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Bachelor thesis

2018 **Dominika Cimpová**

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Misalignment of Profits and Economic Activity by Multinational Enterprises

Bachelor thesis

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Abstract

This thesis analyses the profit shifting behaviour of U.S. multinational companies using panel data set over the period 1983 – 2015. The main objective of the thesis is to compute the extent of misalignment between reported profit and real economic activity and consequential revenue losses caused by profit shifting and to estimate the effect of tax rates on profit shifting behaviour. Using country-level aggregated data published by the Bureau of Economic Analysis I found a substantially increasing trend in the misaligned profit reaching 540 bn US$ in 2015 which is accompanied with tax revenue losses 190 bn US$ in missing profit countries. Majority of the misaligned profit is reported in a small number of jurisdictions with near zero tax rates such as Netherlands, Ireland and Luxembourg. Additionally, I found a significant negative effect of tax rate on misalignment in the recent years, however, only negligible effect at the beginning of the examined period. Results suggest that 1% increase in the statutory tax rate can cause 2.5% growth in the magnitude of misalignment. My findings are consistent with the existing literature. According to the analysis it can be concluded that despite numerous attempts for prevention of profit shifting, it is becoming more serious problem than ever before.

Abstrakt

Tato práce s použitím panelových dat pro období 1983 – 2015 analyzuje přesouvání zisků amerických mezinárodních společností. Hlavním cílem práce je vypočítat rozsah nesouladu mezi vykázaným profitem a skutečnou ekonomickou aktivitou a následné daňové ztráty způsobené přesouváním zisků a také odhadnout efekt daňových sazeb na přesouvání zisků. S použitím souhrnných dat na státní úrovni publikovaných Bureau of Economic Analysis jsem nalezla výrazně rostoucí trend v nesouladu, který v roce 2015 dosáhl 540 miliard US$, což bylo v zemích s chybějícím ziskem doprovázeno ztrátou na daňových ziscích 190 miliard US$. Většina zisku je přesouvána do malého počtu zemí s téměř nulovými daňovými sazbami jako například Nizozemí, Irsko nebo Lucembursko. Dále jsem nalezla výrazný negativní efekt daňových sazeb na přesouvání zisků v nedávných letech, nicméně pouze zanedbatelný efekt na začátku zkoumaného období. Výsledky ukazují, že 1% nárůst v daňové sazbě může zvýšit rozsah nesouladu mezi profitem a ekonomickou aktivitou o 2.5 %. Tato zjištění jsou v souladu z již existující literaturu. Na základě analýzy je možné usoudit, že navzdory pokusům o zabránění přesouvání zisků se z něj stává větší problém než kdy dřív.

Keywords

International taxation, multinational tax avoidance, corporate tax revenue, profit shifting, base erosion

Klíčová slova

Mezinárodní zdanění, mezinárodní daňové úniky, příjmy z daně z příjmů právnických osob, přesouvání zisku, úniky z daňové základny

Declaration of Authorship

I hereby proclaim that I wrote my bachelor thesis on my own under the leadership of my supervisor and that the references include all resources and literature I have used.

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Prague, 8 May 2018

Signature

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Bachelor Thesis Proposal

Author	Dominika Cimpová
Supervisor	Petr Janský, PhD.
Proposed Topic	Misalignment of Profits and Economic Activity by Multinational Enterprises

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Research Question and Motivation

Corporate tax base erosion and profit shifting are a huge threat to the global economy. Tax policies as well as tax rates vary across countries and therefore multinational firms change and differentiate geographic locations of both real economic activity and profits in order to minimise the amount of taxes paid. Some of the profits from countries where real economic activity appears are shown in jurisdictions with very low tax rates such as Bermuda or Luxembourg. Estimated aggregate revenue loss due to profit shifting has been steadily increasing and in 2012 reached $280 billion in total (Clausing, 2016). As the negative consequences connected to tax erosion increased in significance, state authorities were forced to address the issue of missing revenues at the national level by either increasing tax rates, lowering government expenditures or increasing the budget deficit, which only deepened the problems. In order to prevent these situations, we need more strict tax policies but their worldwide application would be very difficult. To effectively design these policies, we need to gather as much information about profit shifting as possible. Previous works concern themselves with various approaches for identifying and measuring income shifting, what are its consequences and how to approach them. In my thesis, I will focus on misalignment of profits and economic activity by multinational enterprises. I am going to explore the magnitude of income shifting within individual industries and depict the changes in time. I would like to answer the following

questions: Is there any inconsistency between reported profit and real economic activity among particular industries? How much profit is missing in particular industries? What is the trend of profit shifting?

Contribution

Previous works analyse the magnitude of profit shifting in absolute as well as in relative terms. Additionally, many papers address the issue of the sensitivity of profit shifting with respect to different tax rates across the countries. The main goal of my thesis is to broaden the analysis of existing studies, investigate them in more details and enlarge the dataset with recent data. Furthermore, I would like to examine the extent of profit misalignment among individual industries and provide information about the development of these misalignments in time.

Methodology

As a main source of data, I will use the Bureau of Economic Analysis (BEA) which includes annual balance sheets of U.S. multinational firms between the years 1983 and 2014 with respect to individual industries. Using the balance sheet data from BEA, I intend to determine the magnitude of misalignment of profits and real economic activity by multinational businesses by constructing appropriate measures of profit and real economic activity. Finally, by comparing the results, I will be able to estimate the magnitude of the missing profits and depict the changes in time.

Outline

1. Introduction
2. Motivation
3. Review of Literature
4. Theoretical Metodology
5. Model creation

6. Evaluation of results

7. Summary

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Abbreviations

BEPS Base Erosion and Profit Shifting

BEA Bureau of Economic Analysis

CCCTB Common Consolidated Corporate Tax Base

IMF International Monetary Fund

MNE Multinational Enterprises

OECD Organisation for Economic Co-Operation and Development

Introduction

Many countries in the developing as well as in the developed parts of the world suffer from base erosion and profit shifting (BEPS). Misallocation of profit causes higher tax revenues in some states and lower in others, particularly the decreased revenues are problem for governments because they have to be compensated from other sources. Pressure on establishing an effective system for controlling the BEPS problem, which arose after the last financial crisis, culminated in 2013, when the Action Plan by the Organization for Economic Co-Operation and Development was introduced. This plan was revised throughout 2014 and his current form from 2015 includes a series of recommendations, which are supposed to at least partly deal with BEPS. In "Action 11" of the final report, the OECD presents results of its analysis of the extent of profit misalignment, which suggest that up to 240 billion U.S. dollars could be lost in 2014 on global corporate tax revenues. Moreover, not only the OECD report but also estimates of other researchers indicate that the BEPS problem is increasing over time and is larger today than ever before.

Clausing (2016) suggests that in today's globalized world, when the number of corporations operating across the borders sharply increases, international tax system needs to be re-designed in order to prevent profit shifting. Because of the separate tax systems, governments can set tax policies that lower their tax rates and thus make their country more attractive for multinationals. This leads to additional misalignment between reported profit and economic activity of these companies.

First part of my analysis follows the recent research of Cobham and Janský (2015). I used data published by the Bureau of Economic Analysis, same as the mentioned researchers, however, I was able to include also data from the most recent years. In the second part, I constructed an econometric model based on the framework established by Hines and Rice (1994) in order to compute the effect of differences in tax rates on profit misalignment.

I found a considerable profit shifting to low tax jurisdictions and thus large tax revenue loses in countries with "more traditional" tax systems, id est countries with average or higher tax rates, ranging from 10 bn dollars in 1983 to approximately 200 bn dollars in 2015. The extent of misalignment as well as the increasing trend correspond with findings in the existing literature using the aggregated country-level data. The results of the regression analysis suggest that there is a significant effect of the tax rate on profit shifting, each additional percentage in a tax rate can increase the magnitude of misalignment between real economic activity and reported profit by 2.5 %.

This thesis is structured in the following way: In the first section, I make an overview of the existing literature regarding tax erosion and profit shifting and describe the principles of U.S. tax system and theoretical background of unitary taxation. The second section provides information on how the dataset was collected, which variables were used in calculations and how the misalignment and losses were measured. The third section describes how the econometric model was created, what are his limitations and also includes descriptive statistics of the variables. The fourth section presents results of the analysis, id est how much profit was shifted, which countries gained and which lose on the tax revenues, what is the estimated effect of differences among tax rates on profit shifting and also provides discussion about the results and compares findings of my analysis with findings of other papers. The last section concludes. At the very end I include a list of used literature followed by appendixes with graphs and tables.

1 Theoretical Background

1.1 Literature Review

Misalignment of profits and economic activity and profit shifting is a topic of considerable interest not only to governments all over the world but also to many academic researchers. During the last 20 years has been written many papers which are concerned with the profit misalignments.

One of the earliest work was done by Hines and Rice (1994) who analysed the BEA country-level aggregated data. They assumed that the reported income in affiliate is a sum of the income generated by this affiliate and the shifted income. Based on this assumption, they constructed a regression controlling for labour and capital inputs (which should predict the level of income) and the difference between tax rate of affiliate and its parent company (which should represent the tax incentive to shift income). The result of the OLS model shows that a one percentage point increase in tax rate cause a decrease of 3 percentage points in reported income.

Similar approach was used also by Huizinga and Laeven (2008). They used firm-level data for 1999 on European firms from the Amadeus database provided by Bureau van Dijk to estimate a regression analogous to that by Hines and Rice, however, their model depended on international tax rates of all countries in which a company has its affiliates. The magnitude of the effect in Huizinga and Laeven (2008) is substantially smaller than those estimated in earlier studies using aggregate country-level data. According to their analysis, Germany experienced the largest outward shifting of the profit, which is in contradiction with Devereux and Loretz (2008) (see below).

Dharmapala (2014) is an author of a study summarizing the most frequent approaches used in the analysis of the magnitude of profit shifting. Besides providing the overview of the available data sources, he also described the regression equations to estimate the extent of BEPS established by the important studies. The second part of the paper presents the major findings of the existing literature and intends to explain differences among them. It

can be clearly seen that the estimates of more recent research tends to be lower than those of older research, which could be caused by the fact that they use more detailed data sources, thus controlling for a country specific effects seems to be of a high importance. This conclusion agrees also with the mentioned analyses by Hines and Rice (1994) and Huizinga and Laeven (2008). Unfortunately, BEA database does not allow me to work with more detailed firm-level data and thus, based on the previous argument, I expect my result to be a bit overestimated. At least, the use of panel data should help me to control for country-specific effects.

Another work based on the same dataset is Keigtley (2013) who examined to which extend are U.S. multinational companies shifting their profit to low-tax countries. Using data published by BEA for the period between 1999 and 2008, he compared the reported profits with real economic activity in two groups of countries – countries with near-zero tax rates and countries with average tax rates. His analysis shows a significant disproportion in the share of declared profits and the share of economic activity reported in individual jurisdictions, for example 43 % of U.S. foreign income was reported in few tax havens (namely in Bermuda, Ireland, Luxembourg, the Netherlands, and Switzerland) in 2008, whereas only 4 % of foreign workforce is hired there and only 7 % of foreign investments was done in these countries. Additionally, his analysis provides an evidence that this disproportion have increased over time. This evidence is supported also by analysis comparing the foreign income as a share of GDP of the two groups – in the countries with average tax rates the share rose from 1 % to 2 % between years 1999 to 2008, in the near-zero tax rate countries it increased from 27 % to 33 % over this period.

Besides other measurements of economic activity, I decided to include formula for CCCTB in my computations. Many researchers are concerned with the topic of unitary taxations. For example the paper by Devereux and Loretz (2008) analyses the effect of the introduction of a common consolidated corporate tax base (CCCTB) on the corporation tax revenues in EU member states. They used firm-level ORBIS data for EU countries provided

by Bureau van Dijk and data on corporate tax revenues published by OECD. According to their analysis, the overall impact of introducing CCCTB on EU tax revenues is rather small but it might have a significant effect on some individual EU member states, for example tax revenues of Belgium, Denmark, Germany and Luxembourg (all of which have high share of taxable income when compared to share of other economic indicators such as turnover, number of employees or cost of employees) would be reduced, on the other hand Sweden, UK, Estonia, Hungary and Slovakia would gain.

Another paper dealing with the similar topic was written by Cobham and Loretz (2014), who analysed the difference between reported profit and real economic activity in a given country. They used the ORBIS dataset, which is available at firm-level data and contains information about total and tangible asseta, turnover, payroll or number of employees and aggregated the individual accounts to obtain a country-by-country information. Compared to the BEA dataset, which I used for my analysis, the statistics in ORBIS dataset are more complete, because BEA cannot publish all the information in order to not reveal specific information about some company (as discussed in "Data" section). In the paper, they tried to figure out an effect of a move from separate accounting to unitary taxation. Their analysis was based on the comparison of percentages of economic activities and reported profit in individual jurisdictions. Overall, results confirm that in many states there is a considerable difference between the share of reported profits and the share of real economic activity. The move from the separate accounting to unitary taxation would cause the states with the most favourable tax systems to lose a significant part of their profit coming from tax revenues, on the other hand, states with higher tax rates would gain an additional tax revenue. However, using different apportionment factors leads to significantly different results, for example while the total assets cause the smallest change in allocation under the separate accounting and the unitary taxation, the number of employees leads to the most significant difference in distribution of the tax revenue. Even though the move from separate accounting to unit-

ary taxation would cause an overall decrease in corporate tax base, most of the countries would benefit because the profit would be redistributed from the countries which currently reports disproportionally higher profit when compared to the real economic activity which takes place there.

The most related article to the first part of my analysis is Cobham and Janský (2015), who used data on the international operations of US multinational groups provided by Bureau of Economic Analysis (for years 1994, 1999 and 2004-2012). They analysed profit shifting by comparing the share of gross profit in each jurisdiction with the share of indicators of economic activity in this jurisdiction. As indicators of economic activity they used total and tangible assets, sales, number of employees, compensation of employees and two other indicators computed from them - Common Consolidated Corporate Tax Base formula and Canadian formula. They calculated the amount of missing profit as well as the amount of missing tax revenues and found a significant increase over the measured period. They expanded research, which was already done, and found evidences that countries at all income levels are harmed by tax erosion and profit shifting. Additionally, they ascertained that the majority of missing profit in the countries where the real economic activity takes place is reported in countries with very low effective tax rates such as the Netherlands, Ireland, Bermuda and Luxembourg.

One of the most recent papers was published by Clausing (2016) who estimated the effect of profit shifting on corporate tax base erosion for the United States. For her analysis she used the BEA data over the period 1983 to 2012. She conducted regression analysis in order to estimate the sensitivity of foreign reported profit and some indicators of real economic activity to the tax rate in a given jurisdiction, controlling for the size of the economy, the average income of the population and the distance between the country and the United States. The regression showed that the tax rate has a significantly negative effect on the reported income, but only a small effect on indicators of economic activity. Additionally, she computed

the impact of profit shifting on the tax revenues of U.S. government and on the reported profits in countries where U.S. affiliates operate. According to her computations, the profit shifting lowered the U.S. revenue by 111 bn. by 2012 and the loses increased considerably in the previous years. She estimated that 82 % of missing profit is reported in seven tax havens, mostly Caymans, the Netherlands, Switzerland, Luxembourg and Bermuda, this result is quite similar to that of Cobham and Janský (2015).

Dowd et al. (2017) chose similar approach using panel data set of U.S. tax returns over the period 2002-2012. Importantly, they allowed the elasticities of affiliates in tax havens to differ from other jurisdictions. Their findings suggest that elasticities based on a log-linear specification may severely understate the sensitivity of profits to tax in low-tax jurisdictions while simultaneously overstating this elasticity in high tax jurisdictions. They estimated, that without controlling for the non-liner relationship, a 1 percentage point increase in the tax rate would result in a 1.4 percent reduction in reported profits, regardless of whether the original tax rate was at 5 percent or 30 percent. However, if different elasticities are allowed, the effect on profits reported in a foreign subsidiary of a 1 percentage point increase in the tax rate depends crucially on whether the country has a low rate or a high rate. For example a change in the tax rate from 5 % to 4 % results in 4.7 percentage points increase in profits while a change from 30 % to 29 % results in a 0.7 percentage points increase in declared profits.

