

# Twisted Politics: The Domestic and International Roots of Tax Policies

## Dissertation

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## **Zusammenfassung**

Die Integration internationaler Kapitalmärkte und die Abschaffung von Kapitalverkehrskontrollen erschwert die Besteuerung mobilen Kapitals. Regierungen benötigen jedoch Steuereinkommen um politische Ziele wie die Produktion öffentlicher Güter und die Umverteilung von Einkommen zu erreichen. In einer integrierten Welt müssen Politiker daher flexible auf öffentliche Nachfrage und internationalen Druck reagieren, um ihre politischen Ziele zu erreichen und wieder gewählt zu werden. Obwohl steigende Kapitalmobilität Regierungen unter Druck setzt und alle Länder ihre Steuersysteme anpassen mussten, sind die Vorhersagen früherer Steuerwettbewerbstheorien nicht eingetreten. Diese Modelle prognostizieren, dass Regierungen jegliche Autonomie über Politikgestaltung verlieren und hohe Kapitalmobilität einen Steuerwettbewerb initiiert, der letztendlich in einem Steuersatz von Null auf Kapitaleinnahmen mündet. Betrachtet man jedoch die Steuersysteme in OECD Mitgliedsstaaten, stellt man fest, dass Steuersätze auf Kapitaleinkommen und Unternehmensgewinne weit entfernt von Null sind und dass Steuersysteme nicht konvergieren.

Die vorliegende Arbeit versucht diese Entwicklungen zu erklären. Ich argumentiere, dass Regierungen sich in einem politischen 'Trilemma' befinden, da sie die Politikziele 'Produktion öffentlicher Güter', 'Senkung der Kapitalsteuern auf ein international wettbewerbsfähiges Niveau' und 'Implementierung symmetrischer Steuersätze auf Kapital und Arbeit' nicht gleichzeitig erreichen können. Die Unvereinbarkeit dieser Politikziele resultiert aus unterschiedlichen Konflikten.



Die weitgehende Abschaffung von Kapitalverkehrskontrollen bedeutet nicht notwendigerweise, dass Kapital vollständig mobil ist. Die de facto Kapitalmobilität hängt vielmehr von Besitzstruktur und Konzentration des Kapitals ab. Je höher die Konzentration, desto kleiner die Kosten und desto höher die Mobilität. Je höher die de facto Mobilität des einheimischen Kapitals desto eher beteiligen sich Regierungen am Steuerwettbewerb und senken Steuern auf Kapital und Unternehmensgewinne. Wenn Steuereinnahmen auf Kapitaleinkommen sinken und Regierungen trotzdem eine gewisse Menge an öffentlichen Gütern bereitstellen müssen, haben sie einen Anreiz die Steuerlast von mobilen auf weniger mobile Produktionsfaktoren, wie Arbeit, zu verschieben. Dies ist aber nur begrenzt möglich, da abhängig Beschäftigte kein Interesse an der Subventionierung von Kapitaleignern haben und Regierungen deshalb politische Unterstützung verlören.

Auf Grundlage dieser politischen Logik entwickle ich ein formal-theoretisches Modell, welches testbare Hypothesen hervorbringt. Diese Vorhersagen überprüfe ich quantitative mit jährlichen Daten für 23 OECD Mitgliedstaaten über den Zeitraum von 1975 bis 2005. In der empirischen Analyse modelliere ich die strategische Interaktion zwischen Regierungen, die im Wettbewerb um mobiles Kapital stehen, direkt. Auch löse ich spezifische Probleme der Datenstruktur wie räumliche Abhängigkeit von Steuerpolitik, Endogenität und Heterogenität zwischen den Ländern. Die Schätzergebnisse bestätigen weitgehend die Vorhersagen des formalen Modells.

## **Chapter 1: Globalization and Taxation: Another Brick in the Wall**

### **1. Introduction**

Taxation provides the bloodstream for governments. Without tax revenues, the supply of public goods and the redistribution of income would not be possible. Yet, the steep increase in capital mobility and the almost complete integration of financial and product markets has reduced governments' discretion in collecting taxes. While – contrary to some early globalization doom theories – international market integration did not entirely wipe out the policy maker's autonomy and her ability to produce public goods and to redistribute income, claims that all governments adjusted the national tax systems to the changing rules of the global economy are certainly no exaggeration.

