013)	
New Zealand	Limited to foreign related-party owned or controlled companies.	Debt-to-assets ratio 60%, interest-bearing debt-to-assets ratio 110% of the entity's group.
Norway	No (authorities may deny interest deduction on a case-by-case basis)	
Poland	Yes	Debt-to-equity ratio 3:1
Portugal	Yes	€ 3 m or 70% of EBITDA (to be decreased by 10% down to 30% in 2017)
Slovak Republic	No	
Slovenia	Yes	Debt-to-equity ratio 4:1
Spain	No (abolished in 2012)	
Sweden	No	
Switzerland	Yes (in most cantons)	Debt-to-equity ratio resulting from maximum indebtedness of assets ranging from 70% to a 100%
Turkey	Yes	Debt-to-equity ratio 3:1
United Kingdom	No (addressed through transfer pricing rules)	
United States	Yes	Debt-to-equity ratio 1.5:1, based on facts and circumstances tests

Source: Ernst & Young Worldwide corporate tax guide 2013, PwC Worldwide Tax Summaries – Corporate Taxes 2013/14.

The summary indicates that the thin capitalization rules are again not applied by every country in the dataset. There are, however, a few similar-policy clusters, which do not seem to have a strong geographical or historical connection. 13 of the 34 countries do not apply the thin capitalization rules as described above. These include Austria, Chile, Estonia, Finland, Iceland, Ireland, Israel, Luxembourg, Netherlands, Norway, Slovak Republic, Sweden and the United Kingdom. The Scandinavian countries with the exception of Denmark generally seem not to apply this rule, although Finland is imposing it in 2014.

Countries that do not apply the thin capitalization rules usually allow their tax authorities to reclassify the interest expense as a distribution of income (i.e. a tax non-deductible expense) if the respective interest significantly exceeds other comparable interest expenses in the market or they apply a steep WHT on interest income, i.e. the thin capitalization rules are applied *ex post*.

Countries that have established the thin capitalization rule usually follow a simple debt-to-equity ratio (mostly 3:1). In this setting, company's equity (time-weighted average equity or value at a given time of a fiscal year) is compared to the amount of its debt (usually only the debt from related parties is considered). The interest related to the debt amount exceeding the 3:1 ratio is then treated as tax non-deductible.

Other applied limits are mostly EBIT, EBITDA or ratio of debt and assets. Germany and Italy compare the value of interest expense and a company's EBITDA. The amount exceeding 30% of EBITDA is then treated as tax non-deductible. The unused EBITDA limit can, however, be carried forward.

Analysis of thin capitalization policy thus again indicates that there is a very low level of cointegration in establishing of the tax base-related policies.

4.2.7 Transfer pricing

Perhaps the largest gaps in the nets of tax collectors are created by incorrect transfer pricing settings. All the greatest corporate income tax scandals of the last few years can be traced back to no or weakly enforced transfer pricing legislation.

Transfer pricing rules, which go hand in hand with the thin capitalization rules are set so that the companies are forced to attribute certain amount of income and/or expenses to the companies in different jurisdictions in order to reflect the underlying economic situation so that all the fees and costs are set at arm's length level, i.e. in a way comparable to similar transactions on the market between unrelated parties. Transfer pricing rules are therefore mostly designed to prevent tax evasion, namely tax evasion through offshore tax havens.

As stated previously, importance of transfer pricing rules can be demonstrated on the recent corporate income tax controversies. For example, the US company Caterpillar paid 55 million dollars to PricewaterhouseCoopers for designing a strategy that shifted 85% or more of its profits to Switzerland, where Caterpillar negotiated an effective corporate income tax rate of 4% to 6%. This shift was accomplished without making any real business changes in Caterpillar's operations (United States Senate, 2014). Such transfer of profits based solely on service and licensing agreements that did not reflect the true business substance of Caterpillar's international activities eventually attracted the authorities.

Strategies similar to that of Caterpillar are being deployed by many other multinational companies, e.g. Starbucks, Google, Microsoft (Bergin, 2012). The

reason, why strategies like “Double Irish with a Dutch Sandwich”¹⁴ are so popular is mostly that they are usually set within the legal boundaries and are therefore considered tax avoidance and not tax evasion. Assessing additional tax based on transfer pricing rules is complicated as it requires well educated tax officials and involves complicated evidencing of the fair market values, prices and rates.

Application of transfer pricing rules is usually connected to the possibility to obtain an advanced pricing agreement (APA)¹⁵. A unilateral advanced pricing ruling is issued by the authorities of a single country. It gives the companies a possibility to receive information of whether a certain transaction meets the transfer pricing rules from the viewpoint of the tax authorities and thus increases the certainty of the taxpayers. Bilateral and multilateral APAs are issued by two or more countries involved in the transactions after they have reached an agreement. The application of transfer pricing rules amongst the countries in our dataset is summarized in the following table.

Table 4.7: 2013 OECD transfer pricing rules summary

Country	Transfer pricing rules	Possibility to obtain APA
Australia	Yes	Yes
Austria	Yes	Yes
Belgium	Yes	Yes
Canada	Yes	Yes
Chile	Yes	No
Czech Republic	Yes	Yes
Denmark	Yes	Yes
Estonia	Yes	No
Finland	Yes	Limited
France	Yes	Yes

¹⁴ “A tax avoidance technique employed by certain large corporations, involving the use of a combination of Irish and Dutch subsidiary companies to shift profits to low or no tax jurisdictions. The double Irish with a Dutch sandwich technique involves sending profits first through one Irish company, then to a Dutch company and finally to a second Irish company headquartered in a tax haven. This technique has allowed certain corporations to dramatically reduce their overall corporate tax rates.” Source: www.investopedia.com

¹⁵ “A decision or ruling issued by the Internal Revenue Service to a taxpayer with regard to a taxation or pricing matter. While determination letters from the IRS usually address transactions that have already occurred, they may also be issued on the tax consequences of proposed transactions, hence the term ‘advance’.” Source: www.investopedia.com

Germany	Yes	Yes
Greece	Yes	Limited
Hungary	Yes	Yes
Iceland	Limited	Limited
Ireland	Yes	Limited
Israel	Yes	Yes
Italy	Yes	Yes
Japan	Yes	Yes
Korea	Yes	Yes
Luxembourg	Yes	Limited
Mexico	Yes	Yes
Netherlands	Yes	Yes
New Zealand	Yes	Yes
Norway	Yes	No
Poland	Yes	Yes
Portugal	Yes	Yes
Slovak Republic	Yes	Limited
Slovenia	Yes	No
Spain	Yes	Yes
Sweden	Yes	Yes
Switzerland	Yes	Only informal
Turkey	Yes	Yes
United Kingdom	Yes	Yes
United States	Yes	Yes

Source: PwC International Transfer Pricing 2013/14

As the summary indicates, all the countries in our dataset have imposed at least a certain level of transfer pricing rules. This is mostly due to the fact that OECD is the main platform of discussion of the transfer pricing rules and the publisher of widely applied OECD Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations. Most of the transfer pricing policies of the countries in the dataset are currently based on these guidelines.

