



Ca' Foscari
University
of Venice

Master's Degree program
Second Cycle (SECS-S/06)

In Economics

Final dissertation

Fiscal competition and tax avoidance in Europe: an assessment.

Supervisor

ch. prof. Federico Etro

Graduand

Giovanni Sgaravatti
843834

Academic Year

2016/2017

“Europe will not be made all at once, or according to a single plan. It will be built through concrete achievements which first create a de facto solidarity” Robert Schuman

Acknowledgments

My most profound gratitude goes first to my family, who has always supported me through the years.

Thank you, mum, for having always believed in my abilities.

Thank you, dad, for teaching me the importance of passion and hard work.

Thank you, uncle, for indicating me the right direction.

Thank you, sister, for being patient with me.

Thank you, grandma, for your constant support.

I am also very thankful to my supervisor, professor Etro, his door was always open whenever I needed advice or help. His thorough comments and suggestions were precious.

I would also like to thank Giulia, whose work helped me with detailed insights on tax competition.

I owe very much also to my mentor at BusinessEurope, Frederik, who taught me how to collect and elaborate data, and to Pieter, who was always very keen to share his knowledge with me.

Finally, I thank my classmates, in particular Alessandro and Enerlida, who shared with me dreams and fears, satisfaction and fatigue.

I thank you all very much, this accomplishment would have not been possible without you.

To Adriano and Raffella.

*They say the best ones are the first to leave,
it was most certainly true in your case.*

Table of contents

Abstract	0
Introduction: Fiscal competition.....	1
Chapter 1: Current developments	4
Chapter 2: An historical overview of fiscal competition	10
Capital mobility.....	10
Race to the bottom	12
Chapter 3: Literature review	19
Tiebout's model	19
The Oates' critique.....	21
Zodrow and Mieszkowski's baseline model.....	23
After Zodrow and Mieszkowski: The Politics of 1992	27
The economic equilibrium of the game	30
The political equilibrium of the game	34
The problem of double taxation	37
A model comparison	38
Hamada's model	38
The effects of taxation.....	40
The monopoly solution.....	42
The monopsony solution	43
The Cournot-Nash solution.....	44
Cooperation through a tax credit.....	44
Bond and Samuelson.....	47
The matter of size; Kanbur and Keen	50
The Nash equilibrium	54
Chapter 4: Possible benefits from tax competition	59
The power to tax.....	59
The efficiency drive of competition	61
An attempt towards theoretical convergence.....	63
Chapter 5: Some by-products of tax competition	65
Redistributive concerns.....	65
Tax havens	67
Appendix	76
Appendix 0.....	76

Appendix 1.....	81
Appendix 2.....	83
Bibliography.....	87

Abstract

Fiscal competition and tax avoidance in Europe: an assessment.

This work attempts to provide a comprehensive picture of fiscal competition in Europe. The main focus is that of presenting and interpreting theoretical models of tax competition such as those elaborated by Persson and Tabellini (1992) and Kanbur and Keen (1993). Some reference to the main developments now under discussion in the European Council and in the EU Parliament about tax-reforms are also provided. The first and foremost important development being the recent proposal of the European Commission for a Common Consolidated Corporate Tax Base (CCCTB) (published on 25 October 2016). Finally, it is given an overview of the topic of tax evasion and tax avoidance, both from an informative and from an economics perspective. The issue of redistribution when governments compete for tax bases is also tackled.

Introduction: Fiscal competition

The term “fiscal competition” refers to a situation where multiple players, which can be countries, regions or other geographical entities, engage in regulatory competition to attract tax bases. These bases can correspond to goods, labour, and capital, the latter in particular is the most relevant for the European framework (Persson & Tabellini, 1992)¹. Some consider such competition to be beneficial to the overall welfare of those engaging in it because it can translate into a driving force for efficiency, which pushes territorial entities to better dealing with limited resources (Kirchgässner & Pommerehne, 1996). In particular, some academics (Belleflamme & Hindriks, 2005) suggest the application of Schumpeter's theory of competition, as the engine of improvement, to governments. The Belgian authors argue that fiscal competition among countries can result in a better allocation of resources, hence in more efficient public services (Hindriks, 2012).

On the other hand, most of the literature on fiscal competition stresses its harmful repercussions. In fact, many models show how such a competition results in a race to the bottom in terms of taxation and in a consequent under-provision of public goods (Wilson, 1999). This is normally explained as the result of a misjudgment of public authorities in terms of the size of marginal costs, which they infer being bigger than what they actually are. Oates describes the problem as follows: “The result of tax competition may well be a tendency toward less than efficient levels of output of local services. In an attempt to keep taxes low to attract business investment, local officials may hold spending below equal marginal costs, particularly for those programs that do not offer direct benefits to local business.” (Oates, 1972).

Regardless of the actual impact of fiscal competition on total welfare, it can surely be stated that the phenomenon is a relevant one today, both because of its size and its political implications.

¹ The two authors do not specify the reasoning behind their claim. However, this can probably be attributed to the fact that capital mobility is much higher than labour mobility and that taxation of capital influences allocation choices of both productive (hence corporative) and financial capital, in contrast to the taxation of products, which normally concerns only businesses in the manufacturing sector.

When countries engage in tax competition the smaller ones have higher incentives to lower tax rates. This happens because the revenues obtained from the foreign tax base they gain in decreasing taxes is normally bigger than the loss incurred domestically due to lower tax rates (Wilson, 1991; Kanbur and Keen 1993). Another undesired by-product of this process is the formation of tax havens. In 1998 the Organisation for Economic Co-operation and Development (OECD) provided four key factors to identify tax havens, stating that they normally show the following characteristics: no or only nominal taxation on income, no effective exchange of information with other countries, lack of transparency in the operation of the legislative, legal or administrative provisions, and no substantial activity on their soil (hence, they engage in favourable tax regimes to attract foreign investments) (OECD, 1998).

Tax disparity obviously results in an opportunity for citizens and for international corporations to engage in practices of tax evasion or aggressive tax planning, aimed at reducing their taxable base and the amount of taxes they have to pay. Considering Switzerland alone, the offshore private wealth detained by Swiss banks amounts to a stunning \$2.3 trillion, of which more than its half (precisely \$1.3 trillion) comes from European countries (Zucman, 2015)². On the other hand, also tax competition on corporate profits is very much worth attention, with corporate taxes having an impact on the overall governments' revenues spanning from 4% in Slovenia to 19.2% in Malta (Eurostat data, 2015) and with corporate tax rates greatly changing from small countries like Cyprus, with a 12.5% rate, to big ones like France, with a regime of 33.33% (KPM, Tax Rates Online data, 2017). In a recent study of the OECD, it was showed how some multinationals manage to reduce their average effective tax rate down to 8.5 percentage points compared to domestic enterprises with similar characteristics (Sorbe & Johansson, 2017). Given such disparities, and the subsequent loss in countries' tax revenues, the European Union has produced many legislative documents addressing the phenomenon, both at the corporate and at the private level. The most renown is probably the "Anti-Tax Avoidance" directive, issued on January the 28th of 2016, which focuses on corporations employing aggressive tax planning strategies. Another one is

² The author collected this figure from the Swiss National Bank (SNB) data portal. Zucman claims that the estimate of \$2.3 trillion is probably a conservative one.

the so-called “Transparency directive” issued in 2001 and then amended in 2004 and again in 2013. This, focused mainly on private investors and it regulates the requirements regarding the disclosure of periodic and ongoing information.

The topic is ongoing also at the global level, with the G20 financial ministers having approved throughout 2015 and 2016 the Base Erosion and Profit Shifting (BEPS) document, released by the OECD in 2013, and then revisited in 2015. Other important measures put in place by the OECD are the Automatic Exchange of Information (AEOI) mechanism and the Common Reporting Standard. They both aim at limiting the phenomena of tax avoidance and have become vastly adopted, to the point that even classic tax havens such as Switzerland have committed to them.

In the following chapter, these and other main undergoing developments are analysed, some focus is also devoted to the strong political pressure now present in Europe and whether this is motivated or not. Afterwards, it is provided a comprehensive literature review on the topic of tax competition and on that of tax havens. Finally, it is presented a critical assessment of the papers analyzed and some considerations on the political dimension of this topic are made.

Chapter 1: Current developments

Last 5th November 2017 the German newspaper Süddeutsche Zeitung shared with the International Consortium of Investigative Journalists (ICIJ) a list of 13.4 million confidential documents referring to offshore investments. In the list, there were 120 000 names of both companies and of public figures such as politicians and celebrities. This leak is second in size only to the one occurred in 2015, passed to history as the “Panama Papers” leak, which exposed 214,488 offshore entities (Bowers, 2017). Only accounting for tax avoidance by multinationals, the OECD estimates a loss between 100 and 240 billion dollars every year worldwide (OECD, 2016). When instead global household wealth is considered, the yearly sum of worldwide loss in revenues due to tax havens amounts to almost \$200bn (Zucman, 2015). The abovementioned leaks got significant relevance both at the domestic level and, most importantly, at the European one. In fact, after the Panama Papers’ scandal, the European Commission’s (EC) vice-president Dombrovskis called for the drafting of a black-list of tax havens, which was approved and published by the Ecofin group on Tuesday the 5th of December 2017³. Also, Margarethe Vestager, the commissioner for competition, said: “We need these scandals [...] to initiate change” and “Thanks to those disclosures, people’s anger served as fuel to accelerate decision-making at the European Council” (Biançon, 2017). The Danish commissioner has recently become a sort of celebrity among European citizens for her fights against the aggressive tax planning of big multinationals. In the last few years, for example, she urged both Ireland and Luxemburg to collect the due taxes from, respectively, Apple and Amazon.

For what concerns corporate taxation, the commissioners do not complain about the disparity of domestic tax rates per se, but about state aid. In the European Union taxation is indeed a member-state prerogative, and consequently, tax competition is the natural outcome of its configuration. What Brussels criticizes is the specific targeting, as a state, of certain profitable taxpayers to attract them in their jurisdiction. The bias is hence allocated to those states giving tax breaks to specific companies. This is what

³ The list was immediately harshly criticised by Non-Governmental-Organisations (NGOs) for the surprising absence of tax havens within the EU, such as Ireland, Luxemburg and the Netherlands.

normally referred to as “unfair competition” (Malherbe, 2015). Therefore, the EU condemns tax specific avoidance arrangements, too often stipulated between the Member States and specific corporations. These deals hamper a level playing field because they grant some multinationals a tax advantage over their competitors. The probably most famous case of a comprehensive release of documents proving such schemes was that which came to light in 2014 with Luxleaks, when the ICIJ released private files reporting favourable Luxemburg’s tax rulings allowed to more than three hundred companies. The enterprises were able to obtain tax breaks through the aid of the consulting firm PricewaterhouseCoopers, dealing with the government to set them up (Kleinnijenhuis, 2014).

From a legal point of view tax avoidance stands somewhere in the grey zone between the concepts of tax planning and tax elusion. Tax planning refers to the practice aimed at minimizing the tax burden of private individuals or companies, and it is legal in most jurisdictions (OECD, 2017). On the other hand, the term of tax elusion indicates the situation where a fiscal entity underreports its taxable base to elude taxation, and it is obviously illegal. Tax avoidance is somehow in between the two, and it is indeed also referred to as “aggressive tax planning”. This is because the fiscal entity, be it a corporation or a private investor, not only takes tax-wise decisions (tax planning), but exploits discrepancies in the international environment to dodge taxes. As written before, the most controversial practice under the umbrella of tax avoidance is that of tax-specific arrangements where tax-payers, who have uncommon economic strength, bargain their own tax rate. Such arrangements normally go under the label of tax rulings. These are in principle perfectly legal and are generally asked by companies to states for clarifying the applicable legislation in specific business-state relationships. However, they often translate into a communication channel between the state and the company, exploited by the latter as a bargaining opportunity for aggressive tax planning and corporate tax avoidance (Policy Department A, 2015). Even if these tax breaks are perfectly legal intra-state (they are granted by governments). They become very controversial from an inter-state perspective, it is enough to look at article 107 of the Treaty on the Functioning of the European Union (TFEU) to understand how these agreements could impoverish a level playing field among corporations and states. The

article concerning fair competition states as follows: “Save as otherwise provided in the Treaties, any aid granted by a Member State or through state resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, in so far as it affects trade between Member States, be incompatible with the internal market” (European Union, 2012).

Even if the above-reported article does not specifically treat fiscal matters, it is clearly stating that Member States should refrain from interfering with the normal economic competition within the EU. In 2014, the European Commission published a comprehensive document on the rules applicable to State aid when it comes to competition law. In the document, it is also clarified article 107 on the matter of tax avoidance and tax competition. In section G.4.1 (C 384/5) one can read: “Tax measures which are open to all economic agents operating within a Member State are in principle general measures. They must be effectively open to all firms on an equal access basis, and they may not de facto be reduced in scope through, for example, the discretionary power of the State to grant them or through other factors that restrict their practical effect. However, this condition does not restrict the power of Member States to decide on the economic policy which they consider most appropriate and, in particular, to spread the tax burden as they see fit across the different factors of production. Provided, that they apply without distinction to all firms and to the production of all goods, [...] (Commission, 2014)”.

For the abovementioned reasons, in 2015 the Commission urged Luxemburg and the Netherlands to collect old taxes from Fiat Finance and Trade⁴ and Starbucks⁵ respectively, due to tax breaks illegally granted under the EU law on competition. The same situation is now unfolding with Ireland and Apple (Commission, 2015). The

⁴ Case SA.38375 Alleged aid to FFT- Luxembourg, Commission decision of 21 October 2015, available at http://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=3_SA_38375.

⁵ Case SA.38374 Alleged aid to Starbucks, Commission decision of 21 October 2015, available at http://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=3_SA_38374.

European Commission has in fact forced Irish authorities to start collecting around 13bn of previously due taxes from Apple⁶, in accordance with article 108 co. 2 of the TFEU.

Along with tax rulings, the most common form of tax avoidance by international corporations is that of profit shifting, which relies on the idea of “materializing” profits where they are taxed the least. Basically, multinationals exploit the fact of operating in different countries to engage in hybrid mismatches. There are two main techniques to do so: intra-group loans and transfer pricing. With the first one, a company’s foreign subsidiary, located in a tax haven, invests in the debt of another controlled subsidiary, located in a high-tax country as for example France. In this way, the subsidiary in France can deduct the interest payments made to the subsidiary in the tax haven, where profits earned from these transfers are taxed very low or not at all (Wilson, 2014). However, this practice is quite easily detectable by tax authorities and it is not as common as the second technique. Transfer pricing relies on the commercial relationship between two branches of the same group. Simply put, the company operating in the low-tax country sells at a high price service to the branch located in the high tax-country, therefore increasing profits where they are taxed little and decreasing them where they are highly taxed. In principle, every intra-group transaction should be carried at the relative market price as if subsidiaries were unrelated (the arm’s length rule). However, such reference does not always exist, for example, it is very difficult to give a price-tag to new technologies or to intangible goods such as patents and logos. This could be why a company such as Google US in 2003 transferred its search and advertising technologies to Google Holdings, which is incorporated in Ireland and is resident in Bermuda. In this way, all the profits generated from that capital are taxed in Bermuda, where the corporate tax rate is 0% (Drucker, 2010; Zucman, 2015).

From the paragraphs above, it seems once again that the problem is not tax competition per se, but its by-product: tax avoidance. The two issues are, indeed, still interlinked nowadays: with tax harmonization and more coordination among the Member States it would be harder for companies to bargain for favourable tax breaks granted by single

⁶ Case SA.38373 Alleged aid to Apple, available at http://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=3_SA_38373.

states and it would be almost impossible for private citizens to elude taxes⁷. This is why the two concepts of competition and avoidance are often discussed together, for example, the UN Committee on Economic, Social and Cultural Rights characterizes both tax competition and tax secrecy as antithetical to international cooperation. In addition to condemning the race to the bottom on corporate taxes as “inconsistent with the duties of the States Parties to the Covenant” (Center for Economic and Social Rights, 2016).

On the same page of the UN Committee seems to be the French president Emmanuel Macron, whose electoral program clearly states the commitment to fight against fiscal arrangements as that stipulated between Apple and Ireland,⁸ and whose public speeches lay the ground for some tax harmonisation among EU Member States⁹. The political pressure for more transparent tax competition pushed firstly the OECD/G20 to come up with the BEPS project (2013-2015) and then the European Commission to bring back to light a 2011’s proposal for a European Common Consolidated Corporate Tax Base (CCCTB). The OECD’s proposal consists of specific actions to address the shortcomings of current tax rules, which now allow taxpayers to exploit loopholes deriving from taxation diversity. On the other hand, the European CCCTB scheme seems to be one step ahead, due to its “unitary business approach”, which relies on the notion of economic substance¹⁰ (Gimdal, 2017). The idea is to re-establish the link between taxation and the economic activity, through the implementation of an appointment formula based on three, equally weighted, factors: labour, assets, and sales by destination. If adopted, the scheme would uniform the rules defining a corporate’s tax base, hence allowing international enterprises to comply with only one system instead of (potentially) 28 different ones. Nonetheless, the CCCTB would grant complete autonomy to Member States in collecting taxes and in deciding above their corporate tax rates. The proposal will also have a voluntary-applicability nature for all those

⁷ The terms coordination and harmonisation generally acquire slightly different connotations. Coordination is normally mentioned when referring to accounting standard and tax bases, while harmonization when talking about tax rates. However, they are sometimes used interchangeably both in the economics literature and in the public debate.

⁸ Please refer to the electoral program of the party En Marche! of 2017.

⁹ For example, in his public speech of the 26th of September in Sorbonne.

¹⁰ Economic or tax substance refers to the actual economic activities of a company, typically assessed through the physical location of its key assets and of its sales.

companies having a consolidated annual turnover under €750 million. Moreover, it would grant an allowance for growth and investment, giving taxpaying entities the possibility to deduct their equity from their taxable base, hence tackling the issue of a more favourable treatment of debt than investment¹¹ (Gimdal, 2017)

¹¹ Now in most jurisdictions interest payments deriving from debt leveraging are deductible, while equity is not.

Chapter 2: An historical overview of fiscal competition

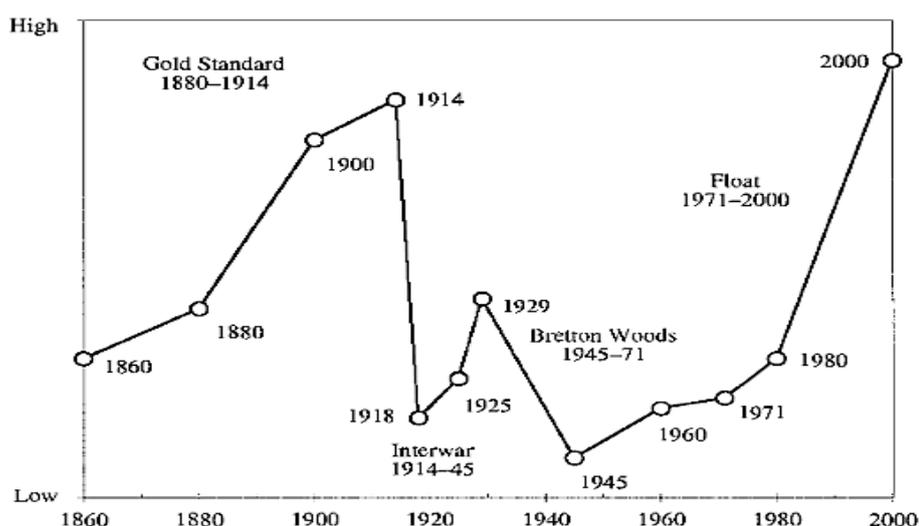
Before starting with the literature review on tax competition I believe important making a brief assessment of the history of international capital mobility and of the overall trend of corporate taxation in Europe.

Capital mobility

In the last one and a half century, capital has tended to become more mobile, this could be attributed to the development of financial markets together with a progressive decline of those barriers and regulations that used to limit international investments. This upward trend in capital mobility was harshly turned around during the great recession and the two world-wars, when governments all around the world deterred international investment (Obstfeld & Taylor, 2003).

Here below it is presented a graph developed by Obstfeld and Taylor depicting capital mobility in the years 1860-2000. On the y-axis the two economists put an index of capital mobility based on the percentage of foreign assets held worldwide¹², while on the x axis there is time.

Figure 1: Capital mobility in the XX century



Source: Obstfeld and Taylor (2003), Figure 3.1

¹² Given the scarcity of historic data for the global economy and the difficulty in estimating this variable, the two authors refer to the graph as a conjecture more than as a factual indicator. For a more precise indicator, though assessed in a much shorter period, please refer to [Appendix O](#).

From this graph, it is straightforward to see how capital mobility in normal conditions has an upward tendency, which is reversed when dramatic socio-economic events such as those of the last century occur. As described above, the point of reference for the elaboration of this graph is the percentage of foreign assets held worldwide, therefore the graph illustrates the mobility level of financial capital. However, it is worth keeping in mind that along with a higher mobility of financial assets, also corporations have become more mobile, and their location and relocation decisions are an important determinant of productive capital mobility.

Another useful parameter often considered in assessing the degree of globalization of the capital market¹³ is the share of foreign direct investment as a percentage of countries' GDPs, higher is this share, more capital is invested internationally. In the tables in [Appendix 0](#) such parameter is reported both for the inward and the outward positions of every OECD country in the time span 2005-2016. It is straightforward noticing the upward trend of almost all countries for both positions. For what concerns the inward foreign direct investment the average percentage of GDP for the OECD average passed from 23.5% in 2005 to 38% in 2016 while for the EU it increased from 29.8% to 48.6%. The outward position among rich countries had a parallel increment in the same time span, which brought the size of foreign investments to increase from 28% to 43% of GDP for the OECD average and from 34.6% to 57.4% for the one of the European Union. These trends are reflected for the five biggest economies in the EU (Germany, France, UK, Italy and Spain), but with less marked positions, with an average of only 33.5% of GDP for inward investments and 42.2% outward. It is instead interesting noticing the case of few relatively small countries such as Ireland, Luxemburg, Switzerland, and the Netherlands. In fact, these countries have very pronounced positions, which in 2016 resulted in more than 100% of their respective GDP for all of them, for both inward and outward foreign investments.

The fact that these countries have such a strong exposition abroad is certainly due to their size; small countries often show a higher degree of economic openness with respect to big countries (Alesina & Wacziarg, 1998). However, this is hardly the only

¹³ See, among the others, (Swank, 1998; Bretschger and Hettich, 200)

explanation given that countries of similar sizes like Austria, Denmark and Portugal have much lower expositions. Another reason why these countries attract so much foreign capital, and why so much capital is by them reinvested abroad, could simply be that they specialized in wealth-management. All these four countries are indeed internationally renowned for their capital-welcoming approach, which includes favourable regulations and low taxes¹⁴.

Race to the bottom

The first country starting this trend and the by far most important is Switzerland. The history of the Helvetic region in attracting capital started in the twenties when the big European countries, annihilated by the war, began to levy high proportional taxes. At that time, in most western countries the tax-rates for the top marginal incomes suddenly soared from the neighbouring of 0% to that of 50%¹⁵ (Zucman, 2015; Piketty, 2013). In response to that upsurge in taxation many wealthy citizens from the bordering countries started to hide capital in Swiss banks and, forever since, Switzerland became synonym of tax haven¹⁶. In the following decades, other countries started to specialize in wealth management, according favourable conditions to both individuals and companies willing to invest, or to hold, capital in their countries. As seen in the introduction, this phenomenon gave rise to disputable services of financial opacity both at the personal and at the corporate level. Out of this evolving trend there were two, contrasting, effects: the international community engaged in multilateral treaties and regulations to fight financial opacity and, probably also due to the little effectiveness of such actions, many developed countries followed the example set by tax havens and decreased their tax rates, in an attempt to retain capital¹⁷. The main tax reforms moving in that direction

¹⁴ The cases of Belgium and Hungary are interesting ones as well. However, they are not here considered due to their specificities. Belgium is the centre of the European institutions and consequently it attracts a lot of foreign investments to lobby policymakers (Brussels is the city with the most lobbies in the World after Washington). On the other hand, Hungary is only very recently trying to position itself as a tax-haven (among the other things, in 2015 the government dropped the country's statutory corporate tax-rate from 19% to 9%).