Finally, Guvenen et al. (2017) examined profit shifting as one of the causes of slowdown in the growth of U.S. GDP. They argued that profit shifting causes part of the economic activity generated by U.S. multinationals to be attributed to their foreign affiliates, leading to an understatement of measured U.S. gross domestic product. They found increasing profit shifting activity by U.S. corporations, which leads to an understatement of measured GDP and then adjust the GDP for those misalignments. The adjustments raised aggregate productivity growth rates by 0.1 percentage points annually from 1994 to 2004, by 0.25 percentage points annually from 2004 to 2008,

and left productivity unchanged after 2008. However, this does not mean that the problem was completely solved, it seemed that worsening subsided, but the problem still persisted – the U.S. value added was underestimated by about 280 billion dollar per year. The upward adjustments to U.S. value added imply downward adjustments to value added in some other countries. For some economies with a low tax rates, such as Ireland and the Netherlands, the adjustments were as large as 10–14 percent of their annual GDP.

1.2 U.S. Tax System and Tax Havens

Till December 2017 the U.S. multinational companies had to pay taxes to the U.S. government on all their income, regardless of whether it was earned in the United States or abroad, thus they were required to pay taxes twice – firstly in the jurisdiction, where their profit was reported and secondly in the United States. The earnings of foreign subsidiaries were taxed at the moment of their repatriation, id est when they were brought back to their parent company. In order to prevent double taxation, the U.S. government provided multinationals with a tax credit, which was equal to the amount paid to a foreign government. Taking an example of a U.S. company operating in the Czech Republic, which reported profit of 1 million $ there. The tax rate was the United States is 35 % and in the Czech Republic 19 %, thus the company paid 190 thousand dollars to the Czech government and 160 thousand dollars to the U.S. government. When a company operated in a country with tax rate higher than 35 percent, it paid no taxes to the U.S. government but did not receive any compensation. The amount of tax credit was not calculated individually for each state, all foreign taxes were added together and the company received tax credit only if the overall amount was lower than the amount which would have had to be paid to the U.S. government.

Hines and Rice (1994) described two possible reasons why multinationals may try to shift their profits to tax havens. The first reason is that parent company which has affiliates operating in high-tax countries can decrease its overall tax burden by shifting part of its profit earned in such a country to

a tax haven. As I have already explained, when the foreign tax liability of a company is higher than 35 %, company does not receive any compensation, therefore, reporting profits, which were actually earned in high-tax country, in a tax haven, can decrease the total taxes by the difference between those two tax rates. The second reason is that when companies defer their income from a tax haven, they can earn interest on the tax liability before they pay it to the U.S. government.

Additionally, Hines and Rice (1994) identified three main devices that move taxable income to tax havens: the use of debt contracts, adjustment of transfer prices and conversion of U. S. export income into tax haven income. Firstly, the interest on debt can be deducted from the taxable income, therefore it seems to be more profitable for multinationals to finance their affiliates in high-tax countries with debt than those in low-tax countries. Secondly, the U.S. law system contains regulations regarding the transfer prices of goods and services between parent firm and its subsidiaries, however there are many other international transfer prices which are not regulated and thus, it can be profitable for companies to transfer its valuable goods (especially intangibles) to their affiliates in tax havens. Lastly, companies may shift income by selling their receivable accounts to their financial subsidiaries in tax havens.

In December of 2017, President Donald Trump and Congress enacted a new tax law which changed the previously described system that was valid for decades. The most significant component of the new system regarding the international taxation is the move to a territorial tax system, which means that only income earned in the United States is taxed there and the active income of U.S. companies earned offshore will no longer be subject to U.S. taxes. Under the territorial tax system corporations have even greater incentives to engage in accounting gimmicks to make their U.S. profits appear to be earned in offshore tax havens such as Bermuda and the Cayman Islands, where corporate profits are not taxed. Hence, it can be assumed that in the next years the trend of the income shifting can increase. Addi-

tionally, the statutory corporate tax rate in the United States was decreased from 35 % to 21 %.

1.3 Unitary Taxation

Under the current system of separate accounting, profits of multinational companies are taxed at the tax rate of the country where they were reported. As I have already explained, the significant differences among the tax rates of individual countries, may motivate multinational companies to shift their profits to jurisdictions with lower tax rates in order to reduce their overall tax burden. The recent financial crisis strengthen the requirement for effective control and prevention of tax avoidance.

The Organisation for Economic Co-operation and Development together with the G8 and G20 countries launched in 2013 the Base Erosion and Profit Shifting initiative in order to help not only the member states but also developing countries to tackle this issue. The BEPS package includes 15 actions which should provide governments with the sufficient instruments to address the tax avoidance. These actions should ensure that the profit will be taxed in the place, where the real economic activity takes place. The initiative is based mainly on the following three steps: making the national tax rules more consistent, strengthening requirements in international standards and enhancing transparency.

In 2011 the European Commission presents the Common Consolidated Corporate Tax Base proposal, which includes a rules for calculating taxable income of companies in EU. It is based on the idea of the unitary taxation – profits would be calculated jointly for all affiliates as if the whole company was a one unit, thus, multinational companies would have to obey only one set of rules at the EU level instead of many different rules at the national levels. The tax base for each country would then be calculated from the consolidated tax base proportionally to the share of economic activity in a given country. The formula provided in the Proposal for a Council Directive on a Common Consolidated Corporate Tax Base (2011) is as follows:

$$ShareA = (\frac{1}{3}\frac{Sales_A}{Sales_{Gr}} + \frac{1}{3}(\frac{1}{2}\frac{Payroll_A}{Payroll_{Gr}} + \frac{1}{2}\frac{NoofEmp_A}{NoofEmp_{Gr}}) + \frac{1}{3}\frac{Asset_A}{Asset_{Gr}}) \times CTB \qquad (1)$$

A denotes the affiliate A and Gr group of all affiliates of a one company.The labour factor consists of equally weighted number of employees and payroll. Payroll is comprised of salaries, wages, bonuses and all other employee compensation, including related pension and social security costs borne by the employer, however BEA provides us only with information about wages and salaries, therefore, a small inaccuracy in payroll is possible. The asset factor includes the average value of all fixed tangible assets owned, rented or leased – in my computations, I used data for property, plant and equipment provided by BEA.

This way we can obtain a share of tax base in each country, the amount of taxes is then calculated simply by multiplying by statutory tax rate.

As shown in a number of analyses, in many countries with near-zero tax rates it appears to be a large inconsistency between the share of economic activity and the share of reported profits. As the taxable profits of each subsidiary would be calculated proportionally to its real economic activity, CCCTB should make tax avoidance more difficult.

2 Methodology

In the following section I would like to describe my proposed analysis. In the first part, I will depict the aim of the analysis. In the second part, I will describe the dataset and variables and also provide a short discussion about their limitations which I had to deal with. The final part provides information about methods which I used in calculations.

In my thesis, I would like to show differences in the shares of reported profit and real economic activity of U.S. multinational firms in individual countries. I decided to base my estimates on the approach of comparing these ratios and thus measure the inconsistency. Using equations described later in this chapter, I tried to estimate the extent of these misalignments, id est how much profit is reported in an inappropriate location, and which countries benefit and which lose the most on the tax revenues. I am aware of the fact that at least part of the inconsistency must not necessarily result of BEPS motivated by differences in tax rates. It might also be caused by different conditions in individual countries, for example higher wages in developed countries or higher number of hired workers in developing countries. One may also say that companies in richer countries can generate profit more easily because of generally more favourable conditions. Thus, I decided to run also a regression analysis in order to estimate the effect of tax rates on misaligned profit. As I used panel data and included also variables to capture country specific effects, results should be independent of different conditions in individual countries and thus more precise than estimates of the first part of the analysis.

2.1 Data

In the following paragraphs I would like to describe from which sources and how was the dataset collected.

For my analysis I used data coming from five separated sources. For the first part of the computations (estimating the extent of misalignment and amount of missing tax revenues) and also for calculation of the de-

pendent variable in the regression analysis in the second part, I used data published by the Bureau of Economic Analysis (BEA). BEA provides annual economic data from national, industry, regional and international accounts. As the statistics are provided in a number of various tables sorted either by countries or by industries, I collected my own dataset, which is more comprehensive and easier to process, by combining their reports about activities of parents and majority-owned foreign affiliates of U.S. multinational enterprises with their income statements and balance sheets. Additionally, I used data published on The World Bank website as independent variables in my regression. The World Bank does not only collects statistics on many economic and demographic indicators, but also analysed them and provides in a number of interactive charts and tables. Statutory tax rates were collected from the IMF database and accompanied by the figures published by KPMG. The Last pieces of data comes from the website of Trading Economies.

The Bureau of Economic Analysis collects statistics about U.S. Direct Investment Abroad since 1983. According to the BEA methodology of collecting data "U.S. direct investment abroad is defined as the ownership or control, direct or indirect, by one U.S. person of 10 percent or more of the voting securities of a foreign business enterprise that is incorporated or an equivalent interest of a foreign business enterprise that is unincorporated" and only those investments which comply with this definition are included in the reported statistics.

However, data from individual years differ. For example, starting from 2009, tables include operating and financial data, which cover both bank and nonbank institutions (parents as well as their foreign affiliates), whereas in the previous years were included only nonbank parents and affiliates. Additionally, there is a difference in the number of countries/industries included in individual tables (income statements presents statistics for less than half of the countries/industries included in tables which describe economic activities of companies). Some statistics are not available so that the data of individual companies would not be published. In order to make my

dataset suitable for further proceeding in statistical program, I used zero value for these cases.

The World Bank database contains a large number of financial as well as macro- and microeconomic indicators, most of the data come from the statistical systems of member states. Additionally, the World Bank co-operates with other international institutions, such as the United Nations, the Organisation for Economic Co-Operation and Development and the International Monetary Fund. From their website I downloaded tables with development of various indicators over time. Statistics for individual indicators, however, differ in the number of countries for which they are reported and for which years. Fortunately, indicators which I used are reported for a sufficient number of countries starting in 1960s with only few exceptions and thus, I did not have to restrict my sample for regression analysis. However, in order to have as complete sample as possible I decided to find the few missing values on the website of **The Trading Economies**.

The main source of corporate statutory tax rates is **the International Monetary Fund** Policy Paper from 2014 together with the annual summaries of corporate tax systems by **KPMG**. KPMG yearly publishes tables with corporate, indirect and individual income tax rates sorted by countries and years. However, the number of countries in individual years differ and therefore, I had to reduce the sample for the part of the regression analysis, in which statutory tax rats instead of effective rates were used.

Taking all the aspect into account, I decided to include years 1983 – 2015 and 56 countries (I added also information about the other countries, these are however compressed together) into my dataset using in the first part of the analysis and for regressions using effective tax rates and 43 countries for the regressions using statutory tax rates.

I decided to use statistics sorted by countries and I am aware of the possible bias which could be caused by unequal conditions in these countries, but I do not have access to any data which would help me to fully control for it. However, I believe that using panel data for sufficiently long period

helps me to deal with this bias by controlling for country-specific effects.

2.2 Variables

In this section I would like to provide a list of used variables with explanation, why I decided to use these particular variables and short discussion over other possibilities.

In the first part of the analysis, I chose six indicator of economic activity (Total Assets, Tangible Assets, Sales, Compensation for Employees, Number of Employees and CCCTB) and one indicator of profit (Gross Profit).

Total Assets is a value used in the most of the BEA's tables, which includes both tangible and intangible assets. As the intangible assets is suspected to be often used for profit shifting, this is not a very good measure because it can downward bias my estimate, thus I would prefer to use **tangible assets**, which should be reported on the balance sheet, unfortunately, BAE's data presents only part of it – fixed assets represented by property, plant and equipment (application of this measure is suggested by Alex Cobham and Petr Janský (2015) and Kimberly A. Clausing (2016)), but there is no information about current assets. Moreover, data for property, plant and equipment are for parent companies available only for years 1989, 1994, 1999, 2004, 2009 and 2014, which makes it unable to precisely use this measure. I estimated statistics for property, plant and equipment for parent companies in periods between these years and decided to include this proxy for tangible assets as well as total assets in my dataset.

Sales are reported in a number of tables with respect to individual countries and industries.

Tables include information about wages (**Compensation of Employees**) paid to employees sorted by countries and industries as well as about **number of employees** in each jurisdiction/industry. Sometimes the exact number of employees cannot be published and only size ranges are given in cells that are suppressed. For this cases, I used the middle value of the range.

CCCTB Formula is a broad indicator of economic activity calculated as a weighted average of previous individual indicators (one-third of tangible assets (in my analysis approximated by net property, plant and equipment), one-third of sales, one-sixth of compensation for employees and one-sixth of number of employees), which is consistent with the definition by European Commission.

Foreign income taxes for majority-owned foreign affiliates are given for each year, unfortunately, data for income tax of parent companies are available only for years 1989, 1994, 1999, 2004, 2009 and 2014, and thus, like in the case of tangible assets, I had to estimate the missing values.

Net income is a measure of profit which is directly presented by BEA. There is also a number of tables with more detailed information sorted by both countries and industries. **Gross profit** is not explicitly given in BEA's tables, I had to compute it by adding foreign income tax to net income (suggested by Alex Cobham and Petr Janský (2015) and Kimberly A. Clausing (2016)).

In my regression analysis I used **misalignment** between the share of reported profit and share of real economic activity according to CCCTB Formula as a dependent variable. Misalignment is expressed either as a share of gross profit in a given jurisdiction or in absolute terms. Negative misalignment suggests that the country reports lower share of gross profit than the share of real economic activity (in other words that a part of a profit is missing), positive misalignment indicates the opposite situation, id est country reports higher share of gross profit than the share of real economic activity (there is an excessive amount of profit).

I decided to include both the **effective tax rate** and the **statutory tax rate** in my analysis. Both of them have some advantages and disadvantages and the existing literature cannot fully agree on which is better to use. More common is probably to use the statutory tax rate such as Dowd (2017) but some very influential works, for example Clausing (2016) preferred effective tax rates. On the following lines I would like to present benefits and draw-

backs of both. On one hand, statutory tax rates are generally exogenous to the firm's choices, because they are determined by the governments. Effective tax rates in part reflect endogenous choices made by the firm, such as its decisions about the use of debt. Statutory tax rates therefore provide a more credible source of identification. On the other hand, effective tax rate takes into account all the deductions and credits which are allowed by law, and thus is a more precise measure of the real paid taxes. Additionally, it can also calculate for other taxes than only income tax and therefore be even more precise, however, BEA provides statistics only for income taxes, thus I had to use this. Furthermore effective tax rate can be easily calculated by dividing income tax by gross profit and hence, there is no need for restricting dataset. Unfortunately, this approach has its limitations as well, sometimes, the information about net income and foreign income tax is missing and therefore, the profit before taxes would be equal to zero and the calculation of effective tax rate would be impossible. Thus, I was forced to not include this case in my regression analysis. Obtaining of a quality source of statutory tax rates was even more complicated. The best source was the IMF databse together with the KPMG tables but, as I have already intended, I still had to reduce the dataset and in the equations using statutory tax rate include only 43 states instead of 56.

Besides the tax rate, I also used **difference between U.S. tax rate and tax rate of individual countries**, where direct investment was reported, in some of the regression equations. The difference is positive in case of higher tax rate in the United States and vice versa.

Additionally, in order to capture country specific effects in my regression I decided to use **total GDP** (as a control of the overall size of the economy) and **GDP per Capita** (as a control of the level of development of a jurisdiction) of the included countries. Including of these indicators (or similarly including of GDP per Capita and population or total GDP and population) is suggested in many papers. The same combination as I have used, included also Clausing (2016), contrarily Dowd (2017) suggests rather

the combination of population and GDP per Capita.

All these indicators (except the number of employees and GDP) are expressed in millions of U.S dollars. Number of employees is given in thousands and GDP in trillions, I had to convert GDP to trillions in order to be able easier interpret coefficient in the regression analysis.