Unfortunately, the summary cannot capture the true nature of the application of the transfer pricing rules as some countries apply them very thoroughly and strictly, while other lack the ability to enforce them due to their complexity. *“In many countries, tax administrations have little capability of developing a “big picture” view of a taxpayer’s global value chain.”* (OECD, 2013)

In this chapter, we have thus found a second policy that is generally applied in our dataset, but we are not able to conclude how well the policy is enforced and the available information and OECD commentary indicates, that there are large differences amongst the countries in this aspect.

4.2.8 Tax policies and tax burden

Based on the previous chapters, we conclude that the fourth hypothesis: “*There has been a convergence of tax policies across countries.*” is rejected with a few exceptions. We have discussed that there are several similarities in tax policies of groups of countries including the three of the Scandinavian countries (Norway, Sweden and Finland), the G7 countries but also the European Union. There are also countries that applied unique or detached approach, i.e. Estonia or Chile. Let us now discuss these conclusions in connection with the actual tax burden variables as presented in the Chapter 2. As stated in the Chapter 3, no data were available for Chile and Mexico and they are thus omitted from this part of the analysis. Moreover, in order to have data of all the remaining countries, we analyze the levels of tax burden variables as of 2011.

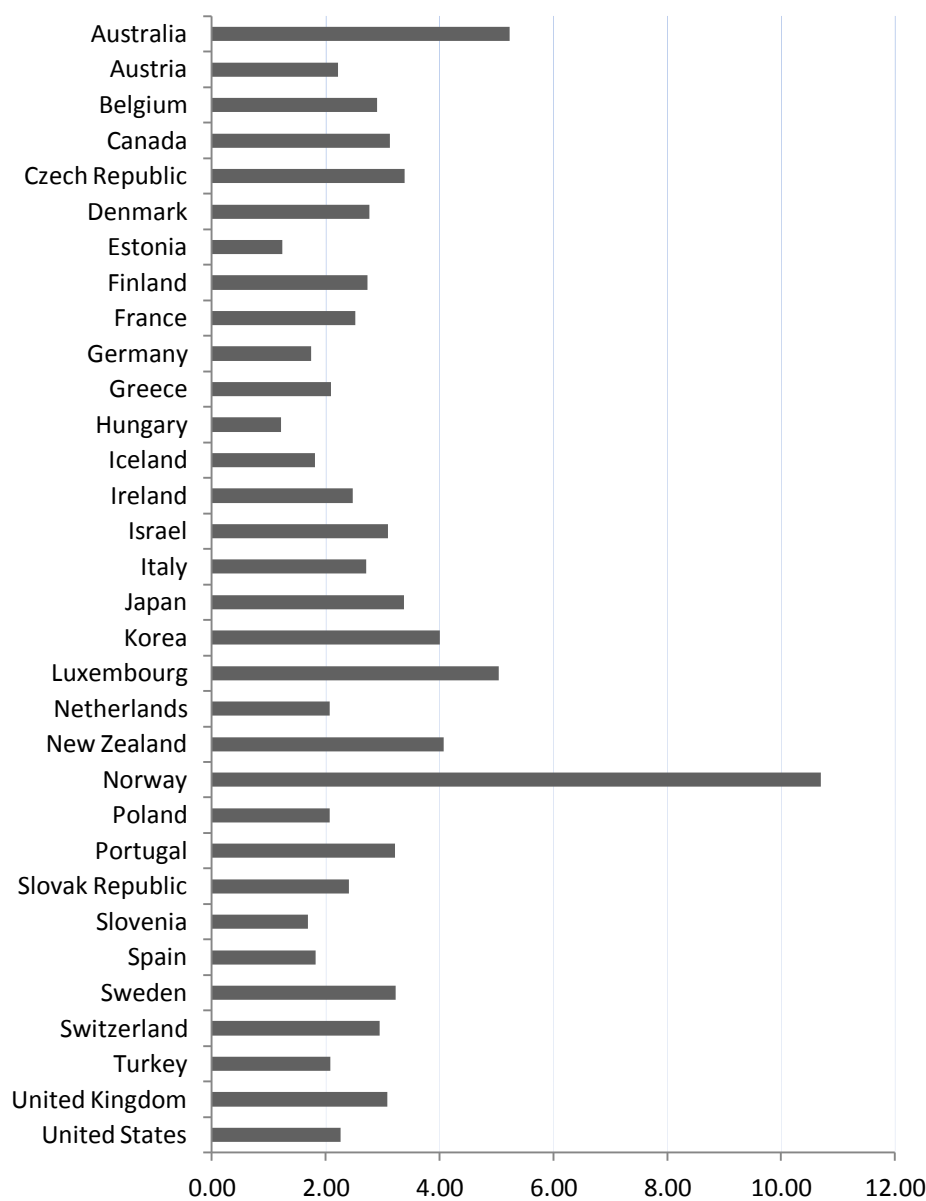


Figure 4.1: 2011 CITGDP %

Source: OECD, author’s computations.

The 2011 simple average CITGDP was 2.98%, median was 2.72%, the first quartile was 2.08% and the third quartile was 3.22%.