¹⁵ The top marginal incomes are normally defined by the 1% share (or even less) of a country's richest population.

¹⁶ Data from the Swiss National Bank seem to indicate that in 2015 Swiss banks managed \$2.3 trillion belonging to non-residents. With \$1.3 trillion coming from Europeans (please refer to annex 0 for a detailed picture).

¹⁷ For a very good account on the effectiveness of multinational treaties against offshore tax evasion please refer to (Zucman, 2015) and/or (Schjelderup, 2015).

were made in the eighties, when capital was re-starting its upward trend in international mobility after the two world-wars (please refer to Figure 1). In that period the countries with the most progressive tax rates started to decrease the upper rates because these were the ones most likely to affect citizens and domestic companies able to relocate capital abroad. In fact, moving capital has always been considered to be costly, this could be justified by the cost of gathering extra information about legal issues, or overcoming country-specific regulations, or hiring foreign employees, etc... (Persson & Tabellini, 1992, p. 691). Therefore, if lowering taxes was a strategy to retain capital it made sense to target that segment of the population willing to incur these mobility costs to lighten its tax burden, henceforth the wealthiest segment of the population. In fact, with a progressive system, the tax burden becomes heavier along with the tax base and with the tax rate.¹⁸

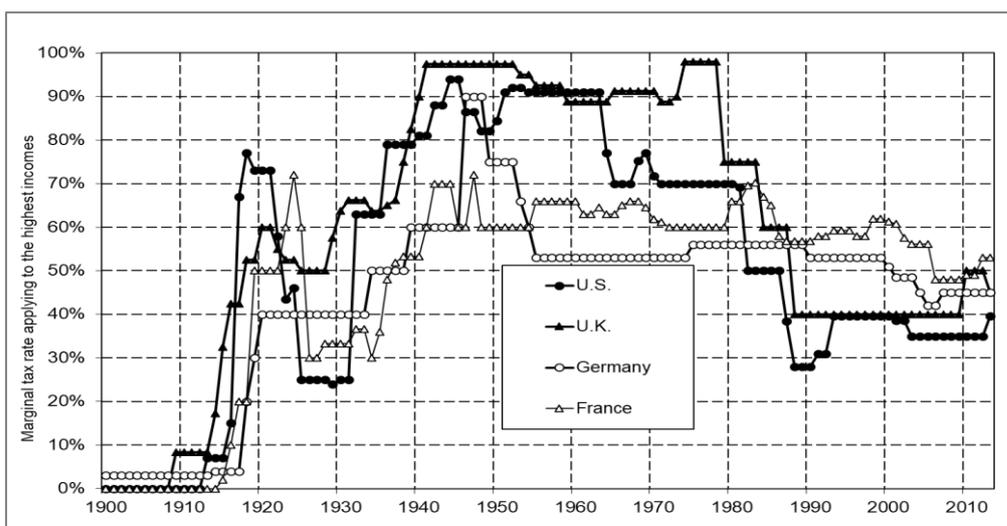
Here below are reported some historic trends in tax rates for the top marginal incomes in few western countries. It is straightforward to see how these rates all increased in the first after-war period and how they fell in the eighties (only the marginal tax rate for Germany was quite stable at the time and begun to decrease after the country's reunification)¹⁹.

¹⁸ It is estimated that in Europe the richest top one percent of the population in the '70s detained around 20% of the overall capital in the region, while the richest ten percent had 60% of it (Piketty, 2013).

¹⁹ The tax-rates under study here have not variated much since, in 2016 they corresponded to 46% in the USA, 45% in the UK, 47% for Germany and 54% for France (OECD database).

Chapter 2: An historical overview of fiscal competition

Figure 2: Top income tax rates (1900-2013), USA, UK, Germany, and France



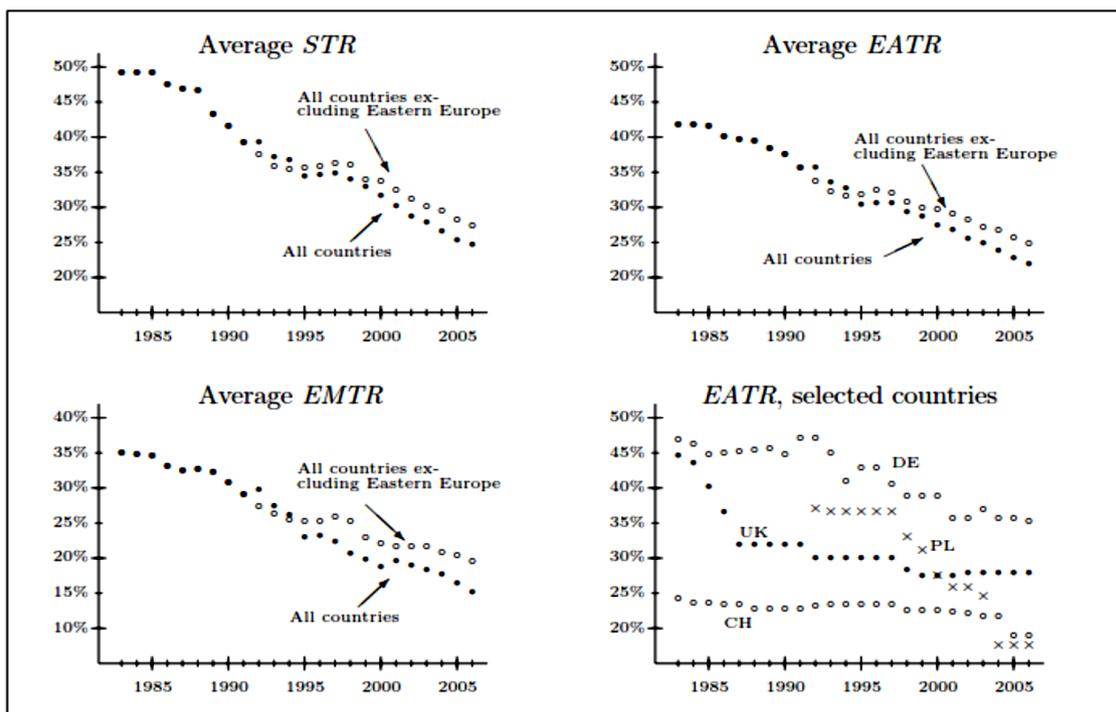
Source: Picketty (2013), Figure 14.1

It is here worth drawing the reader's attention to the trends of the UK and the USA. In fact, it is in these two countries that the swings were most severe, with the UK setting an absolute record in the forties and then again in the seventies with an applicable tax rate on the marginal incomes of 98%. A peculiarity of these two English-speaking countries is the distinction made between *earned* and *unearned* incomes. In the graph are reported the tax rates for the *unearned* income, that is for all the earnings from rents, interests, dividends, etc...

Another tool at the disposal of governments to attract investments, and in particular productive capital, is to downsize corporate taxes. Here-below I report four tables presenting a historical picture of the corporate tax-rate trends in Europe between 1983 and 2006²⁰.

²⁰ All trends were calculated as the unweighted average of the following countries (period): Austria (1983–2006), Belgium (1983–2006), Switzerland (1983–2006), Cyprus (1991–2006), Denmark (1983–2006), Spain (1991–2006), Finland (1983–2006), France (1983–2006), Germany (1983–2006), Greece (1990–2006), Ireland (1983–2006), Iceland (1990–2006), Italy (1983–2006), Luxembourg (1983–2006), Malta (1994–2006), Netherlands (1983–2006), Norway (1990–2006), Portugal (1990–2006), Turkey (1996–2006), Sweden (1983–2006), UK (1983–2006). In Eastern Europe: Bulgaria (1993–2006), Czech Republic (1992–2006), Estonia (1995–2006), Croatia (1995–2006), Hungary (1992–2006), Latvia (1995–2006), Lithuania (1995–2006), Poland (1992–2006), Romania (1994–2006), Slovenia (1995–2006), Slovak Republic (1992–2006).

Figure 3 Trends of Corporate Taxation in Europe 1983-2006



Source: Overesch and Rincke. (2009).

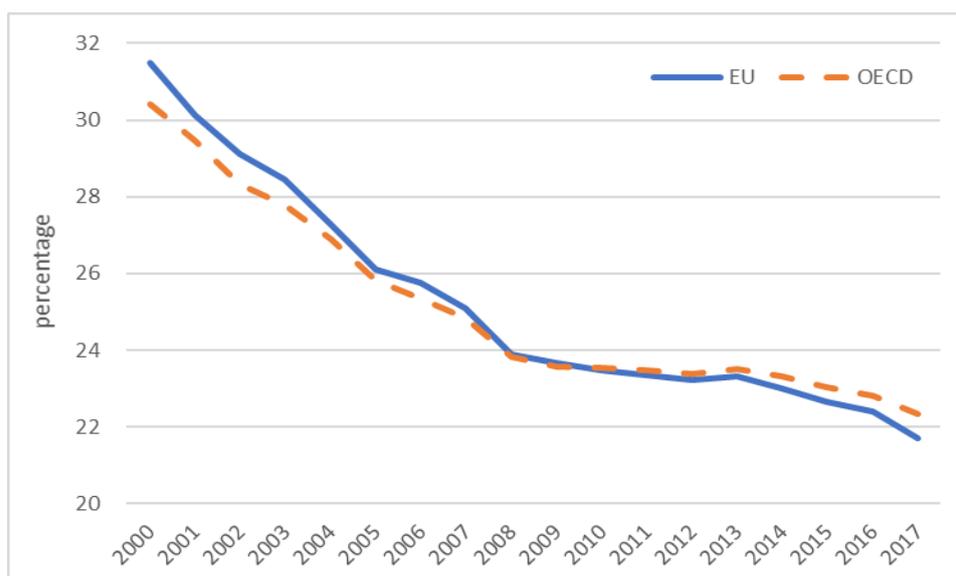
It is straightforward noticing a downward trend for all the considered indicators (STR stands for Statutory Tax Rate, EATR for Effective Average Tax Rate, EMTR for Effective Marginal Tax Rate).

The “race to the bottom” in corporate taxation seems to have continued also in the new millennia, with an average loss in STR of 8 percentage points among the OECD countries (up to 2017) ²¹ and of almost 10 percentage points among the twenty-two EU countries that are also members of the OECD.

²¹ It is here worth mentioning the recent tax-bill passed in the USA that will downsize corporate tax rate from 35% (rate that has remained unchanged throughout all the new century) to 21% in 2018.

Chapter 2: An historical overview of fiscal competition

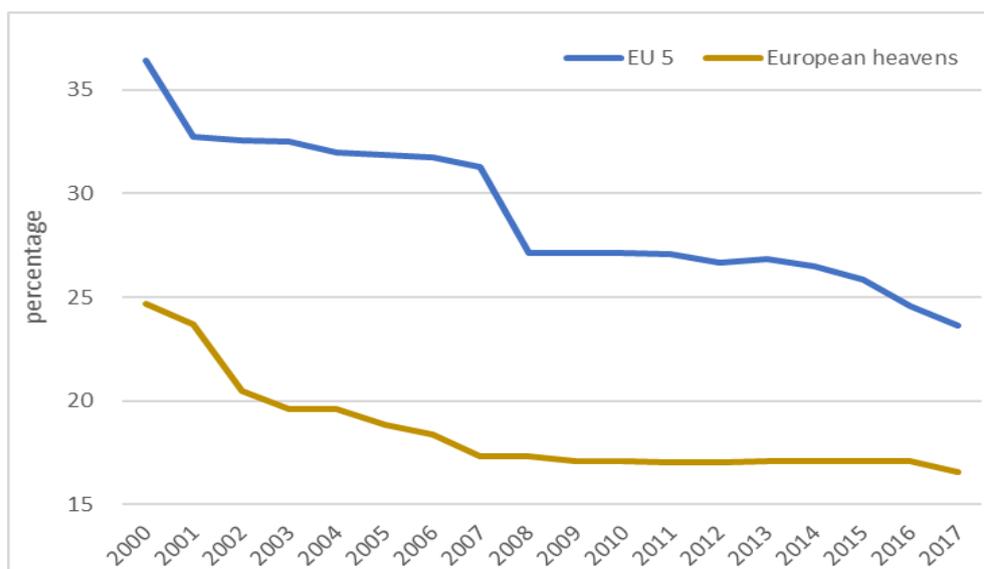
Figure 4: OECD vs EU21 average corporate tax rate (2000-2017)



Source: OECD (Table II.1), author's computations

In the next Figure is reported the unweighted average in corporate STRs for the five biggest economies in the EU against that of the four European “tax havens” mentioned above. Apart from the familiar downward trend, it can be noticed how the gap between the two lines had always been close to 10 percentage points till 2013, when tax-reforms in the five big countries reduced it to approximately 7% points.

Figure 5: EU5 vs 4 European tax havens, average corporate tax rate (2000-2017)



Source: OECD (Table II.1), author's computation

In the following table are analysed the specific variations in the combined (hence the sum of central and sub-central) corporate tax rates for the mentioned countries. The countries are ordered according to the amplitude of the swing occurred between the beginning of the millennial and 2017. The average of such variations can be assessed around ten percentage points, with Germany exhibiting the most dramatic change and Switzerland and France the least. All countries decreased their tax-rate in this time-span.

Figure 6: Corporate Income Tax, EU5 vs 4 European tax havens

Corporate income tax rate	Combined corporate income tax rate			
	Year	2000	2017	Δ
Germany		52,03	30,18	-21,86
Italy		41,25	27,81	-13,44
Ireland		24,00	12,50	-11,50
United Kingdom		30,00	19,00	-11,00
Luxembourg		37,45	27,08	-10,37
Netherlands		35,00	25,00	-10,00
Spain		35,00	25,00	-10,00
Switzerland		24,93	21,15	-3,78
France		37,76	34,43	-3,33

Combined corporate income tax rate - shows the basic combined central and sub-central (statutory) corporate income tax rate given by the central government rate (less deductions for sub-national taxes) plus the sub-central rate.

Source: OECD (Table II.1), author's computations

This trend in capital taxation²² is not something economically bad per-se (as described in in the introduction some argue that tax-competition might be beneficial to the economy). However, many concerns have been advanced that such a race to the bottom could result in an under-provision of public goods and a consequent welfare loss (an extensive literature review is provided in Chapter 3). Moreover, some have raised the issue of a redistributive problem, such trend could increase the tax burden of the low and middle class in response to the lightening of the upper one²³ (Piketty, 2013).

²² Throughout all this work the notion of capital income taxation, if not differently specified, is abbreviated with "capital taxation".

²³ For example, the share of tax-revenues from corporate profits over the total government tax-revenues has been decreasing since 2000 for most of the economies previously compared, except Switzerland. On the other hand, the VAT rate has generally been increasing (please refer to [Appendix Q](#)).

Chapter 2: An historical overview of fiscal competition

Given the extensive body of literature on the topic, this work has by no means the presumption to cover even the slightest part of it. However, some among the most important works in the field are analysed and devoted the attention they deserve from a theoretical standpoint. This was done with an eye on the current developments at the EU level, due to the relevancy of the topic in the institutional debate. In fact, its economic motives, drawbacks and possible benefits must be well understood to allow good policymaking.

Chapter 3: Literature review

In the modern debate on tax competition, there are two main opposing models that since their appearance have been re-elaborated in many different directions: the one of Tiebout, published in 1956, and that described in 1972 by Oates and then formalized by Zodrow and Mieskowski (Wilson, 1999).

The Tiebout's model

The Tiebout's model is one of fiscal competition at the local level, where multiple communities compete offering different bundles of public services that do not change over time. Each community attracts only those citizens whose level of utility is optimized with that particular mix, rather than with the bundle of any other community. With this set-up, Tiebout somehow reverses the classical public economics dilemma of obtaining consumers' (hence voters) preferences for public goods.

Before his piece of work, two of the founding fathers of public economics, Musgrave and Samuelson, had indeed shown how no "market type" solution exists to determine the exact level of expenditures on public goods (Musgrave, 1939; Samuelson, 1954). The argument of Tiebout is that their conclusion is valid for federal expenditures and not for local ones. He argues that, contrary to central spending, local expenditures have a high level of rigidity and do not change much year on year. In fact, it is this rigidity, together with a large variety of communities, that here reverses the classical conclusion on public good provision. In the author's model the voters do reveal their preferences when they choose a bundle of public services. Tiebout depicts an economy with many communities characterized by great variety in their bundles of public goods, and n consumers who autonomously decide where to locate, therefore revealing their preferences²⁴. For his conclusions, Tiebout relies on a set of seven assumptions:

- 1) Consumers are fully mobile and they will move to the community best reflecting their preferences (which are fixed).

²⁴ Some will locate in a community with good services for kids, others will prefer cultural spaces such as libraries, etc...

- 2) Voters are completely aware of differences among revenues and expenditures of all communities.
- 3) The number of communities is very large.
- 4) The ease to find an employment is not considered by consumers picking a community.
- 5) There are no economics externalities between communities.
- 6) For every patten of community services (e.g. that for elders) there is an optimal community size. This optimum is defined by the number of people living in the community, for which the bundle of services can be produced at the lowest average cost.
- 7) Communities not at such an optimum try to increase or decrease their size attracting or distancing population.

With all the above-mentioned assumptions in place, Tiebout shows that consumers will move to the community exactly matching their preferences (hence there is a perfect market equilibrium). However, the author soon recognizes the inadequacy of such a set-up in depicting reality: the number of communities is here indeterminate, there could be as many communities as voters.

To remedy at this distortion Tiebout introduces space into the model, with a cost of registering demand for consumers (mobility cost). Doing so, he prevents the “perfect matching” that was possible before, but still preserves an efficient equilibrium and the preference-revealing outcome of the previous model.

He concludes that: “If production functions show constant returns to scale with generally diminishing factor returns, and if indifference curves are regularly convex, an optimal solution is possible. On the production side, it is assumed that communities are forced to keep production costs at a minimum either through the efficiency of city managers or through competition from other communities.” Tiebout also notes that: “those city managers who are unable to keep costs (taxes) low compared to those of similar communities will find themselves out of a job”.

Therefore, the American professor is here making an argument in favour of fiscal competition: it helps an efficient allocation of resources. However, on the last page of

the paper, Tiebout makes some conjectures on what would happen relaxing assumption number five (i.e. allowing externalities between communities). In which case, he states that “some form of integration may be indicated”, bringing the example of federal, in addition to local, police. Nonetheless, Tiebout concludes his paper stating that integration is justified only if there is an output improvement of the service being integrated, without a total cost increase or the reduction of any other public good. Finally, he calls for policies that promote residential mobility and increase consumers’ knowledge of government’s allocation of resources. Doing so, he states, will result in a general equilibrium solution like that obtained for a private spatial economy (Tiebout, 1956).

Since its first appearance on the journal of political economy, Tiebout’s model has been revisited by many economists who normally assume that: “each region’s government is controlled by its landowners, who seek to maximize the after-tax value of the region’s land by attracting individuals. To do so, the government offers public goods that are financed by local taxes [...] which have to be kept low to attract people to reside in the region.” (Wilson, 1999). Therefore, Tiebout's set-up of regional competition can be described as welfare enhancing, with an efficient equilibrium reached naturally (i.e. the central government cannot reallocate resources to make someone better off without making anyone else worse off).

The Oates’ critique

The second modern economist who extensively wrote on fiscal competition is Wallace E. Oates. The saltwater scholar was fascinated by Tiebout’s work, recognizing its main conclusion (i.e. decentralization allows a better fit of voters’ preferences to the provision of public goods). Moreover, Oates further elaborated some ideas present in Tiebout’s paper, for example in his book on fiscal federalism (1972) he advocates for more widespread public sectors when the goods to be provided are likely to benefit from technological advancements. He writes that having a large number of producers of the same public good will very likely result in different approaches being undertaken to provide the good. In the long run, this promises greater technical progress than if the public good was supplied by only one producer. Furthermore, Oates grants to

competition in the public sector the merit of driving to a more explicit recognition of the costs of public programs, hence to a better public decision-making (Oates, 1972, p. 13). This point will later be further developed by professor Brennan and Buchanan (1980).

However, Oates clearly describes also the shortcomings of decentralizing to an excessive extent. One of the main drawbacks of competition in the public sector, he writes, is the loss in distributional capacity. He brilliantly makes the example of a local government, working independently from the others, willing to apply highly progressive taxation designed to achieve a more equalitarian distribution of income. "Such a program, in view of the relatively high degree of individual mobility that characterizes a national economy, would create strong incentives for the wealthy to move out to neighbouring municipalities and for the poor to migrate into the community. A more nearly equal distribution of income might well result, but it would be caused largely by an outflow of the rich and an influx of the poor, with a consequent fall in the level of per-capita income in the community under consideration" (Oates, 1972, p. 7). Therefore, Oates underlines the peculiar nature of head taxes²⁵ present in Tiebout's model, these are flat taxes that are not very likeable to be charged in any developed economy, where progressive taxation is generally preferred²⁶.

Oates hence stresses the potential efficiency problems emerging from tax competition. Notably, (as seen in the introduction) when discussing competition for capital he concludes that underprovision of public goods is likely. This is due to the race to the bottom in capital taxation, run by jurisdictions attempting to attract investments, with a resulting misjudgement of marginal costs of public goods. His reasoning could be summarized as follows: in presence of tax competition, public officials account for extraneous costs, such as the negative impact of taxation. Therefore, authorities inflate the true value of the marginal cost of public spending, which in turn results in an underprovision of public goods. This behaviour becomes inefficient when all governments make such mistake, with none gaining a competitive advantage over the other and with all communities being worse off (Oates, 1972, p. 143; Wilson, 1999).

²⁵ These may be calculated as the total cost of public goods divided by the number of residents.

²⁶ To the author's knowledge the only countries in the EU adopting a plane proportional tax (generally known as flat tax) are Hungary, Romania and Bulgaria.

Finally, Oates points to the limit of decentralized governments in their capacity to effectively make good use of monetary, as well as fiscal, policies. Therefore, he concludes that both stabilization and distribution problems are better resolved at the central level.

Zodrow and Mieszkowski's baseline model

The earliest pieces of work having the merit of formalizing Oates' ideas were those of Zodrow and Mieszkowski (1986) and Wilson (1986). It is hereby analysed the former, because simpler in structure than the latter (according to Wilson himself) and because of its remarkable relevance in the academic literature on the topic (Wilson, 1999, p. 273).

The model is characterized by N identical regions (they could be cities, municipalities or countries). Each region has the same amount of land and of immobile residents, whose number is normalized to 1 in every jurisdiction, therefore N indicates both the total number of people and jurisdictions. Citizens are all endowed with an equal share of mobile and immobile capital (i.e. land²⁷), which are the only two factors of production. The overall fixed stock of mobile capital in the model is \bar{K} and capital in any region is denoted with K . The rate of return to capital is r , which does not vary across jurisdictions and is endogenously taken by all economic agents in the model. Two outputs are produced by competitive firms through a constant return to scale production function:

$$F(K), \quad F_K > 0, \quad F_{KK} < 0$$

where K is the capital stock in a representative jurisdiction and the fixed land argument is suppressed. Output can either be a private good C or public service P , with the marginal rate of transformation between the two equal to 1. Individuals derive utility from consumption C and publicly provided private good P :

$$U(C, P).$$

²⁷ Land could also be considered as "immobile" labour (Wilson, 1999).

where U is a quasiconcave, twice differentiable function, defined over consumption of private and public goods, both assumed to be normal.