2.3 Computations

In this section, I would like to describe methods which I used in my computations. As I have already suggested, my analysis consists of two parts: in the first part I would like to compare the shares of real economic activity and of declared profit in individual jurisdictions and show that the higher economic activity does not always have to correspond with the higher reported profit. The main tool of the second part is the regression analysis of panel data which should estimate the effect of tax rate on the misalignment between the reported gross profit and the real economic activity.

Firstly, I estimated the extent of misalignment by calculating the share of gross profit reported in the jurisdiction which does not corresponds to the location of the real economic activity. I estimated misalignment in individual countries using the following equation:

$$Misalignment = ShareofGrossProfit - ShareofEconomicActivity \quad (2)$$

Then, the overall misalignment can be calculated either as a sum of the excessive profit shares declared in countries with lower proportion of real economic activity (positive), or as a sum of the missing profit shares in jurisdictions with higher proportion of real economic activity (negative).

Secondly, I calculated also the absolute scale of misalignment, id est the amount of additional profit (which has to be equal to the amount of missing profit) in dollars, simply by multiplying misalignment by actual gross profit:

$$
\begin{aligned}
&AdditionalGrossProfit = ShareofGrossProfit \times ActualGrossProfit \\
&- ShareofEconomicActivity \times ActualGrossProfit \\
&= (ShareofGrossProfit–ShareofEconomicActivity) \times ActualGrossProfit
\end{aligned} \tag{3}
$$

In the case of the perfect alignment between the economic activity and gross profit (when the share of reported gross profit matches the share of economic activity in a given jurisdiction), the bracket would result in zero and thus the estimated profit would be equal to the actual profit.

Thirdly, I estimated also the amount of missing tax payments to governments with lower declared profit and additional tax payment in the states with higher reported profit. It is clear that in the jurisdiction from which was part of a profit shifted to another (in my analysis represented by countries with higher share of economic activity than share of reported profit, id est with negative misalignment), government is missing out also on a certain amount of revenues coming from tax payments. For estimating the misalignment in tax payments of individual countries the following equation was used:

$$
\begin{aligned}
&AdditionalTaxPayments = ShareofGrossProfit \times TaxPayments \\
&- ShareofEconomicActivity \times TaxPayments \\
&= (ShareofGrossProfit–ShareofEconomicActivity) \times TaxPayments
\end{aligned} \tag{4}
$$

The global amount of additional tax payments was then calculated as a sum of all positive individual tax payments and the missing revenues as a sum of negative individual tax payments.

Additionally, I would like to show to which countries most of the profit flows, disproportionate to the economic activity, in other words, which countries gain and which lose the most under the current conditions.

3 Regression Analysis

3.1 Panel Data

Panel data combine both cross-sectional and time series dimension. They allow us to follow multiple units (cross-sectional dimension) over a certain period of time (time series dimension). Their main advantage is that by observing the same individuals over time, we can difference-out the effects of unobserved time-invariant confounders, which would otherwise cause an omitted variable bias.

Panel of data could be either balanced or unbalance. In each period of time t we can have up to N observations, thus the highest possible number of observations across all time periods is T*N, where T is the number of all periods. If the number of observations in some of the period is n <N, then also the total number of observations is lower than T*N and panel is called unbalanced. If number of observations in each period is equal to N, id est no observation in any of the time periods is missing, panel is called balanced. With an unbalanced panel some issues may arise, mainly when the missing values are non-random. In my dataset, when some of the values were missing, they were usually missing repeatedly by the same states, thus I do not believe that the condition of non-randomness was fulfilled and thus, I decided to restrict my sample to balanced panel.

According to Greene (2012) regression model can be expressed in the following form:

$$y_{it} = \beta x_{it} + \alpha z_i + \varepsilon_{it} = \beta x_{it} + c_i + \varepsilon_{it}, i = 1, ..., N, t = 1, ..., T \qquad (5)$$

where i denotes the cross-sectional unit and t time period. In x_{it}, there are K regressors which do not include a constant term. The individual effect is represented by αz_i , where z_i includes a constant term and individual or group specific variables which are either observable or unobservable and are set to be constant over time t.

There are four major models for panel data, in the following part, I would like to describe their main features and explain when and how to use them.

Pooled Regression: If z_i contains only a constant term (when the individual effect does not exist), then ordinary least squares provides consistent and efficient estimates. The model can be represented by the general panel data equation:

$$y_{it} = \beta x_{it} + z_i + \varepsilon_{it}. \tag{6}$$

First Differencing Estimation: The intent of the first differencing is to transform latent heterogeneity out of the model. Starting with the general panel data equation

$$y_{it} = \beta x_{it} + c_i + \varepsilon_{it} \tag{7}$$

and taking the first differences we obtain

$$\Delta y_{it} = y_{it} - y_{it-1} = \Delta\beta x_{it} + \Delta c_i + \Delta\varepsilon_{it}. \tag{8}$$

As I have already suggested, the main advantage of this approach is that it removes latent heterogeneity from the model. On the other hand, differencing also removes time-invariant variables from the model. Additionally, we cannot take difference of the first observation, thus we loss it.

Fixed Effects Model: If z_i is unobserved, but correlated with x_{it}, the least squares estimator of β is biased and inconsistent which is the consequence of an omitted variable as $E[c_i|X_i] \neq 0$. In this case, the general model can be rewritten as

$$y_{it} = \beta x_{it} + \alpha_i + \varepsilon_{it}, \tag{9}$$

where α_i contains all observable effects and specifies an estimable conditional mean. In the fixed effects model α_i is defined as a group-specific constant term. The term "fixed" is used in order to describe the relation between x_{it} and α_i, but α_i still remains stochastic. There are several strategies for estimating fixed effects model. **The Least Square Dummy Variable Model**, which uses dummy variable for each of the individuals, is the most common one because it is easy to proceed and interpret. However, it can be problematic in panels with large number of individuals. The second approach, which is called **Within Estimation**, does not use dummy variable. Instead of dummies, it uses deviation from group means, in other words it uses variation in each individual. The within estimation follows three steps: compute group means of the dependent and independent variables; transform dependent and independent variables to get deviations from their group means; run OLS on the transformed variables without the intercept term. The simplified form of within estimator is

$$(y_{it} - \bar{y}_i) = \beta(x_{it} - \bar{x}_i) + (\varepsilon_{it} - \bar{\varepsilon}_i), \tag{10}$$

where $\bar{y}_i$ is the mean of dependent variable of individual i, $\bar{x}_i$ represent the means of independent variables of group i, and $\bar{\varepsilon}_i$ is the mean of errors of group i. Unfortunately, within estimation has several disadvantages. Firstly, when a model has time-invariant independent variables, deviation from their mean is zero and it is not possible to estimate coefficients of such variables in within estimation. Secondly, the within model produces incorrect statistics for parameter errors and also for mean squared errors, standard errors of the estimates and square root of mean squared errors. As explained below in more details I decided to use clustered errors which have to be computed individually in R and thus should be unaffected. Finally, R^2 of the within estimation is not correct because the intercept term is suppressed. The last possibility is so called **Between Estimation**, which uses variation between groups. It calculates group means of dependent and independent variables,

thus reducing number of observations to N, and then run OLS of aggregated data.

Random Effects Model: In the case when the individual heterogeneity is unobserved, but we can assume that it is uncorrelated to the included variables (id est $E[c_i|X_i] \neq 0$), we can rewrite the model as

$$y_i t = \beta x_{it} + E[\alpha z_i] + (\alpha z_i - E[\alpha z_i]) + \varepsilon_{it} = \beta x_{it} + \alpha + u_i + \varepsilon_{it}, \qquad (11)$$

which is a linear regression with a compound disturbance. In the random effect model, u_i is a group-specific random element which enters the regression identically in each period. This model may by consistently but inefficiently estimated by least squares, therefore other efficient methods are needed.

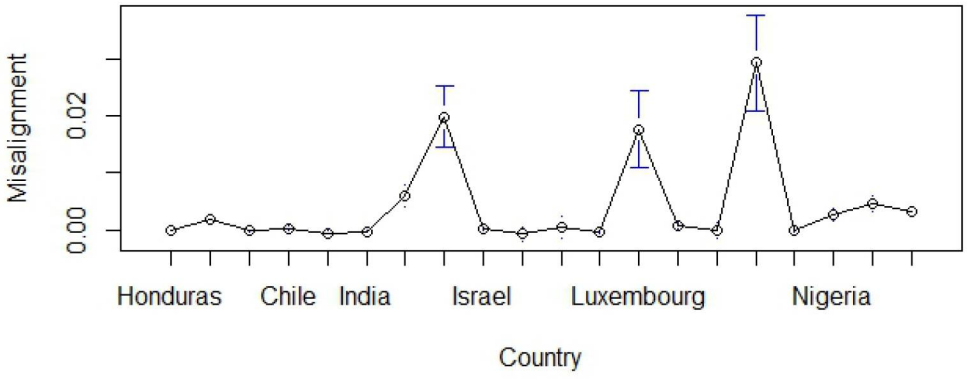
3.2 Model Selection

For the best model selection, I applied the procedure presented by Park (2011). He recommends to start with the simplest estimation – pooled OLS – and then proceed to more difficult ones. The decision itself is based mainly on the heterogeneity and its sources. In case of no heterogeneity in data, we can use pooled OLS, but this does not happen very often. In the case when the individual heterogeneity is captured in the disturbance term and the individual effect is not correlated with any regressors, we should use random effect model. The same model is recommended if each individual has the same disturbance variance as other individuals. On the other hand, if the heterogeneity may be correlated with any regressors or if each individual has its own disturbance, the fixed effect model is preferred.

Figure 1 present heterogeneity in data across individual countries. For the purpose of constructing this particular graph, I had to reduce my dataset and concentrate only on a sample of countries, because if I have used all countries, graph would be messy and difficult to interpret. However, the reduction should not have any negative effect because it is sufficient if there is heterogeneity in a sub-sample of data and we cannot assume homogeneity

even in the whole dataset. On the chart we can see three main deviations, namely Ireland, Luxembourg and New Zealand. Because of these significant deviations I can conclude that there is a heterogeneity in data.

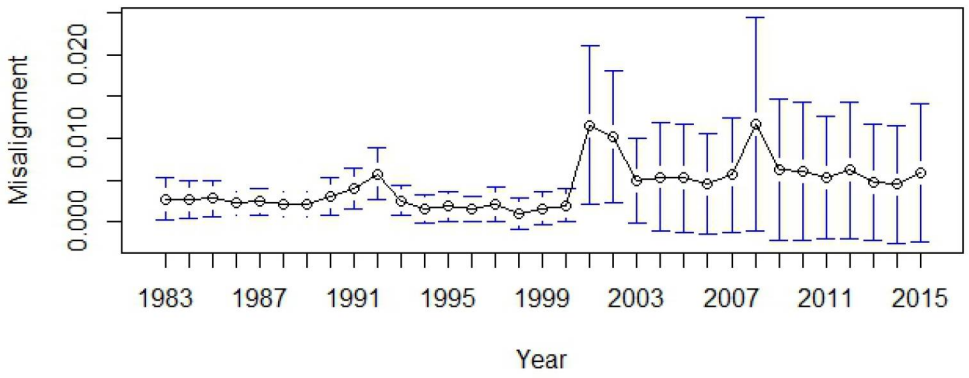
Figure 1: Heterogeneity across Countries



Source: Author's own computation on the basis of the collected data.

Additionally, I also include graph presenting heterogeneity across years (Figure 2). This chart does not show deviations as considerable as the previous one but there are still some bumps which indicates heterogeneity.

Figure 2: Heterogeneity across Years



Source: Author's own computation on the basis of the collected data.

Based on the previous graphs, I would exclude the pooled OLS model and concentrate on the fixed and random effects model. As Park (2011) explains, if the heterogeneity is correlated with any regressor we should use fixed-effect model. Taking an example of tax havens, laws regarding multinational corporations are often less strict in countries which are considered to be tax havens and the transparency of such countries is also often lower. This can be factors which motivate multinationals to shift their profits there, but these factors are also correlated with low tax rate in havens. Another example could be level of safety in a country. The safer the country the higher the motivation to invest there, because we do not have to worry about our assets and labour force that much, but safety may be correlated with GDP per Capita. Based on the previous arguments I would conclude that the heterogeneity is correlated with included regressors and thus, the fixed effects model is more suitable.

Besides the critical thinking about data, we should conduct appropriate tests which help us to decide between models. First test is called Breusch-Pagan LM Test for Random Effects and examines if individual specific variance components are zero, $H_0 : \sigma_u^2 = 0$. If the null hypothesis is rejected, we

can conclude that there is a significant random effect in the panel data, and thus the random effect model is able to deal with heterogeneity better than does the pooled OLS. P-values of the tests for my regression equations were all lower than $2.2e^{-16}$, thus I rejected the null hypothesis and therefore the fixed effect model is more suitable than pooling model.

Second test is called F-test for Fixed Effects investigates whether all dummy variables except one are equal to zero, $H_0 : \mu_1 = \ldots = \mu_{n-1} = 0$. If the null hypothesis is rejected, we can conclude that there is a significant fixed effect and therefore, the fixed effect model is better than the pooled OLS. Similar to the previous test, p-values of all my regressions were smaller than $2.2e^{-16}$, null hypothesis is rejected and therefore fixed effect model is preferred.

Third test is called Hausman Test for Comparing Fixed and Random Effects and examines whether individual effects are correlated with any regressor in the model (under the null hypothesis they are not). If the null hypothesis is rejected, we can conclude that individual effects u_i are significantly correlated with at least one of the regressors in the model and thus we should use a fixed effect model rather than a random effect. The p-values of the tests of all my regression equations are considerably lower than even the 1 % level and therefore are null hypothesis are rejected in all cases and fixed effect model should be the best.

3.3 Model Description

Equations used in my analysis are based on the model by Hines and Rice (1994), which is considered to be one of the most important and influential empirical work on the topic of profit shifting. Their model is based on the premise that the total profit of the affiliate is a sum of the income truly generated by the affiliate and shifted income. Next assumption is that each affiliate generates income using capital and labour inputs and therefore, the measures of these two should be included in regression equation in order to predict the "true" level of income. On the other hand, shifted income is

determined by the tax incentive to move income in or out of the affiliate, these incentive is in their equation represented by the difference between tax rates of the parent company and affiliate. To sum up, their hypothesis was that income reported by a low-tax affiliate that cannot be accounted for by the affiliate's own labour and capital inputs is attributed to income shifting. This approach can be represented by the following equation:

$$Log\pi_i = \beta_0 + \beta_1\tau_i + \beta_2 logK_i + \beta_3 logL_i + \gamma X_i + \varepsilon_i, \tag{12}$$

where π_i represents the profits of multinational affiliate i, K_i represents capital inputs of the affiliate, L_i labour inputs, X_i s a vector of additional affiliate-level controls, ε_i is the error term, and β_0 is a constant. The specification in the literature is log-linear, the natural logarithm of the affiliate's pre-tax profit is modelled as a linear function of the tax rate differential. We are most interested in the coefficient β_1, which represents the change in reported profit associated with the change in tax rate.

In my analysis I have modified the previous equation in the following way: I decided to use misalignment between the share of real economic activity according to CCCTB and the share of declared profit in each country instead of reported profit as the dependent variable. As the CCCTB formula combines sales and number of employees, but also capital (tangible assets) and labour (employment compensation) inputs, I could not use the last two as independent variables. Additionally, as the misalignment can be negative (if the share of reported profit is lower than share of economic activity), I could not use logarithms. Thus, I used simple linear model and regressed misalignment on a tax rate and country level controls (all equations were run for effective as well as statutory tax rate). My basic regression equation takes the following form:

$$Misalignment_{it} = \beta_0 + \beta_1\tau_{it} + \beta_2 GDP_{it} + \beta_3 GDPperCapita_{it} + \mu_t + \psi_i + \varepsilon_{it}, \tag{13}$$

Misalignment represents a difference between the share of a real economic activity and share of reported profit before taxes in country i in year t. I used two possible expressions of misalignment – as a share of gross profit in individual state (called relative misalignment) and value of misalignment in current US dollars (absolute misalignment) in order to make interpretation of coefficients more sensible and intuitive. Variable τ_{it} is a tax rate (either effective or statutory) of state i in year t and represents the tax incentive for profit shifting to or from country i in year t. Country-level controls are GDP and GDP per Capita. The terms μ_t and ψ_i represent a year fixed effect (which controls for unobserved common changes in the profitability of all affiliates in a given year) and a country fixed effect (which controls for the unobserved characteristics of country i that do not change over time), respectively. These two terms are not used in the equation by Hines and Rice (1994), because they did not work with panel. Profits associated with true economic activity should be captured by CCCTB Formula, which is included in the dependent variable, and by country-level controls that account for differences in the productivity of the workforce and in the size of the country's market. The parameter of interest is β_1 which captures the effect of the tax rate on the extent of misalignment in each state.