Nevertheless, actual adjustments fell short of the predictions formulated by the early literature on tax competition. Most of these early models suggested that governments will find it impossible to redistribute income from capital-owners to workers and to maintain the high level of social security and income redistribution developed in the 1960s and 1970s and defended and reformed in the 1980s. Virtually all first generation models of tax competition claimed that tax rates on capital income under perfect capital mobility would converge to zero. These predictions have been proven wrong. No “race to the bottom” in capital tax rates has occurred and there are little signs that it will occur in the foreseeable future. Actual tax rates in most OECD countries remain high and the tax systems continue to vary greatly between different jurisdictions.

My dissertation aims at providing an answer to both puzzles: the persistently high tax rates on mobile capital and the large variation in domestic tax systems. I argue that governments face a political trilemma, in which they cannot maintain the politically optimal level of public good provision, reduce capital taxes to competitive levels and implement a political support-maximizing mix of tax rates on capital and labour simultaneously.

In particular, while legal restriction on capital flows have been eliminated by virtually all OECD countries, de facto capital mobility falls short of being perfect. Limits to full capital mobility result from ownership structures: the higher the concentration of capital, the higher the de facto mobility of capital and the lower the equilibrium tax rate. Second, the demand for the provision of public goods further constraints governments' choices of the capital tax rate. If revenue from taxation of mobile factors declines, politicians cannot necessarily cut back spending without losing political support. Increases in revenue from immobile factors such as labour or consumption need to match losses in collected taxes from capital in order to maintain a satisfactory level of public good provision. Policy makers, accordingly, do not face a simple optimization problem when deciding on capital taxation. Rather, they have to choose a tax system which allows them to supply an appropriate level of public goods.

Policy makers finally face a trade-off resulting from the redistributive conflict between capital-owners and workers. This conflict does not resemble a mere zero-sum game, because lower levels of capital taxation are likely to improve aggregate welfare, but the decision on capital taxation also cannot be analyzed in isolation from the distributive effects of reducing taxes on mobile factors.

## Chapter 1: Globalization and Taxation: Another Brick in the Wall

This political logic of tax competition generates important testable predictions: First, governments in countries with low de facto mobility of capital will maintain a relatively high level of capital taxation, a high level of public good provision, and a low difference between tax rates on mobile and immobile factors. Second, governments facing a low demand for public good provision will reduce the tax rate on capital without necessarily changing the gap between taxes on capital and wage income. Finally, governments in countries in which the voters' concerns about tax symmetry remain weakly developed will lower capital taxation. At the same time, they will push taxes on immobile factors upwards in order to maintain a high level of public good provision.

Importantly, these three political considerations work simultaneously and are also influenced by the intensity of international competition for mobile capital. Therefore, the lower the capital tax rates in other countries, the more severely governments feel the pressure from the three trade-offs in tax competition.

The sketched argument can straightforwardly be generalized. Domestic policy makers face several domestic and international trade-offs. In deciding upon tax policy they can only reach two of the three policy goals 'maintaining a solid capital base despite international tax competition', 'generating a sufficiently high tax revenue', and 'avoiding social injustice'. Since governments face a trilemmatic situation and cannot achieve all policy aims simultaneously, they choose a combination of tax rates on mobile and immobile tax bases and public good provision that maximizes their political support under these constraints.

The degree of budget rigidities and the strength of societal equity needs is country specific and the severity of tax competition pressures depends on the de facto ability of capital owners to move capital through jurisdictions. Based on this argumentation a convergence of capital tax rates and national tax systems cannot be expected. The theory instead predicts persistently high tax rates on mobile sources and high variation between domestic tax mixes.

### **2. Contribution**

The purpose of all research is scientific progress. My dissertation builds on valuable insight of the literature on taxation and tax competition, but transcends existing approaches in several aspects in order to provide a more comprehensive explanation of how governments decide upon domestic taxation and why they implement distinct tax systems. Though I do not claim that all my arguments and assumptions are entirely new, I am not aware of another model which combines and augments different lines of reasoning into an equally comprehensive model of taxation, which is able to explain the variation in tax systems across OECD countries and at the very same time provides a convincing answer to the important question why capital taxes persist.