Local public services are modelled as a public purchase of output, financed by either a head tax H , or by unit tax on capital T .

Government budget balance requires:

$$P = TK + H \quad (1)$$

The first-order conditions for firm optimization require the marginal product of capital equates to its total cost²⁸:

$$r + T = F_K(K) \quad (2)$$

Therefore, the total cost of capital is here given by the sum of the unit tax and by r , which can be considered the cost of renting land from citizens or of hiring workers. It is from this equation above that Zodrow and Mieskowski show how, in this set-up, taxing capital has a distortionary effect, driving K out of the jurisdiction increasing the tax.

The above effect becomes evident differentiating (2) on both sides by T , what obtained is the change in local capital expected by jurisdictions when increasing the tax, due to the firms' response function.

The derivative yields the following equation:

$$1 = F_{KK} \frac{dK}{dT} \quad \rightarrow \quad \frac{dK}{dT} = \frac{1}{F_{KK}} < 0 \quad (3)$$

The inequality clearly indicates that capital taxes negatively affect the amount of K held by a jurisdiction.

Wilson will later present an interpretation of inequality (3) that better reflects Oates' thinking in terms of marginal benefits and marginal costs. The Michigan's academic argues that if a government wants to finance a unite rise in P , the respective increment

²⁸ Or put differently, the rate of return on capital is equal to its marginal productivity net of taxes.

of T must cover both the marginal cost of P , denoted MC , and the consequent outflow of tax revenues from capital $t\Delta K$. He then writes that: “At the region’s optimal level of P , the sum of the residents’ marginal willingness to pay for another unit of P , or “marginal benefit” of P , is equated to this wage reduction²⁹: $MB = MC - t\Delta K$ ”. He therefore concludes: “[...] the equation demonstrates that the marginal benefit of P exceeds the marginal resource cost to compensate for the tax-induced capital outflow. In other words, we have a “modified” Samuelson rule for public good provision, since the actual Samuelson rule for efficient good provision would require $MB = MC$ ” (Wilson, 1999, p. 274).

Contrary to Wilson, Zodrow and Mieskowski proceed more formally and additionally conclude that the inefficiency experienced through capital taxation would be avoided with the sole use of a head tax H . The way they do it is starting from defining the level of private good in a representative jurisdiction:

$$C = [F(K) - (r + T)K] + r(\bar{K}/N) - H \quad (4)$$

where the first term represents the revenues from land-renting, the second is the return to mobile capital, and the third is the head tax.

Then, substituting the public and private goods “prices” (1) and (4) into the utility function, and $K(r + T)$ for K gives the “indirect utility” V

$$V(H, T) = U[C(H, T), P(H, T)]$$

that rewritten becomes:

$$V = U\{[F[K(r + T)] - (r + T)K(r + T) + r\bar{K}/N - H], TK(r + T) + H\} \quad (5)$$

to maximize the utility function of consumers in their jurisdiction the first order conditions with $T, \frac{\partial V}{\partial T}$, yields to:

²⁹ Here Wilson considers the immobile capital to be labour, however the reasoning would not change if instead of “wage reduction” he had written “loss in land-renting revenues”.

$$(U_C)[F_K K' - K - K'(r + T)] + (U_P)(K + TK') = 0 \quad (6)$$

which, knowing $r + T = F_K(K)$, brings to:

$$(U_C)(-K) + (U_P)(K + TK') = 0 \quad (7)$$

This finally allows to present the equation:

$$\frac{U_P}{U_C} = \frac{K}{K + TK'} > 1 \quad (8)$$

This is obtained assuming H exogenous, r given, and knowing that the first derivative of K with respect to T is negative, while T itself being positive.

Equation (8) shows how relying only on property taxation in this model is distortionary and that the Samuelson condition does not hold. The inequality indicates that the marginal utility derived by the public good P is bigger than that from consumption of the private good C . Therefore, there is underprovision of P (i.e. individuals would benefit from a redistribution of consumption in the direction of public services).

On the other hand, if H is made endogenous we obtain the first order condition with respect to H :

$$\frac{\partial V}{\partial H}: -U_C + U_P = 0 \quad (9)$$

This means that the two marginal utilities equate, that is:

$$\frac{U_P}{U_C} = 1 \quad (10)$$

Therefore, Zodrow and Mieszkowski conclude that when the first order conditions (7) and (9) are taken together, hence allowing both T and H to be endogenously chosen by the government, the only way they can both hold is having $T = 0$. This implies that the head tax would be preferred to the capital tax (equal to zero), allowing for the

Samuelson condition to hold. If instead the property tax is preferred, and the head tax is constrained to some level, the representative jurisdictional government's first order condition for T is like in (7). Thus, the marginal rate of transformation between public and private goods is bigger than one, indicating underprovision of public services. In such a model it can be concluded that fiscal competition for mobile capital induces governments to prefer lump-sum (flat) to capital (redistributive) taxation.

The paper then continues considering what happens when all jurisdictions are forced to exclusively use property taxation. In this case, the production possibility frontier does not change (there is no "income effect" on the jurisdiction's budget constraint). However, also, in this situation, there is underprovision of public services. This is caused by the change in slope of the representative consumer's indifference curve, due to the perceived distortionary effect of the property tax (Zodrow & Mieszkowski, 1986, p. 362). The two authors then consider the case of public goods going as input into the business production process, however, this case goes beyond the scope of this work and is not here analysed.

[After Zodrow and Mieszkowski: The Politics of 1992](#)

The publication of the model presented above had the merit of bringing back into discussion the issue of fiscal competition in a moment of great European ferment. Indeed, the Maastricht treaty was signed only three years afterwards, laying down the basis of the single currency and of further political and economic unification. One of the natural consequences of the creation of an internal European market, with the abolishment of national regulations and barriers, was an increased mobility of capital, goods and labour. This development led some academics to investigate the likely outcome of such increased mobility from a fiscal perspective. In 1992 Persson and Tabellini tried to address these concerns. Their merit was to add three important characteristics to the baseline model of Zodrow and Mieszkowski. These were: a temporal framework of two periods, a political equilibrium, determined through majority voting, and a mobility cost-function for capital. They justified the last assumption claiming that there are higher costs investing abroad than in one's domestic country, these could be thought to be as the burden of gathering extra information on

legal and marketing issues of the foreign country, or as hiring foreign employees (Persson and Tabellini, 1992). Therefore, in this model, there is no more complete free mobility of capital because it is here constrained by these information costs. Finally, they also dropped the assumption of a benevolent government and substituted it with that of self-interested policymakers.

In Persson and Tabellini's model, there are two countries within Europe competing for productive capital. Both countries produce the same commodity and have access to the same technology. All citizens living in the two countries have the same preferences but heterogenous endowments.

The representative i th individual maximizes:

$$W^i \equiv U(c^i) + d^i \quad (2.1)$$

where $U(\cdot)$ is a well-behaved utility function, and c and d denote consumption in the first and second period, respectively.

In the first period, the i th individual receives an endowment $1 + e^i$, and decides upon the portion of it to invest and where to do so. His budget constraint is:

$$1 + e^i \geq c^i + k^i + b^i \quad (2.2)$$

where k^i and b^i characterize domestic and foreign investment, respectively. The endowment variable is distributed in the population within the interval $[-1, 1]$ and the distribution is positively skewed (with the mean being equal to zero and bigger than the median).

In the second period, each individual pays capital taxes and receives a lump sum transfer g , from the government. This second budget constraint is:

$$(1 - \theta)k^i + (1 - \theta^*)b^i + g - M(b^i; \mu) \geq d^i \quad (2.3)$$

Where θ and θ^* are the tax rates levied, respectively, domestically and abroad, and

$M(b^i; \mu)$ denotes the net mobility costs of investing abroad. In particular, the variable μ defines the extent of this mobility costs, which are inversely related to the degree of unification obtained within the European Union.

Therefore, in this model, given the identical technological standard of the two countries, the only reason to invest abroad is to exploit tax differential; it is worth investing abroad only whether the gain, obtainable from lower taxes in the foreign country, overcomes the mobility costs of moving capitals. The authors assume that the source principle of capital taxation applies and therefore all capital in the domestic country is taxed at the same rate θ . Finally, in the model only redistributive taxation is considered, hence excluding any form of flat (or head) taxes. The government budget constraint can hence

$$\theta k + \theta b^* \geq g \quad (2.4)$$

be written as:

The temporal dimension of events is as follows: first, two policymakers are simultaneously elected under majority voting in the two countries; second, both policymakers commit to a value of θ and of θ^* ; finally, private investors decide where to invest. A politico-economic equilibrium has to satisfy three optimality conditions: (i) For whatever value of θ and of θ^* private agents make optimal economic decisions and the markets clear. (ii) The domestic policy θ is optimal for the domestic policymaker and, viceversa, θ^* is optimal for the foreign policymaker. (iii) Policymakers are preferred to any other candidate in their region by the majority of voters.

Persson and Tabellini here underline the agency problem emerging from such set up; the policymakers behave as Nash players when deciding upon the tax policy, but voters do not, therefore the last ones could be willing to elect a policymaker that does not share their own preferences (this issue is better explained in the next section).

The economic equilibrium of the game

The first order conditions for the consumer's optimization problem imply³⁰:

$$c^i = U_c^{-1}(1 - \theta) \equiv C(\theta) \quad (2.5a)$$

$$b^i = M_b^{-1}(\theta - \theta^*; \mu) \equiv B(\theta, \theta^*; \mu) \quad (2.5b)$$

$$k^i = 1 + e^i - C(\theta) - B(\theta, \theta^*; \mu) \equiv K(\theta, \theta^*; \mu) + e^i \quad (2.5c)$$

$$d^i = g + (1 - \theta)K(\theta, \theta^*; \mu) + (1 - \theta^*)B(\theta, \theta^*; \mu) - M(B(\theta, \theta^*; \mu); \mu) + (1 - \theta)e^i, \quad (2.5d)$$

Here, Persson and Tabellini let the reader noticing how, according to the construction of the utility function $U(\cdot)$ (convex) and that of the mobility function $M(\cdot)$ (concave) one can deduct:

$$B_\theta = -B_{\theta^*} > 0 \quad (2.6a)$$

$$K_\theta = -C_\theta - B_\theta < 0 \quad (2.6b)$$

$$K_{\theta^*} = -B_{\theta^*} > 0 \quad (2.6c)$$

Therefore, foreign investments increase along with any increase of the domestic capital tax θ , while savings decrease ($C_\theta > 0$), thereby reducing domestic investment. Now, using the FOCs and the budget constraint (2.4), it can also be written the indirect utility function of the domestic policymaker:

$$W^g(\theta, \theta^*; \mu) \equiv U(C(\theta)) + K(\theta, \theta^*; \mu) + \theta B^*(\theta^*, \theta; \mu) - M(B(\theta, \theta^*; \mu); \mu) + (1 - \theta^*)B(\theta, \theta^*; \mu) + (1 - \theta)e^g, \quad (2.7)$$

where e^g is the endowment of the policymaker, and the indirect utility function is

³⁰ Here the FOCs can be obtained using the Kuhn-Tucker theorem, with the Lagrangian made up of equation (2.1) together with the budget inequalities from (2.2) to (2.4). The solution is obtained when all the three λ multipliers are positive.

completely symmetrical to that of the foreign policymaker $W^{*g}(\theta^*, \theta, \mu)$. The equilibrium policies are obtained when the two policymakers play their best response functions to each-others, maximizing their indirect utility functions with respect to their domestic policies (θ or θ^*), keeping the other tax rate as given (θ^* or θ). This maximization problem, together with the FOCs from (2.5), results in the optimality conditions (2.8):

$$\theta^g = \frac{B^* - e^g}{(C_\theta + B_\theta - B_\theta^*)} \quad ; \quad \theta^{*g} = \frac{B - e^{*g}}{(C_{\theta^*} + B_{\theta^*} - B_{\theta^*})} \quad (2.8)$$

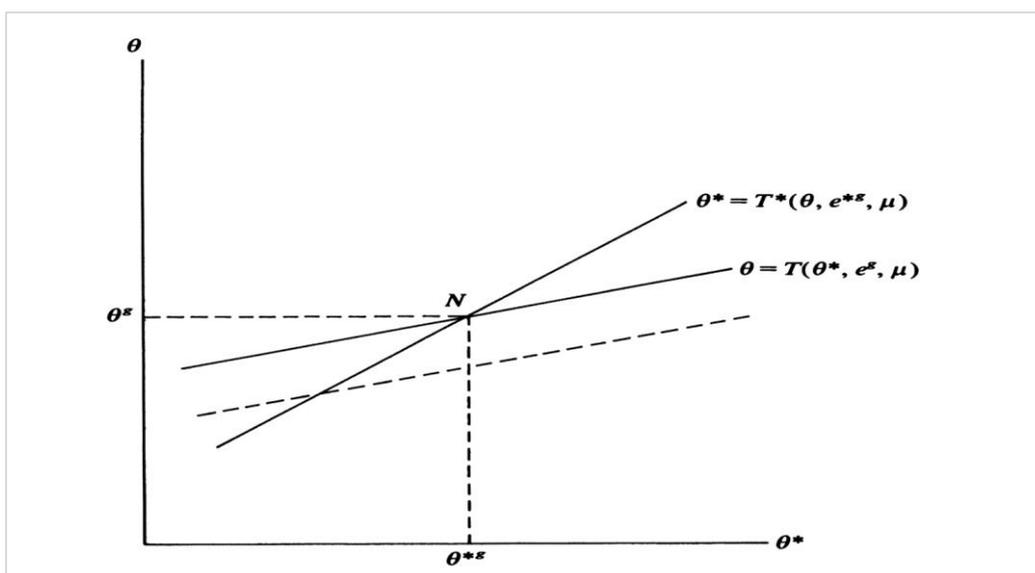
Considering the domestic policy θ^g one can see how increasing capital taxes can have two redistributive effects in favour of the policymaker. The first being from foreign investors, in proportion to their investment B^* , and the second from wealthy citizens³¹. However, the increment has also a marginal cost, represented by diminishing savings ($C_\theta > 0$), more capital flight ($B_\theta > 0$) and less foreign investment ($B_\theta^* < 0$).

Therefore, from (2.8) one can distinguish two external and opposing effects when changing the tax rate on capital. These are called by Persson and Tabellini the “tax the foreigner” and the “tax-competition” effects. The first one comes from the extra gains emerging out of foreign capital, which could be obtained by increasing the tax rate. This effect, therefore, tends to push θ above the Pareto-efficient frontier of the game (i.e. the rate charged in a cooperative equilibrium). On the other hand, the second one pushes tax rates downwards, due to the flight of domestic and foreign capital when θ increases.

Equations (2.8) can be written as $\theta = T(\theta^*; e^g; \mu)$ and $\theta^* = T^*(\theta; e^{*g}; \mu)$ and through the implicit function theorem one can verify that the two policies are strategic complements (hence they move in the same direction) and can be depicted as done below.

³¹ It is worth recalling that the distribution is positively skewed within $[-1;1]$, with the median income being lower than the average one. Therefore, when the policymaker is elected through majority voting, he is expected to have an endowment equal to that of the median voter (hence $0 - e^g > 0$)

Figure 7: Reaction functions



Source: Persson and Tabellini (1992), Figure 1

The complementarity of the two reaction functions is maybe easier to catch when (2.8) is written as:

$$B^* - e^g - \theta^g (C_\theta + B_\theta - B_\theta^*) = 0 \quad (2.8a)$$

$$B - e^{*g} - \theta^{*g} (C_{\theta^*} + B_{\theta^*} - B_{\theta^*}) = 0 \quad (2.8b)$$

The positions of the two reaction functions depend on the initial endowments of the policymakers, e^g and e^{*g} , and on the mobility costs μ . As the endowment of one policymaker increases the response-function line shifts downward. For example, if e^g rises, the line $T(\theta^*; e^g, \mu)$ shifts downwards towards the dotted line, moving the equilibrium N to a lower level (which implies lower capital taxes in both countries). Intuitively, this is explained as the decreased propensity of policymakers to redistribute when their endowments increase.

At this point of the paper, the two authors offer their interpretation of the economic consequences of further European integration. As seen above, they conjecture that more integration would result in more capital mobility and lower costs for it. In the first place, they try to see what happens to the Nash equilibrium when mobility costs grow and then they proceed analysing what would happen to decrease or suppressing them.

One can derive the effects of a change in μ on the reaction functions from (2.8), the lines are going to be shifted by:

$$T_{\mu}(\theta^*; e^g, \mu) = B_{\mu}^* - \theta^g (B_{\theta\mu} + B_{\theta^*\mu}^*) \quad (2.9a)$$

$$T_{\mu}^*(\theta; e^{*g}, \mu) = B_{\mu} - \theta^{*g} (B_{\theta^*\mu}^* + B_{\theta\mu}) \quad (2.9b)$$

The first term on the right-hand side of (2.9) indicates that higher mobility costs reduce the marginal gain of capital taxation ($B_{\mu}^*, B_{\mu} < 0$ when $B^*, B > 0$). In other words, a higher μ decreases foreign investments and, accordingly, the incentive to keep capital taxation high so as to tax foreigners. This result captures what was previously called the “tax-the-foreigner” effect. On the other hand, the second term of (2.9) indicates that an increment of mobility costs μ reduces the marginal costs of capital taxation³². This comes intuitively when thinking at the reduced elasticity of capital movements when mobility costs rise, which allows policymaker to levy higher taxes without worrying about the capital flight that they would have witnessed before the increment in μ .

Finally, Persson and Tabellini estimate the effect of a lower μ due to further European integration. They first consider a symmetric equilibrium (when both countries charge the same capital tax rate). In this situation, there would be no foreign investment $B = B^* = 0$. Therefore the “tax-the-foreigner” effect would be null, granting the “tax-competition” effect full weight. In this framework $T_{\mu}, T_{\mu}^* > 0$ and the tax rates move in the same downwards direction when μ decreases. Therefore, in a symmetric equilibrium European integration should bring lower capital taxes everywhere.

In the case of a non-symmetric equilibrium, the resulting outcome is less straightforward. For concreteness, it can be supposed that the domestic country has a higher capital tax rate than the foreign one ($\theta > \theta^*$). This could result from a more left-wing government where the endowment of the elected policymaker is less than that of his counterpart abroad ($e^g < e^{*g}$). In this case capital travels from the domestic country to the foreign one ($B > 0 > B^*$). Therefore, now it must be considered also the tax-the-

³² This result comes from the initial assumptions the two authors made about the mobility cost function $M(b^i, \mu)$, in particular that $B_{\theta\mu}, B_{\theta^*\mu}^* < 0$.

foreigner effect. In the home country this moves in the same direction of the tax-competition effect and both push towards lower capital taxes $T_\mu > 0$ (because $B^* < 0$). On the other hand, in the foreign country the two effects move in opposite directions ($B > 0$, hence the government has an incentive to levy higher taxes). Persson and Tabellini therefore close this section of the paper writing that: “The general conclusion is thus that lower mobility costs certainly lead to lower taxes in the home (high-tax) country, but they may lead to either lower or higher taxes in the foreign (low-tax) country. Moreover, even if taxes fall in both countries, they certainly fall more in the high-tax country.” They also add that, according to such mechanism, further European integration is expected to lead to tax convergence.

The political equilibrium of the game

After studying the economic equilibrium, the authors turn to the political equilibrium. They estimate that the convergence process described above is going to be slowed down by a discrepancy between the endowment of the policymaker and that of the median voter. Indeed, even if the median voter is going to cast the electoral outcome (i.e. the policymaker who is going to win is that preferred by the median voter). This does not automatically imply that the two of them have the same endowments, and the authors indeed prove that they will differ: $e^g \neq e^m$. The difference emerges from the different timing of decision-making between voters and politicians (voting happens before deciding upon a tax rate).

The discrepancy originates because the policymakers, simultaneously deciding upon their country’s tax rate, take the foreigner tax-policy θ^* (or θ) as given. On the other hand, voters move before, evaluating the policy ex-ante and realizing that the foreign tax policy will be set according to (2.8). Therefore, for the median voter the optimal domestic policy must be decided as: $\theta^m = Argmax_\theta W^m(\theta, T^*(\theta, e^{*g}, \mu), \mu)$, where W^m is the median voter’s indirect utility function (identical to (2.7) with e^g substituted by e^m).

The optimal policies for the median voters are hence defined through (2.7) and (2.8) by:

$$B^* - e^m - \theta^m(C_\theta + B_\theta - B_\theta^*) + T_\theta^*(\theta B_\theta^* - \theta B_{\theta^*} - B) = 0 \quad (3.1a)$$

$$B - e^{*m} - \theta^{*m}(C_{\theta^*}^* + B_{\theta^*}^* - B_{\theta^*}) + T_{\theta^*}(\theta^* B_{\theta} - \theta^* B_{\theta}^* - B^*) = 0 \quad (3.1b)$$

Therefore, the marginal gains of raising θ are still as before, in (2.8), but the marginal costs now account also for the foreign policymaker's response function.

Now, the median voter will vote (and hence elect) a policymaker who finds ex-post optimal to set θ^g equal to his own θ^m (and $\theta^{*g} = \theta^{*m}$).

Combining (3.1) and (2.9) one can then obtain the endowments of the domestic and foreign policymakers:

$$e^g = e^m - T_{\theta^*}(\theta B_{\theta^*}^* - \theta B_{\theta^*} - B) \quad (3.2a)$$

$$e^{*g} = e^{*m} - T_{\theta^*}(\theta^* B_{\theta} - \theta^* B_{\theta}^* - B^*) \quad (3.2b)$$

If a symmetric equilibrium is considered, where $e^g = e^{*g}$, once again only the tax competition effect operates because $B = B^* = 0$. In this case the last expression on the right-hand side of (3.1) is positive (since $T_{\theta^*} > 0$ and $B_{\theta^*}^* - B_{\theta^*} > 0$ as well). Therefore, the capital costs of increasing the tax rate θ are lower ex-ante (hence in the voters' perspective) than ex-post (as assessed by the policymaker). This can be explained by the exclusive awareness of voters that an increase in capital taxation in the domestic country automatically results in a tax-rate rise also abroad (due to the upward slopes of the reaction functions). Consequently, the perceived revenue loss due to capital moving abroad is smaller ex-ante than ex-post. Thus, the optimal capital tax rate for the median voter will be higher than that estimated ex-post by the policymaker when $e^g = e^m$. This will induce voters to elect a policymaker with preferences more to the left than the majority of them, strategy that will assure the optimal tax policy θ^m .

As before, the result is less straightforward when a non-symmetric equilibrium is considered. Let us take for example the case where $e^m < e^{*m}$ (hence where the population's wealth distribution is more positively-skewed in the domestic country). Again, the tax rates will be like $\theta^m > \theta^{*m}$ and $B > 0 > B^*$. In this case, given that $B^* < 0$, the right-hand side of (3.1b) is all positive, therefore, further reducing the ex-ante costs of capital taxation (even with respect to the symmetric equilibrium). Nonetheless, when analysing the domestic country, the result is mixed; the first part of the response

function in (3.1a) still reduces marginal costs, but now the last part (B) increases them (the tax-the-foreigner effect goes in opposite direction to the tax-competition effect). Therefore, it can be concluded that in the foreign country a left-wing policymaker will surely be elected (therefore mitigating the economic push towards lower capital taxes), while this is not sure when considering the domestic country, where the policymaker could be to the left or to the right of the median voter ($e^g \lesseqgtr e^m$).