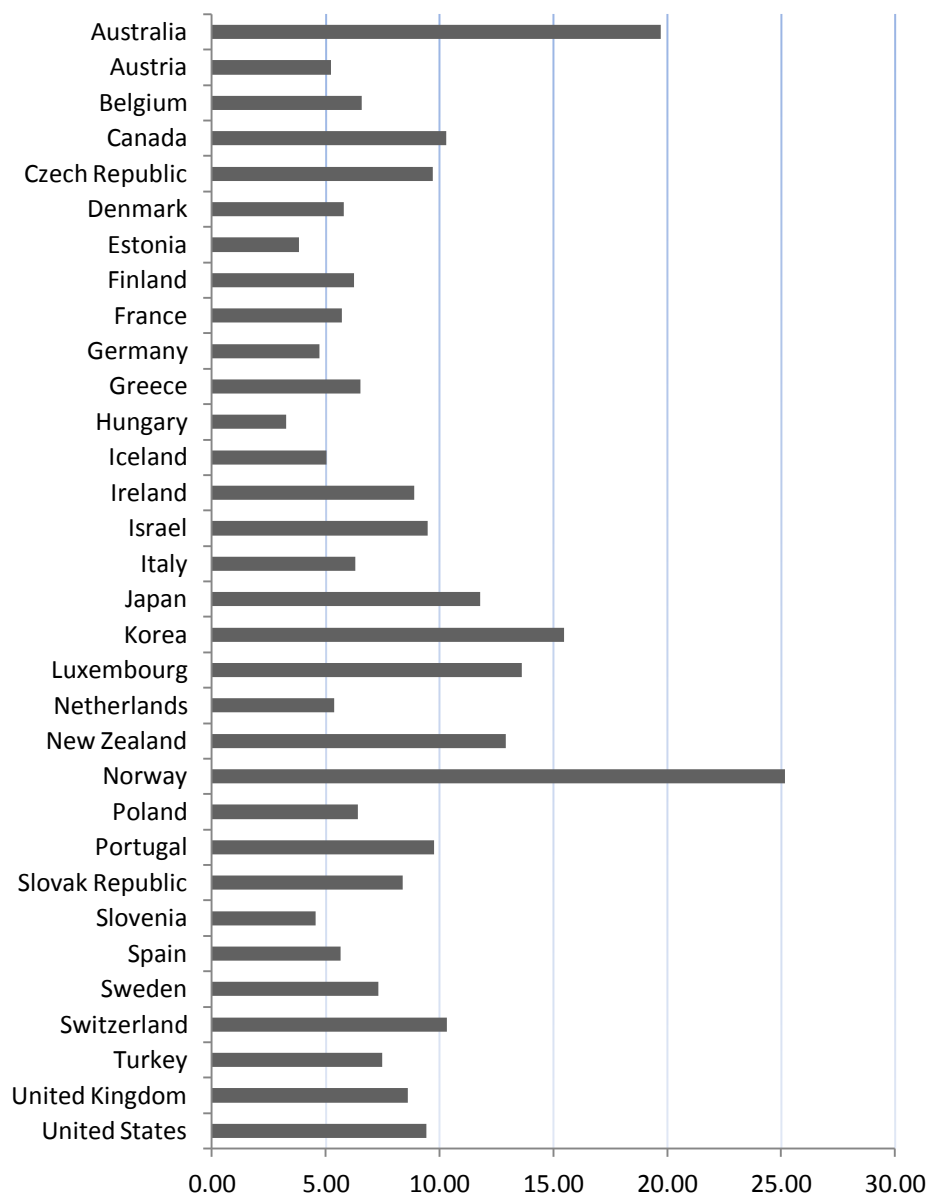


Figure 4.2: 2011 CITGTR %

Source: OECD, author’s computations.

The 2011 simple average CITGTR was 8.74%, median was 7.39%, the first quartile was 5.70% and the third quartile was 9.90%.

As the figures clearly indicate, the corporate income tax burden was by far the highest in Norway with CITGDP of 10.70% and CITGTR of 25.16%. Norway is a country with an above average corporate income tax rate of 28%, unlimited tax loss carry-forward, R&D tax credits policy (with no carry-forwards or carry-backs), no possibility of consolidated CIT returns, no legislation on thin capitalization and double tax treaties with all OECD member states but Slovakia. Otherwise similar

Norway and Finland do not exhibit such a high level of tax burden. Finland's 2011 CITGDP and CITGTR were 2.73% and 6.25% respectively. These values are very close to average or median (mostly slightly below). Sweden's 2011 CITGDP and CITGTR were 3.23% and 7.31%, i.e. mostly slightly above average and median. This leads us to a conclusion that the above average tax burden is country-specific. Norway is the only one of the three Scandinavian countries that is not an EU member state. Norway also has a considerable petroleum production and although "*profits and losses on upstream petroleum activities in other jurisdictions are exempt from Norwegian taxation*", "*a special petroleum tax of 50% applies to income from oil and gas production and from pipeline transportation*". (Ernst & Young, 2013) Norway's recipe to higher corporate income tax income might thus prove very hard to replicate, as it strongly depends on natural resources, which remain profitable even under excessive taxation. The fact that the mining, drilling and gas-transporting companies cannot simply move to a different jurisdiction is the likely explanation of why Norway is not afraid of global tax competition. Such explanation is in contradiction to the findings of Cai & Treisman (2005), who claim that well endowed countries fight harder for capital, i.e. they set their tax burden lower. Another explanation is provided by Görg, Molana, & Montagna (2009), who believe that higher provision of public goods might mitigate the effect of higher corporate income taxes.

The second country with a notably higher corporate income tax burden is Australia with CITGDP of 5.23% and CITGTR of 19.73%. Australia has an above average corporate income tax rate of 30%, one year tax loss carry-backs and unlimited carry-forwards, tax loss credit policy with indefinite carry-forwards, thin capitalization rules in force and the possibility to file a group consolidated CIT return. It has not signed a double taxation avoidance treaty with 6 of the OECD member states. One apparent thing Australia has in common with Norway is that it is rich in natural resources. Australia has also exploited this opportunity through Petroleum Resource Rent Tax of 40% (Ernst & Young, 2013). Both Australia and Norway also exhibited a statistically significant increasing trend in the tax burden in the country-specific OLS regressions as reported above in the Table 3.2. Estimated effect of time was statistically significant at the 1% significance level in the case of Australia and at the 5% significance level in the case of Norway.

Countries, whose corporate income tax burden falls under the first quartile, include Estonia, Germany, Hungary, Iceland, Netherlands, Slovenia and Spain. Poland is only in the first quartile of CITGDP while Austria is only in the first quartile of CITGTR. With the exception of Iceland, these are all EU member states.

Otherwise there is no similarity in the applied tax policies as e.g. tax rates range from 15% in Germany to 30% in Spain. For some reason these countries seem to tax companies less extensively than the rest of the OECD countries and one of the possible explanations is tax competition.

Estonian exceptional corporate income tax regime, as described at the end of Chapter 4.2.3 does not seem to be paying off as well as the Estonian authorities probably had hoped when implementing it. The Figure 4.3 shows that introduction of the new Income Tax Act in 2000 lead to a 50% drop of tax burden from which from which the country started recovering two years later. Since then Estonia still has not started significantly outperforming neither the rest of the OECD countries nor its own CIT tax burden of years prior to 2000.