Next form of the equation is based on the idea that the main motivation to shift profit to tax havens is attributing to near-zero tax rates and therefore should be misalignment in such jurisdictions more sensitive to the change in tax rate. Similar approach was used also by Dowd (2017). In order to control for this, I included a second order approximations of the tax rate and thus allowed for non-linear relationship between tax rate and misalignment. I expect β_1 to be lower since operations that are located in non-haven jurisdictions are likely to be less sensitive to tax considerations. Another approach of exploring non-linearity can be including of dummy variables for countries with a tax haven status, but this could be problematic, because existing literature cannot fully agree on which countries should be considered to be tax havens. Therefore, I prefer the first approach and the

new form of the equation is:

$$Misalignment_{it} = \beta_0 + \beta_1 \tau_{it} + \beta_2 \tau_{it}^2 + \beta_3 GDP_{it} + \beta_4 GDPperCapita_{it} + \mu_t + \psi_i + \varepsilon_{it}, \quad (14)$$

Additionally, I conducted also analysis of the similar equations using difference between the U.S. tax rate in year t and tax rate in individual countries instead of the simple tax rate. Even though the recent more complex analysis used the tax rate difference between the affiliate and a measure of the average tax rate faced by all the affiliates of the corporation, I was not able to construct such a net of the tax rates, because BEA includes only aggregated information and it is not possible to trace individual companies. Thus, I used simply the difference between tax rate facing by parent company (U.S. tax rate) and tax rate of each individual country, this approach was used in most of the older studies, for example also by Hines and Rice (1994).

$$Misalignment_{it} = \beta_0 + \beta_1 \sigma_{it} + \beta_2 GDP_{it} + \beta_3 GDPperCapita_{it} + \mu_t + \psi_i + \varepsilon_{it}, \quad (15)$$

$$Misalignment_{it} = \beta_0 + \beta_1 \sigma_{it} + \beta_2 \sigma_{it}^2 + \beta_3 GDP_{it} + \beta_4 GDPperCapita_{it} + \mu_t + \psi_i + \varepsilon_{it}, \quad (16)$$

where $\sigma_i t$ can be calculated as $\tau_{USt} - \tau_{it}$.

3.4 Econometric Issues

One of the most crucial part when performing regression analysis is **computation of errors**. Several types of standard errors exist and each of them is based on different assumptions, if we get our assumptions about the errors wrong, then our standard errors will be biased.

If we can assume homoscedasticity, id est if we can assume that all errors have the same variance and that there is no correlation across errors, we can use the most simple conventional standard errors. However, homoscedasticity is a very strong assumption and it is often violated. If we think that there is a greater variance in some of our observations, we have to assume heteroscedasticity. Heteroscedasticity is not a problem for coefficients, but it biases the estimates of the conventional standard errors and thus, in order to obtain unbiased estimates, we have to compute robust standard errors. Robust standard errors are usually larger than the conventional standard errors.

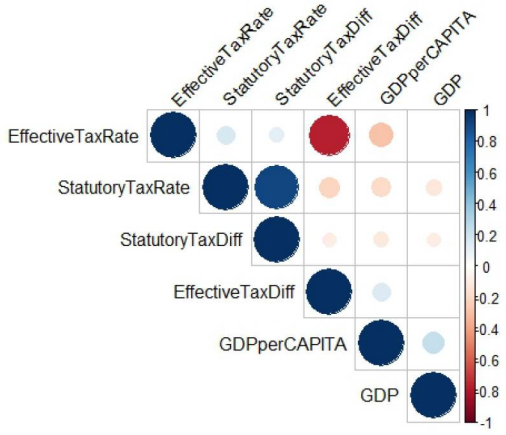
Panel Data models often require even different calculations of standard errors. As I have already mentioned, when calculating standard errors, we usually assume random sampling, such that the residuals of two observations should not be systematically related. Unfortunately, this is not sufficient when we work with panel data, because additionally to cross-sectional dimension, they have also a time series dimension. Many economic variables are correlated over time (good times are more likely if the last period was good and vice versa). The robust standard errors allow a (nonparametric) correlation between residuals and regressors but not correlation over time. Therefore, we have to use clustered standard errors, which allow correlation within "clusters", in my case it means that errors of individual states are allowed to be correlated over time. However, we still have to assume no correlation between clusters. It is advised to have at least 40-50 clusters, with lower number of clusters we must use additional techniques, fortunately as I have 56 and 43 countries = 56 and 43 clusters, so everything should be alright.

I would also like to make a short note on **collinearity**. Multicollinearity occurs when the model includes multiple factors that are correlated not just to the response variable, but also to each other. Multicollinearity increases the standard errors of the coefficients. Increased standard errors in turn means that coefficients for some independent variables may be found not

to be significantly different from zero. Without multicollinearity (and thus, with lower standard errors), those coefficients might be significant.

The following correlation matrix (Figure 3) shows collinearity between individual independent variables of my model. The bolder the colour the bigger the correlation coefficient and the larger the circle the more significant correlation is. Correlation of GDP with Tax/Tax Difference (which effect I estimated) is very small and therefore, it is not necessary to worry about it, but it seems that there is a correlation between GDP per Capita and those variables of interest which is, particularly in case of statutory tax rate, quite high – -0.28. I tried to include population instead of GDP per Capita, but also this variable was still correlated with tax rates and its correlation with GDP was even higher. Moreover, as I have already explained, the existing literature used combination of GDP and GDP per Capita as well and hence I decided to include them in my equations despite the correlation. I am aware that it can decrease significance of the coefficients. The correlation coefficient between GDP per Capita and GDP is also higher – 0.24, but it is the lowest out of all possible combinations of GDP, GDP per Capita and population. (Note: graph shows a strong correlation between tax and tax difference, but this is not an issue, because they are not used in the same equation)

Figure 3: Correlation among Individual Variables



Source: Author's own computation on the basis of the collected data.

Table 1: Correlation among Independent Variables

	Effective Tax Rate	Differences in Effective Tax Rates	Statutory Tax Rate	Differences in Statutory Tax Rates	GDP per CAPITA	GDP
Effective Tax Rate	1	-0.771	0.170	0.112	-0.280	-0.003
Differences in Effective Tax Rates	-0.771	1	-0.212	-0.097	0.154	-0.031
Statutory Tax Rate	0.170	-0.212	1	0.919	-0.183	-0.124
Differences in Statutory tax Rates	0.112	-0.097	0.919	1	-0.116	-0.100
GDP per CAPITA	-0.280	0.154	-0.183	-0.116	1	0.236
GDP	-0.003	-0.031	-0.124	-0.100	0.236	1

Source: Author's own computation on the basis of the collected data.

Another problem can be caused by the fact that the dependent variable - misalignment - consists of two separate variables - gross profit and real economic activity. The interpretation of the coefficients in the regression analysis can be then confusing because it is not possible to infer how are these two parts effected by the independent variables and hence how they influence the changes of misalignment. In order to address this, I conducted additional regressions with gross profit and real economic activity as a dependent variables and with the same independent variables as an original regression.

Table 2: Effect of Tax Rates on the Share of Gross Profit

	Share of Gross Profit			
	(1)	(2)	(3)	(4)
Effective Tax Rate	−0.011*			
	(0.008)			
Differences in Effective Tax Rates		−0.005***		
		(0.001)		
Statutory Tax Rate			−0.014***	
			(0.014)	
Differences in Statutory Tax Rates				−0.011***
				(0.013)
GDP	0.011*	0.010*	0.011*	0.011*
	(0.006)	(0.006)	(0.006)	(0.006)
GDP per CAPITA	0.305***	0.335***	0.325**	0.349**
	(0.102)	(0.110)	(0.148)	(0.147)
Observations	1,848	1,848	1,419	1,419
R^2	0.251	0.249	0.250	0.249
Adjusted R^2	0.227	0.224	0.226	0.225
F Statistic	200.216*** (df = 3; 1789)	197.441*** (df = 3; 1789)	152.749*** (df = 3; 1373)	151.955*** (df = 3; 1373)
Note:				*p<0.1; **p<0.05; ***p<0.01

Tax Rates are expressed in decimals, GDP in trillions $, GDP per Capita in millions $.

Source: Author's own computation on the basis of the collected data.

Table 3: Effect of Tax Rates on the Share of Real Economic Activity

	Share of Real Economic Activity			
	(1)	(2)	(3)	(4)
Effective Tax Rate	−0.002			
	(0.001)			
Differences in Effective Tax Rates		−0.0003		
		(0.001)		
Statutory Tax Rate			−0.010	
			(0.006)	
Differences in Statutory Tax Rates				−0.008
				(0.007)
GDP	−0.005	−0.005	0.005	0.005
	(0.003)	(0.003)	(0.003)	(0.003)
GDP per CAPITA	0.101*	0.108*	0.093	0.111
	(0.055)	(0.057)	(0.078)	(0.079)
Observations	1,848	1,848	1,419	1,419
R^2	0.319	0.317	0.342	0.339
Adjusted R^2	0.297	0.294	0.321	0.318
F Statistic	279.136*** (df = 3; 1789)	276.259*** (df = 3; 1789)	238.303*** (df = 3; 1373)	235.001*** (df = 3; 1373)

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

Tax Rates are expressed in decimals, GDP in trillions $, GDP per Capita in millions $.

Source: Author's own computation on the basis of the collected data.

Table 2 contains results of regressing tax rates and differences of tax rates on share of gross profit in individual jurisdictions using GDP and GDP per Capita as country level controls. Column (1) contains results of the regression including effective tax rate, column (2) differences in effective tax rates, column (3) statutory tax rate and column (4) differences in statutory tax rates. Results suggest that the effect of both statutory and effective tax rates on the share of reported gross profit is negative and highly significant. Table 3 contains results of regressing the same variables on the share of economic activity. None of the variables of interest seems to have a significant effect. The results are consistent with findings of Clausing (2016). Thus, it can be conclude that the tax rates affect misalignment through its effect on gross profit.

3.5 Descriptive Statistics

In the following part, I would like to present some statistical parameter of variables which were used in regression analysis. Table 4 presents the most important statistical features of the variables.

Table 4: Descriptive Statistics

Statistic	N	Mean	St. Dev.	Min	Median	Max
Relative Misalignment	1,848	−0.039	0.896	−5.036	0.124	2.277
Absolute Misalignment	1,848	−0.001	0.033	−0.539	0.00003	0.162
Effective Tax Rate	1,848	0.290	0.197	0.002	0.261	0.952
Differences in Effective Tax Rates	1,848	0.014	0.247	−0.730	0.015	0.884
Statutory Tax Rate	1,419	0.335	0.088	0.125	0.330	0.618
Differences in Statutory Tax Rates	1,419	−0.072	0.080	−0.298	−0.086	0.214
GDP per CAPITA	1,848	0.018	0.019	0.0002	0.011	0.119
GDP	1,848	0.659	1.685	0.001	0.179	18.121

Relative Misalignment is expressed in decimals, Absolute Misalignment in trillions $, Tax Rates in decimals, GDP in trillions $, GDP per Capita in millions $.

Source: Author's own computation on the basis of the collected data.

Firstly, I would like to discuss features of dependent variables – **relative and absolute misalignment**. As I have already explained, relative misalignment expresses the excess or misaligned profit as a share of the reported gross profit in a given country, absolute misalignment expresses misaligned profit in absolute numbers – trillions of US dollars. The values of relative misalignment varies between -5.036 (Spain, 2012) and 2.277 (Luxembourg, 1993) with men -0.039 and median 0.124. This means that the missing profit of Spain was in year 2012 five-times higher than the actual declared gross profit and that Luxembourg reported in year 1993 more than three-times higher profit than the real economic activity. Higher median indicates, that some unusually low values can bias the mean. Absolute misalignment ranges between -539 bn (USA, 2015) and 162 bn (Netherlands, 2015) dollars. Mean of the absolute misalignment is -0.001 and median 0.00003, mean is therefore, again, lower than median, but in this case is the difference negligible.

The previous figures indicates what is the difference between relative and absolute misalignment – even though is the relative misalignment highest of Spain, the absolute misalignment is very low compared to that in the United States. The reason is very simple – multiply more profit was reported in the USA than in Spain.

Secondly, I want to present two independent variables, whose effect I am going to estimate – **effective tax rate** and **differences in tax rates**. Individual effective tax rate varies from 0.2 % (Barbados, 1998) to 95.2 % (Republic of Korea, 1992) and the tax difference between US and other individual countries from – 73.0 % (Spain, 1983) to 88.4 % (Luxembourg, 2002). In 1983 the Spain effective tax rate was 89.5 % and the effective tax rate in the United States 16.5 %, the actual difference was +73.0 %, however, in my regression I have to distinguish between cases when the U.S. tax rate is higher and when lower than the tax rate of the other state, therefore, I calculated every difference as U.S. tax rate minus the tax rate of other country. Thus, if the tax rate of the other country is higher than the tax rate in United States, the number has to be negative. Mean of the effective tax rate approximately 3 % lower than median which suggest that in the dataset are some particular high values. Mean and median of the tax difference are almost identical.

Figure 4 represents development of the average effective tax rate and average difference between tax rates across years. Average effective tax rate was calculated as an average of tax rates of all countries in dataset. Average difference expresses the mean of differences of U.S. tax rate and tax rates of individual countries, in other words, the average the difference between the tax rates in the United States and in the other countries. Primarily it tells us, whether the U.S. tax rate was higher or lower than others and by how much. On the first sight we can see the clear downward slopping trend in average effective tax rate, which decreased almost by 20 % during the examined period. On the other hand, the difference variable considerably increased between years 1983 and 2015 with most significant surges in year

1992, 2002 and 2008. At the beginning of the period was the U.S. tax rate on average by 25 % lower than tax rates of other states. In the mentioned years it was on average 35 %, 60 % and 18 %, respectively, higher than tax rates of other countries. In between those three deviated years, difference fluctuates around zero which means that the U.S. effective tax rate was very similar to those in other states.

Figure 4: Average Effective Tax Rate and Differences in Effective Tax Rates

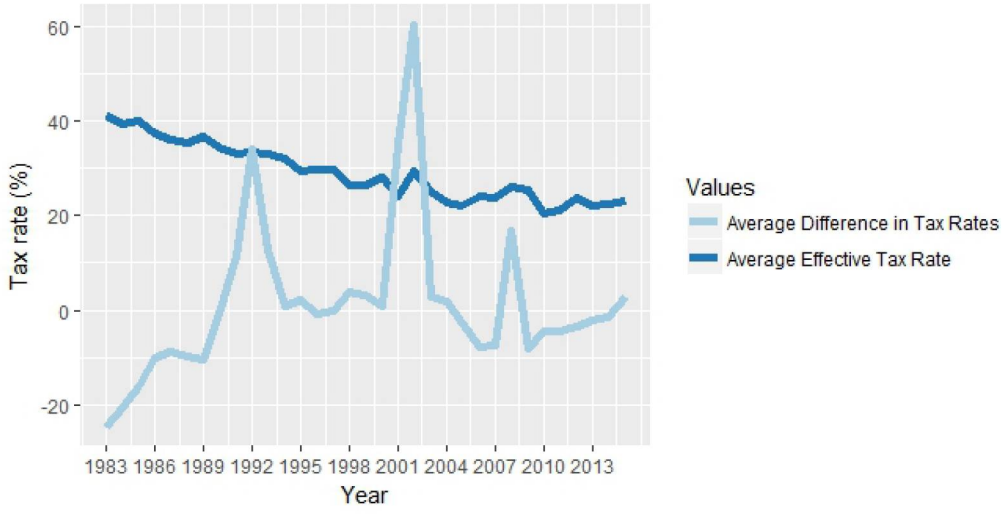


Figure 4 shows development of average effective tax rate and average difference in effective tax rates across years. Tax rates are expressed in percents.