Finally, Persson and Tabellini consider what a change in μ would imply for the political equilibrium, they prove that in a symmetric equilibrium $\frac{de^g}{d\mu} > 0$, hence that lower mobility costs would result in the election of a policymaker more to the left (with $e^g \ll e^m$). Nonetheless, they state that this political effect of a lower μ is dominated by the economic effect previously described. Thus, they predict that a decrease in the mobility costs for capital will lower tax rates among European countries, but to a smaller extent (hence at a slower path) than what expected when the political repercussions are neglected. They then conclude that in a non-symmetric equilibrium the political “mitigating-effect” is even smaller than before.

Overall, it can be summarized that European integration has both economic and political repercussions. The economic consequences of the single market are stronger than the political ones, however, these greatly mitigate the race to the bottom in capital taxation, because voters find optimal to react to the economic change electing governments less sensitive to the strategic aspects of tax policy (Persson & Tabellini, 1992).

The problem of double taxation

In the tax competition debate, much has been said about the problem of double taxation and how to tackle it. Double taxation occurs when a tax base is taxed twice and excessively. This happens when two different jurisdictions claim taxes over the same tax base without considering the taxpayer's liability in the other jurisdiction. Double taxation results in overburdening a taxpayer with fiscal claims and hence in hampering international investments. The problem derives from the different principles that countries can adopt when taxing capital. There are mainly three different approaches when it comes to international taxations, these are: source-based, residence-based and destination-based.

The source-based taxation is probably the most common principle and relies on the concept that capital should be taxed at its source; in the sense of the location where industrial assets are based (therefore where it is created). The second is the residence-based principle, according to which, profits should be taxed in the country where headquarters are placed. Hence residence companies are taxed over their worldwide profits, domestic and foreign. Lately, it has also gained momentum the destination-based principle. This basically relies on the idea of taxing where sales are made, and it is now rising in popularity due to the difficulty authorities face in taxing digital companies.

There are a few different instruments countries can use to tackle double taxation, but all of them fall under the general characterisations of tax exemptions, tax credits and tax deductions. The last two are the most adopted when countries stipulate bilateral agreements to face the issue³³. Consequently, tax credits and tax deductions are also the two most studied instruments in the economics literature tackling double taxation.

The two systems yield the following after-tax income Y_t :

$$\text{Tax credit} \qquad Y_t = Y[1 - \max(t^h, t^f)]$$

$$\text{Tax deduction} \qquad Y_t = Y(1 - t^h)(1 - t^f)$$

³³ Both the UN and the OECD have developed their own treaty-models to address double taxation, these should serve as a standard to countries engaging in these bilateral agreements.

where Y is the initial income and t^h, t^f are respectively the home and foreign taxation rates.

In the twentieth-century tax credits were generally preferred to tax deductions because they were considered to be more beneficial to international trade and to better prevent double taxation (Musgrave, 1969; Hamada, 1966). This general preference for tax credits was opposed at the end of the century by Samuelson and Bond (1989). Their merit was to consider the problem with a Nash-equilibrium approach, not only when deductions are applied but also when the system adopted is that of tax-credits. They hence allowed tax rates to be freely set by governments optimally responding to each-others in both situations, proving tax credits can result in a race to the top in terms of taxation and end up preventing international investment altogether. Therefore, tax deductions should be preferred, even if they result in a race to the bottom. They also showed how the downsizing of taxes becomes more relevant as the size of one country decreases. According to the model, when capital-exporting countries are too small to affect the terms of trade in capital they will charge a zero-tax rate.

A model comparison

Before Persson and Tabellini's paper, only few other works had addressed the problem of international capital mobility with a game-theory approach. One of the most prominent, both for its relevance and for its pioneering value, was that of Hamada (1966). In this section, the models of Hamada and that of Bond and Samuelson (1989) will be described and compared.

Hamada's model

In the first model, the Japanese professor contrasts a two-country non-cooperative equilibrium with tax deductions, with an equilibrium achieved through an international tax agreement (in the form of tax credits). In both set-ups there are two countries differing in their initial stocks of capital, with K_h representing the amount of capital owned by the home country and K_f that present in the foreign country. It is here assumed that the gross product of capital in the home country is less than that in the foreign country. Therefore, in this situation the home country becomes a capital exporter, while the foreign country a capital importer, and the amount of capital moving

abroad from the domestic country will be hereafter denoted with K . The production functions can therefore be written as:

$$f_h(K_h - K) \text{ and } f_f(K_f + K)$$

where f_h and f_f represent, respectively, the production functions of the home and the foreign country.

The marginal product of each country is positive and decreasing, so that:

$$f'_h(K_h - K) > 0 ; f'_f(K_f + K) > 0 \text{ and,}$$

$$f''_h(K_h - K) < 0 ; f''_f(K_f + K) < 0$$

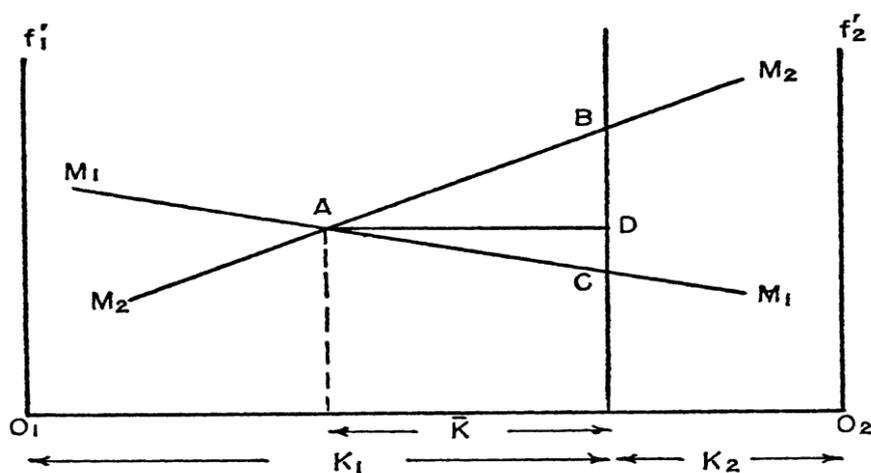
Therefore, without government taxation³⁴ the Pareto-optimal allocation of capital is such that:

$$f'_h(K_h - \bar{K}) = f'_f(K_f + \bar{K}) \quad (4.0)$$

with \bar{K} denoting the optimal quantity of capital exported from the domestic to the foreign country in a perfectly competitive market.

To show the difference between the two allocations of capital Hamada illustrates the solution as follows:

Figure 7: Optimal allocation of capital with no taxation



Source: Hamada (1966)

³⁴ It is interesting noticing that the same result could be obtained with pure residence-based taxation, because in this case the important rates of return are those considered at the gross level (hence before taxes).

In the graph domestic capital is measured horizontally from the left, while foreign capital from the right. The marginal products of the two countries are given vertically by the curves M_1M_1 and M_2M_2 , for the home and the foreign country, respectively. From above, it becomes clear that the movement of capital \bar{K} will increase the overall product by the area of the triangle ABC , which will be divided into ACD for the domestic country and in ABD for the foreign one.

The effects of taxation

Even if the level of \bar{K} is optimal from a global perspective, this is not necessarily so from the nationalistic standpoint. Indeed, through some form of taxation one country can raise its national income at the expense of the other. In the situation presented by Hamada, both countries tax capital according to the source-principle, however the domestic country does not give up taxing foreign profits made out of its domestic capital. To reduce the burden of double taxation that would then emerge, the domestic country adopts a system of tax deductions (the home country taxes the profit made abroad net of the taxes already payed in the foreign country).

To ease the analysis, it is here assumed that only the exported capital is taxed. Therefore, in this situation the optimal allocation of capital sees the marginal products of the two countries, net of taxes, to be equal:

$$f'_h(K_h - K) = f'_f(K_f + K)(1 - t_h)(1 - t_f) \quad (4.1)$$

Which, rewritten gives:

$$\frac{f'_h(K_h - K)}{(1 - t_h)} = f'_f(K_f + K)(1 - t_f) \quad (4.1a)$$

When the only policy variables are t_h and t_f , the two countries try to maximize their national products P_h and P_f subject to (4.1). Their national products are, for the domestic and the foreign country, respectively:

$$P_h = f_h(K_h - K) + (1 - t_f) f'_f(K_f + K)K$$

$$P_f = f_f(K_f + K) - (1 - t_f) f'_f(K_f + K)K$$

Maximizing P_h with respect to t_h , given t_f , and remembering that K depends from t_h and t_f (i.e. $K \equiv K(t_h; t_f)$) one obtains:

$$f'_h = (1 - t_f)(f'_f + Kf''_f) \quad (4.2)$$

where $f'_h = f'_h(K_h - K)$ and $f'_f = f'_f(K_f + K)$ and so forth.

Now, substituting (4.1a) into (4.2) yields to the reaction function of the domestic country:

$$t_h = -\frac{Kf''_f}{f'_f} \quad (4.3)$$

Moreover, it is here worth noticing that from (4.1a) one can also derive a more intuitive relation between the tax rates of the domestic and of the foreign countries:

$$t_h = 1 - \frac{f'_h}{(1 - t_f)f'_f} \quad (4.4)$$

From (4.4) it is easy to see that an increment in t_f reduces t_h .

Analogously, the reaction function of the foreign (capital-importing) country is obtained maximizing P_f with respect to t_f , fixing t_h . This in turn gives:

$$f'_f = (1 - t_h)(f'_h + Kf''_h) \quad (4.5)$$

And, following the same procedure as before:

$$t_f = -\frac{Kf''_h}{f'_h - Kf''_h} \quad (4.6)$$

From the equilibrium condition (4.1a) then it can also be derived:

$$t_f = 1 - \frac{f'_h}{(1 - t_h)f'_f} \quad (4.7)$$

Which, as before, indicates an inverse relation between the two tax rates.

obtained starting from the demand curve M_2M_2 , this is going to be $MR = f'_f + f''_f K$.³⁵ Therefore at the intersection between these two lines (M_1M_1 and MR), the production function of the home country is $f_h = f'_f + f''_f K$ ³⁶ and traded capital $K = (f'_h - f'_f)/f''_f$. Graphically, the amount of exported capital corresponds to the segment $\overline{P_1Q}$ and the optimal tax charged by the domestic country for profits made abroad equals to:

$$t_h = \frac{R_1S_1}{R_1P_1} \equiv -\frac{Kf''_f}{f'_f} \equiv \frac{f'_f - f'_h}{f'_f}$$

Which, from (4.6), induces the foreign country to respond with $t_f = 0$.

The total productivity advantage gained in this solution with respect to the initial allocation of capital (with no international investment) is equal to the area of the trapezoid R_1S_1CB . Most of which is obtained by the exporting country (except for the triangle BER_1). With respect to the competitive solution represented by A (with no taxes), the quantity of exported capital is less, as it is the overall advantage (comparing areas, $R_1S_1CB < ABC$). Finally, also the gain for the capital-importing country is smaller than before. However, that of the domestic country is bigger (Ambrosanio, et al., 1997, p. 329).

The monopsony solution

Suppose now that the “leader” is the importing country and that it behaves as a monopsony³⁷. In this set-up the foreign country chooses its tax rate first and, given the domestic country’s response function, it can behave as a monopsony.

The foreign country imports capital up to the point where its marginal gain f'_f (represented in the graph as M_2M_2) equals its marginal cost $MC = f'_h - Kf''_h$. The optimal quantity of imported capital is now $\overline{QP_2}$, corresponding to the point R_2 , where the curves M_2M_2 and MC intersect. This in turn results to $f'_f = f'_h - f''_h K$, and $K = (f'_h - f'_f)/f''_h$, equations that combined with (4.5) give:

³⁵ Given that the marginal product decreases along with increasing capital, MR is below M_2M_2 . ($f''_f < 0$)

³⁶ This is a monopoly situation because the domestic country can freely choose any point on the marginal productivity curve of the foreign country.

³⁷ This corresponds to a situation where a buyer’s bargaining power is much higher than that of a seller.

$$t_f = \frac{R_2 S_2}{R_2 P_2} \equiv -\frac{K f_h''}{f_h' - K f_h''} \equiv \frac{f_f' - f_h'}{f_f'}$$

As before, from the best response function of the “passive” country (4.5), one obtains the second tax rate to be zero (i.e. $t_h = 0$).

Again, this solution is superior to that with no capital movements, but it is inferior to the competitive solution defined by A . In this case the smaller gain between the two countries is made by the domestic economy, with the area of S_2CF smaller than that of the foreign country, S_2R_2BF (Ambrosanio, et al., 1997, p. 330).

The Cournot-Nash solution

In this case, both countries have the same economic leverage and both best-respond to each other taking as given the other country’s tax rate. Therefore, each country exports/imports capital to the point where marginal cost equates marginal revenue. Accordingly, the quantity of capital internationally traded is defined by the point T , where $MC = MR$, and, from (4.2) and (4.5), $f_h' - K f_h'' = f_f' + K f_f''$. This is graphically represented by the segment $\overline{QP_3}$, that is $K = (f_h' - f_f') / (f_h'' + f_f'')$.

Tax policies now are:

$$t_h = \frac{R_3 T}{R_3 P_3} \equiv -\frac{K f_f''}{f_f'} \qquad t_f = \frac{T S_3}{T P_3} \equiv -\frac{K f_h''}{f_h' - K f_h''}$$

The total gain obtained from international investment is now $R_3 S_3 CB$, which is lower than both cases presented before. The results from the three cases just discussed show that, in non-cooperative games, the quantity of traded capital is less than the optimal amount \bar{K} . An intuitive solution to this problem for the two countries would be to cooperatively agree over tax policies maximizing the aggregate product (Ambrosanio, et al., 1997, p. 331; Hamada, 1966).

Cooperation through a tax credit

Given the above conclusion, Hamada now analyses the case of international tax agreements taking the form of tax credits. As already mentioned, these agreements normally allow taxes paid in the foreign country to be credited to the tax due in the

domestic (capital-exporting) country. In this section Hamada gets rid of the assumption on the discrimination between foreign and domestic profits, hence in the following analysis all domestic capitals are taxed at the rate t_h in the home country and t_f in the foreign one (with $t_h > t_f$)³⁸. However, according to the tax agreement, those taxes paid by the domestic investors in the foreign country are credited by the domestic country, so that the total amount of taxes to be payed will be equal to $(t_h - t_f)f'_f K$. This implies that only the domestic tax rate matters in the investors' allocative decisions. They equate net-of-tax returns in the two countries, so that:

$$(1 - t_h)f'_h(K_h - K) = (1 - t_h)f'_f(K_f + K)$$

The equation above corresponds to (4.0), which defined the competitive equilibrium without taxes, so that $f'_h(K_h - K) = f'_f(K_f + K)$ and $K = \bar{K}$. Thus, when $t_h > t_f$ the international tax agreement enables the two countries to achieve the Pareto-optimal allocation of capital.

Even if the tax level for the capital traded is now determined by t_h , the distribution of the gains obtained through the international trade between countries depends from t_f . Higher is t_f , higher is the share of overall gains acquired by the foreign (capital-importing) country. In particular, the home and the foreign countries' domestic products are given by:

$$P_h = f_h(K_h - \bar{K}) + (1 - t_f) f'_f(K_f + \bar{K})\bar{K}$$

$$P_f = f_f(K_f + \bar{K}) - (1 - t_f) f'_f(K_f + \bar{K})\bar{K}$$

Figure 9 here below gives a graphical interpretation.

³⁸ Obviously, this analysis is valid only when $t_h > t_f$, otherwise t_h becomes irrelevant in the capital exporting decisions of domestic investors.

Bond and Samuelson

Hamada's final conclusion on the superiority of tax-credits over tax-deductions is however based on a disputable comparison. Indeed, Hamada places tax-credits into the category of international agreements, and accordingly, studies them under a cooperative framework. On the other hand, Hamada studies tax-deductions under a non-cooperative game-setting (Bond & Samuelson, 1989; Ambrosanio, et al., 1997). In 1989, Bond and Samuelson took and analysed Hamada's model and investigated what happens when the two countries want to maximize their domestic product in a non-cooperative manner. As anticipated before, their conclusion is contrary to Hamada's and much more drastic; tax-credits can suppress trade altogether.

Given that Bond and Samuelson's analytical process is very similar to that of Hamada under tax deductions, it is hereafter reported only the market condition of equilibrium under the tax-credit mechanism. This corresponds to:

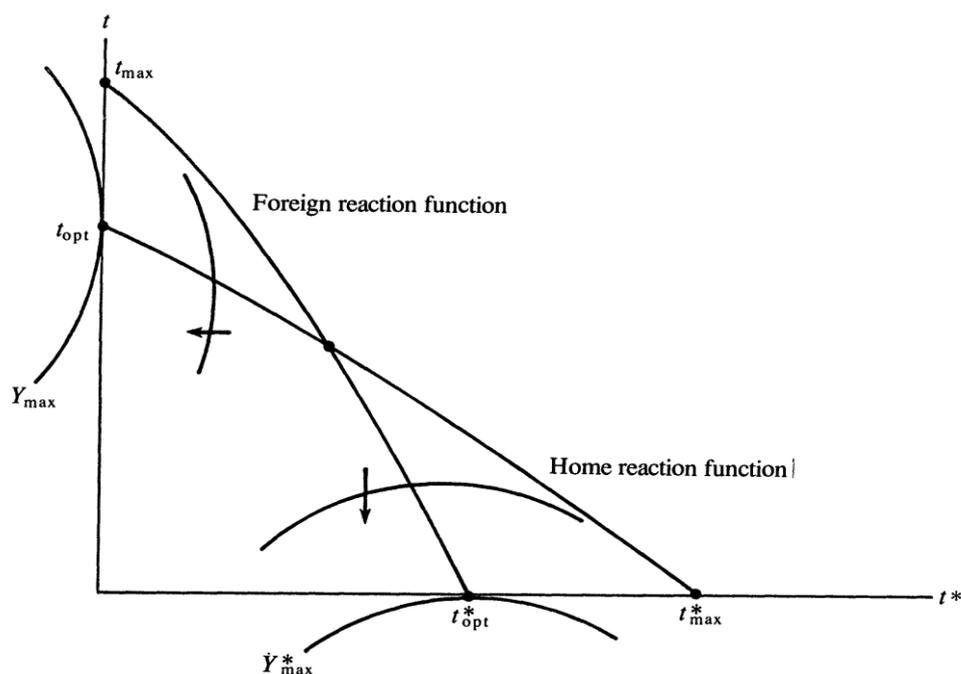
$$F_K(K - Z) = F_K^*(K^* + Z)[1 - \max(t, t^*)]$$

where F_K and F_K^* are the first derivatives with respect to K of the domestic and foreign countries' production functions. Z denotes the internationally traded capital and t and t^* are, respectively, the domestic and foreign tax rates.

Solutions are here presented in an intuitive way³⁹ and the cases when one country dominates over the other (monopoly and monopsony) are not illustrated because identical to those obtained with the deduction method analysed before. The Cournot-Nash equilibrium is instead presented, first for the deduction system and then for the tax credit.

³⁹ However, if the reader is interested to the mathematical justification of the following results please refer to Annex 2.

Figure 10: Nash equilibrium with deductions



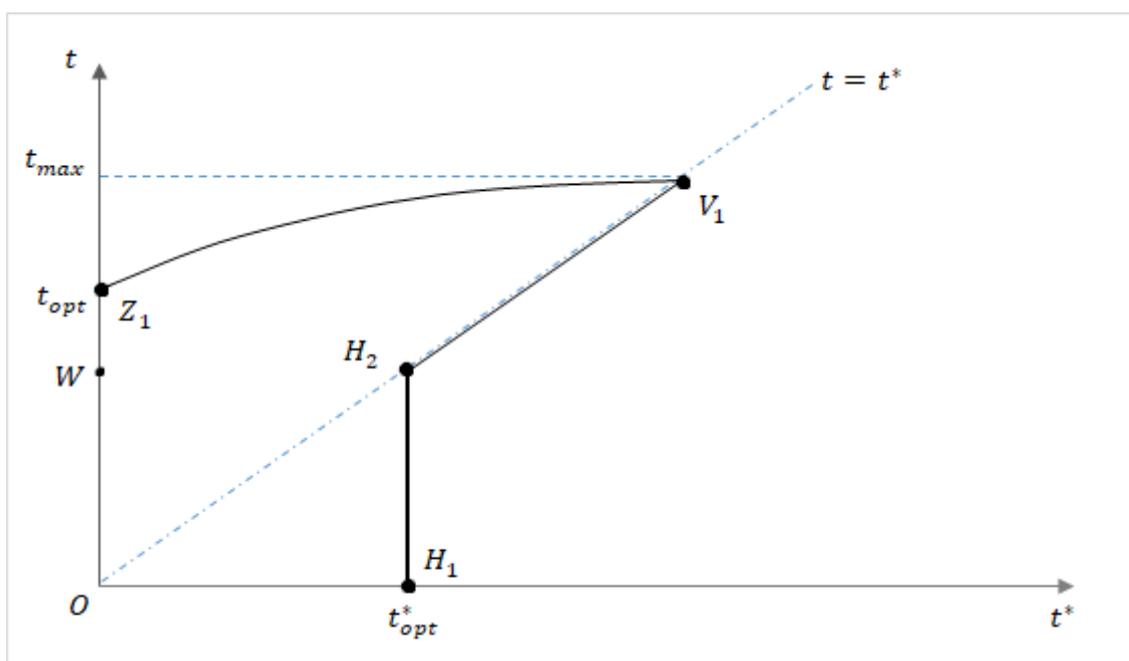
Source: Bond and Samuelson (1989)

The graph above represents the solutions obtainable with the deduction system. The intercept between the vertical axis and the foreign country's reaction function defines the maximum tax rate the domestic country can impose (above which there is no more capital trade) this results in $t^* = 0$ (the best response of the capital-importing country would be to set its tax rate equal to zero). On the other hand, the intercept on the vertical axis with the home reaction function defines the optimal tax rate in the situation of monopoly, with $t^* = 0$. One immediately sees that $t_{opt} < t_{max}$. A symmetrical reasoning applies to the horizontal axis.

The Nash equilibrium is defined in the point of intersection between the two reaction functions. In such point, the amount of capital traded is positive and both countries gain an advantage with respect to the autarky solution (Ambrosanio, et al., 1997).

Figure 11 instead represents the countries' reaction functions with a tax-credit. Z_1V_1 defines the reaction function of the domestic country. Again, the intercept with the vertical axis defines the best tax rate in the monopoly solution, with the tax rate of the foreign country equal to zero. The result is identical to that obtained in the deductions case.

Figure 11. Nash equilibrium with tax credits



Source: Ambrosanio et al (1997)

When $0 < t^* < t_{max}^*$ the domestic country is always better off with a tax rate higher than the one of the foreign country. Indeed, if the domestic country sets its tax rate below t^* it does not influence capital-movements but neither it receives tax-revenues. Instead, increasing the domestic tax rate over the foreigner ($t > t^*$) rises tax-revenues but decreases exported capital. The optimal domestic policy, t_{opt} , is such to balance these two effects and is higher than the foreign tax rate (please refer to annex 2 for the analytical examination).

On the other hand, the reaction function of the capital-importing country is $H_1H_2V_1$. The intercept with the horizontal axis, H_1 , represents the solution in the monopsony case (i.e. when the domestic country is “passive”). The same rate, t_{opt}^* , is maintained through the whole segment H_1H_2 , which matches all the tax-values of the capital-exporting country between zero and W . In this case, the foreign country maximizes its national product with t_{opt}^* and it has no reason to change the rate because $t < t_{opt}^*$. This depends from the fact that, as long as $t < t^*$, even if the domestic country varies its rate this does not affect the overall capital allocation. However, when t increases above W , the foreign country is better-off setting $t^* = t$, because doing so rises its tax revenues without

affecting the capital-trade. In this situation the foreign reaction function corresponds to the segment H_2V_1 , coinciding with the 45° line.