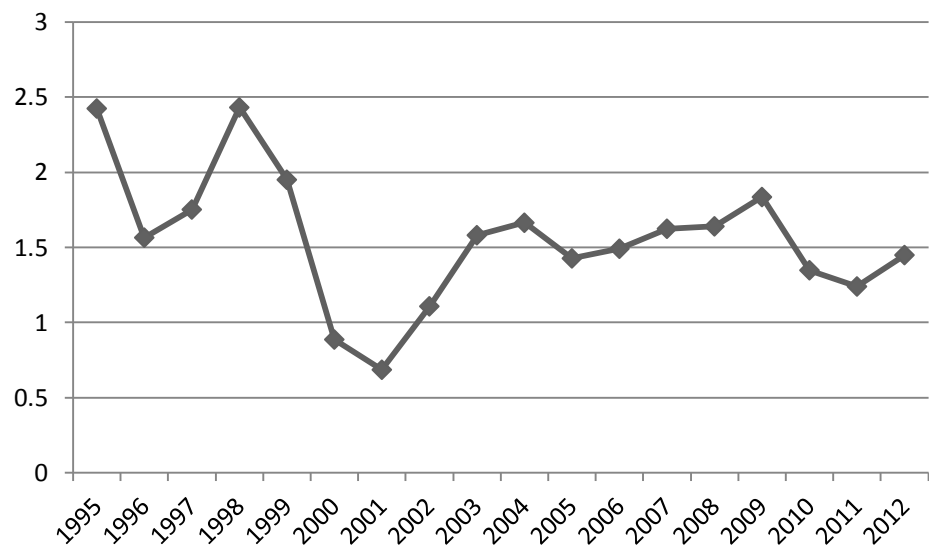


Figure 4.3: Estonian CITGDP, %

Source: OECD

Even though the income from the corporate income tax may have been very low in some of the countries, they may still profit from this situation. The following figure summarizes the structure of tax income in the OECD countries.

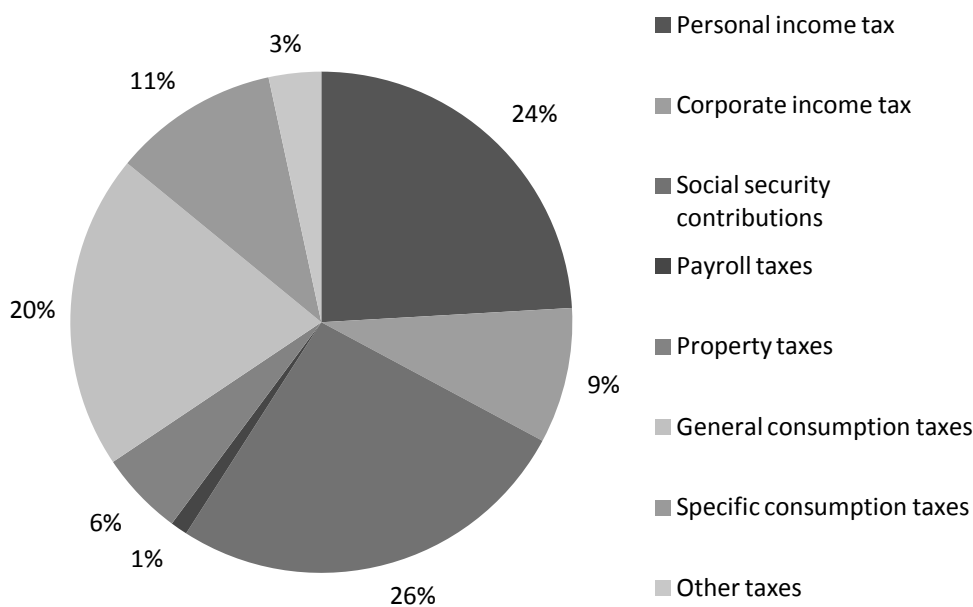


Figure 4.4: 2011 tax structures in the OECD area

Source: OECD

Corporate income tax on average represents less than 10% of the revenues of the OECD countries, while personal income tax and social security contributions together represent more than 50% of the revenues. Consumption taxes on average represent more than 30% of the OECD countries' tax revenues. It may thus be profitable for countries to attract businesses that attract jobs and consumption by lowering of corporate income taxes, especially during recessions when unemployment increases and people are less willing change their job for a chance of job in a foreign country.

The future of corporate income tax policies in the OECD is currently being proposed in the OECD Action Plan on Base Erosion and Profit Shifting (BEPS)¹⁶. Discussion resulting from the BEPS may lead to increased cointegration and cooperation in governments' corporate income tax policies.

¹⁶ The BEPS Plan is summarized by OECD (2013) in 15 points. These points include the following:

*“Address the challenges of the digital economy;
neutralise the effects of hybrid mismatch agreements;
strengthen controlled foreign company rules;
limit base erosion via interest deductions and other financial payments;
counter harmful tax practices more effectively, taking into account transparency and substance;
prevent treaty abuse;
prevent the artificial avoidance of permanent establishment status;
assure that transfer pricing outcomes are in line with value creation: intangibles, risks and capital,
other high-risk transactions;
establish methodologies to collect and analyse data on BEPS and the actions to address it;
require tax payers to disclose their aggressive tax planning arrangements;
re-examine transfer pricing documentation;
make dispute resolution mechanism more effective; develop a multilateral instrument”*

5 Conclusion

In the previous chapters, we have discussed the possible negative effect of globalization and diminishing control of national tax authorities on the countries' corporate tax income and the possible positive effect of shift towards uniformity of CIT legislation and thus higher transparency for the (potential) tax payers.

In the quantitative analysis part of the thesis, we have applied descriptive analysis and various econometric methods, namely Arellano-Bond general method of moments estimator and the fixed effects estimator on OECD panel data, but we were not able to find any evidence supporting the “race to the bottom” hypothesis of decrease of government tax income. Such results are in support of results of Stewart & Webb (2006), who have designed the explanatory variables discussed in our analysis, i.e. the ratio of corporate income tax government income to GDP or to general government tax revenue. In some cases, we have even found pieces of evidence supporting the contradictory hypothesis of gradual increase in the corporate income tax burden. Such hypothesis may be explained e.g. by the fact that multinational companies still, despite the existence of double taxation treaties, often face double taxation of their income. It is important to say that although we were operating under an assumption that countries and companies became generally more globalized as time has passed, we cannot completely reject the hypothesis that globalization has an effect of pushing effective income tax rates down. The effect might just have been offset by other effects correlated with time.

We found that countries with the highest levels of corporate income tax burden that also exhibit an increasing trend are the ones rich in natural resources that have imposed additional taxes on acquisition and transportation of these resources.