Source: Author's own computation on the basis of the collected data.

Thirdly, I would like to discuss also statutory tax rates and its differences. Individual statutory tax rates ranges from 12.5 % (Ireland, 2015) to 61.75 % (Finland, 1984) and tax differences from -29.75 % to 21.4%, the logic behind positive and negative numbers is the same as in the case of the differences in the effective tax rates. Means and medians of both variables are quite similar to each other, which suggests that there are no extreme values which would bias a mean.

Figure 5 shows the development of the average statutory tax rate and the average difference between the tax rates across years. Intuition is similar as in the Figure 4 – average statutory tax rate is average of tax rates of all countries in dataset and average difference the mean of differences of

U.S. tax rate and tax rates of individual countries. Both lines has a clear downward slopping trend. Average statutory tax rate decreased by 20 % from 45 % to 27 % over the period. The difference in tax rates stays almost the whole period below zero which means, that the US tax rate was slightly lower than the mean of the tax rater of other countries.

Figure 5: Average Statutory Tax Rate and Differences in Statutory Tax Rates

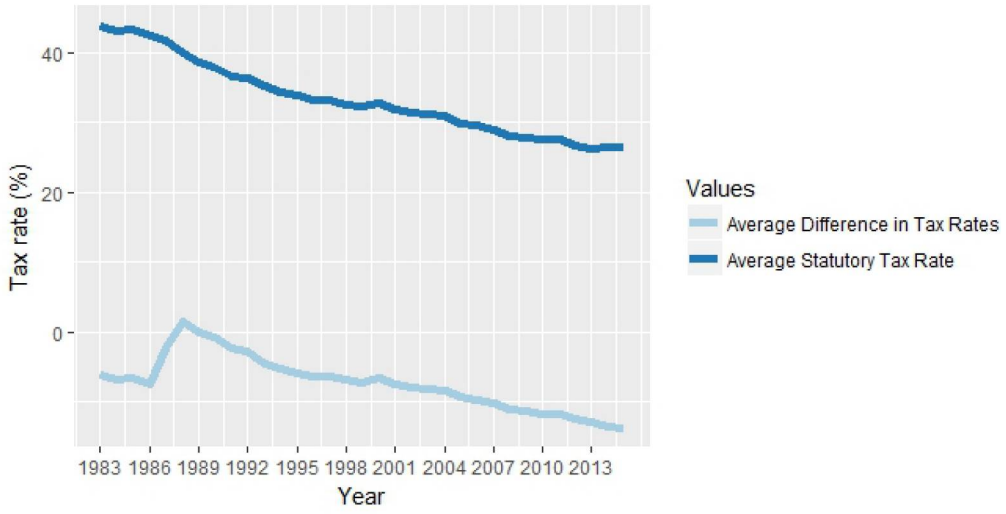


Figure 5 shows development of average statutory tax rate and average difference in statutory tax rates across years. Tax rates are expressed in percents.

Source: Author's own computation on the basis of the collected data.

Additionally, Figure 6 shows development of effective and statutory tax rates over time. Overall stayed statutory tax rate above the effective tax rate over the whole period. This is sensible, because effective tax rate accounts for deductions and concessions. Development of statutory tax rate seems to be smoother, effective tax rate shows, mainly in the recent years, considerable fluctuations. It is important to point out that the rates stay close to each other and therefore, I do not expect regression using effective and statutory tax rates to significantly differ from each other.

Figure 6: Average Effective Tax Rate and Average Statutory Tax Rate

Figure 6 shows development of average effective tax rate and average statutory tax rate across years. Tax rates are expressed in percents.

Source: Author's own computation on the basis of the collected data.

Finally, I would like to briefly describe also variables which were used in order to control for country-specific effects – GDP and GDP per Capita. The population values range from 159 USD (Nigeria, 1983) to 119 thousands USD (Luxembourg, 2015), GDP from 889 million USD (Bermuda, 1983) to 18.12 trillion USD (USA, 2015) with means 11 thousands and 652 billion, respectively. A considerable difference between means and medians of both variables may be interested, in both cases is median about fourth-times smaller than mean, which indicates, that mean is highly influenced by small number of unusual large values.

Figure 7 and Figure 8 show development of the average GDP per Capita and gross world product over the examined period. Evolutions on both graphs are similar to each other. GDP per Capita increased by 8 thousands, which means about five times between 1983 and 2015. Proportional increase in GWP was even greater – it increased approximately eight times.

Figure 7: Development of GDP per Capita

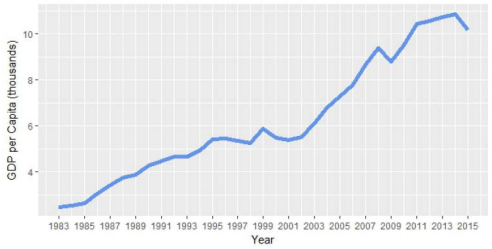


Figure 7 shows development of average GDP per Capita across years. GDP per Capita is expressed in thousands.

Source: Author's own calculations on the basis of the collected data.

Figure 8: Development of GDP

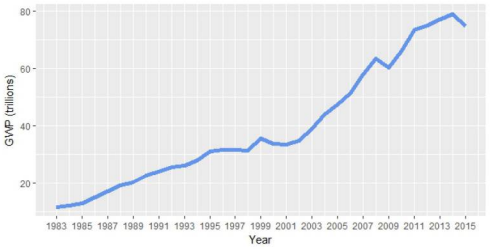


Figure 8 shows development of Dross World Product across years. GWP is expressed in trillions.

Source: Author's own calculations on the basis of the collected data.

4 Results

In the following section I would like to describe my results. At the beginning, I will present results of the first part of my analysis, id est computations of the extent of misalignment and its consequences in terms of tax losses. In the second part, I will demonstrate results of the regression analysis. The final part provides discussion about the results and puts them into context of the existing literature.

4.1 Indications of Profit Shifting

Firstly, before I start analysing the extent of misalignment and it consequences, I would like to present some graphs and tables which indicate inconsistencies between the reported profits and the real economic activity and thus possibility of profit shifting.

Table 5 and Table 6 contrast states where the highest share of profit was reported with the states where the most of the real economic activity took place in 2015.

Table 5: Countries with the Highest Share of Reported Gross Profit

	Country	Gross Profit	CCCTB Formula	Effective Tax Rate	Statutory Tax Rate
1	Netherlands	7.3404	1.1084	1.99	25
2	Ireland	5.2304	1.7179	2.93	12.5
3	United Kingdom	4.207	3.142	6.55	20
4	Luxembourg	3.1798	0.3159	1.01	29.22
5	Switzerland	2.8166	1.2572	4.28	18
6	Bermuda	2.7367	0.2556	0.92	X
7	Caribbean	2.4513	0.3167	0.9	X
8	Singapore	2.1339	1.6899	3.1	17
9	Canada	1.9604	3.0967	11.09	26.5
10	China	1.0479	1.6417	19.25	25

Gross profit is expressed as a share of total gross profit in 2015, CCCTB Formula expresses the share of real economic activity in year 2015, tax rates are expressed in percents.

Source: Author's own calculations on the basis of the collected data.

Table 6: Countries with the Highest Share of Real Economic Activity

	Country	CCCTB_Formula	Gross_Profit	Effective Tax Rate	Statutory Tax Rate
1	United Kingdom	3.142	4.207	6.55	20
2	Canada	3.0967	1.9604	11.09	26.5
3	Ireland	1.7179	5.2304	2.93	12.5
4	Singapore	1.6899	2.1339	3.1	17
5	Germany	1.6756	0.7923	23.73	29.72
6	China	1.6417	1.0479	19.25	25
7	Switzerland	1.2572	2.8166	4.28	17.92
8	Mexico	1.1974	0.8643	21.91	30
9	Netherlands	1.1084	7.3404	1.99	25
10	Australia	1.0652	0.2221	37.97	30

Gross profit is expressed as a share of total gross profit in 2015, CCCTB Formula expresses the share of real economic activity in year 2015, tax rates are expressed in percents.

Source: Author's own calculations on the basis of the collected data.

Table 5 shows ten jurisdiction, where the highest shares of gross profit were reported in 2015 (excluding United States). First column shows share of reported profit, the second one share of real economic activity according to CCCTB Formula and the last two effective and statutory tax rates of a given country in percents. Figures suggest significant discrepancies between declared profit and the real economic activity among many states. Netherlands, where the highest share of profit was declared, Ireland, Luxembourg, Switzerland, Bermuda and Caribbean evince considerably higher shares of profit than economic activity. The share of reported profit is in case of Netherlands almost seven-times and in case of Luxembourg ten-times higher than the share of real economic activity. On the other hand, share of real economic activity is higher in case of Canada and China.

Table 6 presents ten jurisdictions, where the highest share of economic activity took place (excluding United States). First column represents share of real economic activity according to CCCTB Formula the second one share of reported gross profit and the last two effective and statutory tax rates of a given country in percents. On the last place we can see Australia, which has the highest effective tax rate among the states included in the table,

share of reported profit is in Australia five times lower than the share of real economic activity. Canada, Germany, China and Mexico also have higher tax rates than the rest of the table and their share of profit is also lower than the share of real economic activity.

Following series of graphs reports development of the shares of reported profit in tax havens. As the definitions of the tax havens are not fully consistent and every author lists as tax havens slightly different states, I decided to use 5 states with the lowest average of effective tax rate across years and compare them with the 5 states which has effective tax rates closest to the average across this period. The share shown in the graph is the sum of the shares of reported profit of those five states, namely Netherlands, Ireland, Luxembourg, Switzerland and Bermuda as "Tax Haves" and United Kingdom, Canada, Germany, Mexico and Australia as "Traditional Economies".

Figure 9 depicts the shares of profits declared in states labeled as tax havens and in those labeled as traditional economies. The light blue line representing tax havens has a steep upward trend, share increased from 3 percents in 1983 to more than 20 percents in 2015 with the peak of almost 35 percents in 2008. On the other hand, share of profit reported in traditional economies changed only slightly, the dark blue line evinces a mild downward trend with only one distinct deviation in 2001.

Figure 10 shows how the individual tax havens contribute to the aggregated share. It can be seen that not only the overall share of tax havens but also share of each of the individual countries rose over time. In year 2015 about 45 % of income of U.S. multinational came from abroad, from that 21.3 % from 5 countries identified as tax havens – the most from Netherlands (7.3 %), then Ireland (5.3 %), Luxembourg (3.2 %), Switzerland (2.8 %) and the less from Bermuda (2.7 %).

Figure 9: Reported Gross Profit in Tax Havens and in Traditional Economies

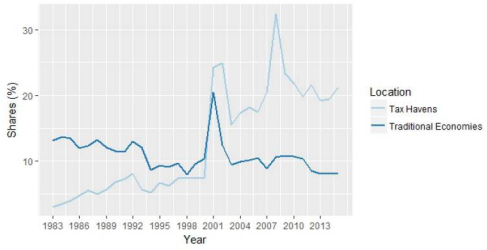


Figure 9 shows development of reported gross profit in 5 tax havens (Netherlands, Ireland, Bermuda, Luxembourg and Switzerland) and in 5 traditional economies (United Kingdom, Canada, Germany, Mexico and Australia) across years.

Source: Author's own calculations on the basis of the collected data.

Figure 10: Shares of Reported Gross Profit in Individual Tax Havens

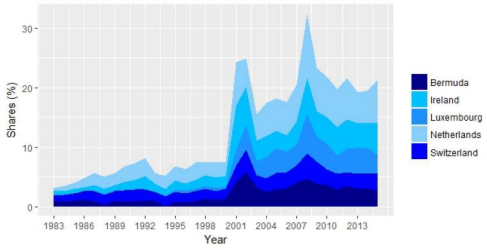


Figure 10 shows development of shares of reported gross profit in 5 tax havens, namely Netherlands, Ireland, Bermuda, Luxembourg and Switzerland, across years. Shares are expressed in percents.

Source: Author's own calculations on the basis of the collected data.

The noticeable increase visible on the previous graphs is, however, not accompanied with a growth of economic activity as can be seen on the Figure 11. The dark blue line represents the development of share of declared gross profit in tax havens, same as on the previous graphs, the light line symbolizes development of the real economic activity calculated with CCCTB Formula which took place in those states. On the first sight can be seen that the even though was the reported profit many times multiplied, there is slight increase in the economic activity, which cannot be proportionally sufficient. At the beginning of the examined period, there is only a tiny difference between the share of reported profit and share of real economic activity, but over the years it increase by 20 %. Moreover, the trend toward more widespread use of tax havens by U.S. multinational corporations shows no particular sign of slowing down.

Figure 11: Repoted Gross Profit and Real Economic Activity in Tax Havens

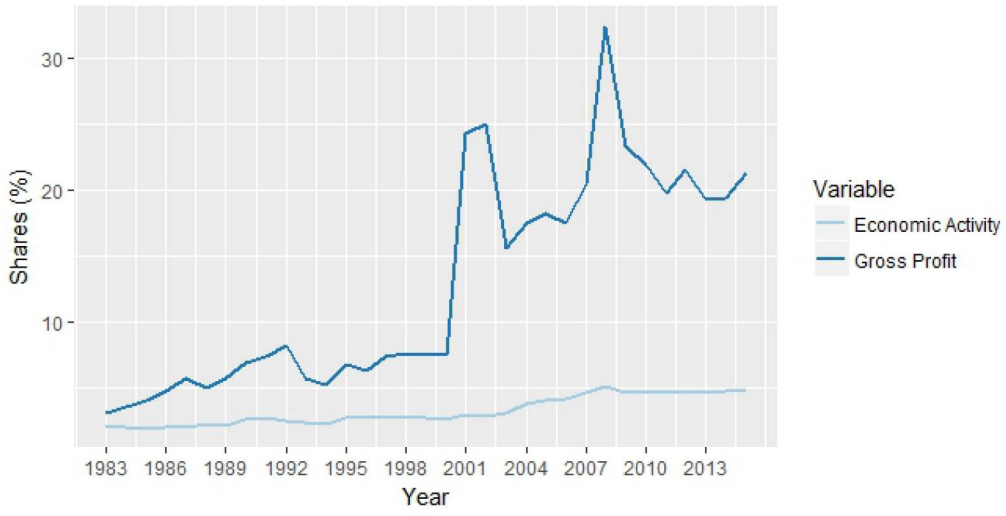


Figure 11 shows development of shares of reported gross profit and real economic activity in 5 tax havens (Netherlands, Ireland, Bermuda, Luxembourg and Switzerland) across years.

Source: Author's own computation on the basis of the collected data.

4.2 The Extent of Misalignment

Figure 12 illustrates sum of the excess profits which were reported in a jurisdiction where the insufficient proportion of economic activity takes place by various measures of economic activity. In order to receive full alignment of gross profit with economic activity, this amount of profit would have to be declared in jurisdiction which under the current conditions appear to lose out.

Figure 12: Relative Extent of Profit Misalignment

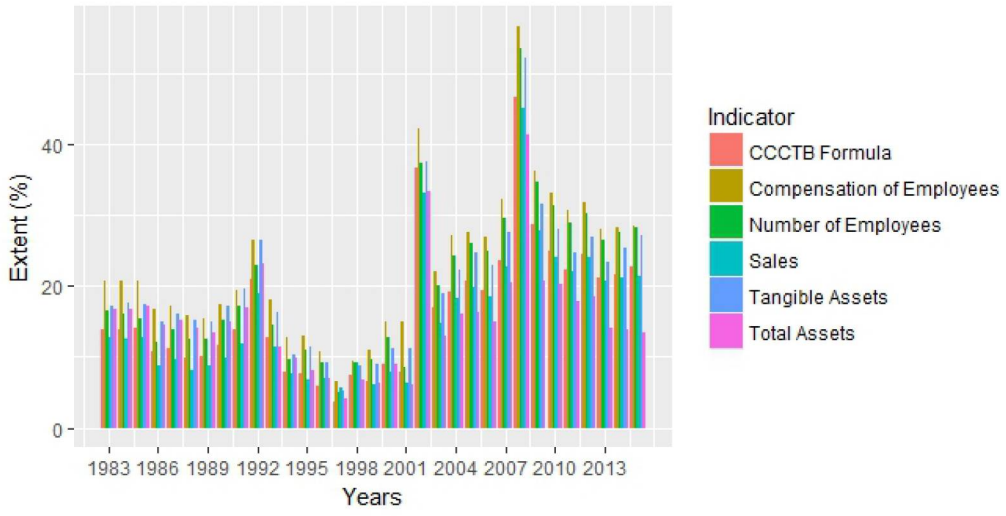


Figure 12 shows the extent of profit misalignment expressed as a share of total reported gross profit in a given year (in percents).