Finally, the Cournot-Nash equilibrium is obtained at the intersection point between the two reaction functions V_1 . This, coincides with the equilibrium tax rates $t^* = t = t_{max}$. Therefore, the Nash equilibrium with tax-credits prevents trade in capital and results in a lower total product than that with tax-deductions (Ambrosanio, et al., 1997; Bond & Samuelson, 1989).

The matter of size; Kanbur and Keen

As mentioned above, the last decade of the XX century was a period of growing European ferment. The year after Persson and Tabellini's paper was published, other two economists decided to focus their efforts on possible fiscal developments of the European single market. In 1993, Kanbur and Keen analysed the importance of size when countries freely compete for tax bases once all forms of custom-duties are abolished. They concluded that in a non-cooperative setting, differences in size exacerbate inefficiencies and result in extra welfare loss (Kanbur & Keen, 1993).

The model Kanbur and Keen present in the paper is a spatial, partial-equilibrium, model. Two countries compete in the interval $[-1,1]$ and there is only one taxed good. The difference in dimension is exhibited by the population size; bigger the country, higher is the population belonging to it. It will hereafter be adopted the convention of lowercase letters to refer to the home country and uppercase ones for the foreign.

There are h individuals in the home country and H in the foreign country. The relative size of the home country will be referred as $\theta = h/H$ and h is considered small when $\theta < 1$.

In the model, taxes are levied according to the destination-based principle, therefore, every shop selling the good will pay taxes where the sale takes place. It is important here the assumption of no tax-adjustments when purchases of the good are made abroad (which is a fair assumption concerning the EU for the purchase of goods intended for

personal use, but it is not when thinking at the good to be financial capital)⁴⁰. Consumers, even if in different proportions, are uniformly distributed in both countries and buy the good only if its price is below or equal to their reservation price. Reservation prices are identical for all citizens within one country but could differ between countries: that of “home” consumers is v , while that of foreign consumers is V . These are net of the producer price (which is the same in both countries), therefore the price at which consumers are charged in a country, when there is no cross-shopping, perfectly matches the tax imposed by the corresponding jurisdiction. These taxes are denoted by t and T .

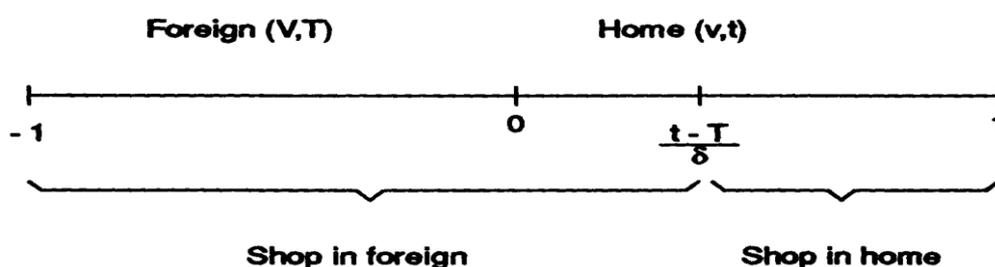
When the border is open and cross-shopping allowed, the problem a domestic consumer faces is whether to buy at home at the price t or to travel to the border with the foreign country and buy abroad at the price T . If the consumer decides to travel to the frontier he also incurs in the cost of moving, $\delta > 0$ per unit distance from the frontier. Supposing a consumer lives at a distance s from the frontier, he will buy the good abroad if and only if (4.1) and (4.2) are satisfied:

$$v - T - \delta s > v - t \quad \text{which can be rewritten as} \quad \frac{t-T}{\delta} > s \quad (4.1)$$

$$v - T - \delta s > 0 \quad (4.2)$$

If the two equations are satisfied and if $v > t > T$ then the situation can be depicted as below; all consumers living further than $\frac{t-T}{\delta}$ from the foreign country shop in their domestic country, while those living closer to the foreign region shop abroad.

Figure 12: Cross-border shopping with $t > T$



Source: Kanbur and Keen (1993)

⁴⁰ Nonetheless, with the proper changes in structure, the model can be applied to other international tax problems. For example, the good could be interpreted as productive capital and the model could hence become a location-decision problem for multinationals (or a transfer price problem).

Another important assumption of the model is that governments are Leviathans, hence their objective is to maximize tax revenues (a welfarist justification for it could be that consumers have a really high marginal valuation of public goods which tax revenues go to finance).

As abovementioned, when the border is closed (hence with no cross-border shopping) to extract as much surplus as they can, the two governments will levy taxes exactly equal to the reservation prices of their citizens:

$$t_c^* = v \quad T_c^* = V \quad (4.3)$$

Where the asterisk indicates optimality, while the subscript c denotes the closed border.

Here below it is now examined the non-cooperative equilibrium when the border is open and governments behave in the Nash manner. At the beginning, v and V are assumed to be infinite, so there are no restrictions in the governments' tax-setting decisions. Firstly, Kanbur and Keen derive the response function of the home country, with the analysis of the foreign one being analogous.

The revenues of the home country are:

$$t \geq T \quad r(t, T) = \left\{ \begin{array}{l} th \left\{ 1 - \left(\frac{t-T}{\delta} \right) \right\} \\ th + tH \left(\frac{(T-t)}{\delta} \right) \end{array} \right. \quad (4.4a)$$

$$t \leq T \quad (4.4b)$$

The revenues reflect what previously illustrated; if $t \geq T$ the home country loses a share of revenues from its domestic citizens who shop abroad, while if $t \leq T$ the home country gets all the revenues from its habitants (th), plus a share of cross shoppers $\left(\frac{T-t}{\delta} \right)$, which is proportional to the tax differential $(T-t)$ and inversely related to the cost of travelling (δ).

Maximizing (4.4) it emerges that the country size (relative to the foreign one) is critical in defining the best response function to be adopted⁴¹.

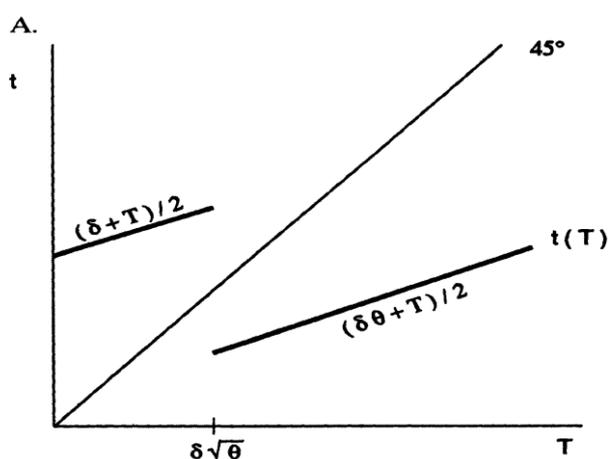
If the domestic country is the smaller, hence if $\theta \leq 1$, its best response is:

$$\begin{aligned} T \leq \delta\sqrt{\theta} \\ T \geq \delta\sqrt{\theta} \end{aligned} \quad t(T) = \begin{cases} \frac{1}{2}(\delta + T) \\ \frac{1}{2}(\delta\theta + T) \end{cases} \quad (4.5)$$

While if it is larger, hence $\theta \geq 1$, the best response becomes:

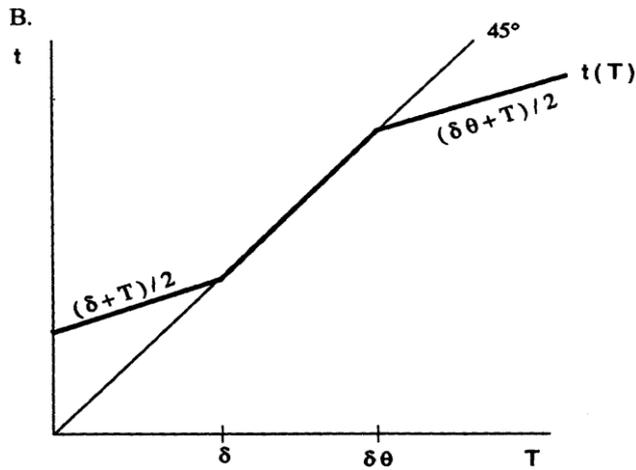
$$\begin{aligned} T \leq \delta \\ \delta \leq T \leq \delta\theta \\ T \geq \delta\theta \end{aligned} \quad t(T) = \begin{cases} \frac{1}{2}(\delta + T) \\ T \\ \frac{1}{2}(\delta\theta + T) \end{cases} \quad (4.6)$$

From the two equations above, one can see that there is a fundamental asymmetry in the best response function of the home country depending on its size (whether it is the smallest or the largest between the two). This becomes clearer when the two equations (4.5) and (4.6) are depicted as in the graphs below:



In this situation ($\theta < 1$), the home country always undercuts the foreigner tax rate, except when this is very low (i.e. when $T < \delta\sqrt{\theta}$). In this case the, tax rate of the foreign country is so low that undercutting it is not worth any longer.

⁴¹ Please refer to Appendix 1 for the analytical proof of (4.5) and (4.6)



In this opposite situation ($\theta > 1$), the revenue-maximizing tax rate $t(T)$ always increases together with the foreign tax rate. In fact, for the home country there is no longer any gain to be obtained by a dramatic shift of tax rate to undercut the other country: given its smallness the switch in numbers from the foreign market is not enough to make this the optimal policy.

The Nash equilibrium

To study the Nash equilibrium, it is hereafter assumed $\theta \leq 1$, so that the home country is the smaller. Therefore, the domestic country's best response is as in (4.5), while that of the foreign country is obtained by analogy with (4.6):

$$\begin{aligned}
 & t \leq \delta \\
 & \delta \leq t \leq \delta/\theta \\
 & t \geq \delta/\theta
 \end{aligned}
 \quad
 T(t) = \begin{cases} \frac{1}{2}(\delta + T) \\ t \\ \frac{1}{2}\left(\frac{\delta}{\theta} + t\right) \end{cases}
 \quad (4.7)$$

remember that θ was defined to be h/H , hence when computing the best response of the foreign country $H/h = 1/\theta$.

The discontinuity in the best response of the small country makes the Nash equilibrium existence problematic, to find it Kanbur and Keen start by showing that no equilibrium can be obtained when $t > T$. From (4.7) one sees that the large, foreign, country will charge a lower tax than the domestic one only if $t \geq \delta/\theta$, in which case $T(t) = \frac{1}{2}\left(\frac{\delta}{\theta} + t\right)$, while from (4.5), $t(T) = \frac{1}{2}(\delta + T)$.⁴²

Substituting the two best response functions when $t > T$ in one another, one obtains:

$$t = \left(\frac{\delta}{\theta}\right) \left(\frac{1+2\theta}{3}\right) \leq \frac{\delta}{\theta}, \text{ which contradicts the condition for the foreign country to be willing to undercut.}$$

⁴² i.e. in these two best-response cases $T < t$.

On the other hand, when considering the possibility of $t < T$, one obtains from (4.5) that $t = \frac{1}{2}(\delta\theta + T)$ and $T \geq \delta\sqrt{\theta}$. While from (4.7) that $T = \frac{1}{2}(\delta + t)$, with $t < \delta$. Solving for these two equation one gets the Nash equilibrium tax rates:

$$\begin{aligned} t^N &= \delta \left[\frac{1}{3} + \left(\frac{2}{3} \right) \theta \right] \\ T^N &= \delta \left[\frac{2}{3} + \left(\frac{1}{3} \right) \theta \right] \end{aligned} \tag{4.8}$$

In this case, the conditions of existence hold (i.e. T^N is bigger than $\delta\sqrt{\theta}$ and t^N is less than δ). Finally, it is straightforward to show that an equilibrium with $t = T$ is attainable only when $\theta = 1$, which yields to $t = T = \delta$.

From above one can notice how, whenever one country is smaller than the other, its best response function is to levy lower taxes than its neighbour so as to acquire a share of its citizens' tax-revenues.

Surprisingly enough, the result does not change when restrictions are imposed on the consumers' reservation prices (till now assumed to be infinite). Indeed, through a quite lengthy argument, Kanbur and Keen demonstrate that even assuming $\delta < \min\{v, V\}$ and $\max\{v, V\} \leq 2[\min\{v, V\}]$; (4.8) remains the unique Nash equilibrium⁴³. The first assumption implies that if the good was given away for free in one country all consumers would shop in that country. This ensures that $t^N < v$ and that $T^N < V$ therefore taxes are imposed to be less than the reservation prices. The second assumption restricts the combined range of reservation prices, implying that the reservation price of one country cannot be too far away from the other one. This ensures that it is no country's interest to prize its own citizens out of the market.

The equilibrium obtained in (4.8) indicates the existence of a tax differential between the two countries, and specifically, it means that in equilibrium the small country strictly undercuts the large one. The result, therefore, bears what seems to be a peculiarity of tax havens: their smallness. Moreover, it resembles a result often found in the trade

⁴³ Unique when $\theta \neq 1$. If the reader is interested in the proof of the statement made above, this can be found in the appendix of the working paper n. 819 of Kanbur and Keen (1991).

literature; the optimal level of taxation for small countries is closer to zero than for large countries (Markusen & Wigle, 1989; Bond & Samuelson, 1989).

The authors then compare tax revenues between the closed border situation and those obtained substituting (4.8) in (4.4a) and in (4.4b). Doing this gives:

$$\begin{aligned} r^N &= H\delta \left(\frac{1+2\theta}{3}\right)^2 \\ R^N &= H\delta \left(\frac{2+\theta}{3}\right)^2 \end{aligned} \tag{4.9}$$

From a quick comparison, one can tell that the large, foreign, country is clearly worse off; some of its citizens now cross-shop, and those who do not will pay less than V ⁴⁴. In contrast, the impact on the small country is less obvious, on the one hand opening the border let it gain some cross-shoppers from the larger country, but on the other hand it constrained its ability to extract surplus from its own citizens. Kanbur and Keen demonstrate how, if θ is small enough, the first effect dominates the second, they hence show that the small country, if small enough, benefits from an open border, while the large ones do not.

Finally, it is straightforward to prove that the sum of revenues from the two countries is higher in a closed border situation than in an open border one.

These three results can be summarized as follows: “Moving from the closed border solution to the Nash equilibrium with an open border:

- (a) strictly reduces revenue in the larger country;
- (b) increases revenue in the small country if and only if θ is below some $\theta^* \in (0,1)$;
- (c) strictly reduces join revenue.” (Kanbur & Keen, 1993)

⁴⁴ Revenues with the closed border are $R = VH$ for the foreign country and $r = hv$ for the home country. The foreign country loses some of its own shoppers because $\left(\frac{2+\theta}{3}\right)^2 < 1$ and those who shop in the country pay less than before because, by the first assumption, $\delta < V$.

Parts (a) and (c) simply come from the comparison of revenues in a close border situation with those obtained in (4.9). Point (b) instead requires equation (4.10) to be spelled out:

$$f(\theta) = r^N - vh = H \left\{ \delta \left(\frac{1 + 2\theta}{3} \right)^2 - v\theta \right\} \quad (4.10)$$

(4.10) compares the revenues of the small country after and before the border was opened. Point (b) is derived from the strict convexity of $f(\theta)$, which assumes a positive value in zero ($f(0) > 0$) and a negative value in one ($f(1) = H(\delta - v) < 0$) due to the assumptions previously made. This proves the existence of a θ^* for which the border opening increases the small country's revenues. It is here worth noticing that if $\theta = 1$, so that the Nash equilibrium is symmetric, both countries lose revenues, hence opening the border is Pareto-worsening.

Once proven what mentioned above, Kanbur and Keen turn to the comparison of relative revenues between the two countries both in absolute and in per capita terms. In absolute terms, it is enough to look at (4.9) to obtain $R^N - r^N = \delta H(1 - \theta^2)/3 \geq 0$, which indicates that total revenues are still higher in the bigger country. On the other hand, looking at the per capital tax revenues one gets: $\frac{R^N}{H} - \frac{r^N}{h} = -\frac{\delta(1-\theta^3)}{9\theta} \leq 0$, this shows that in the Nash equilibrium per capital revenues are higher in the tax haven.

Finally, it is analysed the role of the "transportation cost" parameter δ . As described at the beginning, the extent of cross-border shopping between the two countries equals to $(T - t)/\delta$, while the tax differential obtainable from (4.8) is $T^N - t^N = \frac{1}{3}\delta(1 - \theta)$. Combining the two equations it becomes clear that the amount of cross-border shopping in the Nash equilibrium is independent of transportation costs⁴⁵. On the other hand, from (4.9) it is immediate to see how an increase in δ is strictly Pareto-improving. These two, possibly counterintuitive, results emphasize the centrality of strategic responses in shaping the non-cooperative outcome. For the first conclusion one could have expected that an increase in the mobility costs δ decreased the amount of cross-

⁴⁵ The extent of cross-border shopping is here $(T - t)/\delta$ and not the opposite, because, differently from the beginning of the discussion, the home country is assumed to be the small one, hence $T > t$.

border shopping. However, a rise in transportation costs enables the large country to charge a higher T^N ; strategy that is immediately followed by the small country with a rise in t^N . Therefore, according to this model, an increase in δ enables both countries to extract more surplus from citizens, leaving unaffected cross-border shopping. The same reasoning applies when thinking about the second result from the perspective of the small country (an increase in δ is Pareto-improving because both countries are going to be better off)⁴⁶.

Concluding, there is one general simple lesson that can be learned from this model; once strategical tax-setting is accounted for, increasing transportation costs can have little or no effect on the amount of cross-border shopping, and it can instead be beneficial also to tax havens.

Kanbur and Keen then continue the discussion analysing the effects of two tax-coordination policies: tax harmonization and the imposition of a minimum tax rate. In the first case, tax harmonization results to be welfare degrading; the losses incurred by the small country outsize the gains obtained by the large country. In the second case, the imposition of a minimum tax rate instead benefits both countries; the strategic response of the large country is such to guarantee the small country a sufficient level of cross-shopping. Given the focus of this work, the detailed discussion of these two proposals is hereby omitted. It was decided so because neither of the two proposals is closely related to what is being discussed at the European level. Indeed, in the European Union tax rates are still an exclusive matter of Member States, and there is no indication (to the author's knowledge) that this will change in the foreseeable future.

⁴⁶ Of course, now that reservation prices are constrained to be finite and that δ must comply with the assumption $\delta < \min\{v, V\}$, transportation costs cannot be allowed to increase indefinitely.

Chapter 4: Possible benefits from tax competition

Most of the literature presented until now points to the drawbacks of non-cooperative tax setting; the first one being an inefficient allocation of capital (Hamda, 1966; Bond and Samuelson, 1989) and the second one being a welfare loss due to underprovision of public goods (Zodrow and Mieszkowski, 1989; Kanbur and Keen, 1993). However, these results heavily rely on the classical assumption of a benevolent government trying to maximize the social welfare function of its citizens.

The power to tax

This classical view was firstly challenged by Brennan and Buchanan (1980), the two authors argued that the State should be viewed as a self-centred Leviathan, whose main purpose is to increase its size. The philosophical idea, laying the ground for all their thinking, relies on the Hobbesian conception of *homo homini lupus*. Given the intrinsic egoistic nature of men, and the obvious consideration that any public institution is composed of men, one should think of governments as selfish entities whose main interest is to increase their size and power. They argued that, as simplistic as it is, the conventional economic assumption of the selfish individuals has been shown having powerful explanatory potential and there is, therefore, no reason why it should not be applied to public institutions.

After Brennan and Buchanan's book was published, in 1980, thinking of governments as revenue-maximisers became the norm in the public finance theory (Haufler, 2001). However, what commonly differs in the theoretical models from the idea of Brennan and Buchanan is the underlying motive of the Leviathan. In fact, in most of the literature on tax-competition produced in the last century (and in all the models presented before, excluding only that of Persson and Tabellini, 1992), public institutions are assumed to be benevolent, hence aiming at maximizing the welfare of their citizens. This divergence in the assumption of government's nature is clearly stated in Kanbur and Keen 1993's paper: "Also central to the model is an assumption that governments are Leviathans: the objective of each is to maximize its tax revenue. The analysis can thus be viewed either as providing a public-choice perspective on strategic aspects of tax-setting in an international context or our preferred interpretation as a conventional welfarist

treatment of such issues for the case in which consumers place a very high marginal valuation on some public good which tax revenue goes to finance” (Kanbur and Keen, 1993, p.878).

Conversely, Brennan and Buchanan (and those later adopting the same view), assume that policymakers detain a share of public revenues to be consumed for their own personal use. They hence justify the general tendency of governments to increase their sizes with the policymakers’ voracity for extra revenues; bigger is the government’ size and higher its revenues, bigger the share policymakers can retain (Brennan and Buchanan, 1980). Therefore, governments should be constrained both in what concerns the policymakers’ discretion in the allocation of public funds and in their tax-collecting capacity⁴⁷.

These tax-collecting constraints should be either constitutionally imposed or naturally obtained through tax-competition. The first method should be adopted in the case of a closed economy and could take the form of tax-rates ceilings, while the second could be relied upon in the case of an open economy and some tax-restrictions could nonetheless be indicated. The underlying idea is that competition among governments (or decentralized authorities) can exercise a disciplinary force that in turn constraints public spending and, most importantly, waste. When public authorities compete for tax bases they are forced to either decrease tax rates or to improve the services provided, in both cases voters are likely to benefit from it. Brennan and Buchanan also make the parallel with the classical economics theory: “... tax *competition* among separate units rather than tax collusion is an objective to be sought in its own right. The argument is of course, obvious when the parallel is drawn with the monopoly-competition relationship in economic theory. But notions that are obvious in one area are often neglected elsewhere, and restatement of the familiar from one setting becomes a challenge to orthodoxy in another” (Brennan and Buchanan, 1980, p.186).

⁴⁷ Brennan and Buchanan stress, and further elaborate, Tiebout’s idea of fiscal accountability; there should always be a direct link between each type of taxes and the public goods provided with those taxes.

The efficiency drive of competition

More recent works on the efficiency force of inter-state competition are those of Belleflamme and Hindriks (2005) and Besley and Smart (2007). The authors, however, adopt a slightly different approach to the discussion. Both the mentioned papers in fact relate to the political agency model introduced by Barro (1973). The idea is that the quality of public institutions strictly depends on the ability voters have in dealing with the asymmetry of information vis a vis to public officers (Besley and Smart, 2007). Basically, the main point these authors make is that competition can serve as a screening device citizens use to discriminate between good and bad politicians; comparing the performances of their region against those of similar regions, citizens have extra means to infer their government quality. The branch of literature covering this topic is generally known as “yardstick competition”.

To see the logic of their argument it is hereafter presented a very simple model drawn from Hindriks and Myles (2006, Chapter 17). Assume that a government of a certain country can implement only one of two kinds of policies at a time: either policy A or policy B. The former is the best policy to be adopted under good economic circumstances (state a), while the latter should be adopted when the economy is down (state b). Therefore, if the economy happens to be in state a , voters obtain a higher welfare level when policy a , rather than policy b , is adopted. However, policymakers are selfish and may opt for policy A in state b , or vice-versa policy B in state a , to get some private gains (here assumed to be in the form of some rent $r > 0$). What could prevent politicians from implementing the wrong policy is the value they appoint to be re-elected and suppose that value is $V > r$. The government (along with its officers) benefits from better knowledge than citizens: it knows the prevailing conditions (i.e. whether state a or b as occurred), while common people can only observe their current welfare.