We have identified several factors affecting the level of tax burden. The recent financial economic crisis and recession has caused an expected decline in the corporate tax income. In the Arellano-Bond estimation, we also found evidence of connection between an increase in the ratio of exports in the economy and a decrease in the tax burden. The Arellano-Bond estimation might not be the best choice given the structure of the dataset, but on the other hand it is applicable even with endogenous regressors. In the FE estimation, we also found evidence of an increasing effect of an increase in government indebtedness and FDI outflows, although these results may suffer from inconsistency due to endogeneity.

In addition to systematic deterioration of the corporate income tax burden, we have also evaluated the possibility of its convergence across countries in time. Again we were not able to find any evidence of convergence, which also speaks in support of the results of Stewart & Webb (2006).

In the qualitative analysis part the thesis, we have discussed corporate income tax rate setting, connection through treaties on avoidance of double taxation and various corporate income tax base-related policies and how these are applied in the OECD countries. The applied policies differ substantially across the dataset with a few notable similarities amongst the most developed countries or Scandinavian countries and a notable uniqueness of Estonian corporate income tax policy and Chilean relations to other OECD countries. Only the transfer pricing legislation and the tax loss carry-forward policy are applied almost unilaterally in the OECD only with differences to practical aspects of the application.

Overall, we conclude that although the world is getting significantly more and more globalized, it has had a very little effect on the corporate income tax income of the OECD countries, which is neither deteriorating nor converging. The specific corporate income tax policies exhibit a certain level of standardization, but the differences are still substantial and no two OECD countries apply the exact same policies. However, a window of opportunity to change this has opened as all the OECD countries are currently discussing BEPS, increasingly recognizing the ability of globalized companies to optimize their tax liability through international transactions and proposing ways to tackle this optimization through similar policies, international cooperation, mutual international help and exchange of information.

In the future work in the area of corporate income tax burden, better results may be achieved by extending the dataset for the non-OECD countries, which would not only increase the amount of information, but would also provide better basis for the usage of Arellano-Bond GMM estimator. More variables could also be tested to have an impact on the level of tax burden. Deeper attention should be given to the possibility of gradual increase in the corporate tax burden and to the lack of convergence in both tax burden and corporate income tax policies. A hypothesis of whether some countries are giving up their corporate income tax income in order to receive higher income from personal income tax and consumption taxes should also be evaluated.

Bibliography

- Arellano, M. & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, 58, 277–297.
- Avi-Yonah, R. S. (2000). Globalization, tax competition, and the fiscal crisis of the welfare state. *Harvard Law Review*, 1573-1676.
- Bénassy-Quéré, A., Goyalraja, N., & Trannoy, A. (2007). Tax and public input competition. *Economic Policy*, 22(50), 385-430.
- Bergin, T. (2012) Special Report: How Starbucks avoids UK taxes. *Reuters*. Retrieved June 2014 from <http://www.reuters.com/article/2012/10/15/us-britain-starbucks-tax-idUSBRE89E0EX20121015>
- Blouin, J., Huizinga, H., Laeven, M. L., & Nicodème, G. (2014) Thin capitalization rules and multinational firm capital structure. *IMF Working Paper*, No. 14/12. International Monetary Fund.
- Cai, H., & Treisman, D. (2005). Does competition for capital discipline governments? Decentralization, globalization, and public policy. *The American Economic Review*, 95(3), 817-830.
- Cerny, P. G. (2010). The competition state today: from raison d'État to raison du Monde. *Policy studies*, 31(1), 5-21.
- Deacon, B. (2000). Eastern European welfare states: the impact of the politics of globalization. *Journal of European Social Policy* 10.2: 146-161.
- Deloitte (2013). *2013 Global Survey of R&D Tax Incentives*, March 2013
- Devereux, M. P., & Sørensen, P. B. (2006). The corporate income tax: international trends and options for fundamental reform. *European Economy*, No. 264. Brussels: European Commission, Directorate-General for Economic and Financial Affairs.

- Dreher, A. (2006). The influence of globalization on taxes and social policy: An empirical analysis for OECD countries. *European Journal of Political Economy*, 22(1), 179-201.
- Ernst & Young (2013). *Worldwide Corporate Tax Guide 2013*, March 2013
- Everhart, J. R. (2013) Substance Over Form: An Alternate Tax Doctrine Approach to Reduce the Tax Revenue Losses Caused by the Misclassification of Employees as Independent Contractors in the Financial Services Industry. July 21, 2013. Available at SSRN: <http://ssrn.com/abstract=2296626>
- Feld, L. P., & Reulier, E. (2009). Strategic tax competition in Switzerland: Evidence from a panel of the Swiss cantons. *German Economic Review*, 10(1), 91-114.
- Fuest, C. (2008). The European Commission's proposal for a common consolidated corporate tax base. *Oxford Review of Economic Policy*, 24(4), 720-739.
- Funke, M. & Strulik, H. (2006). Taxation, Growth and Welfare: Dynamic Effects of Estonia's 2000 Income Tax Act. *Finnish Economic Papers*, vol. 19(1), pages 25-38, Spring.
- Genschel, P., & Schwarz, P. (2012). Tax competition and fiscal democracy. *TranState working papers*, No. 161
- Genschel, P. & Seelkopf, L. (2012). Did the Competition State Rise? Globalization, International Tax Competition, and National Welfare. August 30, 2012. Available at SSRN: <http://ssrn.com/abstract=2138848>
- Görg, H., Molana, H., & Montagna, C. (2009). Foreign direct investment, tax competition and social expenditure. *International Review of Economics & Finance*, 18(1), 31-37.
- Hibbs, D. A., & Piculescu, V. (2010). Tax Toleration and Tax Compliance: How Government Affects the Propensity of Firms to Enter the Unofficial Economy. *American Journal of Political Science*, 54(1), 18-33.
- Hicks, A. M., & Swank, D. H. (1992). Politics, institutions, and welfare spending in industrialized democracies, 1960-82. *The American Political Science Review*, 658-674.
- Hong, Q., & Smart, M. (2010). In praise of tax havens: International tax planning and foreign direct investment. *European Economic Review*, 54(1), 82-95.