Source: Author's own computation on the basis of the collected data.

Misalignment varies over time, overall it grows over the period from roughly 15 – 20 percents of total gross profit in the 1983, to around 20 – 30 percents in the 2015. The maximum of approximately 50 percents was reached in 2008, this, however, does not necessarily mean, that there was such a sharp increase in profit shifting, more probably is this deviation caused by the overall decrease of profit in the period of financial crisis.

The extent of misalignment estimated with respect to individual indicators of economic activity differs and the magnitude of these differences rose over time. The greatest misalignment in each years of the examined period was estimated by wages followed by tangible assets. In the first half of the period was the least misalignment computed with respect to sales, in the other half with respect to total assets. It is interesting to point out, that the difference between the extent of misalignment computed with respect to total assets and to tangible assets was very tiny at the beginning but significantly increased across year (in year 2015 was the difference almost 20 %). This supports the hypothesis that intangible assets, which is besides tangible assets also part of the total assets, is often use to profit shifting. As

the CCCTB is a combination of the other indicators, it is the most "middle" value (this is also a reason why I decided to use it in estimation of misalignment in the regression analysis).

4.3 Additional Gross Profit and Additional Tax Payments

Figure 13 provides information about the additional excess profit which is reported in a jurisdiction with a lower share of real economic activity than share of declared gross profit, expressed in absolute terms (id est in current billions of US dollars). The excess profit rose from 23 – 37 bn dollars in 1983 to 554 – 739 bn dollars in 2015. In 80s and 90s was an increase rather small, on the other hand, since the beginning of the new millennium it started grow sharply and reached the plateau in 2008. Compared to the previous graph, there is no significant deviation in 2008 which means that the high relative extent of misalignment was caused by decrease in overall profit, as I have already suggested. Again, Compensation of Employees indicates the highest misalignment and Sales and Total Assets lowest.

Figure 13: Absolute Extent of Profit Misalignment

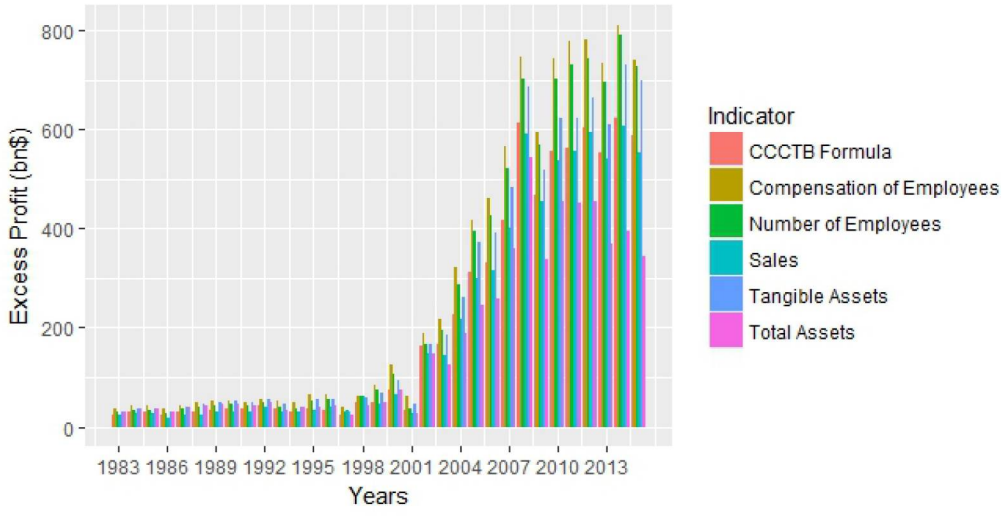


Figure 13 shows the extent of profit misalignment expressed in billions $ across years.

Source: Author's own computation on the basis of the collected data.

Table 7 and Table 8 list jurisdictions with maximum excess profit and

jurisdictions with highest missing profit in year 2015 together with effective and statutory tax rates of these countries (except United States). The misaligned profit was calculated with respect to CCCTB Formula and is expressed in billions. Netherlands, which reported highest excess profit – 162 bn dollars – accounts for almost one-third of misaligned excess profits. A bit lower excess profit was declared in Ireland, Luxembourg and Bermuda, which together with Netherlands account for 66 % of the misaligned excess profit. All of the states in the first table have a very low effective tax rate (except for Nigeria on the last place) – Netherlands 2 %, Ireland 3 %, some other states even lower. The most profit is missing in countries with significantly higher tax rates than those of states in the Table 7, namely in Canada (almost 30 bn dollars), then in Germany, Australia, Brazil, France and China – all of which are leading economies of the world (the most profit – 260 bn dollars – is missing in United States, which account for more than 60 % of all missing profit).

Table 7: Countries with the Most Excess Profit in Year 2015

	Country	Profit	Effective Tax Rate	Statutory Tax Rate
1	Netherlands	161.56	1.99	25
2	Ireland	91.06	2.93	12.5
3	Luxembourg	74.24	1.01	29.22
4	Bermuda	64.32	0.92	X
5	Caribbean	55.33	0.9	X
6	Switzerland	40.42	4.28	18
7	United Kingdom	27.61	6.55	20
8	Singapore	11.5	3.1	17
9	Hong Kong	4.38	6.3	16.5
10	Nigeria	3.29	80	30

Gross profit is expressed in billions of current US dollars, tax rates are expressed in percents.

Source: Author's own calculations on the basis of the collected data.

Table 8: Countries with the Most Missing Profit in Year 2015

	Country	Profit	Effective Tax Rate	StatutoryTax Rate
1	Canada	29.46	11.09	26.5
2	Germany	22.9	23.73	29.72
3	Australia	21.85	37.97	30
4	Brazil	21.43	20	34
5	France	17.44	59.26	33.33
6	China	15.39	19.25	25
7	Mexico	8.63	21.91	30
8	Italy	7.61	26.02	31.4
9	Russia	4.83	25	20
10	Belgium	0.75	19.58	33.99

Gross profit is expressed in billions of current US dollars, tax rates are expressed in percents.

Source: Author's own calculations on the basis of the collected data.

Figure 14 and Figure 15 show the excess, respectively missed tax payments in the jurisdictions which reports additional excess, respectively missed gross profit. The estimated missing tax payments increased from about 8 – 18 bn in 1983 to 83 – 229 bn in 2015, excess tax payments from 10 – 15 bn to 73 – 125 bn. As the majority of the profit is being shifted from higher tax rate jurisdictions to those with lower tax rates, it is logical that the missing tax revenues are higher than the excessive. From the difference between these two (70 – 100 bn in 2015) benefit US multinational companies which shifted its profit to low tax countries and thus harmed higher tax rate countries. Again, different indicators of economic activity provide different estimates of excess/missing tax revenues.

Figure 14: Excess Tax Payments

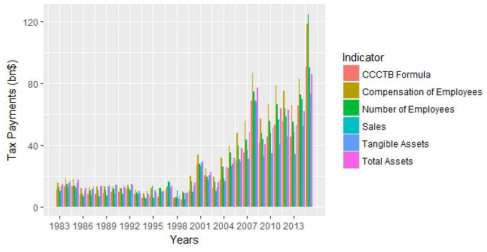


Figure 14 shows the total excess tax payments expressed in billions $ across years.

Source: Author's own calculations on the basis of the collected data.

Figure 15: Missing Tax Payments

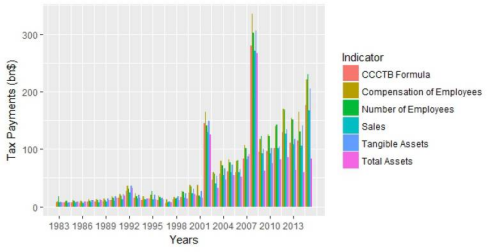


Figure 15 shows the total missing tax payments expressed in billions $ across years.

Source: Author's own calculations on the basis of the collected data.

4.4 Results of the Regression Analysis and Discussion

In this section, I would like to describe results of the regression analysis. As I have already explained in the methodological part, the model consists of four regression equations. Each equation was estimated by three different models using for panel data analysis – pooling regression, fixed effects and random effects and for each equation were used both effective and statutory tax rates. Fixed effects model was appraise as the most suitable one and therefore, I will present its result.

Firstly, Figure 16 visualizes relationship between statutory tax rate and absolute misalignment. As the trendline can be easily influenced by outliers I did not include such values, fortunately it was only a very small number of observations. This scatterplot depicts how is the absolute misalignment correlated with the statutory tax rate. Negative misalignment means that in a jurisdiction was reported lower share of gross profit than the real economic activity, in other words, that the country is missing part of its gross profit. Positive misalignment indicates that in the country was declared higher share of gross profit than the real economic activity. Downward-slopped trendline suggests that the higher the statutory tax rate, the more negative is the misalignment (and in turn the more profit is missing). Thus, the scatterplot indicates negative relationship between the tax rate and misalignment.

Figure 16: Correlation between Absolute Misalignment and Statutory Tax Rate

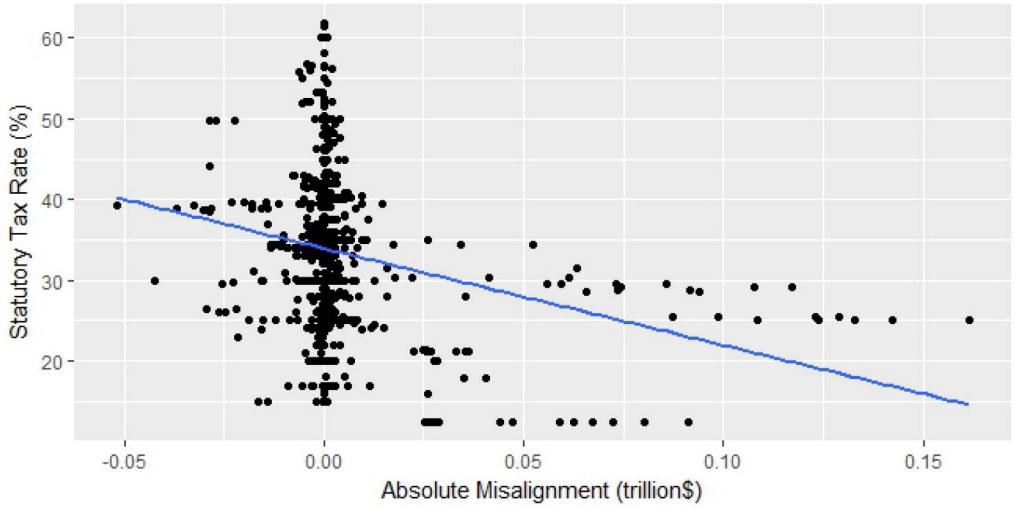


Figure 16 shows correlation between absolute misalignment (expressed in trillions $) and statutory tax rate(expressed in percents). Correlation coefficient $\rho = -0.21$.

Source: Author's own computation on the basis of the collected data.

Scatterplots showing relationship between effective/statutory tax rate or its differences and absolute/relative misalignment can be found in the appendix. Trends of all the graphs are quite similar to each other.

Results of the regressing effective tax rate on relative misalignment (id est misalignment expressed as a share of a gross profit of a given jurisdiction) can be found in Table 9. Table contains results of the fixed effects model. Standard errors are reported in brackets and are clustered at the country level. Column (1) contains results of the equation using effective tax rate, column (2) difference between U.S. effective tax rate and effective tax rates of other countries, column (3) statutory tax rate and column (4) difference between U.S. statutory tax rate and statutory tax rates of the other countries. The estimated effect of effective tax rate on misalignment is – 0.297, however this coefficient is not significant. The estimated effect of the difference in effective tax rates is – 0.603, this coefficient is highly significant. Both statutory tax rate and difference in statutory tax rates have significant effect on relative misalignment - -2.503 and -2.327, respectively. GDP seems to have negative effect significant at 10% level, coefficients of

individual equations are similar to each other. Effect of GDP per Capita is positive but insignificant in all equations.

The estimated effect of tax rate means that an increase of 10 percentage points in tax rate, can increase the magnitude of the negative misalignment (or decrease the magnitude of positive misalignment) by almost 3 percentage points holding other controls fixed. The sign of the effect seems to be reasonable because the more negative the misalignment is, the higher is the share of economic activity when compared to the share of reported gross profit, id est the more profit is missing in a jurisdiction, however, I would expect the effect to be bigger, because the range of values of relative misalignment is quite wide. The estimated coefficient of statutory tax rate is about ten-times greater than that of effective tax rate and, in my opinion, more sensible – a 10 % increase in statutory tax rate leads to a 25 % increase in the magnitude of the negative misalignment (or decrease in positive misalignment). When we consider the width of the ranges of tax rate and that of misalignment, this seems to be more logical than the estimated effect of the effective tax rate. Interpretation of the difference in tax rates is similar – if the U.S. tax rate is 10 % higher than the tax rate of the other state (and thus is the difference positive), negative coefficient increases the magnitude of the negative misalignment (or decrease the positive misalignment) by 6 % in case of effective tax rate and by 23 % in case of statutory tax rate. The coefficient of GDP means that with an additional trillion US dollars, the magnitude of the negative misalignment increases (or the positive misalignment decreases) by 12 - 13 %. This also seems to be reasonable because, as we have previously seen, states which suffer from the missing profit the most are big economies such as United States, Canada, China or leading European economies with a high GDP, on the other hand, states with the highest shares of excess profit are usually small jurisdictions such as Bermuda and Luxembourg. Coefficient of GDP per Capita means that an increase of GDP per Capita by one thousand causes 0.1 – 0.7 % increase in positive misalignment (or decrease in the magnitude of negative misalignment). Sign of this estimate seems to

be sensible, states with highly positive misalignment are usually small states with high GDP per Capita such as Luxembourg or Netherlands.

Table 9: Effect of Tax Rates on Relative Misalignment

	Relative Misalignment			
	(1)	(2)	(3)	(4)
Effective Tax Rate	−0.297			
	(0.597)			
Differences in Effective Tax Rates		−0.603**		
		(0.297)		
Statutory Tax Rate			−2.503**	
			(1.185)	
Difference in Statutory Tax Rates				−2.327*
				(1.299)
GDP	−0.126*	−0.123*	−0.121*	−0.128*
	(0.072)	(0.071)	(0.063)	(0.067)
GDP per CAPITA	7.275	6.830	1.362	2.091
	(5.030)	(4.842)	(4.726)	(4.888)
Observations	1,848	1,848	1,419	1,419
R^2	0.26	0.10	0.16	0.15
Adjusted R^2	0.20	0.09	0.14	0.13
F Statistic	3.794*** (df = 3; 1789)	6.184*** (df = 3; 1789)	7.555*** (df = 3; 1373)	6.769*** (df = 3; 1373)

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

Relative Misalignment is expressed as a share of a reported gross profit in a given country. Tax rates are expressed in decimals, GDP in trillions $, GDP per Capita in millions $.

Source: Author's own calculations on the basis of the collected data.

Table 10 presents results of similar equations including besides the simple tax rate or its difference also their quadratic approximations. As a dependent variable was used relative misalignment. The estimated coefficients of the second order polynomials are insignificant and the coefficient of previously included variables changed only slightly.