It is not novel to the discussion of the effects of tax competition that domestic constraints prevent governments from setting very low tax rates on mobile factors. Especially researchers in political science and political economy hold domestic institutional settings responsible for limiting policy makers in their ability to implement the welfare maximizing capital tax rate of zero (Hays 2003, Hallerberg and Basinger 1998, 1999, Basinger and

Hallerberg 2004, Genschel 2002). Some scholars have also argued that budgetary pressures and the necessity of gathering revenue in order to provide public goods exert a significant impact on domestic tax policy making (Swank and Steinmo 2002, Genschel 2002, Swank 1998, 2002, 2004). Particularly, budgetary needs provide an incentive to shift tax burdens from mobile to immobile factors. Yet, this shift is counterbalanced because higher labour taxes tend to boost inequality (Steinmo 1993, 1994), discourage employment and growth (Bird, Perry and Wilson 1991), and governments in an internationalized environment are forced to use tax policy to compensate workers for the market induced fall in gross wages (Rodrik 1997, 1998, Hicks and Swank 1992, Quinn 1997). Based on these observations, corporate taxation remains politically popular leading to a tax symmetry trade-off which causes cuts in corporate tax rates to spill over into personal income taxation (Ganghof 2000b, 2004, Genschel 2002).

The argument of political popularity is implicitly based on the assumption of at least partially opportunistic governments.<sup>1</sup> In several studies on taxation, the notion of governments' need to take voter preferences into account seems to be present (Ganghof 2004, Genschel 2002, Hallerberg and Basinger 1998, 1999, Basinger and Hallerberg 2004), though not explicitly incorporated into theoretical models. The formulated arguments mostly point to the increased international competitiveness. Opportunistic governments not only have to respond to the demands and politically-expressed wishes of the electorate but to the pressure of international market

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1 In the economic literature Persson and Tabellini (1994) and Haufler (2001) point to differences in the relative strength of interest groups which can result in different optimal tax mixes of wage and capital taxation when two competing governments maximize the political support from workers and capitalists.

forces (Krugman 1994). Thus, even though politicians behave opportunistically, they are forced by globalization to redesign their tax systems largely irrespective of the preferences or desires of the majority of citizens (Steinmo 1994, p.10). An apparent flaw of this literature consists in the over-emphasis of the international dimension and the under-estimation of how strongly policy makers feel limited by the voter-will.

The question of incomplete capital mobility is not entirely new either. Yet, a number of empirical studies only found inconclusive evidence for the influence of taxation on firm decisions (Mosley 2000, Devereux and Griffith 1998, Hall and Sockice 2001). Proposed explanations for this observation mainly oscillate around the argument that investments come only in lumpy increments (Black and Hoyt 1989). Since the key actors are large firms, they do not react very elastically to changes in tax burdens abroad (Ganghof 1999, Swank 1998, 2002) and have a home bias (Haupt and Peters 2005). On the other hand large multinational corporations profit from differences in national tax systems by engaging in multiple tax avoidance strategies such as transfer pricing, reallocating profits and debts, and thin capitalization (Zodrow 2006, Stöwhase 2005). This observation indicates a higher de facto mobility of large firms. In addition, the level of regulation (e.g. taxation) might not be the only factor for a firm's decision of location, other variables such as infrastructure exert an important influence as well (Aschauer 1989, 1993).

Even though parts of my argument have been already discussed in the extant literature on taxation, my line of argumentation creates several innovations for the theoretical explanation of domestic tax policy outcomes. Incorporating the de facto ability of capital to move through jurisdictions

into the theoretical explanation and empirical investigation of domestic tax policy outcomes provides a novel answer to the puzzle of non-zero capital taxation. Analyzing the impact of de facto capital mobility in addition to legal restriction to capital transactions permits to more accurately model the incentives for governments to engage in international tax competition. To put it more directly: since governments need to achieve policy goals such as public good provision and income redistribution in order to stay in office, the main constraint they face in reaching these aims is the actual ability and willingness of capital to leave the domestic economy.