- Ivanyina, M. (2007). Tax Competition and Governmental Efficiency. *Faculty of Social Sciences, Eotvos Lorand University Working Papers*, (20).
- Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1991). Anomalies: The endowment effect, loss aversion, and status quo bias. *The journal of economic perspectives*, 5(1), 193-206.
- Karkalakos, S. & Makris, M. (2008). Capital Tax Competition in the European Union: Theory and Evidence from Two Natural Experiments, *MPRA Working Paper*, No. 21437. Munich.
- Kinoshita, Y., & Campos, N. F. (2003). Why does FDI go where it goes? New evidence from the transitional economies. *William Davidson Institute Working Paper*, 573
- Konya, L. (2006). Exports and growth: Granger causality analysis on OECD countries with a panel data approach. *Economic Modelling*, 23(6), 978-992.
- Kotsogiannis, C., & Serfes, K. (2010). Public Goods and Tax Competition in a Two-Sided Market. *Journal of Public Economic Theory*, 12(2), 281-321.
- Laule, G., & Weber, R. (2011). Harmonisation of the Tax Systems in Europe Judgements of the European Court of Justice. Available at: http://www.whitecase.com/files/Publication/9cab222c-8616-4116-a384-867ae59533dc/Presentation/PublicationAttachment/96e6413b-9ce1-404e-8969-8e00250438eb/tax_harmony_english.pdf
- Li, Q. (2006). Democracy, Autocracy, and Tax Incentives to Foreign Direct Investors: A Cross-National Analysis. *Journal of Politics*, 68(1), 62-74.
- Mas-Colell, M. D. Whinston & J. R. Green (1995). *Microeconomic Theory*. New York: Oxford University Press
- Neumann, R., Holman, J., & Alm, J. (2009). Globalization and tax policy. *The North American Journal of Economics and Finance*, 20(2), 193-211.
- Nicodème, G. (2007). Corporate tax competition and coordination in the European Union: what do we know? Where do we stand? In Read, C. & Gregoriou, G. N. (Eds.), *International taxation handbook* (pp. 171-208). Elsevier, London., chap. 8.

-
- OECD (2012). *Model Tax Convention on Income and on Capital 2010: Full Version*. OECD Publishing.
- OECD (2013). *Action Plan on Base Erosion and Profit Shifting*. OECD Publishing.
- Onaran, O., Boesch, V., & Leibrecht, M. (2012). How does globalization affect the implicit tax rates on labor income, capital income, and consumption in the European Union?. *Economic inquiry*, 50(4), 880-904.
- Picciotto, S. (2007). The International Crisis of Income Taxation: Combating Tax Havens, Capital Flight and Corruption. *15th Commonwealth Law Conference*.
- Roodman, D. (2009a). How to do xtabond2: An introduction to difference and system GMM in Stata. *Stata Journal*, 9(1), 86.
- Roodman, D. (2009b). A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics*, 71(1), 135-158.
- Romer, C. D., & Romer, D. H. (2009). Do tax cuts starve the beast: The effect of tax changes on government spending. *Brookings Papers on Economic Activity*, vol. 40(1), pages 139-214. The Brookings Institution.
- Romer, C. D., & Romer, D. H. (2010). The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks, *American Economic Review*, vol. 100(3), pages 763-801, June. American Economic Association.
- Ross, S. A., Westerfield, R. W., Jaffe, J., & Jordan, B. D. (2002). *Corporate finance: 6th* (6th Edition). McGraw-Hill.
- Ruiz, F. & Gerard, M. (2008). Is there evidence of strategic corporate tax interaction among EU countries. *MPRA Paper 10094*, University Library of Munich, Germany.
- Sauvant, K. P., & Sachs, L. E. (Eds.). (2009). *The effect of treaties on foreign direct investment: Bilateral investment treaties, double taxation treaties, and investment flows*. Oxford University Press.
- Scharf, K. A. (2001). International capital tax evasion and the foreign tax credit puzzle. *Canadian Journal of Economics/Revue canadienne d'économie*, 34(2), 465-480.

-
- Scharpf, F. W., & Schmidt, V. A. (Eds.). (2000). *Welfare and work in the open economy: volume ii: diverse responses to common challenges in twelve countries*, Vol. 2. Oxford University Press.
- Slemrod, J. (2004). Are corporate tax rates, or countries, converging?. *Journal of Public Economics*, 88.6: 1169-1186.
- Stepanyan, Vahram, (2003), Reforming Tax Systems: Experience of the Baltics, Russia, and Other Countries of the Former Soviet Union, *IMF Working Papers*, No 03/173, International Monetary Fund
- Stewart, K. & M. Webb (2006): International competition in corporate taxation: evidence from the OECD time series. *Economic policy*, Vol. 21, Issue 45, pp. 153-201.
- Tanzi, V. (1996). Globalization, Tax Competition and the Future of Tax Systems. *IMF Working Paper*, No. 96/141. Available at SSRN: <http://ssrn.com/abstract=883038>
- United States Senate (2014). Caterpillar's Offshore Tax Strategy. *Majority Staff Report of the Permanent Subcommittee on Investigations*.
- Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. MIT press. 2nd ed. ISBN: 978-0-262-23258-6

Appendix A: CITGDP GMM estimates

CITGDP Dynamic panel-data estimation, two-step system GMM						
			Number of observations		388	
			Number of groups		29	
			Obs. per group	min	4	
				avg	13.38	
				max	18	
Number of instruments		27	Wald chi2(11)		594.38	
			Overall p-value		< 0.001	
Variable	Coefficient	Std. Err.	z	P-value	Signif.	95% Conf. Interval
CITGDP_L1	1.0696	0.3685	2.90	0.004	***	0.4838 0.7253
CITGDP_L2	-0.3579	0.2027	-1.77	0.077	*	-0.0058 0.0311
year	-0.0095	0.0239	-0.40	0.692		-0.0069 0.0179
crisis	-0.1562	0.2037	-0.77	0.443		0.0000 0.0001
average_wage	0.0001	0.0000	1.29	0.197		-0.0507 0.0035
unemployment	-0.0066	0.0398	-0.17	0.868		0.0016 0.0172
debt_gross	-0.0040	0.0076	-0.53	0.598		0.0203 0.1892
net_lending	0.0099	0.0414	0.24	0.811		-0.1212 -0.0143
FDIin	0.0195	0.0148	1.32	0.187		-0.0393 0.0258
FDIout	-0.0327	0.0221	-1.48	0.138		-0.0003 0.0000
exports	-0.0088	0.0037	-2.37	0.018	**	-0.0003 0.0000
_cons	18.4983	46.9146	0.39	0.693		-51.0666 76.0322

* - significant at 10% signif. level, ** - 5% signif. level, *** - 1% signif. level,L1 - lag

Instruments for first differences equation

Standard
First differences in year, crisis
GMM-type (missing value = 0, collapsed)
Lags 3 and 4 of CITGDP
Lags 2 and 3 of employment, average_wage, unemployment, debt_gross, net_lending, FDIin, FDIout, employment