Table 10: Effect of Tax Rates on Relative Misalignment (including quadratic terms)

	Relative Misalignment			
	(1)	(2)	(3)	(4)
Effective Tax Rate	−0.298			
	(0.597)			
Effective Tax Rate^2	0.032			
	(0.196)			
Differences in Effective Tax Rate		−0.593**		
		(0.297)		
Differences in Effective Tax Rate^2		0.431		
		(0.287)		
Statutory Tax Rate			−2.501**	
			(1.187)	
Statutory Tax Rate^2			0.514	
			(0.938)	
Differences in Statutory Tax Rates				−2.345*
				(1.292)
Differences in Statutory Tax Rates^2				−6.005
				(4.022)
GDP	−0.126*	−0.123*	−0.120*	−0.128**
	(0.072)	(0.071)	(0.063)	(0.064)
GDP per CAPITA	7.281	6.811	1.340	2.281
	(5.039)	(4.855)	(4.700)	(4.832)
Observations	1,848	1,848	1,419	1,419
R^2	0.26	0.11	0.16	0.17
Adjusted R^2	0.23	0.10	0.15	0.16
F Statistic	2.847** (df = 4; 1788)	4.818*** (df = 4; 1788)	5.738*** (df = 4; 1372)	5.797*** (df = 4; 1372)

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

Relative Misalignment is expressed as a share of a reported gross profit in a given country.Tax rates are expressed in decimals, GDP in trillions $, GDP per Capita in millions $.

Source: Author's own calculations on the basis of the collected data.

Table 11 and Table 12 present results of provide results of the model with absolute misalignment (expressed in million dollars) as a dependent variable. Again, standard errors are reported in brackets and are clustered at the country level, column (1) contains results of the equation including effective tax rate, column (2) difference between effective tax rates, column (3) statutory tax rate and column (4) difference between statutory tax rates.

The estimated effect of the effective tax rate is -0.005, of the difference in effective tax rates -0.002, of the statutory tax rate -0.023 and of the difference in statutory tax rates -0.019, any of the coefficients is not significant. Estimated coefficients of GDP are smaller than those in the previous equations, negative and highly significant. The estimated effect of GDP per Capita is very similar in each of those four equations, around 0.7. The estimated effect of the effective tax rate means that 10 % increase in the effective tax rate leads to increase of the magnitude of the negative misalignment (or decrease in positive misalignment) by 500 million dollars. The sign and also the size of the estimate are reasonable, because, as previously discussed, the higher the tax rate, the more negative the misalignment and the more profit is missing. The effect of the statutory tax rate is even greater, 10 % increase in statutory tax rate increases the magnitude of negative misalignment (or decrease positive misalignment) by more than 2 billion. Effects of the differences are similar.

Table 11: Effect of Tax Rates on Absolute Misalignment

	Absolute Misalignment			
	(1)	(2)	(3)	(4)
Effective Tax Rate	−0.005			
	(0.004)			
Difference in Effective Tax Rates		−0.002		
		(0.002)		
Statutory Tax Rate			−0.023	
			(0.025)	
Difference in Statutory Tax Rates				−0.019
				(0.021)
GDP	−0.022**	−0.021**	−0.022**	−0.022**
	(0.010)	(0.010)	(0.010)	(0.010)
GDP per CAPITA	0.672***	0.687***	0.660**	0.697**
	(0.206)	(0.210)	(0.287)	(0.280)
Observations	1,848	1,848	1,419	1,419
R^2	0.446	0.446	0.450	0.449
Adjusted R^2	0.428	0.428	0.432	0.431
F Statistic	480.324*** (df = 3; 1789)	479.500*** (df = 3; 1789)	374.539*** (df = 3; 1373)	373.109*** (df = 3; 1373)

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

Absolute misalignment is expressed in trillions $.Tax rates are expressed in decimals, GDP in trillions $, GDP per Capita in millions $.

Source: Author's own calculations on the basis of the collected data.

Table 12 shows results of the model with absolute misalignment as a dependent variable and equations including quadratic terms. The estimated coefficients of the quadratic terms are small and insignificant and it does not affect estimated coefficients of other variables.

Table 12: Effect of Tax Rates on Absolute Misalignment (including quadratic terms)

	Absolute Misalignment			
	(1)	(2)	(3)	(4)
Effective Tax Rate	−0.005			
	(0.004)			
Effective Tax Rate^2	−0.005*			
	(0.003)			
Difference in Effective Tax Rates		−0.002		
		(0.002)		
Difference in Effective Tax Rates^2		−0.002		
		(0.002)		
Statutory Tax Rate			−0.023	
			(0.025)	
Statutory Tax Rate^2			0.003	
			(0.006)	
Difference in Statutory Tax Rates				−0.019
				(0.021)
Difference in Statutory Tax Rates^2				−0.072*
				(0.041)
GDP	−0.022**	−0.021**	−0.022**	−0.022**
	(0.010)	(0.010)	(0.010)	(0.010)
GDP per CAPITA	0.673***	0.687***	0.660**	0.699**
	(0.206)	(0.210)	(0.287)	(0.281)
Observations	1,848	1,848	1,419	1,419
R^2	0.447	0.446	0.450	0.450
Adjusted R^2	0.429	0.427	0.432	0.432
F Statistic	361.428*** (df = 4; 1788)	359.469*** (df = 4; 1788)	280.733*** (df = 4; 1372)	281.020*** (df = 4; 1372)

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

Absolute misalignment is expressed in trillions $.Tax rates are expressed in decimals, GDP in trillions $, GDP per Capita in millions $.

Source: Author's own calculations on the basis of the collected data.

Overall can be said that the statutory tax rate is in explaining relative misalignment better than the effective tax rate. Not only because of the insignificance of the effective tax rate (this can be caused also by using clustered standard errors of collinearity between independent variables) but also because of the size of the estimate, which is, in my opinion, too low for the coefficient of effective tax rate. The same holds also for differences in tax rate, even though is difference in effective tax rates more significant, I

expect the difference in statutory tax rates to be more credible because of its size. According to the previous analysis of the effects of tax rate on profit and economic activity can be conclude that the magnitude of misalignment changes due to changes in reported profit and not in real economic activity.

Neither the simple tax rates, nor the difference in tax rates have a significant effect on absolute misalignment.

Additionally, in order to examine how the estimated effect of variables of interest changed over time, I divided dataset into halves and estimated with those subdatasets effect of statutory tax rate and difference in statutory tax rates on relative misalignment (also with including quadratic terms). Firstly, I run regression only with data prior the year 2000 and afterwards only for data beginning in 2000.

Table 13: Effect of Tax Rates on Relative Misalignment before 2000

	Relative Misalignment			
	(1)	(2)	(3)	(4)
Statutory Tax Rate	−1.347	−1.346		
	(1.153)	(1.149)		
Statutory Tax Rate^2		0.257		
		(0.541)		
Difference in Statutory Tax Rates			−0.716	−0.710
			(1.247)	(1.249)
Difference in Statutory Tax Rates^2				1.786
				(3.314)
GDP	−0.201	−0.201	−0.194	−0.193
	(0.169)	(0.169)	(0.169)	(0.169)
GDP per CAPITA	12.231	12.303	4.865	4.840
	(9.938)	(9.962)	(8.634)	(8.629)
Observations	731	731	731	731
R^2	0.15	0.16	0.13	0.13
Adjusted R^2	0.13	0.14	0.12	0.12
F Statistic	1.258 (df = 3; 685)	0.969 (df = 4; 684)	0.660 (df = 3; 685)	0.548 (df = 4; 684)

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

Relative Misalignment is expressed as a share of a reported gross profit in a given country.Tax rates are expressed in decimals, GDP in trillions $, GDP per Capita in millions $.

Source: Author's own calculations on the basis of the collected data.

Table 14: Effect of Tax Rates on Relative Misalignment after 2000

	Relative Misalignment			
	(1)	(2)	(3)	(4)
Statutory Tax Rate	−2.446**	−2.384**		
	(1.203)	(1.224)		
Statutory Tax Rate^2		−3.801*		
		(1.978)		
Difference in Statutory Tax Rates			−2.669**	−2.749**
			(1.190)	(1.203)
Difference in Statutory Tax Rates^2				6.729**
				(3.187)
GDP	−0.207**	−0.204**	−0.204**	−0.196**
	(0.087)	(0.084)	(0.086)	(0.086)
GDP per CAPITA	4.234	3.156	4.708	4.235
	(4.644)	(4.842)	(4.529)	(4.680)
Observations	688	688	688	688
R^2	0.17	0.16	0.18	0.23
Adjusted R^2	0.15	0.14	0.17	0.21
F Statistic	3.698** (df = 3; 642)	4.203*** (df = 4; 641)	3.862*** (df = 3; 642)	3.719*** (df = 4; 641)

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

Relative Misalignment is expressed as a share of a reported gross profit in a given country.Tax rates are expressed in decimals, GDP in trillions $, GDP per Capita in millions $.

Source: Author's own calculations on the basis of the collected data.

Results show that coefficient for data before 2000 are considerably smaller than estimates after 2000 and that they are not significant. Coefficients estimated for years after 2000 are highly significant and also quadratic terms seem to have stronger effect than in the previous estimates with undivided dataset. This consists with the first part of the analysis which showed that the problem with BEPS steeply increased in the new millennium.

4.5 Comparison with the Existing Literature

The first part of the analysis was similar to the one made by Cobham and Janský (2015). However, I was able to collect larger dataset. Mainly, I added the newest available data for years 2013-2015 and also complemented

information about parent companies in some years of 80s and 90s, which were unable to obtain at the time they gathered data. Our results regarding the relative as well as absolute extent of misalignment are very similar, occasionally differences are negligible. They can be caused by the extrapolating of the trend of some variables (such as taxes paid by parent companies) which are available only for some years. Estimated numbers in between those years can be a reason for discrepancies. The estimates of missing profit and revenue loses are also highly consistent with the results of the BEPS analysis made by Kim Clausing (2016), who states that low tax countries such as Netherlands, Luxembourg and Ireland tend to benefit from the profit shifting the most. In order to understand the results in broader context it is interesting to remind the analysis by Guvenen (2017), who estimated that profit shifting understate US GDP by almost 2 % and for some small low tax rate countries such as Bermuda and Caribbean, it implies overstating by 5 to 6 times their annual GDP.

Similarly to my approach, majority of the regression analysis estimating profit shifting is based on the framework established by Hines and Rice (1994), however, they use logarithm of reported gross profit as a dependent variable. This approach was repeated many times in the existing literature, for example by Clausing (2015) or Dowd (2017). The estimation made by Hines and Rice (1994) showed a 2.25 % decrease in reported profit as a reaction to 1 % increase in a tax rate and Clausing (2016) estimated an effect of 1.9 %. Both these analysis were based on the country-level aggregated data published by the Bureau of Economic Analysis. It can be argued that a lower coefficient estimated by Clausing (2016) was caused by the more precise data than those in year 1994. Lower estimates in the more recent years are an overall trend, which is, however, caused mainly by availability of company-level data and thus it can be assumed that the estimate by Clausing (2016) is still overstated. As I have already mentioned, Dowd (2017) analysis is unique mainly by allowing for non-linear relationship between tax rates and reported profit. They found that when controlling for this non-linearity,

a 1% increase of tax rate in jurisdiction with near-zero tax rate can cause a decrease in reported profit by almost 5 %, on the other hand in a country with tax rate around 30 % the consequential decrease is only 0.7 %. My result suggest that an increase in statutory tax rate by 1 % is followed by a 2.5 % (when using statutory tax rate) or by 2.3 % (when using difference in statutory tax rates) increase in the magnitude of negative misalignment (or decrease in positive misalignment). According to the separate analyses of the affects on profit and real economic activity are those changes caused by reported profit. A slight difference in my results can be caused by my transformation of the equation used by all the previously mentioned authors. As I have already mentioned in the previous chapter, instead of using capital and labour inputs as independent variables, I included CCCTB formula as a part of the dependent variable. However, CCCTB formula in calculated besides capital and labour inputs also from sales, which are not included in the original equation. Even though I included a second order approximation of the tax variable, as suggested by Dowd (2017), I did not obtain result, which would significantly differ from the previous without quadratic term.

To sum up, the first part of the analysis using the newest available data reveals the ongoing trend in the extent of misalignment explored in the existing literature. It seems that the actions which were taken so far are not sufficient because neither the relative nor the absolute misalignment have decreased and hence the governments still suffer from tax revenue losses. In the second part, I transformed the equation used by many researchers, who estimated effect of tax rate on the reported profit, and computed the effect of statutory and effective tax rates on relative and absolute misalignment calculated with respect to the CCCTB formula. This new approach exposed a significant effect of the statutory tax rate, which is similar to that found by previous researchers using country-level aggregated data. Additionally, by dividing dataset into samples according to years, I found no significant effect of tax rate on misalignment before 2000, however, significance rose steeply after 2000.

Conclusion

My thesis started with three questions, I asked "What is the extent of profit shifting?", "What are its consequences?" and "How does the tax rates effect misalignment?". The main objective of my thesis was to undertake an analysis of corporate tax base erosion due to profit shifting and to estimate the effect of differences in tax rate. According to the existing literature, there seem to be considerable evidence about the inconsistency between reported profits and economic activity in many jurisdictions.

Using survey data from the Bureau of Economic Analysis for years 1983 – 2015 and following the approach of Cobam and Janský (2015), I found that the 10 % increase in the relative extent of misalignment, means an enormous increase in absolute misalignment from approximately 30 bn dollars to 800 bn dollars. This growing trend is accompanied by increasing tax losses for some governments and, on the other hand, with rising tax revenues for others. The United States seems to suffer from profit shifting the most, only in the year 2015 about 540 bn dollars were missing, which implies about 190 bn loss on tax revenue. Also other leading economies, such as Canada, Germany and Australia evinced considerable losses. On the other hand, I found excess profit for example in Netherlands (162 bn), Ireland (91 bn) and Luxembourg (74 bn).

In order to answer my third question I established an econometric panel data model. The theoretical basis for these specifications was highly influential framework established by Hines and Rice (1994) assuming gross profit to be constituted by "true" income generated by real economic activity and shifted income. The same logic can be seen behind my regression equations. The dependent variable – misalignment – expresses the difference between reported profit and the "true" profit (id est profit truly generated in a given jurisdiction), while the independent variables were chosen so that they can capture the incentive to move profit. Is the profit shifted mainly because of differences in tax rates? Because of the level of development in a country and hence by more safety of banking institutions (proxy by GDP per

Capita)? Or because of the overall size of the economy? Using panel data should help to control for unobserved state-specific characteristics. I found a significant effect of statutory tax rates on relative misalignment, particularly 1 % increase in statutory tax rate causes 2.5 % increase in the magnitude of negative misalignment (or decrease in positive misalignment). Since the misalignment is negative in a situation when the share of profit in a given jurisdiction is lower than the share of real economic activity, this estimate implies decrease in profit as a consequence of increase in tax rate. The size of the effect is similar to that estimated in the previous literature.

Overall the analysis showed a high misalignment between reported gross profit and the real economic activity. Since the share of profit considerably exceeds share of the economic activity mainly in jurisdiction with near-zero tax rates, it may be inferred that the profit is shifted deliberately in order to avoid greater tax burden. The motivation by low tax rates was confirmed also by regression analysis. Corporate tax erosion due to profit shifting is a large problem with many negative consequences and what is even more concerning, despite international attempts, the increasing trend does not seem to slow down.

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Appendix A

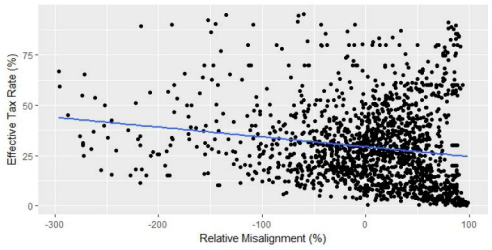

Figure 17: Correlation between Relative Misalignment and Effective Tax Rate

Tax Rate is expressed in percents, Relative Misalignment as a share of Gross Profit, correlation coefficient $\rho = -0.17$.

Source: Author's own calculations on the basis of the collected data.

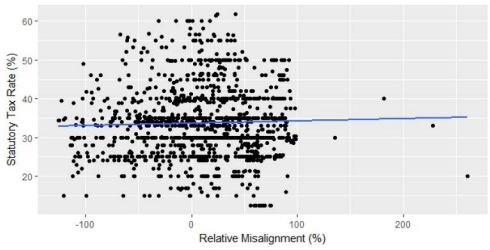

Figure 18: Correlation between Relative Misalignment and Statutory Tax Rate

Tax Rate is expressed in percents, Relative Misalignment as a share of Gross Profit, correlation coefficient $\rho = 0.03$.