Unlike most economic accounts of tax competition I assume governments to be opportunistic and solely interested in maximizing political support. Treating policy makers as vote maximizers allows directly incorporating domestic constraints into the political process. Voters' demands for public good provision and tax symmetry directly influence the ability of policy makers to adapt domestic tax policy to international competitive pressures. Different domestic constraints and settings simultaneously influence the ability of policy makers to play the tax competition game. Yet, opportunistic governments might not only be incapable to implement very low tax rates on mobile capital and shift the tax burden towards the immobile factor labour, they might be unwilling to do so since this strategy does not allow maximizing political support. Hence, even though domestic institutional constraints might limit governments' sheer ability to implement efficient tax rates, the real question is whether government want to do so if this jeopardizes their chances of staying in office.

Since voters directly react to tax asymmetry and the redistributive consequences of taxation, the sketched argument also implies that we have



to analyse taxes on immobile and mobile factors simultaneously. The majority of the electorate punishes a large tax gap and forces policy makers to maintain tax symmetry. Yet, governments can substitute income from one tax base by revenue from another tax source and vice versa. Most of the recent research on tax competition is dedicated to explain non-zero capital tax rates. This limited focus on capital taxation necessarily leaves out an important aspect of domestic tax policy making and provides only partial explanations which might lead to wrong predictions. The simultaneous analysis of capital and labour taxation prevents isolated theoretical accounts of specific aspects of domestic tax policy making leading to incomplete results.

The domestic and international trade-offs governments face are country specific. Policy makers less concerned with budget rigidities and tax equality considerations in economies dominated by highly mobile capital are more likely to engage in tax competition than governments who face greater constraints and a more favourable ownership structure of domestic capital. The proposed theoretical account of domestic taxation allows not only explaining persistently high capital tax rates but also the large variation in domestic tax systems.

### **3. Organization**

The remainder of this dissertation is organized as follows: chapter 2 gives a short overview over empirical observations, stylized facts and observable reactions of policy makers to international pressures which guide the research on tax competition and fiscal federalism.

## Chapter 1: Globalization and Taxation: Another Brick in the Wall

In chapter 3 I review the relevant literature whereby I mainly focus on generation three models which attempt to explain persistently high capital taxation and tax revenue by arguing that domestic economic and political constraints hinder domestic policy makers from setting very low capital tax rates. The discussion of the existent literature shall provide an overview over the main arguments brought forward with respect to domestic tax policy making and – more importantly – to point to some deficiencies of extant explanations in order to justify the proposed theoretical model and empirical investigation.

Based on the puzzles and questions left open by earlier studies on taxation, chapter 4 discusses necessary changes and additions in order to provide a more comprehensive theory of tax competition. I mainly alter common assumption of the tax competition literature like perfect capital mobility, the number of tax instruments a government disposes of, I am allowing for heterogeneous countries and assume governments to maximize political support. Based on these underlying assumptions, I argue that the tax policy decision is determined by opposing goals governments want to achieve with taxation. The actual choice of tax rates on capital and labour is influenced by demands of the domestic electorate for public good provision and tax symmetry and the de facto ability of capital owners to shift capital towards low-tax countries.

I translate the developed arguments into a formal theoretical model in chapter 5. Doing so enables me to make precise predictions about optimal choices of tax rates on capital and labour under a variety of domestic and international settings. This chapter concludes by stating the hypotheses derived from the theoretical model.

## Chapter 1: Globalization and Taxation: Another Brick in the Wall

The next chapter (6) provides the research design for the empirical analysis including a discussion of the case selection, the operationalization and measurement of the dependent variable and the basic specification of the empirical model.

The following chapter 7 presents the econometric analysis. I first discuss the set up of the instrumental variable two stage least squares model followed by operationalization, measurement and descriptive statistics of all explanatory, control and instrumental variables. Estimation results are discussed in chapter 7.3, whereby I first present baseline models including the main independent variables for which I also calculate and discuss conditional and marginal effects. I, then, augment the empirical model by additional control variables found to be important in existing empirical studies. Chapter 7.4 provides various robustness tests such as altering the first year of observation and estimating single observation and country-wise jackknife models in order to confirm the validity of the empirical results. An interpretation of the empirical findings in light of the proposed theory completes the empirical chapter (7.5).