Table 1: Policy accountability and voter welfare

	State a	State b
Policy A	(0,3)	(r ,0)
Policy B	(r ,1)	(0,1)

Source: Hindriks and Myles (2006)

To induce politicians to act for the best, voters set a re-election rule. This can be thought of as a threat-mechanism that citizens implement to control the incumbent; if he does not deliver a certain level of welfare, then they commit to voting for another policymaker at the following elections. In doing so, voters have to calibrate the trade-off between setting too high and too low expectations for their welfare level. If the standard the incumbent must meet to be re-elected is set too high (e.g. citizens commit to voting for the incumbent only if their welfare level is 3), then the incumbent cannot be re-elected whatever he does if conditions turn out to be bad (state b). In such case, the policymaker has an incentive to get the rent r and do not run for the second mandate. On the other hand, if voters set the standard for re-election too low (e.g. at 1) the incumbent would be able to capture the rent r and still get re-elected if conditions are good (state a), but citizens would obtain less than what they could have (i.e. 3). Therefore, here voters can never be sure of extracting all the welfare, because sometimes policymakers have the possibility of escaping from their control and divert rent.

Suppose now that the electorate can compare their welfare situation with that of citizens from totally similar countries, experiencing the same external prevailing conditions. Then from observation of the outcome obtained in these other countries, citizens can infer whether the economy is in the good state a or in the bad one b . The information is revealed when at least one of the other governments adopts the best policy given the economic circumstances. Therefore, citizens would commit to voting the incumbent when they get a welfare level of 3 if conditions are good, or of 1 if they are bad. The incumbent, in turn, knows that choosing the right policy will give him $V > r$, while on the other hand choosing the wrong one will give him the lower payoff $r < V$. Concluding, it appears evident that governmental competition here benefits voters, in which they gain control over their politicians and deduce what they can obtain through comparison instead than solely through politicians' actions.

The parallel with fiscal competition then comes naturally: "inter-governmental competition makes the cost of public programs more visible, as well as their benefits, which in turn make public officers more accountable for their decisions. Stated briefly, competition may induce government officials to reduce waste and thus reduce the

effective price of public goods” (Hindriks, 2004). Some empirical evidence for inter-state yardstick competition in the USA comes from Besley and Case (1995), the two authors found encouraging results for the view that vote-seeking and tax-setting are tied together in the nexus of yardstick competition.

[An attempt towards theoretical convergence](#)

The most important piece of work trying to incorporate the arguments pro and against tax competition is that of Edwards and Keen (1996). The two authors believe that both the classic-Pigouvian view of a benevolent-despotic government and that proposed by Brennan and Buchanan of a selfish Leviathan central authority have some merits. They therefore try to structure an economic model starting from the assumption of a government that is not completely benevolent, nor totally selfish. Their model is an extension of that previously analysed of Zodrow and Mieszkowsky (1986). However, here Edwards and Keen set-up the government’s objective function so that it includes the utility of the representative consumer (U) together with a “waste” component (C) that exclusively benefits policymakers. With this set-up, tax competition is opposed to tax coordination, where the latter takes the form of a cooperatively-agreed tax-increment dT from the non-cooperative equilibrium.

Through a similar analysis to that described for Zodrow and Mieszkowky, the two authors conclude that a multilateral increase in the tax on mobile capital increases the representative citizen’s welfare if and only if:

$$-\frac{TK'}{K} > \frac{dC}{dR}$$

where K stands for mobile capital, K' is the first derivative with respect to T and R denotes government revenues. Therefore, Edwards and Keen determine that coordination is welfare improving, with respect to tax competition, if and only if the elasticity of the tax base exceeds the policy-maker’s marginal propensity to waste tax revenues. Thus, their great merit stands in trying to bring the international tax-setting debate from a somehow philosophical exchange of views on the nature of governments to the more practical evaluation of economic quantities. In their paper they call the economic community to shift the discussion from a sterile clash of views to the

Chapter 4: Possible benefits from tax competition

evaluation of the tax-base elasticity; they make the example of what would happen if consensus is obtained that such elasticity is 0.4. In such scenario, it would become generally accepted that coordination turns out to be welfare improving when incumbents have a waste propension for additional revenue below 40%.

Chapter 5: Some by-products of tax competition

Redistributive concerns

Up to this point of the discussion, a central issue about the nature of public authority has been overlooked. This concerns the economic necessity of governments. In fact, governments are generally recognized to provide goods that would not otherwise be commercialized in competitive private-markets. Therefore, as noted by Sinn (1997, p. 248): “Since governments have stepped in where markets have failed it can hardly be expected that a reintroduction of a market through the back door of system competition will work. It is likely to bring about the same kind of market failure that justified government intervention in the first place.”

Sinn continues mentioning a “selection principle” that should be applied in choosing public goods. He argues that this principle is key in defining public goods and that its consequences are too often neglected in the debate on fiscal competition. The most important aspect of this principle is that the cost function of public goods is normally characterized by marginal costs being below average costs. Therefore, in a competitive setting, where prices are driven down to the point they match marginal costs, such goods would bring private firms to bankruptcy, while governments would be forced to accrue deficit. In this scenario, states would soon be forced to increase taxes to reduce debt, but in a situation of market competition, these taxes cannot be levied on mobile factors of production without incurring in a capital flight from the country. Consequently, central authorities are constrained to either increase taxes on immobile factors or limit the provision of the public good. In both cases, this rises redistribution concerns given that mobile factors often belong only to the richer individuals (Sinn, 1994).

In the two abovementioned papers, Sinn makes multiple examples, structured both discursively (1994) and formally (1997), on the importance of a central authority. These examples span from the possible cost savings deriving from a central military body, to the well-known problem of pollution, to the importance of uniform standards (for networks such as railways, cable technologies, etc...), to that of avoiding social dumping.

The latter affects three categories: international redistribution, internal redistribution and quality standard. Given the relevancy it has in the literature on tax competition, it is here briefly discussed the internal redistribution problem. The argument Sinn makes is that redistributive policies within a country can be thought of as a publicly-granted insurance. He argues that normally a government fills the gap left by the private insurance market because, contrary to this one, it does not take pre-existing inequalities among agent-types as given. Basically, the difference stands in the fact that the government insures citizens without knowing *a priori* their risk-type, hence before sorting out the “good-risk” against the “bad-risk” types. The explicative example he provides is that of a couple willing to insurance their child before this comes to light, hence without knowing if he/she is going to be born handicapped or healthy, gifted or untalented. Risk-adverse parents would like to insurance their baby against lifetime income variations. However, this cannot be provided by the private market because it would bind the child with the scheme for all his life-time, with no possibility of stepping out. On the other hand, governments can afford these types of contracts providing insurance through tax law. Where a redistributive tax system insures against a bad endowment of innate abilities and unfortunate events due to bad luck throughout the whole lifespan of individuals (Sinn, 1997).

In the model Sinn proposes, the key problem of inter-state fiscal competition is the resulting loss of enforcing capacity that governments incur. The more tax bases are mobile, the more individuals whose realizations turn out to be good (hence the lucky ones) have an incentive to move their tax bases (or themselves) to the country imposing the lowest taxes. Consequently, a single state will always have the incentive to undercut the tax rates of its neighbouring countries to attract net contributors of public funds. Hence, with competition, one crucial assumption of the insurance scheme is no-longer satisfied, that is: the government being able to force the “good risks” to participate by paying taxes. The extreme conclusion of this example is that the only stable equilibrium is one where redistributive taxes are brought down to zero for all the countries competing and if one state decides to increase them it incurs in a fiscal deficit because it would attract the underprivileged and distance the wealthy. Or in Sinn words. “A Europe with free migration is like an insurance market where customers can choose the

company ex-post, after the insurance period is over and everyone knows whether he has incurred a loss or not” (Sinn, 1994).

Tax havens

In the literature on fiscal competition, Sinn is not the only one arising distributional concerns. In fact, many academics have shown how, in presence of tax competition, the tax instruments economically privileged are those arising the most serious redistributive concerns⁴⁸. This is something already suggested by the models of Tiebout (1956), Zodrow-Mieskowski (1986) and Hamada (1966), where head taxes bring Pareto efficiency, while capital taxes (almost always) invalidate an efficient allocation of capital. The result is so common in the literature on tax competition that Wilson writes: “The analysis of alternative tax instruments must confront a fundamental result on optimal taxation in an open economy: if a government can satisfy its revenue requirement using a system of optimal commodity taxes, then it should not use tax instruments that distort the pattern of goods trade or factor trade with other regions” (Wilson, 1999, p. 281). This implies that governments should always avoid making use of source-based capital taxation, privileging residence-based capital taxes levied on each resident’s capital income (Wilson, 1999). The conclusion on the undesirability of source-based taxation is shared also by Gordon (1986) who stresses the economic-efficiency predominance of resident-based taxation also for labour and commodities. The idea is that for an open economy interregional trade can be viewed as a productive sector of the country, therefore governments should avoid any policy distorting trade. In other words, the elasticity of mobile factors is much higher than the one of labour and savings of residents, hence governments should privilege the latter tax base if they want to minimize the deadweight loss of taxation (Wilson, 1999). This line of thinking brought Bucovetsky and Wilson (1991) to state that if countries are not large enough to have influence over the equilibrium after-tax return on capital, then they should exclusively rely on labour income taxation.

From above, it seems straightforward that fiscal-policy recommendations should direct governments in the direction of resident-based capital-taxes. However, this form of

⁴⁸ It is nonetheless worth noticing that this economic equilibrium is likely to be partly balanced by the resulting political equilibrium that brings to power leftish politicians, keen to strong redistributive policies (Persson & Tabellini, 1992).

taxation generally implies much higher administrative burdens and tax compliancy costs than taxation on domestic-made income (Gordon & Mason, 1995; Wilson, 1999). Moreover, the use of residence-based taxation for mobile factors becomes almost impossible to be rigorously employed when in presence of foreign non-cooperative tax jurisdictions.

Until the OECD's famous report on harmful tax competition (OECD, 1998), the central issue of tax havens had been systematically overlooked in the academic debate (Wilson, 2014). It was with this report, where it was provided for the first time a generally accepted definition of tax havens, that a growing body of literature started to take form, yielding very heterogeneous results. The probably most important extension to the standard tax competition model that includes tax havens must be attributed to Slemrod and Wilson (2009). In their analysis, the two authors assume tax-competition for capital among a large, but finite, number of identical countries. They then add a number of "parasitic" tax havens, which impoverish tax revenues of the non-haven countries (they do so attracting foreign firms' profits through concealment services)⁴⁹. In their paper, Slemrod and Wilson show how tax havens worsen the classical result of tax-competition models (that is an equilibrium with tax rates on mobile capital set to inefficiently low levels). They also underline how, according to their result, most of the tax burden from the inefficiently low taxes is borne by immobile workers in the form of lower wages. Therefore, the elimination of some or all of the havens would result in higher equilibrium taxes, more public services and higher welfare levels of the non-haven countries⁵⁰ (Slemrod and Wilson, 2009; Wilson, 2014).

A different conclusion was provided by Johannesen (2010) in a qualitative deviation from Slemrod and Wilson's model. In the paper, the author, in fact, allows profit-shifting not only towards tax havens but also among non-haven countries. With this set-up, Johannesen investigates the equilibrium attainable without tax-havens first and with tax-havens afterwards. In the first scenario, the profit shifting activities bring about an asymmetric equilibrium, where some countries choose to impose a high tax-rate and

⁴⁹ Please refer to Gravelle (2009) for some elaborations on profit-shifting activities of US companies.

⁵⁰ This contrasts the result find by Elsayyad and Konrad (2012), where it is argued that only eliminating tax havens altogether is welfare improving, while a sequential approach could do more harm than good because it reduces competition among them.

others choose a low one⁵¹. Under this equilibrium, the low-tax countries benefit from their tax-rate in that they attract capital from the high-tax countries⁵². However, when tax havens are introduced in the model, the low-tax countries do not gain anything from the foreign firms' profits any-longer, because these are now all brought to tax-havens (charging a zero tax-rate on profits). Therefore, the new equilibrium could now be a symmetric one, where the low-tax countries uniform their rates upwards, to the level of the high-tax countries. Finally, the new revenues obtained with this equilibrium could more than offset the loss due to tax havens (Johannesen, 2010).

Similar conclusions are also shared by Hong & Smart (2010) and Hines (2010), in particular, these two papers underline the role of tax havens in allowing governments to better discriminate between mobile and immobile capital. This, in turn, raises the question of whether capital should have preferential taxation when it is mobile or immobile and when it is domestic or foreign (to guarantee its best possible allocation). Even if different answers have been provided⁵³, there is general agreement in concluding that small countries are more favourable to such preferential regimes, while big countries are not (Mongrain and Wilson, 2014). Finally, Picketty (2013), Schjelderup (2015) and Zucman (2015) emphasize the secrecy aspect of tax havens, stressing how the detrimental effects of these countries extend beyond the profit-shifting activities and how fiscal opacity often shelters money-laundering for criminal activities and corruption, both of which are very likely to affect the economic growth of developing countries. As Wilson emphasizes: "To fully assess the welfare effects of tax havens, we need to consider the full range of their activities" (Wilson, 2014).

⁵¹ This could be justified by the Ricardo's theory of comparative advantage, where one country specializes in labour-intense goods, while the other in capital-intense products.

⁵² The author distinguishes tax havens from low-tax countries depicting the first ones as only interested in facilitating profit-shifting, while low-tax countries tax capital and also compete for real investment.

⁵³ For an exhaustive literature review on the topic please see (Wilson, 2014).

Conclusions

This work tried to provide a good picture of fiscal competition in Europe. This was done with a very broad perspective, also considering and describing tax avoidance and tax evasion. It was decided to proceed in this way because an increasing number of economists now consider tax-havens to be the by-product of tax competition (Kanbur and Keen, 1993; Wilson, 1999). Moreover, most of the current debate on tax competition has been driven by the international scandals triggered by large leaks of data from off-shore service providers, normally situated in tax-haven countries. However, the broad focus adopted made almost impossible to exhaustively cover both the economic literature and the global developments occurred after the treaty of Rome. Therefore, only those works considered to be the most relevant for a general assessment of the current situation of tax competition in the EU were investigated.

In the first chapter, some attention was given to the Base Erosion and Profit Shifting document and the Automatic Exchange of Information directive, both of which aim at constraining the harmful consequences of unregulated tax competition. Moreover, major relevance was given to the current re-launch of the 2011's proposal for a European Common Consolidated Corporate Tax Base. This could be considered as the boldest proposal made by European Commission in the recent past to bring around better tax-coordination in the EU. Its significance stands in the notion of economic substance; hence in the twofold attempt of re-establishing a strong link between taxation and economic activity, and level up the rules defining a corporate tax base in the EU.

After these major developments were presented, the case of tax competition was investigated from an empirical perspective. It was first considered the evolution of capital mobility in the last one-and-a-half century, with particular attention to the last fifty years. The analysis indicates that, since the eighties, capital mobility has constantly increased, with most countries experiencing great flows of direct investments both inward and outward, sometimes exceeding their own GDP. Correspondingly, data indicate that both marginal personal tax rates and average corporate taxes have been

Conclusions

decreasing among the most advanced economies. Which raised the question of whether this is justified in the economic theory and what are the likely implications.

Therefore, in the third chapter, primary weight was given to some of the most important theoretical models in terms of both their relevancy in the economics literature and their explicative capacity. The first model presented was that elaborated in the fifties by Tiebout, who could be considered the founding father of that branch of economics literature in favour of public-competition. In his model, Tiebout sets up competition for mobile households among an indefinitely large number of local authorities, each providing a unique bundle of public services so to attract only those citizens whose level of utility is optimized with that particular mix. With this set-up, Tiebout argues that competition is welfare-enhancing in that it helps to differentiate the bundles of public goods to the point where every citizen finds the community best reflecting his preferences. After this important result, professor Oates raised the issue of redistribution, in fact for his analysis Tiebout relies on head taxes, which are not very likely to be implemented in western countries due to their lack of progressivity. In the case taxes on capital are implemented Oates points to the risk of underprovision of public services which would bring down welfare levels. Moreover, he underlines the importance of a central authority to make good use of monetary, as well as fiscal, policies.

After these two early works were presented, it was analysed the paper of Zodrow and Mieszkowski (1986), who formalized the above-mentioned discussion. In particular, they demonstrated the distortionary effects of a tax on mobile capital, showing that the Samuelson condition does not hold in its presence and that it negatively affects the provision of public goods. The subsequent paper discussed was that of Persson and Tabellini (1992). Their work is important both for the historical moment of its appearance (it was published the same year of the Maastricht-treaty) and for its key assumption of selfish policymakers. They confirmed the general result that tax competition negatively affects income redistribution, penalising those with the lowest endowments, however, they concluded that this economic equilibrium is watered down by the political equilibrium, with the appointment of leftish politicians eager to redistribute. At this point of the paper, it was considered worth clarifying some key

Conclusions

concepts in the literature of tax competition along with the central problem of double taxation. The theoretical models of both Hamada (1966) and Bond and Samuelson (1989) were analysed, and the different conclusions obtained in their papers were confronted. Hamada indeed recommends tax credits while Bond and Samuelson argue that the strategic setting of tax credits would prevent capital trade altogether, and they hence indicate tax deductions to be the type of international tax-agreement countries should adopt. Later on, the focus was moved to the key matter of size, with the analysis of the 1993's paper of Kanbur and Keen. In their work, the two authors prove the centrality of size in international tax-setting. In particular, they show how small countries tend to undercut big ones to attract tax bases. Their finding is backed by a lot of empirical evidence and became critical in the discussion on tax competition, especially in its extension to tax havens.

In chapter 4, it was investigated the Pigouvian assumption of benevolent governments, which is normally adopted also in the literature on tax competition, and the ideas of Brennan and Buchanan (1980) were presented. Their line of thought was integrated with a brief discussion of the models on asymmetric information elaborated by Besley and Smart (2007) and Hindriks (2004). Finally, the chapter is concluded presenting an important result obtained by Edwards and Keen (1996), who tried to merge the two contrasting views in one-single model.

In chapter 5, the main distributional concerns in the literature on tax competition were presented in a discursive manner. In particular, the ideas of Sinn were discussed, starting from his strong critique of the practice of comparing private market competition to inter-state competition. In the very final part of this work the major advancements in including tax havens in the theoretical models of the academic literature were described.

This dissertation, therefore, confirms that the downward trend in tax rates for mobile capital, predicted by the theoretical models, is backed by important empirical evidence. This is especially true looking at the statutory corporate tax rates in most advanced economies and at the top personal income tax rates. The underlying trend seems to be correlated with the increasing mobility of capital, as the literature on tax competition suggests. Downsizing taxation should in theory allow a better allocation of capital with

Conclusions

a consequent Pareto improvement, given the higher aggregate production, and an overall social-gain. This gain in efficiency can be obtained because the current tax system does not allow for an optimal allocation of capital. In most OECD countries the preferred tax design is indeed that of a source-based taxation (Auerbach, et al., 2008). This type of taxation is inefficient because it negatively affects the rate of return on capital, which therefore is not perfectly allocated. This is why, classical models of tax competition, assuming source-based taxation, suggest that an open economy should charge a zero-rate on mobile capital (Gordon, 1986; Bond and Samuelson, 1989). Moreover, Zodrow and Mieszkowski (1986) demonstrated how, if other tax instruments are not sufficient to raise the required revenues, then there is underprovision of public goods. Provided that this type of tax influences location decisions, source-based taxation can henceforth be thought to be the principal cause of the race to the bottom in terms of capital taxation, which raises serious equity concerns. It was in fact illustrated how, once taxation on mobile capital is lowered from international pressure, the incidence of taxation mostly falls on the immobile factors of production (land and labour) (Wilson, 1999).

From a theoretical standpoint, the issue could be solved with pure residence-based or destination-based taxation. In fact, with these taxes, the allocation decisions of capital would not be distorted (Auerbach, et al., 2008). Suppose, for example, that all countries adopted residence-based taxation worldwide. In such scenario, there would be no incentive for companies to shift profits among subsidiaries to reduce their tax liability. Nor would the tax affect foreign capital investments. However, such tax would be very challenging to implement with multinationals, which may have hundreds or thousands of subsidiaries around the world. Checking and verifying the taxable income in every country could result being too demanding for tax authorities, even if everything is consolidated into a single financial statement. Moreover, a pure resident-based taxation would not grant the capital-import neutrality, that is: capital invested into a specific region would be treated differently for tax purposes depending on its country of origin. This would affect the level playing field among companies operating in that region, discriminating those with the higher domestic tax rate (Ambrosanio, et al., 1997; Griffith, et al., 2007).

Conclusions

The abovementioned problematics should dissuade the adoption of a tax system solely based on either the source-based or on the residence-based principle. It was this logic that brought most developed countries to implement a mix of the two systems (even if priority is normally given to the source-based principle). However, this mix seems to be unsatisfactory and to incentivize tax avoidance and tax evasion practices, penalizing immobile capital (Auerbach, et al., 2008). A very interesting alternative is that of a destination-based capital tax. This was seriously discussed for the first time by Bond and Devereux (2002). The two authors consider three different types of destination-based taxes, but they obtain the most promising result in terms of equity and efficiency with a VAT-type capital tax. This type of tax could be considered as a cash-flow tax, with revenues being taxed only in the country in which the sales to a third party take place, and all real costs, including labour, would be deductible. By design, this tax would be neutral with respect to production, investment and location decisions. In particular, given its neutrality with respect to location decision, such a tax would not be subject to competition and it would avoid creating incentives for multinationals to engage in tax planning (Bond & Devereux, 2002). However, a VAT-type capital-tax would require a great deal of coordination among the countries implementing it⁵⁴. Moreover, there are many transition issues that should be accounted for, and its implementation should be adopted by numerous countries altogether (please refer to Auerbach et al., 2008, for an extensive discussion).

Regardless of the initial problems of implementation, such a tax seems promising from both an economic and an ethical point of view. It is with this perspective that the recent proposals at the OECD and at the European level should be looked at. Both the BEPS and the AEOI are going in the right direction, with a major focus on increasing the exchanges of information and to uniform tax practices. However, the proposal that ought to receive the most attention is that of a CCCTB in Europe. It is so, because the system would define the tax base for corporations in the whole European Union, it would make use of an appointment formula that also accounts for sales and labour (hence very much approaching the proposal of Bond and Devereux) and, if adopted, it would be

⁵⁴ Like a classical VAT, this tax should relieve all the costs incurred in exporting, and any VAT-type of tax a company has paid on intermediate goods should be refunded.

Conclusions

simultaneously implemented by 28 countries. Moreover, the reform would leave small countries complete freedom to decide upon their tax rates, therefore not excessively hampering their means to attract real capital.

Finally, also the efficiency-enhancing effects of competition should be borne in mind. This is particularly true at the local level, where redistribution concerns are much less important (they are normally taken care of by the central authority). Indeed, empirical evidence shows that competition at the local level does not necessarily result in underprovision of public goods⁵⁵, and it could actually be beneficial to some public services⁵⁶.

At the beginning of this work, it was illustrated how public pressure for a change in capital taxation is becoming increasingly strong. However, before proposing any policy reform, governments should closely consider the economic literature on this topic. Moreover, an effort at the European level is required because reforms implemented only in single countries are not likely to produce any relevant change. This is why the EU impasse on taxation matters should be politically overcome. The importance of taking orchestrated action is so strong that Junker himself, ex-prime minister of a country that is clearly benefiting from the status-quo, called the EU to switch from unanimity to qualified majority voting on taxation matters in the foreseeable future (Reuters, 2017).