Instruments for levels equation

Standard
year, crisis, _cons
GMM-type (missing value = 0, collapsed)
First difference in lag 2 of CITGDP
First difference in lag 1 of employment, average_wage, unemployment, debt_gross, net_lending, FDIin, FDIout, employment

Arellano-Bond test for AR in first differences

Order	z	p-value
AR(1)	-1.79	0.074
AR(2)	1.58	0.114
AR(3)	-1.45	0.148
AR(4)	0.48	0.629
AR(5)	0.53	0.594

Sargan test for overidentifying restrictions

chi2(15) = 10.27
p-value = 0.802

Hansen test for overidentifying restrictions

chi2(15) = 12.84
p-value = 0.615

Appendix B: CITGTR GMM estimates

CITGTR Dynamic panel-data estimation, two-step system GMM							
				Number of observations		388	
				Number of groups		29	
				Obs. per group	min	4	
					avg	13.38	
					max	18	
Number of instruments		27		Wald chi2(11)		376.55	
				Overall p-value		< 0.001	
Variable	Coefficient	Std. Err.	z	P-value	Signif.	95% Conf. Interval	
CITGDP_L1	1.0868	0.2140	5.08	<0.001	***	0.6673	1.5063
CITGDP_L2	-0.1479	0.1954	-0.76	0.449		-0.5309	0.2351
year	0.0358	0.0397	0.90	0.367		-0.0420	0.1135
crisis	-0.8094	0.4571	-1.77	0.077	*	-1.7052	0.0864
average_wage	0.0000	0.0000	1.29	0.198		0.0000	0.0001
unemployment	0.0297	0.0617	0.48	0.631		-0.0913	0.1506
debt_gross	-0.0065	0.0141	-0.46	0.646		-0.0341	0.0212
net_lending	-0.0639	0.0775	-0.83	0.409		-0.2158	0.0879
FDIin	0.0777	0.0475	1.63	0.102		-0.0155	0.1708
FDIout	-0.0493	0.0743	-0.66	0.507		-0.1950	0.0964
exports	-0.0246	0.0112	-2.20	0.028	**	-0.0465	-0.0027
_cons	-71.5019	79.1279	-0.90	0.366		-226.5898	83.5861

* - significant at 10% signif. level, ** - 5% signif. level, *** - 1% signif. level,L1 - lag

Instruments for first differences equation

Standard
First differences in year, crisis
GMM-type (missing value = 0, collapsed)
Lags 4 and 5 of CITGTR
Lags 4 and 5 of employment, average_wage, unemployment, debt_gross, net_lending, FDIin, FDIout, employment

Instruments for levels equation

Standard
year, crisis, _cons
GMM-type (missing value = 0, collapsed)
First difference in lag 3 of CITGTR
First difference in lag 3 of employment, average_wage, unemployment, debt_gross, net_lending, FDIin, FDIout, employment

Arellano-Bond test for AR in first differences

Order	z	p-value
AR(1)	-1.87	0.062
AR(2)	0.88	0.379
AR(3)	-1.42	0.155
AR(4)	0.68	0.500
AR(5)	0.65	0.518

Sargan test for overidentifying restrictions

chi2(15) = 12.31
p-value = 0.655

Hansen test for overidentifying restrictions

chi2(15) = 15.73
p-value = 0.400

Appendix C: Tax Burden FE estimates

CITGDP Fixed-effects (within) regression								
R-sq:	within	=	0.682	Number of observations		388		
	between	=	0.673	Number of groups		29		
	overall	=	0.693	Obs. per group	min	4		
					avg	13.40		
max					18			
corr (u_i, Xb) =	-0.0384			F(11,28)		94.72		
						Overall p-value		< 0.0001
Variable	Coefficient	Std. Err.	t	P-value	Signif.	95% Conf. Interval		
CITGDP_L1	0.5842	0.0526	11.10	< 0.001	***	0.4764	0.6920	
CITGDP_L2	0.0062	0.0499	0.12	0.902		-0.0960	0.1084	
year	-0.0022	0.0142	-0.16	0.877		-0.0312	0.0268	
crisis	-0.3250	0.1036	-3.14	0.004	***	-0.5372	-0.1129	
average_wage	0.0000	0.0000	1.49	0.148		0.0000	0.0001	
unemployment	-0.0025	0.0160	-0.16	0.877		-0.0353	0.0303	
debt_gross	0.0105	0.0042	2.48	0.019	**	0.0018	0.0192	
net_lending	0.0673	0.0352	1.91	0.066	*	-0.0049	0.1395	
FDIin	-0.0056	0.0048	-1.17	0.252		-0.0153	0.0042	
FDIout	0.0294	0.0104	2.83	0.009	***	0.0081	0.0508	
exports	-0.0038	0.0069	-0.55	0.587		-0.0180	0.0104	
_cons	3.9541	27.5597	0.14	0.887		-52.4994	60.4076	
* - significant at 10% signif. level, ** - 5% signif. level, *** - 1% signif. level,L1 - lag								
sigma_u	0.7688							
sigma_e	0.4766							
rho	0.7224 (fraction of variance due to u_i)							

CITGDP Fixed-effects (within) regression								
R-sq:	within	=	0.658	Number of observations		388		
	between	=	0.726	Number of groups		29		
	overall	=	0.711	Obs. per group	min	4		
					avg	13.40		
max					18			
corr (u_i, Xb) =	0.0543		F(11,28)		113.18			
				Overall p-value		< 0.0001		
Variable	Coefficient	Std. Err.	t	P-value	Signif.	95% Conf. Interval		
CITGDP_L1	0.6120	0.0596	10.27	< 0.001	***	0.4899	0.7341	
CITGDP_L2	-0.0140	0.0612	-0.23	0.821		-0.1393	0.1114	
year	-0.0091	0.0352	-0.26	0.798		-0.0812	0.0630	
crisis	-0.7515	0.2521	-2.98	0.006	***	-1.2679	-0.2350	
average_wage	0.0001	0.0001	1.65	0.110		0.0000	0.0003	
unemployment	-0.0231	0.0358	-0.64	0.524		-0.0963	0.0502	
debt_gross	0.0190	0.0111	1.72	0.097	*	-0.0036	0.0417	
net_lending	0.1387	0.0825	1.68	0.104		-0.0303	0.3076	
FDLin	-0.0014	0.0123	-0.12	0.907		-0.0267	0.0238	
FDIout	0.0566	0.0236	2.40	0.023	**	0.0083	0.1049	
exports	-0.0037	0.0176	-0.21	0.834		-0.0398	0.0323	
_cons	17.0907	68.6062	0.25	0.805		-123.4427	157.6240	
* - significant at 10% signif. level, ** - 5% signif. level, *** - 1% signif. level,L1 - lag								
sigma_u	2.0047							
sigma_e	1.2014							
rho	0.7358 (fraction of variance due to u_i)							