The final chapter (8) wraps up the main arguments and results and discusses the relationship between theoretical propositions and empirical findings and places the presented research into the larger framework of policy making in an integrated world.

## **Chapter 2: Globalization and Tax Reforms in OECD Countries**

### **1. Introduction**

There can be little if any doubt that the liberalization of global financial markets has put national tax systems under adjustment pressures, perhaps in some cases even under stress.

The abolition of capital restrictions and the reduction of barriers to trade allow corporations to produce goods and services wherever the conditions are optimal – regardless of the location of their markets. Freed from these legal restrictions, corporations sliced-up the value chain, relocated production to low-wage countries, and established holdings in low-tax jurisdictions. Indeed, many corporations take advantage of their extended opportunities. They globalize production and serve more markets than ever before. Yet, the political consequences of these changes, although important and significant, were hardly as encompassing as expected (Steinmo 1994). In fact, political changes must be called moderate. Even though all OECD countries reduced statutory rates on corporate income, these reductions were mostly accompanied by a broadening of the capital tax base. Tax credits, exemptions and other possibilities of tax avoidance have been widely abolished in order to render tax cuts fiscally neutral and maintain revenue from capital taxation. The fiscal neutrality of tax reforms was also secured by merely reducing top corporate rates, which only few if any companies actually pay. A superficial look at tax reforms in OECD countries over the last three decades does neither reveal a large burden shift to immobile factors since top personal income rates were cut along with corporate tax

rates. Yet, examining the effective tax rates on the immobile factor discloses a slightly different picture: a steady increase in social security contributions pushed effective labour tax rates on average upwards.

Especially large welfare states like France struggled to cope with the new conditions brought about by globalization. The French unemployment rate rose from under 5 percent in the late 1970s to over 10 percent in the late 1990s – a development which largely accelerated the pressure on national security systems and government spending. At the same time, international tax competition allegedly causes a yearly loss of over \$3 billion in tax revenue from corporate taxation (Avi-Yonah 2000) and about the same amount from personal income taxation. For whatever reasons, the French public debt went up from less than 30 percent of the domestic GDP in the early 1980s to more than 50 percent in 2005.

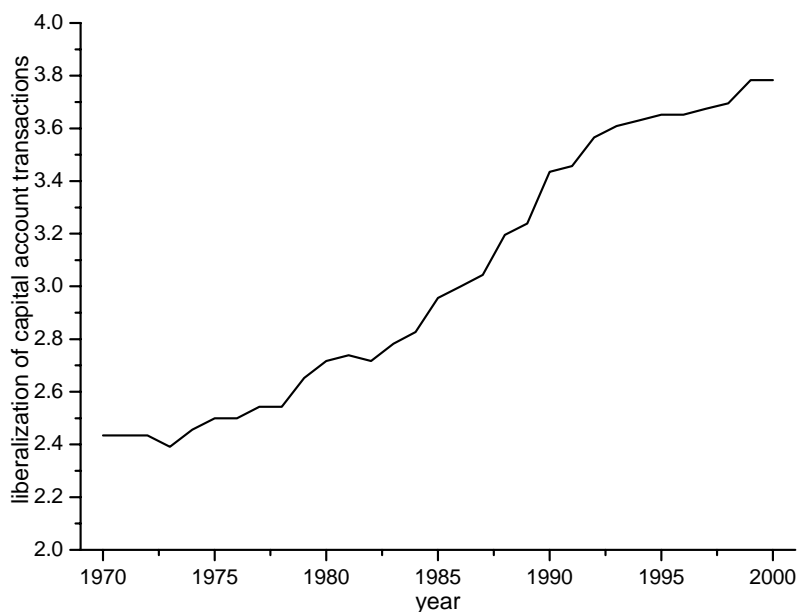
This chapter presents and discusses the recent trends in tax policy in OECD countries from both a descriptive and an analytical angle. First, I will show that legal capital mobility and trade openness have sharply increased over the last three decades and triggered a massive upward trend of capital flows and the trade of goods and services. Second, domestic governments reacted to the altered international situation by implementing tax reforms on corporate income. However, the predicted race to the bottom can be observed neither for effective nor for statutory tax rates.