Source: Author's own calculations on the basis of the collected data.

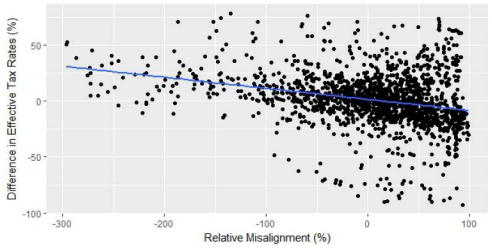

Figure 19: Correlation between Relative Misalignment and Difference in Effective Tax Rates

Difference Tax Rates is expressed in percents, Relative Misalignment as a share of Gross Profit, correlation coefficient $\rho = -0.28$.

Source: Author's own calculations on the basis of the collected data.

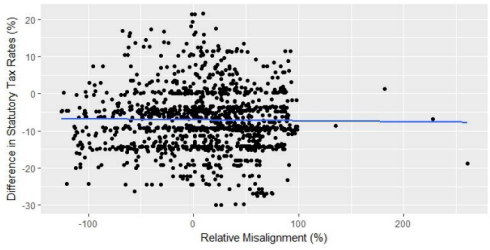

Figure 20: Correlation between Relative Misalignment and Difference in Statutory Tax Rates

Difference Tax Rates is expressed in percents, Relative Misalignment as a share of Gross Profit, correlation coefficient $\rho = -0.02$.

Source: Author's own calculations on the basis of the collected data.

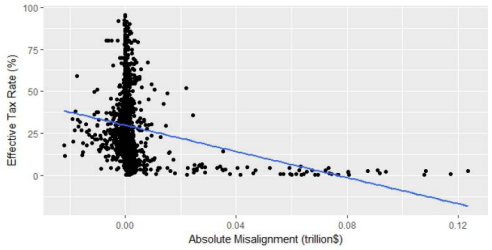

Figure 21: Correlation between Absolute Misalignment and Effective Tax Rate

Tax Rate is expressed in percents, Absolute Misalignment in trillions of dollars, correlation coefficient $\rho = -0.23$.

Source: Author's own calculations on the basis of the collected data.

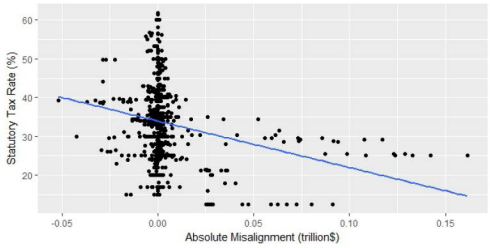

Figure 22: Correlation between Absolute Misalignment and Statutory Tax Rate

Tax Rate is expressed in percents, Absolute Misalignment in trillions of dollars, correlation coefficient $\rho = -0.21$.

Source: Author's own calculations on the basis of the collected data.

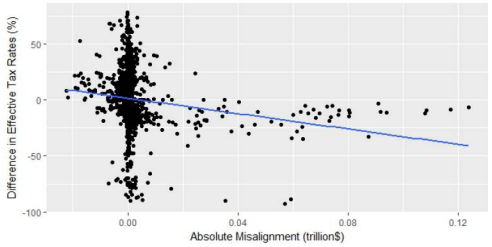

Figure 23: Correlation between Absolute Misalignment and Difference in Effective Tax Rates

Difference in Tax Rates is expressed in percents, Absolute Misalignment in trillions of dollars, correlation coefficient $\rho = -0.17$.

Source: Author's own calculations on the basis of the collected data.

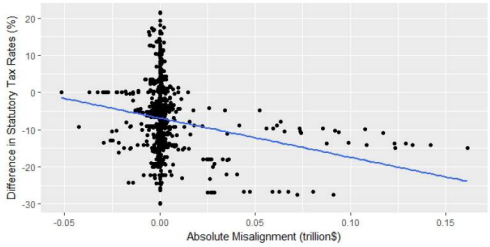

Figure 24: Correlation between Absolute Misalignment and Difference in Statutory Tax Rates

Difference in Tax Rates is expressed in percents, Absolute Misalignment in trillions of dollars, correlation coefficient $\rho = -0.20$.

Source: Author's own calculations on the basis of the collected data.

Appendix B

Table 15: Relative Extent of Profit Misalignment

	Year	Total Assets	Tangible Assets	Sales	Compensation for Employees	Number of Employees	CCCTB Formula
1	1983	16.79	17.08	12.83	20.7	16.5	13.88
2	1984	16.61	17.57	12.46	20.66	16.12	13.82
3	1985	17.23	17.48	12.84	20.64	15.5	14.13
4	1986	14.46	14.85	8.84	16.79	12.1	10.67
5	1987	15.24	15.96	9.71	17.26	13.93	11.29
6	1988	14.11	15.09	8.12	15.82	12.58	9.78
7	1989	13.32	14.86	8.74	15.45	12.41	10.15
8	1990	14.91	17.24	9.81	17.34	15.09	11.64
9	1991	16.84	19.64	11.84	19.3	17.14	13.91
10	1992	23.13	26.43	18.89	26.43	22.99	20.84
11	1993	11.46	16.23	11.31	18.13	14.48	12.71
12	1994	9.88	10.31	7.67	12.65	9.64	7.96
13	1995	8.03	11.38	6.71	13.03	10.96	7.62
14	1996	7.06	9.17	6.94	10.78	9.23	5.9
15	1997	4.04	5.13	5.62	6.64	5.03	3.65
16	1998	6.69	8.64	9.1	9.33	9.23	7.32
17	1999	6.37	8.87	6.05	11.01	9.73	6.47
18	2000	8.86	11.24	7.95	14.87	12.74	9.01
19	2001	6.2	11.11	6.41	14.87	8.54	7.81
20	2002	33.27	37.44	33.1	42.08	37.24	36.68
21	2003	12.87	19	14.77	22.14	20.07	16.97
22	2004	15.96	22.17	18.23	27.05	24.26	19.24
23	2005	16.18	24.72	19.84	27.65	26.05	20.65
24	2006	15.05	22.83	18.46	26.94	24.88	19.44
25	2007	20.41	27.46	22.78	32.13	29.6	23.64
26	2008	41.24	52.07	44.97	56.66	53.4	46.62
27	2009	20.62	31.66	27.74	36.28	34.73	28.57
28	2010	20.33	27.91	24.03	33.21	31.37	24.87
29	2011	17.79	24.65	21.99	30.78	28.87	22.24
30	2012	18.5	26.91	24.13	31.68	30.2	24.5
31	2013	14.01	23.3	20.63	27.99	26.52	21.04
32	2014	13.76	25.39	21.12	28.17	27.49	21.66
33	2015	13.34	27.03	21.37	28.53	28.14	22.77

Extent of profit misalignment is expressed as a percentage of total gross profit earned in each year.

Source: Author's own calculations on the basis of the collected data.

Table 16: Absolute Extent of Profit Misalignment

	Year	Total Assets	Tangible Assets	Sales	Compensation of Employees	Number of Employees	CCCTB Formula
1	1983	30714.53	31245.28	23480	37880.59	30193.42	25390.27
2	1984	35599.12	37656.21	26700.55	44261.97	34535.91	29609.27
3	1985	36266.48	36807.17	27023.01	43460.65	32625.76	29755.61
4	1986	30907.89	31751.77	18904.47	35897.47	25873.36	22818.45
5	1987	38787.03	40629.98	24710.08	43943.19	35476.71	28747.83
6	1988	43313.78	46343.93	24946.79	48593.3	38637.61	30030.19
7	1989	44812.97	50026.89	29424.88	51980.58	41765.01	34167.05
8	1990	45676.19	52813.01	30042.55	53126.71	46211.96	35663.35
9	1991	43571.27	50814.01	30619.09	49921.28	44325.58	35975.98
10	1992	48460.27	55365	39579.14	55371.62	48169.18	43668.4
11	1993	32182.78	45599.82	31779.43	50922.09	40681.39	35703.55
12	1994	39055.45	40765.97	30348.15	50037.18	38124.97	31463.1
13	1995	39395.47	55791.11	32886.21	63908.51	53763.43	37354.22
14	1996	41764.37	54234.57	41008.64	63735.8	54564.55	34880.11
15	1997	24647.4	31329.98	34297.71	40531.33	30718.22	22298.98
16	1998	44352.31	57326.5	60365.43	61864.06	61226.44	48541.3
17	1999	48976.62	68187.04	46515.54	84595.66	74750.45	49729.74
18	2000	74005.58	93843.9	66431.41	124146.32	106370.52	75224.45
19	2001	26022.11	46656.86	26932.69	62445.96	35843.79	32777.73
20	2002	148656.11	167271.93	147887.97	187985.69	166365.23	163882.62
21	2003	125716.7	185511.69	144292.63	216234.22	196048.02	165710.28
22	2004	189186.81	262861.98	216095.3	320634.74	287553.01	228092.93
23	2005	244720.37	373892.55	300020.33	418173.29	393885.6	312245.49
24	2006	257696.72	390996.98	316086.31	461415.24	426128.77	332947.13
25	2007	359579.94	483816.58	401302.49	566051.94	521524.87	416516.53
26	2008	543145.04	685873.93	592313.46	746329.08	703307.43	614003.53
27	2009	338675.08	519858.27	455510.96	595729.01	570405.09	469112.03
28	2010	455026	624646.82	537624.78	743230.84	702055.41	556449.11
29	2011	451208.95	625057.89	557522.08	780464.44	732195.44	563868.02
30	2012	455982	663345.42	594860.13	780955.7	744470.69	603934.89
31	2013	368192.38	612249.21	542085.57	735392.71	696843.61	552944.49
32	2014	396557.41	731924.66	608980.67	812128.97	792479.73	624274.04
33	2015	345928.79	700767.13	554065.32	739620.43	729471.26	590225.87

Extent of profit misalignment is expressed in millions of current US dollars.

Source: Author's own calculations on the basis of the collected data.

Table 17: Missing Tax Payments

	Year	Total Assets	Tangible Assets	Sales	Compensation of Employees	Number of Employees	CCCTB Formula
1	1983	7414.59	8785.18	7726.23	9004.49	18303.25	7708.35
2	1984	7074.98	7801.37	6422.09	9115.52	10224.75	6647.31
3	1985	8733.24	9187.02	6847.06	10531.93	9271.57	7381.14
4	1986	8423.71	8868.17	5397.65	10125.43	8608.37	6377.53
5	1987	10615.98	11406.74	6975.41	11854.78	10416.23	7940.79
6	1988	10925.91	12260.86	6826.98	12401.95	10597.12	7907.69
7	1989	11442.71	13348.25	8159.46	13281.29	11456.56	9099.09
8	1990	14804.63	17276.44	9739.96	17451.9	15440.88	11664.38
9	1991	18620.67	22088.08	12759.54	21919.62	19222.22	15420.12
10	1992	31826.22	35807.98	24315.96	35700.36	30747.31	27537.45
11	1993	14540.41	20812.55	13338.77	22359.91	17732.63	15475.01
12	1994	14036.76	13210.18	12146.91	17652.66	12342.22	11773.58
13	1995	11456.36	17570.52	11189.64	20817.55	17706.58	12450.93
14	1996	12161.72	15653.68	13676.2	19380.36	16286.79	11258.32
15	1997	6820.73	8072.44	8685.45	12106.88	7044.2	5268.33
16	1998	10662.65	17271.65	14824.15	16989.79	13560.74	12366.54
17	1999	14078.87	22518.95	15193.56	26236.72	25298.8	16278.6
18	2000	21368.33	31061.71	22487.58	37909.5	34666.51	24773.68
19	2001	15401.19	27000.33	15939.41	36958.65	19309.27	19359.07
20	2002	124891.88	149133.6	128635.1	164629.4	140317.02	144869.88
21	2003	32490.87	53377.61	40098.79	59211.8	57390.94	47193.92
22	2004	46006.51	65780.29	55006.38	79650.37	72000.95	57673.13
23	2005	54472	72841.83	59392.41	82101.01	77340.18	61225.35
24	2006	52074.91	65397.48	59352.14	79366.18	80409.9	60071.11
25	2007	90669.07	87608.61	82238.33	106603.66	102118.7	83195.97
26	2008	266707.18	306292.85	270778.83	335404.34	302081.96	280378.66
27	2009	62378.05	100336.68	92917.56	117972.64	123147.75	95153.8
28	2010	74956.61	101520.85	92971.23	125623.29	122014.4	95725.52
29	2011	81544.19	103919.18	101379.05	139512.34	141854.64	101943.25
30	2012	85526.32	134594.83	126132.03	170046.16	167873.74	128544.84
31	2013	62997.24	117530.8	107594.82	153910.58	150921.57	110519.15
32	2014	59762.69	140532.76	105864.16	164937.03	130696.68	115219.2
33	2015	82716.72	204521.72	166472.85	220276.35	229766.24	176448.25

Missing tax payments are expressed in millions of current US dollars.

Source: Author's own calculations on the basis of the collected data.

Table 18: Excess Tax Payments

	Year	Total Assets	Tangible Assets	Sales	Compensation of Employees	Number of Employees	CCCTB Formula
1	1983	14472.48	12868.25	10205.86	15231.16	12362.64	10797.79
2	1984	17107.96	15587.39	11978.25	17975.15	14331.5	12918.07
3	1985	17216.48	15300.36	12039.59	17940.39	13635.78	12934.89
4	1986	12183.61	10565.7	6720.8	11961.38	8693.08	7826.78
5	1987	13151.5	11730.52	7027.97	12702.76	10320.04	8112.68
6	1988	13622.01	12979.09	6827.07	13187.49	10758.39	8132.74
7	1989	13722.46	13061.98	7308.58	13169.76	10367.82	8430.39
8	1990	13846.07	13956.52	7922.63	13205.76	11602.48	9333.72
9	1991	12432.25	13505.57	7977.66	12187.98	11466.07	9385.92
10	1992	14113.1	14679.03	10565.23	13979.83	12223.72	11446.61
11	1993	8402.18	10131.61	7348.77	11263.02	9255.76	7985.25
12	1994	7872.64	9896.63	5230.73	8639.01	6273.6	5566.77
13	1995	9022.34	10440.17	5854.6	11883.27	13553.22	6479.79
14	1996	9691.62	10215.3	9042.62	12052.92	11806.88	6277.09
15	1997	13452.89	11922.54	15744.45	13030.36	16585.53	11224.82
16	1998	7166.89	4947.98	10563.46	5461.97	6323.02	5717.33
17	1999	8875.8	8476.24	4700.02	10180.28	9042.45	4646.61
18	2000	15195.43	13330.56	9668.7	19620.09	16363.83	10440.99
19	2001	29577.57	28585.44	26233.17	33290.92	27614.36	27000.32
20	2002	22233.94	20166.42	17122.25	24772.68	19554.27	20449.5
21	2003	15916.12	12350.66	10129.13	19399.45	15833.89	11877.27
22	2004	25768.3	16536.77	18126.76	31493.84	25489.94	17517.52
23	2005	31604.91	27566.61	26107.98	39555.43	35017.91	25002.4
24	2006	38055.78	29053.18	30596.43	47806.86	39508.52	29628.07
25	2007	48356.72	31267.99	36685	55397.94	43389.17	35173.49
26	2008	76976.98	67788.96	68681.99	86874.48	74840.71	68681.84
27	2009	40198.78	32661.47	43673.48	57096.84	47866.41	41424.37
28	2010	51131.06	34612.7	47561.75	66140.16	55326.93	45293.17
29	2011	63792.04	40521.83	56656.59	79166.41	66243.67	52920.77
30	2012	63128.53	45107.86	58365.8	75261.88	64046.65	55096.9
31	2013	52659.83	34132.94	48724.95	66032.36	55032.05	45089.62
32	2014	62046.3	52204.74	69626.39	82980.46	72822.01	65378.18
33	2015	85856.94	73275.68	90478.13	118622.52	125230.76	90850.72

Excess tax payments are expressed in millions of current US dollars.

Source: Author's own calculations on the basis of the collected data.