Appendix E: Correlation FE estimates

CITGDP absolute difference from 2010 weighted average								
Fixed-effects (within) regression								
R-sq:	within	=	0.635	Number of observations		434		
	between	=	0.717	Number of groups		29		
	overall	=	0.696	Obs. per group	min	6		
					avg	15		
max					18			
corr (u_i, Xb) =	-0.0013			F(7,28)		127.49		
					Overall p-value		< 0.0001	
Variable	Coefficient	Std. Err.	t	P-value	Signif.	95% Conf. Interval		
diff_2010_wa_L1	0.6237	0.0245	25.46	< 0.001	***	0.5735	0.6739	
year	-0.0053	0.0150	-0.35	0.726		-0.0361	0.0255	
crisis	-0.0903	0.0893	-1.01	0.321		-0.2733	0.0927	
average_wage	0.0000	0.0000	1.73	0.094	*	0.0000	0.0001	
unemployment	0.0202	0.0105	1.92	0.065	*	-0.0014	0.0418	
debt_gross	0.0046	0.0035	1.32	0.197		-0.0025	0.0118	
net_lending	0.0622	0.0270	2.30	0.029	**	0.0068	0.1176	
_cons	9.2721	29.3317	0.32	0.754		-50.8112	69.3553	
* - significant at 10% signif. level, ** - 5% signif. level, *** - 1% signif. level,L1 - lag								
sigma_u	0.5836							
sigma_e	0.4550							
rho	0.6219 (fraction of variance due to u_i)							

CITGTR absolute difference from 2010 weighted average							
Fixed-effects (within) regression							
R-sq:	within	=	0.586	Number of observations		389	
	between	=	0.766	Number of groups		29	
	overall	=	0.720	Obs. per group	min	4	
					avg	13.4	
					max	18	
corr (u_i, Xb) =	0.1008			F(9,28)		181.84	
				Overall p-value		< 0.0001	
Variable	Coefficient	Std. Err.	t	P-value	Signif.	[95% Conf. Interval]	
diff_2010_wa_L1	0.6533	0.0242	27.00	< 0.001	***	0.6038	0.7029
year	-0.0155	0.0321	-0.48	0.633		-0.0814	0.0503
crisis	0.3303	0.2324	1.42	0.166		-0.1458	0.8064
average_wage	0.0001	0.0001	1.54	0.134		0.0000	0.0002
unemployment	0.0467	0.0311	1.50	0.144		-0.0170	0.1104
debt_gross	0.0013	0.0102	0.13	0.901		-0.0195	0.0221
net_lending	0.1087	0.0664	1.64	0.113		-0.0274	0.2447
FDI_in	-0.0423	0.0200	-2.12	0.043	**	-0.0832	-0.0014
FDI_out	0.0214	0.0117	1.83	0.078	*	-0.0026	0.0455
_cons	28.7817	62.6451	0.46	0.649		-99.5410	157.1044
* - significant at 10% signif. level, ** - 5% signif. level, *** - 1% signif. level, L1 - lag							
sigma_u	1.1377						
sigma_e	1.2256						
rho	0.4629 (fraction of variance due to u_i)						

Appendix F: 2013 DTTs overview

Country	AUS	AUT	BEL	CAN	CHL	CZE	DNK	EST	FIN	FRA	DEU	GRC	HUN	IS	IRL	ISR	ITA	JPN	KOR	LUX	MEX	NLD	NZL	NOR	POL	PRT	SVK	SVN	ESP	SWE	CHE	TUR	GBR	USA	Total
Australia	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	26
Austria	X	-	X	X	O	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31
Belgium	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	33
Canada	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	33
Chile	X	O	X	X	-	O	X	O	O	X	O	O	O	O	X	O	O	X	X	O	X	O	X	X	X	X	X	X	O	X	X	X	O	X	16
Czech Republic	X	X	X	X	O	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	32
Denmark	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X	32
Estonia	O	X	X	X	O	X	X	-	X	X	X	X	X	X	X	X	X	O	X	X	O	X	O	X	X	X	X	X	X	X	X	X	X	X	28
Finland	X	X	X	X	O	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	32
France	X	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	33
Germany	X	X	X	X	O	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X	31
Greece	O	X	X	X	O	X	X	X	X	X	X	-	X	X	X	X	X	O	X	X	X	X	O	X	X	X	X	O	X	X	X	X	X	X	28
Hungary	X	X	X	X	O	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X	X	31
Iceland	O	O	X	X	O	X	X	X	X	X	X	X	X	-	X	O	X	O	X	X	X	X	O	X	X	X	X	X	O	X	X	X	O	X	25
Ireland	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	33
Israel	O	X	X	X	O	X	X	X	X	X	X	X	X	O	X	-	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X	X	29
Italy	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	32
Japan	X	X	X	X	O	X	X	O	X	X	X	O	X	O	X	X	X	-	X	X	X	X	X	X	X	X	O	O	O	X	X	X	X	X	26
Korea	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	33
Luxembourg	O	X	X	X	O	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	O	X	X	X	X	X	X	X	X	X	X	X	30
Mexico	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	O	X	X	X	O	X	X	30
Netherlands	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	32
New Zealand	X	X	X	X	X	X	X	O	X	X	X	O	O	O	X	O	X	X	X	O	X	X	-	X	X	O	O	O	X	X	X	X	X	X	24
Norway	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	O	O	X	X	X	X	X	X	32
Poland	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	33
Portugal	O	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X	X	O	X	X	-	X	X	X	X	X	X	X	X	30
Slovak Republic	X	X	X	X	O	X	O	X	X	X	O	O	X	X	X	X	X	O	X	X	X	X	O	O	X	X	-	X	X	X	X	X	X	X	26
Slovenia	O	X	X	X	O	X	X	X	X	X	X	X	X	O	X	X	X	O	X	X	O	X	O	X	X	X	X	-	X	X	X	X	X	X	27
Spain	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X	X	33
Sweden	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X	33
Switzerland	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X	33
Turkey	X	X	X	X	O	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	-	X	X	X	30
United Kingdom	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X	33
United States	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	32

Source: Ernst & Young Worldwide corporate tax guide 2013