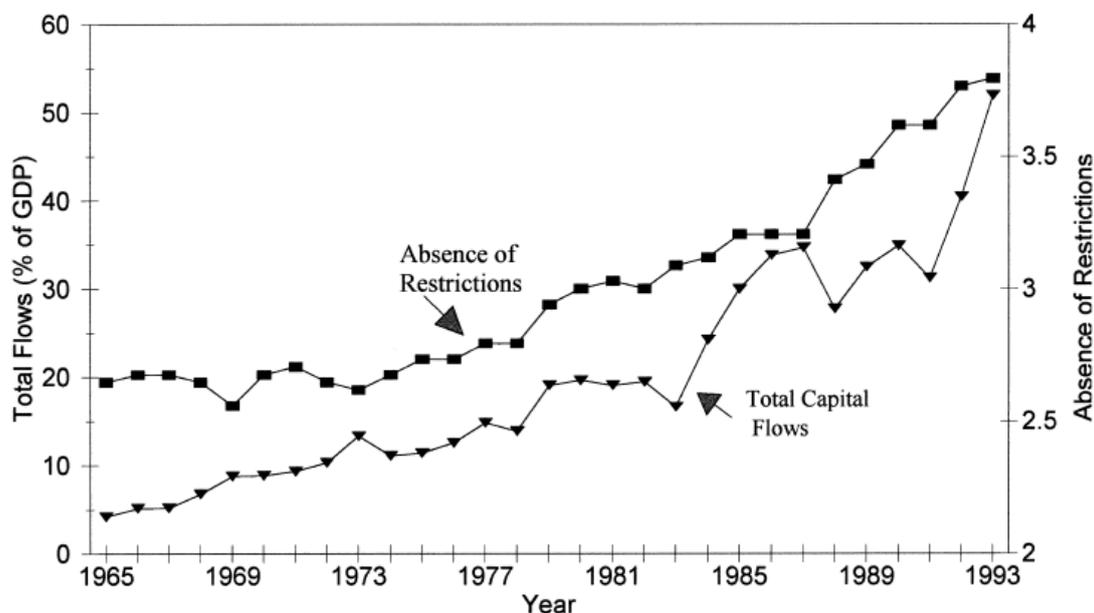
⁵⁵ See for example, Kirchgässner and Pommerehne (1996), their study investigated the resulting effects of tax competition for people with high personal income among the Swiss cantons, finding that the level of public goods does not get affected.

⁵⁶ Hoxby (2000) finds that greater competition among school districts has a significant effect both in improving educational performances and in reducing expenditures per student.

Appendix

Appendix 0

International Capital Mobility: Potential and Total Flows (1965-1993) for seventeen OECD countries



Swank (1998), Figure 1

The figure above illustrates the degree of actual and potential capital mobility for seventeen OECD economies in the time span 1965-1993. The economies considered are Australia, Austria, Belgium, Canada, Denmark, Finland, France, West Germany, Ireland, Italy, Japan, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom and the United States. The variables included for the estimate are: “the absence of restrictions on payments and receipts of capital, [...], the actual volumes of inflows and outflows of direct, portfolio, and bank finance across national borders” (Swank, 1998, p. 673).

In the following two pages are reported the OECD tables presenting the inward and outward foreign direct investment positions of the OECD countries. The biggest five European economies and the OECD and EU averages are highlighted in yellow.

Appendix

Foreign Direct Investment, inward position

As a share of GDP (%)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016 ^P
OECD¹	23,5	27,1	29,9	23,1	28,7	29,4	27,8	30,8	33,7	33,8	36,2	38,0
Australia	32,5	36,9	39,7	29,1	43,4	40,7	36,1	38,9	37,1	38,5	43,1	45,2
Austria*	26,6	33,9	42,6	35,2	43,9	42,7	37,0	42,1	43,6	41,7	43,7	39,9
Belgium*								97,7	92,9	93,4	115,2	101,9
Canada	54,6	53,7	70,5	40,0	63,3	61,0	48,2	52,3	53,3	55,5	51,3	63,7
Chile*					74,9	72,9	67,8	75,8	76,2	85,5	94,4	99,6
Czech Republic	44,5	51,4	59,4	48,0	61,0	61,9	52,9	65,8	64,0	58,5	62,4	60,0
Denmark*	28,2	32,6	34,8	29,4	32,1	30,1	28,6	30,1	21,8	27,2	30,4	31,7
Estonia	79,9	71,4	70,5	63,9	80,6	79,7	70,6	82,2	87,8	79,7	83,6	83,0
Finland									32,9	34,4	35,1	33,8
France	16,9	21,2	23,4	19,3	24,1	23,8	24,4	25,4	27,1	24,6	28,3	28,3
Germany	22,6	27,9	29,4	24,7	28,2	28,1	26,3	24,4	25,5	22,1	23,4	22,6
Greece	11,8	15,1	16,7	10,8	12,8	11,7	10,1	10,1	10,8	10,4	13,8	14,6
Hungary*	54,3	69,8	68,6	56,0	76,1	69,7	60,9	81,7	80,6	71,5	69,3	64,3
Iceland*	28,1	45,1	77,3	52,2	66,9	88,9	86,2	72,9	47,6	45,9	46,8	48,6
Ireland								169,9	170,8	161,2	305,6	276,5
Israel ^{2,4}	21,6	28,2	27,5	22,3	27,1	25,7	24,8	29,4	29,5	29,0	33,2	33,7
Italy									17,1	16,4	18,7	18,6
Japan ⁶	2,1	2,4	2,9	4,0	3,8	3,8	3,7	3,3	3,3	3,5	4,0	3,9
Korea ²	11,7	11,4	10,9	9,5	13,5	12,4	11,2	12,9	13,9	12,7	13,0	13,1
Latvia	29,0	35,0	35,6	31,8	44,4	46,0	42,5	48,1	52,7	48,1	54,5	51,2
Luxembourg*								292,4	284,5	380,8	368,1	351,1
Mexico*	28,3	28,8	29,6	23,7	42,9	42,0	38,6	45,2	45,3	44,8	53,4	
Netherlands*	70,7	76,1	91,4	69,2	75,3	70,3	68,3	75,8	89,9	84,8	97,5	107,1
New Zealand	38,4	44,9	42,9	33,1	46,5	39,1	38,2	40,6	39,5	38,2	37,9	38,1
Norway*									36,5	34,7	38,1	39,7
Poland*	28,2	33,6	38,3	27,8	38,1	39,1	31,1	39,8	43,7	38,9	38,5	39,4
Portugal*	26,3	33,5	37,7	27,5	35,1	35,6	34,7	44,9	48,1	44,9	52,1	51,8
Slovak Republic						56,2	52,9	59,0	58,9	49,4	52,7	48,8
Slovenia	19,4	22,4	22,7	21,5	22,4	22,2	22,4	26,3	25,5	24,8	29,4	30,5
Spain*									43,7	41,2	43,3	41,5
Sweden*									62,2	51,2	56,6	53,7
Switzerland*										100,6	113,8	129,8
Turkey	14,2	17,2	23,0	10,5	22,3	24,2	16,4	21,8	15,9	19,5	18,1	16,4
United Kingdom	31,4	38,7	36,7	31,7	43,4	44,0	44,4	54,4	55,6	52,7	49,2	56,3
United States	21,5	23,8	24,5	16,9	20,8	22,9	22,5	24,2	29,6	31,3	31,5	35,2
Total World ^{1,3}	23,9	27,4	30,5	23,9	30,0	30,8	28,9	31,3	33,3	33,5	35,7	38,1
European Union (EU)¹	29,8	35,4	38,8	32,9	40,0	40,3	38,3	44,2	45,0	42,3	48,2	48,6
G20 countries ¹	19,5	22,3	24,1	17,9	23,5	24,3	22,8	24,3	26,3	26,4	27,1	29,5
G20-OECD countries ¹	19,9	22,9	24,8	18,2	23,2	24,0	22,8	24,8	27,8	28,3	29,1	31,3
G20-non OECD countries ¹	17,8	19,4	21,5	16,8	24,3	25,3	22,9	23,0	23,0	22,5	23,1	25,7

*Data excludes SPEs. Corresponding data below including SPEs:												
Austria	49,2	57,7	72,8	62,5	75,7	66,5	58,7	67,6	68,5	62,3	64,6	53,0
Belgium				71,0	68,7	75,8	60,9	103,0	106,4	104,6	121,3	107,3
Chile					75,9	74,5	69,4	77,0	77,2	86,5	95,5	100,6
Denmark	37,1	39,1	42,6	35,1	38,2	34,4	31,8	32,8	26,2	35,5	37,5	40,5
Hungary	54,3	104,4	140,7	163,0	204,2	163,4	161,3	194,8	184,3	160,6	161,7	191,7
Iceland	28,1	45,1	77,3	52,2	66,9	88,9	86,2	72,9	75,9	64,5	67,3	65,8
Luxembourg								4.476,2	4.828,2	4.819,1	6.322,0	6.062,1
Netherlands	239,9	290,9	329,3	303,2	375,8	380,0	392,0	461,3	507,6	475,1	530,4	531,8
Norway									36,9	35,0	38,7	40,3
Poland	28,8	35,3	40,1	29,4	40,2	40,8	33,0	40,6	44,3	39,3	38,8	39,9
Portugal	33,8	43,0	49,8	40,3	48,5	48,3	42,4	52,9	55,3	52,4	58,9	58,0
Spain									46,8	43,5	45,6	44,3
Sweden	44,2	54,1	60,2	54,2	77,3	71,1	62,0	68,7	67,8	55,9	61,1	57,3
Switzerland	41,8	62,7	74,0	81,1	92,6	105,1	98,1	111,5	114,1	115,7	132,2	149,4

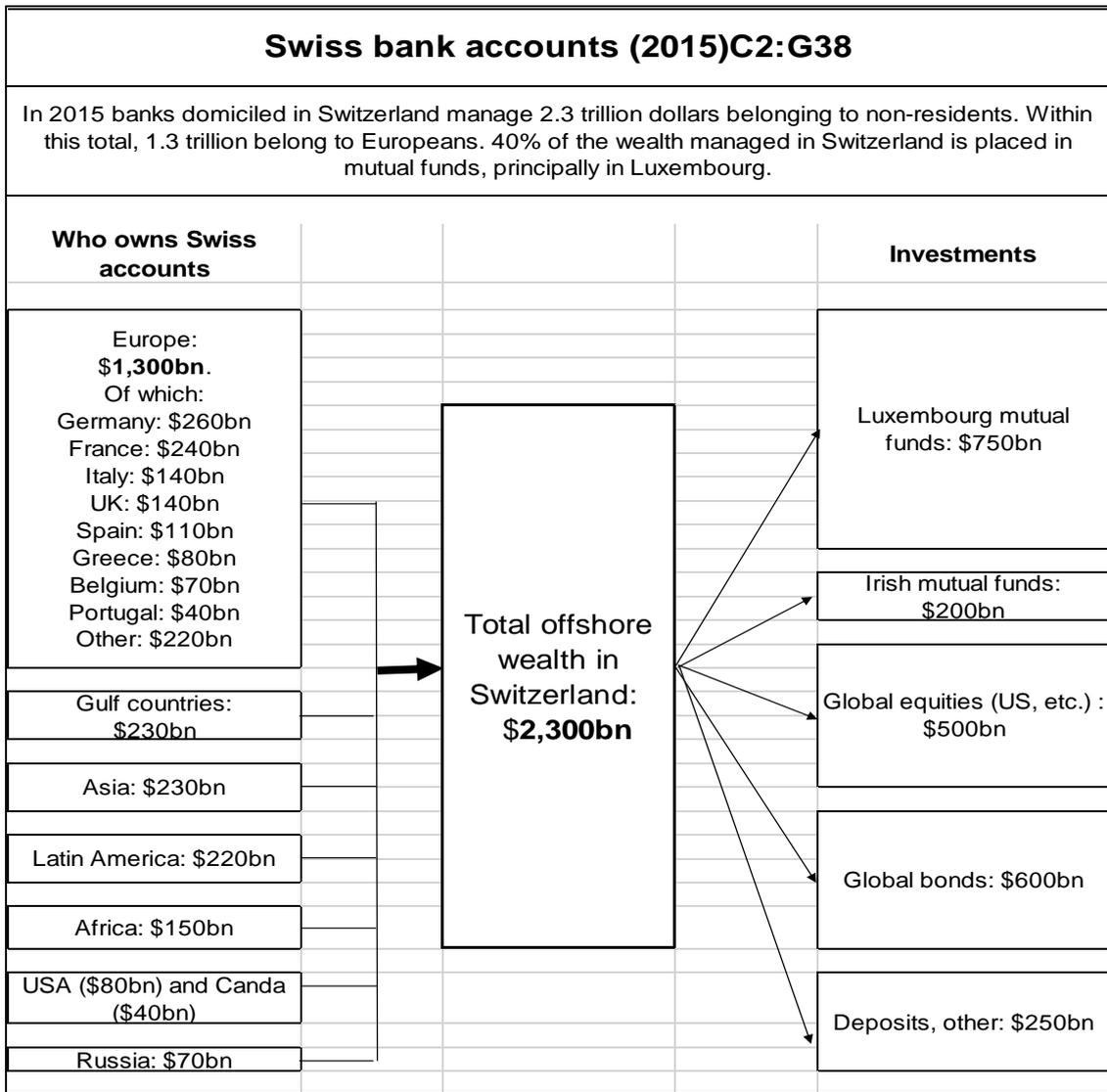
Source: OECD Table 6, www.oecd.org/investment/statistics

Appendix

Foreign Direct Investment, outward position

As a share of GDP (%)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016 ^P
OECD¹	28,0	32,8	36,5	28,5	36,5	37,7	35,2	38,1	41,3	39,9	42,3	43,0
Australia	26,9	32,3	34,6	23,1	36,0	34,8	27,2	30,1	29,8	30,6	31,4	31,5
Austria*	24,0	32,9	40,4	36,2	44,5	48,1	46,5	53,0	55,7	51,1	55,8	53,4
Belgium*								84,3	89,5	104,3	129,8	121,9
Canada	59,2	59,4	64,9	41,6	65,1	61,9	49,8	53,3	61,4	62,8	70,6	81,8
Chile*					30,3	27,0	29,9	35,4	36,4	40,3	44,0	46,7
Czech Republic	2,6	3,2	4,5	5,3	7,2	7,2	5,8	8,4	9,9	8,8	10,0	9,2
Denmark*	33,3	37,4	39,8	39,9	47,9	51,4	51,2	56,2	45,9	47,5	56,0	57,4
Estonia	13,5	20,4	26,8	26,7	31,9	28,4	20,7	26,3	27,4	24,5	27,6	28,2
Finland									53,8	43,0	40,7	46,6
France	28,4	35,4	37,9	32,0	41,6	44,3	43,6	47,4	47,2	45,4	51,5	51,1
Germany	29,1	34,7	38,1	33,3	39,7	40,5	38,1	37,9	38,6	35,7	39,8	38,4
Greece	5,5	8,2	9,9	10,5	12,0	14,2	16,7	18,3	15,1	13,7	14,0	11,5
Hungary*	7,7	11,9	13,9	12,7	16,6	17,1	18,8	29,6	28,5	29,2	29,0	19,8
Iceland*	60,5	82,2	118,2	53,4	79,0	86,5	78,5	86,5	61,4	49,0	45,5	29,4
Ireland								182,7	223,5	240,0	313,0	276,2
Israel ^{2,4}	16,2	25,6	27,9	25,2	27,7	29,0	27,6	28,2	26,5	25,6	28,3	30,8
Italy									25,2	22,8	25,7	25,5
Japan ⁶	8,1	9,9	12,0	13,5	14,2	14,6	15,5	16,7	21,7	23,8	28,0	26,6
Korea ²	4,3	4,9	6,7	9,8	13,4	13,2	14,3	16,6	18,3	18,5	20,7	21,7
Latvia	1,7	2,2	3,0	2,9	3,4	3,8	3,0	4,0	5,3	4,3	5,3	5,5
Luxembourg*								227,8	246,7	273,7	333,5	353,4
Mexico*	6,2	6,3	7,2	6,0	12,6	13,9	13,2	16,3	14,7	14,5	16,2	
Netherlands*	93,9	110,6	112,6	96,0	112,5	115,8	111,4	120,8	132,4	118,7	162,2	179,8
New Zealand	10,3	11,4	10,9	10,4	11,4	11,0	11,3	10,9	9,6	9,0	9,7	9,0
Norway*									34,7	32,4	44,6	48,1
Poland*	0,6	1,3	1,7	1,5	2,6	3,4	3,6	5,2	5,3	4,0	4,7	5,8
Portugal*	15,7	18,7	20,0	16,3	18,4	18,5	22,2	23,1	23,5	20,4	24,0	24,0
Slovak Republic						3,9	4,1	5,1	4,9	2,8	2,8	3,0
Slovenia	9,0	11,4	15,6	15,2	17,6	17,0	15,3	16,3	14,8	13,0	13,9	13,5
Spain*									38,1	35,9	39,1	39,2
Sweden*									71,6	65,8	72,1	70,6
Switzerland*										142,8	154,9	164,9
Turkey	1,7	1,6	1,8	2,3	3,5	2,9	3,3	3,5	3,5	4,2	4,1	4,5
United Kingdom	49,4	54,6	60,3	56,7	69,4	69,4	66,3	64,0	66,0	56,1	54,4	57,0
United States	27,8	32,3	36,4	21,1	30,0	32,1	29,1	32,3	37,5	36,0	33,2	34,2
Total World ^{1,3}	24,6	28,5	31,4	24,1	30,4	30,4	27,9	29,9	31,9	31,3	33,5	35,0
European Union (EU) ¹	34,6	40,7	43,9	39,6	48,6	50,6	47,9	52,3	52,4	49,0	57,0	57,4
G20 countries ¹	22,3	25,7	28,2	20,3	26,1	25,9	23,5	24,9	27,3	26,6	27,4	28,5
G20-OECD countries ¹	25,5	29,7	33,3	24,5	31,8	32,7	30,4	32,5	36,2	34,9	35,4	36,0
G20 -non OECD countries ¹	5,9	7,4	8,3	6,1	7,9	7,6	7,1	7,8	8,4	9,2	10,6	12,6
*Data excludes SPEs. Corresponding data below including SPEs:												
Austria	46,7	56,5	70,9	64,2	76,4	72,2	69,2	80,5	81,9	74,2	77,2	66,0
Belgium				56,9	67,3	68,0	57,2	88,7	94,4	108,5	134,1	126,6
Chile					31,4	28,5	31,7	36,9	37,7	42,2	45,9	48,6
Denmark	41,3	43,0	47,4	45,4	54,2	56,5	55,5	59,6	50,7	55,6	62,8	66,0
Hungary		50,9	97,1	121,7	145,5	113,0	118,0	149,6	141,2	119,3	120,6	149,4
Iceland									89,5	67,3	66,0	46,5
Luxembourg								5.392,6	5.697,8	5.772,5	7.552,2	7.371,7
Netherlands	311,3	388,8	399,5	370,2	465,1	480,7	488,1	568,1	617,2	566,2	651,3	659,5
Norway									34,9	32,8	45,1	48,8
Poland	1,2	3,0	3,5	3,2	4,8	5,1	5,5	6,2	5,8	4,5	4,9	6,2
Portugal	20,7	25,0	28,2	24,0	27,5	26,1	25,1	26,3	26,9	23,9	28,5	28,1
Spain									40,4	37,7	41,3	41,9
Sweden	53,4	62,5	68,0	62,8	82,2	76,7	67,4	71,6	76,2	70,1	75,5	73,9
Switzerland	106,0	132,7	136,6	131,2	160,3	179,2	158,6	178,6	174,4	155,7	169,4	181,3

Source: OECD Table 5, www.oecd.org/investment/statistics



Source: Zucman (2015) Figure 2⁵⁷

The graph above depicts an estimate made by Zucman on the non-resident composition of accounts held in Switzerland. Even if the academic made use of data directly from the Swiss National Bank, he admits that the estimate cannot be precise in the division of wealth country-by-country because more than 60% of the assets belonging to foreigners are attributed to tax havens where shell corporations, trusts and foundations are domiciliated.

⁵⁷ In the book Zucman has simply put in graphics what published on the Quarterly Journal of Economics and on the Journal of Economic Perspective in 2013 and 2014 (references in bibliography).

Appendix

Corporate tax rate EU5 vs European havens (2000-2017)

Corporate income tax rate	Combined corporate income tax rate			
	Year	2000	2017	Δ
Germany		52,03	30,18	-21,86
Italy		41,25	27,81	-13,44
Ireland		24,00	12,50	-11,50
United Kingdom		30,00	19,00	-11,00
Luxembourg		37,45	27,08	-10,37
Netherlands		35,00	25,00	-10,00
Spain		35,00	25,00	-10,00
Switzerland		24,93	21,15	-3,78
France		37,76	34,43	-3,33

Combined corporate income tax rate - shows the basic combined central and sub-central (statutory) corporate income tax rate given by the central government rate (less deductions for sub-national taxes) plus the sub-central rate.

Source: OECD (Table II.1), author's computation

Regardless of the dramatic cuts in corporate tax rates (CIT), the share of government revenues deriving from them did not decrease as much. However, it is important to underline that it started from a very low percentage, on average in the OECD in 2000 only 9.5% of total public revenues came from corporate taxes. Therefore, a general decrease of 0.7 percentage points means a relative cut of 8% in CIT revenues (or a one-third reduction in the case of Luxembourg).

Percentage of total government revenues from taxes on income, profits and capital gains of corporations

Year	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	2016	Δ(2016-1965)	Δ(2016-2000)
Luxembourg	11,04	19,32	15,63	16,21	17,66	16,14	18,01	17,99	15,45	15,38	11,91	12,24	1,20	-5,75
France	5,27	6,29	5,19	5,13	4,45	5,33	4,87	6,91	5,50	5,56	4,63	4,51	-0,76	-2,40
Netherlands	8,07	6,69	7,72	6,59	6,96	7,55	8,12	10,87	9,71	6,40	7,22	8,52	0,45	-2,36
Spain	9,19	8,17	6,91	5,08	5,15	8,82	5,74	9,13	10,99	6,21	7,04	6,81	-2,38	-2,32
UK	4,42	8,69	6,19	8,36	12,61	9,92	8,08	10,62	10,48	8,90	7,54	8,45	4,03	-2,17
Italy	6,89	6,55	6,31	7,79	9,25	10,04	8,68	6,90	5,74	5,47	4,72	4,97	-1,91	-1,92
OECD	8,81	8,73	7,58	7,58	7,96	8,06	8,13	9,55	10,27	8,79	8,86	8,86	0,05	-0,69
Ireland	9,06	8,81	4,83	4,54	3,22	4,92	8,38	11,70	11,02	8,71	11,34	11,59	2,52	-0,11
Germany	7,83	5,67	4,42	5,46	6,12	4,83	2,79	4,83	5,13	4,26	4,67	5,30	-2,52	0,47
Switzerland	7,72	8,25	8,48	6,39	6,78	7,43	6,69	8,92	8,43	10,12	10,83	10,83	3,11	1,92

Source: OECD (Tables 3.7-3.14), author's computations⁵⁸

One of the worrying advanced by academics is that reductions in capital taxes could result in relative rises in other types of taxes, normally considered less progressive.

⁵⁸ The data of 2016 was missing for the OECD average; it was hence used that from 2015.

Appendix

Value Added Tax EU5 vs European tax havens plus OECD average

	1975	1985	1995	2005	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Δ
UK	8	15	17,5	17,5	17,5	17,5	15	17,5	20	20	20	20	20	20	20	20	12
Italy	12	18	19	20	20	20	20	20	20	21	21	22	22	22	22	22	10
Germany	11	14	15	16	19	19	19	19	19	19	19	19	19	19	19	19	8
Luxembourg	10	12	15	15	15	15	15	15	15	15	15	15	17	17	17	17	7
Netherlands	16	19	17,5	19	19	19	19	19	19	19	21	21	21	21	21	21	5
Spain	-	-	16	16	16	16	16	16	18	18	21	21	21	21	21	21	5
OECD	15,6	17,3	17,7	17,8	17,8	17,7	17,7	18,1	18,7	18,8	19	19,1	19,2	19,2	19,2	19,2	3,6
Ireland	19,5	23	21	21	21	21	21,5	21	21	23	23	23	23	23	23	23	3,5
Switzerland	-	-	6,5	7,6	7,6	7,6	7,6	7,6	8	8	8	8	8	8	8	8	1,5
France	20	18,6	20,6	19,6	19,6	19,6	19,6	19,6	19,6	19,6	19,6	20	20	20	20	20	0

Source: OECD (Table 2.A2.1.), author's computation

Appendix 1

Derivation of (4.5) and (4.6) comes from a three-step approach⁵⁹. The first one consists in finding the optimal t when the home country is artificially constrained in charging a local tax at least as high as the foreign country, hence when $t \geq T$. Maximizing $r(t, T)$ with respect to t , subject to $t \geq T$, one obtains:

$$t^1(T) = \begin{cases} \frac{1}{2}(\delta + T) & ; T \leq \delta \\ T & ; T \geq \delta \end{cases} \quad \begin{matrix} \text{(A1.a)} \\ \text{(A1.b)} \end{matrix}$$

The second part of A1 derives from the first; when $t > T$ then we have (A1.a) and δ must be bigger than T , otherwise $t = T$, as we have in (A1.b).

This results in the maximized revenues:

$$r(t^1(T), T) = \begin{cases} \frac{h}{\delta} \left(\frac{T + \delta}{2} \right)^2 & ; T \leq \delta \\ hT & ; T \geq \delta \end{cases} \quad \begin{matrix} \text{(A2.a)} \\ \text{(A2.b)} \end{matrix}$$

The second step is specular to the first one, but with the domestic tax rate constrained to be below the foreign one ($t \leq T$):

⁵⁹ For a more exhaustive demonstration please refer to the working paper n.819 of Kanbur and Keen (1991)

$$t^2(T) = \begin{cases} T & ; T \leq \delta\theta \\ \frac{1}{2}(\theta\delta + T) & ; T \geq \delta\theta \end{cases} \quad \begin{matrix} \text{(A3.a)} \\ \text{(A3.b)} \end{matrix}$$

with the maximized revenues of:

$$r(t^2(T), T) = \begin{cases} hT & ; T \leq \delta\theta \\ \frac{H}{\delta} \left(\frac{T + \theta\delta}{2} \right)^2 & ; T \geq \delta\theta \end{cases} \quad \begin{matrix} \text{(A4.a)} \\ \text{(A4.b)} \end{matrix}$$

The final step is to compare for all T the maximized revenues under these constrained problems. There are four possibilities to consider:

(a) For $T \leq \min[\delta, \delta\theta]$, comparing (A2.a) and (A4.a) gives:

$$r^1 - r^2 = h(T - \delta)^2 / \delta^4 \geq 0$$

Therefore $t(T) = t^1(T) = \frac{1}{2}(\delta + T)$ (because $r^1 > r^2$)

(b) For $T \geq \max[\delta, \delta\theta]$, comparing (A2.b) and (A4.b)

$$r^1 - r^2 = -\frac{H(\delta\theta - T)^2}{\delta^4} \leq 0$$

Therefore $t(T) = t^2(T) = \frac{1}{2}(\delta\theta + T)$ (because $r^1 < r^2$)

(c) If $\theta \geq 1$ then for $T \in [\delta, \delta\theta]$ one finds from (A2.b) and (A4.a) that:

$$r^1 = r^2 \text{ and consequently } t = T$$

(d) If $\theta \leq 1$ then for $T \in [\delta\theta, \delta]$ one gets from (A2.a) and (A4.b) that:

$$r^1 - r^2 = \frac{H(1 - \theta)(\theta\delta^2 - T^2)}{\delta^4} \geq 0$$

$r^1 - r^2 \geq 0$ iff $(\theta\delta^2 - T^2) \geq 0$, therefore from (A1.a) and (A3.b) one gets:

$$t(T) = \begin{cases} \frac{1}{2}(\delta + T) & ; \delta\theta \leq T \leq \delta\sqrt{\theta} \\ \frac{1}{2}(\theta\delta + T) & ; \delta\sqrt{\theta} \leq T \leq \delta \end{cases}$$

Putting together (a)-(d) gives (4.5) and (4.6).

Appendix 2

Exactly as in Hamada's paper, it is here assumed that countries can discriminate between domestic and foreign capital and between domestically located and foreign-located capital when setting tax rates. Again, only traded capital is subject to taxation and all earnings are repatriated to capital owners in the home country.

In the case of tax deductions, the capital market equilibrium is:

$$F_K(K - Z) = F_K^*(K^* + Z)(1 - t)(1 - t^*) \quad (\text{A2.1})$$

while in the case of tax-credit it is:

$$F_K(K - Z) = F_K^*(K^* + Z)[1 - \max(t, t^*)] \quad (\text{A2.2})$$

Tax deduction

To solve for the equilibrium tax rates under the tax deduction system Bond and Samuelson start by total differentiating (A2.1), this leads to:

$$dZ[-F_{KK} - F_K^*ss^*] + ds[-F_K^*s^*] + ds^*[-F_K^*s] = 0 \quad (\text{A2.3})$$

where the functions' arguments $(K - Z)$ and $(K^* + Z)$ are here omitted, while s and s^* refer respectively to $(1 - t)$ and $(1 - t^*)$.

From (A2.1) it is known that $F_K^* = F_K/ss^*$, hence we can write (A2.3) as:

$$dZ \left[-F_{KK}F_K \left(\frac{ss^*}{F_K} \right) - F_K^*ss^* \right] = ds[F_K^*s^*] + ds^*[F_K^*s]$$

Then multiplying by F_K both sides of the equation one gets:

$$ss^*dZ(-F_KF_{KK}^* - F_K^*F_{KK}) = F_K[ds(F_K^*s^*) + ds^*(F_K^*s)]$$

$$dZ(-F_KF_{KK}^* - F_K^*F_{KK}) = F_KF_K^* \left(\frac{ds}{s} + \frac{ds^*}{s^*} \right)$$

Appendix

which leads to:

$$dZ = \frac{F_K F_K^*}{-(F_K F_{KK}^* + F_K^* F_{KK})} \left(\frac{ds}{s} + \frac{ds^*}{s^*} \right)$$

Then dividing the nominator and the denominator of the right-hand side by $F_{KK} F_{KK}^*$:

$$dZ = \left[\frac{\left(\frac{F_K F_K^*}{F_{KK} F_{KK}^*} \right)}{-\frac{(F_K F_{KK}^* + F_K^* F_{KK})}{F_{KK} F_{KK}^*}} \right] \left(\frac{ds}{s} + \frac{ds^*}{s^*} \right)$$

Finally, dividing both sides by Z and multiplying and dividing only the right-hand side again by Z , one obtains:

$$\hat{Z} = \frac{\epsilon \epsilon^*}{(\epsilon + \epsilon^*)} [(\widehat{1-t}) + (\widehat{1-t^*})] \quad (\text{A2.4})$$

where $\epsilon \equiv -\frac{F_K}{F_{KK}Z} > 0$ is the elasticity of supply of exported capital and $\epsilon^* \equiv -\frac{F_K^*}{F_{KK}^*Z} > 0$ is the elasticity of demand for imported capital.

(A2.4) indicates that increments in the tax rate of either country will lead to a decrease in the quantity of capital traded Z .

The national income levels of the two countries are expressed as:

$$Y(t, t^*) = F[K - Z(t, t^*)] + (1 - t^*)F_K^*[K^* + Z(t, t^*)]Z(t, t^*) \quad (\text{A2.5a})$$

$$Y^*(t, t^*) = F^*[K^* + Z(t, t^*)] - (1 - t^*)F_K^*[K^* + Z(t, t^*)]Z(t, t^*) \quad (\text{A2.5b})$$

For the Nash equilibrium to be defined, it must be found a pair of tax rates (t, t^*) that maximizes the national products Y and Y^* . To do so, Bond and Samuelson totally differentiate (A2.5) which yields to:

$$dY = \left[F_K^*(1 - t^*) - F_K - \frac{(1 - t^*)F_K^*}{\epsilon^*} \right] dZ + F_K^*Zd(1 - t^*) \quad (\text{A2.6a})$$

$$dY^* = \left[F_K^*t^* + \frac{(1 - t^*)F_K^*}{\epsilon^*} \right] dZ - F_K^*Zd(1 - t^*) \quad (\text{A2.6b})$$

Now, substituting (A2.1) and (A2.4) in (A2.6) gives (after some adjustments):

$$dY = B \left[-\left(t - \frac{1}{\epsilon^*}\right) \left(\frac{dt}{1-t}\right) - \left(t + \frac{1}{\epsilon}\right) \left(\frac{dt^*}{1-t^*}\right) \right] \quad (\text{A2.7a})$$

$$dY^* = B \left\{ -\left[\frac{t^*}{1-t^*} + \frac{1}{\epsilon}\right] \left(\frac{dt}{1-t}\right) - \left[\frac{t^*}{1-t^*} - \frac{1}{\epsilon}\right] \left(\frac{dt^*}{1-t^*}\right) \right\} \quad (\text{A2.7b})$$

Where $B \equiv \epsilon\epsilon^*(1-t)ZF_K^*/(\epsilon + \epsilon^*) > 0$.

From inspection of the (A2.7a), one can see that Y is decreasing in t^* . For given t^* , Y is optimized by setting the optimal $t = \tilde{t} = 1/\epsilon^*$. On the other hand, inspection of the (A2.7b) indicates that Y^* decreases in t . For given t , Y^* is optimized by setting $\tilde{t}^*/(1 - \tilde{t}^*) = 1/\epsilon$. From these conclusions, Bond and Samuelson draw the reaction functions depicted in Figure 9. By the figure it can be inferred that, in the situation where one of the two tax rates is equal to zero (e.g. $t^* = 0$), there is a tax rate for the other country (t^{opt}) being lower than its maximal ($t^{opt} < t_{max}$), hence inducing $Z > 0$ and yielding an higher level of national product ($Y > F(K)$). Therefore, $t_{opt} < t_{max}$ and $t_{opt}^* < t_{max}^*$ and Nash-equilibrium is find at the intersection point between the two reaction functions with $Z(t, t^*) > 0$.

Tax credits

In the case of tax credits Bond and Samuelson start by totally differentiating (A2.2) and then, in an analogues manner as that described above, they get:

$$\begin{matrix} t > t^* \\ t < t^* \end{matrix} \quad \hat{Z} = \begin{cases} \epsilon\epsilon^*(\widehat{1-t})/(\epsilon + \epsilon^*) \\ \epsilon\epsilon^*(\widehat{1-t^*})/(\epsilon + \epsilon^*) \end{cases} \quad (\text{A2.8})$$

Increases in the higher tax rate lead to a reduction in the amount of capital traded Z . Then, substituting (A2.2) and (A2.8) into (A2.5a) yields to the effects of taxes on the domestic product.

$$\begin{matrix} t > t^* \\ t < t^* \end{matrix} \quad dY = \begin{cases} -BZ \left[\left(\frac{t-t^*}{1-t^*} - \frac{1}{\epsilon^*}\right) \left(\frac{dt}{1-t}\right) + \frac{\epsilon + \epsilon^*}{\epsilon\epsilon^*} \frac{dt^*}{1-t^*} \right] \\ -BZ \left(\frac{1}{\epsilon} \frac{dt^*}{1-t^*}\right). \end{cases} \quad (\text{A2.9})$$

Appendix

For $t < t^*$, variations in the domestic tax rate have no effect on the home country real income, since the location of home capital is not affected. For $t > t^*$, increases in the domestic tax raise additional revenues, but also reduce the amount of traded capital. The optimal choice of t occurs when these two effects balance, hence when $(t - t^*)/(1 - t^*) = 1/\epsilon^*$. Therefore, the home country's best reaction function when it exports capital (hence $Z > 0$) is to levy a tax rate higher than the foreign country ($t > t^*$). So that the domestic reaction function always lies above the line $t = t^*$ (Bond & Samuelson, 1989).

Analogously, the foreign country's reaction function is obtained substituting (A2.2) and (A2.8) in (A2.5b):

$$dY = \begin{cases} -BZ \left[\left(\frac{t^*}{1-t^*} - \frac{1}{\epsilon^*} \right) \left(\frac{dt}{1-t} \right) + \frac{\epsilon + \epsilon^*}{\epsilon \epsilon^*} \frac{dt^*}{1-t^*} \right] & t > t^* \\ -BZ \left[\left(\frac{t^*}{1-t^*} \right) - \frac{1}{\epsilon} \right] & t < t^* \end{cases} \quad (\text{A2.9})$$

This is illustrated in figure 7 when $t > t^*$ it is in the foreign country's interest to raise its tax to the level of the domestic country, since any tax increase results in extra revenues for the foreign country without affecting the allocation of capital. On the other hand, when $t < t^*$, the optimal tax rate for the capital-importing country is $t_{opt}^* = 1/(1 + \epsilon)$ (this is the optimal tax rate when the capital exporting country is passive) (Bond & Samuelson, 1989).

Bibliography

- Alesina, A. & Wacziarg, R., 1998. Openness, Country Size and Government. *Journal of Public Economics*, Volume 69, pp. 305-321.
- Ambrosanio, M. F., Bordignon, M., Galmarini, U. & Panteghini, P., 1997. *Lezioni di Teoria delle Imposte*. prima ed. Milano: Etas Libri.
- Auerbach, A. J., Devereux, M. P. & Simpson, H., 2008. Taxing Corporate Income. *the National Bureau of Economic Research*, Volume Working Paper 14494, pp. 837-913.
- Barro, R. J., 1973. The control of politicians: an economic model.. *Public Choice*, Volume 14, pp. 19-42.
- Belleflamme, P. & Hindriks, J., 2005. Yardstick competition and political agency problems. *Social choice and welfare*, Volume 24, pp. 155-169.
- Besley, T. & Case, A., 1995. Incumbent Behavior: Vote Seeking, Tax Setting and Yardstick Competition. *American Economic Review*, Volume 85, pp. 25-45.
- Besley, T. & Smart, M., 2007. Fiscal restraints and voter welfare. *Journal of Public Economics*, Volume 91, pp. 755-773.
- Biançon, P., 2017. Maragrethe Vestager: Paradise Papers can serve as an electroshock. *Poitico*.
- Bond, L. & Samuelson, E. W., 1989. Strategic Behaviour and the Rules for International Taxation of Capital. *The Economic Journal*, 99(398), pp. 1099-1111.
- Bond, S. R. & Devereux, M. P., 2002. Cash Flow Taxes in an Open Economy. *Center for Economic Policy Research*.
- Bowers, S., 2017. Leaked documents expose secret tale of Apple's offshore island hop. *International Consortium of Investigative Journalists*.
- Brennan, G. & Buchanan, J. M., 1980. *The Power to Tax: Analytical Foundations of a Fiscal Constitution*. Cambridge: Cambridge University Press.
- Bretschger, L. & Hettich, F., 2000. Globalisation, capital mobility and tax competition: Theory and evidence for OECD countries. *EconStore*.
- Bucovetsky, S. & Wilson, J. D., 1991. Tax Competition with Two Tax Instruments. *Regional Science and Urban Economics*, Volume 21, pp. 333-350.
- Commission, E., 2014. *EU Competition Law: Rules Applicable to State Aid*, Bruxelles: s.n.
- Commission, E., 2015. *Report on Competition Policy*, Brussels: s.n.
- Drucker, J., 2010. Google 2.4% Rate Shows How \$60 Billion Is Lost to Tax Loopholes. *Bloomberg*.
- Edwards, J. & Keen, M., 1996. Tax competition and Leviathan. *European Economic Review*, Volume 40, pp. 113-134.
- Elsayyad, M. & K. A. K., 2012. Fighting Multiple Tax Havens. *Journal of International Economics*, Volume 86, pp. 295-305.

Bibliography

European Union, O. J. o. t., 2012. *Consolidated version of the Treaty on the Functioning of the European Union*, Bruxelles: s.n.

Gimdal, G., 2017. *Common corporate tax base (CCTB)*, Brussels: European Parliamentary Research Service.

Gordon, R. H., 1986. Taxation of Investment and Saving in the World Economy. *American Economic Review*, Volume 76, pp. 1086-1102.

Gordon, R. H. & Mason, J. K. M., 1995. Why is There Corporate Taxation in a Small Open Economy? The Role of Transfer Pricing and Income Shifting. *University of Chicago Press*.

Gravelle, J. G., 2009. Tax Havens: International Tax Avoidance and Evasion. *National Tax Journal*, 62(4).

Griffith, R., Hines, J. & Sørensen, P. B., 2007. International Capital Taxation. *Institute for Fiscal Studies*.

Hamada, K., 1966. Strategic aspects of taxation on foreign investment income. *Quarterly Journal of Economics*, Volume 80, pp. 361-375.

Haufler, A., 2001. *Taxation in a Global Economy*. Cambridge: Cambridge University Press.

Hindriks, J., 2004. Inter-Governmental Competition: Market Solutions to Political Problems. *Department of Economics CORE, Université Catholique de Louvain*, p. 15.

Hindriks, J., 2012. *Gestione Publique: Theorie et Pratique*. s.l.:De Boeck.

Hindriks, J. & Myles, G., 2006. *Intermediate Public Economics*. Boston: MIT Press.

Hines, J., 2010. Treasure Islands. *Journal of Economic Perspective*, Volume 24, pp. 103-126.

Hong, Q. & Smart, M., 2010. In Praise of Tax Havens: International Tax Planning and Foreign Direct Investment. *European Economic Review*, Volume 54, pp. 82-95.

Johannessen, N., 2010. Imperfect Tax Competition for Profits, Asymmetric Equilibrium and Beneficial Tax Havens. *Journal of International Economics*, Volume 81, pp. 253-264.

Kanbur, R. & Keen, M., 1991. *Jeux Sans Frontières: Tax Competition and Tax Coordination when Countries Differ in Size*, Kingston, Ontario, Canada: Queen's University.

Kanbur, R. & Keen, M., 1993. Jeux Sans Frontières: Tax Competition and Tax Coordination When Countries Differ in Size. *The American Economic Review*, pp. 877-892.

Kirchgässner, G. & Pommerehne, W. W., 1996. Tax harmonization and tax competition in the European Union: Lessons from Switzerland. *Journal of Public Economics*, pp. 351-371.

Kleinnijenhuis, J., 2014. Is Your Head Spinning? 5 Tips to Understand the 'Lux Leaks' Files. *International Consortium of Investigative Journalists*.

M., H. C., 2000. Does competition among public schools benefit students and taxpayers?. *American Economic Review*, Volume 90, pp. 1209-1238.

Macron, E., 2017. *Public speech* [Interview] (26 September 2017).

Malherbe, P., 2015. International Trade Regulation. In: *Legal Aspects of International Business Management*. Louvain la Neuve: Louvain School of Management.

Bibliography

- Marche!, P. E., 2017. *Electoral program April 27th and May the 7th*, Paris: s.n.
- Markusen, J. R. & Wigle, R. M., 1989. Nash Equilibrium Tariffs for the United States and Canada: The Role of Country Size, Scale Economies and Capital Mobility. *Journal of Political Economy*, Volume 97, pp. 368-386.
- Mongrain, S. & Wilson, J., 2014. Tax Competition with Heterogeneous Capital Mobility. *Institut d'Economia de Barcelona*.
- Musgrave, P. B., 1969. *United States Taxation of Foreign Investment Income: Issues and Arguments*, Cambridge, Massachusetts: International Tax Program, Harvard Law School.
- Musgrave, R. A., 1939. The Voluntary Exchange Theory of Public Economy. *Quarterly Journal of Economics*, Issue 52, pp. 213-217.
- Oates, W. E., 1972. *Fiscal Federalism*. New York: Harcourt Brace Jovanovich.
- Obstfeld, M. & Taylor, A. M., 2003. *Globalization in Historical Perspective*. s.l.:University of Chicago Press.
- OECD, 1998. *Harmful Tax Competition: An Emerging Global Issue*, s.l.: s.n.
- OECD, 2016. *Secretary-General report to the G20 leaders*, Hangzhou, China: s.n.
- Persson, T. & Tabellini, G., 1992. The Politics of 1992: Fiscal Policy and European Integration. *The Review of Economic Studies*, pp. 689-701.
- Piketty, T., 2013. *Le capital au XXI siècle*. s.l.:Editiones du Seuil.
- Policy Department A, E. P., 2015. *'Tax rulings' in the EU Member States*. Bruxelles, European Parliament.
- Reuters, 2017. EU should enforce rules to prevent vetoes on tax reforms: Juncker. *Reuters*, 13 September.
- Rights, C. f. E. a. S., 2016. [Online]
Available at: <http://www.cesr.org/tax-competition-and-corporate-tax-avoidance-inconsistent-human-rights-un-treaty-body>
- Samuelson, P. A., 1954. The Pure Theory of Public Expenditures. *The Review of Economics and Statistics*, pp. 387-389.
- Schjelderup, G., 2015. Secrecy Jurisdictions. *International Tax and Public Finance*.
- Sinn, H.-W., 1994. How much Europe? Subsidiarity, Centralization and Fiscal Competition. *Scottish Journal of Political Economy*, 41(1), pp. 85-107.
- Sinn, H.-W., 1997. The selection principle and market failure in systems competition. *Journal of Public Economics*, Volume 66, pp. 247-274.
- Slemrod, J. & Wilson, J., 2009. Tax competition with parasitic tax havens. *Journal of Public Economics*, Volume 93, pp. 1261-1270.
- Sorbe, S. & Johansson, Å., 2017. *International tax planning, competition and market structure*, Paris: OECD.

Bibliography

- Stiglitz, J., 1983. *The Theory of Local Public Goods Twenty-Five Years After Tiebout: A Perspective*, s.l.: working paper 954.
- Swank, D., 1998. Funding the Welfare State: Globalisation and the Taxation of Business in Advanced Market Economies. *Political Studies*, Volume 46, pp. 671-692.
- Tiebout, C. M., 1956. A Pure Theory of Local Expenditures. *The Journal of Political Economy*, 64(5).
- Wilson, J. D., 1986. A Theory of Interragional Tax Competition. *Journal of Urban Economics*, Volume 19, pp. 296-315.
- Wilson, J. D., 1991. Tax competition with Interregional differences in factor endowments. *Regional Science and Urban Economics*, pp. 423-451.
- Wilson, J. D., 1999. Theories of Tax Competition. *National Tax Journal*, June, p. 269.
- Wilson, J. D., 2014. *Tax Havens in a World of Competing Countries*, s.l.: CESifo DICE Report.
- Zodrow, G. R. & Mieszkowski, P., 1986. Pigou, Tiebout, Property Taxation, and the Underprovision of Local Public Goods. *Journal of Urban Economics*, Volume 19, pp. 356-370.
- Zucman, G., 2013. The Missing Wealth of Nations: Are Europe and the U.S. Net Debtors or Net Creditors?. *Quarterly Journal of Economics*, 128(3).
- Zucman, G., 2014. Taxing Across Borders: Tracking Personal Wealth and Corporate Profits. *Journal of Economic Perspective*, 28(4), pp. 121-148.
- Zucman, G., 2015. *The Hidden Wealth of Nations*. s.l.:The University of Chicago Press.