### **2. Foundations: The Abolition of Capital Controls and Restrictions to Trade**

Since the early 1970s the international economic system has gone through massive changes. The far reaching elimination of restrictions to

international capital flows improved the possibilities for capital to move through jurisdictions. Figure 1 depicts the mean development of legal capital account liberalization (Quinn 1997) between 1970 and 2000 for the 23 OECD countries analyzed in the empirical part of this dissertation. This measure ranges from 0 to 4, whereby 0 stands for very high restrictions and 4 denotes completely unrestricted inward and outward capital account transactions. Clearly, overall legal capital mobility has risen steadily and sharply over the last three decades. Still, barriers to capital account transactions were not fully abolished by the year 2000. Before that a number of countries maintained relatively high restrictions to capital flows.

*Figure 1: Liberalization of Inward and Outward Capital Account Transactions (0-4): Quinn 1997, Annual Mean of 23 OECD Countries*



Market Integration became especially visible on international capital markets. Between the early 1980s and late 1990s the annual flow of outbound FDI across OECD countries has nominally increased by more than 1200 percent by rising from less than \$50 billion to more than \$600

billion (Haufler 2001: 1). During the same period the commodity trade has more than tripled from a total export volume of \$1667 billion in 1983 to \$5377 billion in 1998 (IMF 1990, 1999). The mobility of labour, however, did not follow the same trend: between 1981 and 1995 the share of foreigners in the total population increased only slightly in most OECD countries and remained below 10 percent in all Western European nations, with exception of the smallest countries Luxembourg and Switzerland (OECD-SOPEMI 1994, 1997).

When goods and financial capital can move freely across jurisdictions, real capital is following. More and more firms have transferred their operations to countries with low wages and taxes due to increasingly intensive international product and cost competition. The more liberal the trade relations and the lower the relative transportation costs, the easier the relocation of production becomes (Sinn 2003, p. 2). The improved possibilities for capital to freely move to jurisdictions providing favourable conditions put domestic tax systems under pressure. With high capital mobility the incentives for capital owners to shift capital to low-tax countries grew massively which triggered competition for mobile capital bases. In short, globalization induced international tax competition.

### **3. Trends in Tax Reforms and Tax Levels in OECD/EU Countries**

The large number of tax reforms implemented in many countries over the last 20 years as a reaction to international competitive forces reveals how important the issue of tax arbitrage has become in real politics. Tax competition started with the tax reform act of 1986 in the US where the

nominal corporate tax rate was cut by 12 percent from 46 to 34 percent. Canada as direct neighbour followed this trend closely and implemented successively lower tax rates on corporate profits. More recently Canada cut corporate taxation further back in several steps from 28 to 21 percent between 2000 and 2005.

Following this major tax reform in the US the average tax burden imposed by EU countries on US firms fell by more than 12 percent between 1986 and 2000. Top corporate tax rates (on retained profits) significantly declined between 1980 and 2004 for EU countries and fell by more than 13 per cent points. Within the OECD average statutory corporate tax rates fell by 15 percent until 2005.

Countries reacted quite differently to the increased competitive pressures. Even though most countries cut marginal corporate tax rates, marginal rates remain at very different levels and effective tax rates on capital vary largely. Germany substantially changed its corporate tax law in several steps. In 1994 Germany introduced the so called "Location Preservation Act" (Standortsicherungsgesetz, StandOG, §32c ESt) which reduced corporate tax rates from 50 to 45 percent. The tax rate was cut further to 40 percent by the "Tax Relief Act" (Steuerentlastungsgesetz, StEntG 1999/2000/2002) in 1999. For retained profits the tax rate was decreased again from 40 to 25 percent by the "Tax Reduction Act" (Steuersenkungsgesetz, StSenkG 2000) which came in effect in January 2001. The newly elected Grand Coalition put another major corporate tax reform on top of their governmental program. Nominal corporate tax rates are to fall from about 39 percent to slightly less than 30 percent.



Arguably, smaller countries felt the competitive pressure of tax competition even earlier. Ireland, for example, reacted significantly to the changes in capital mobility and aggressively engaged in the competition for mobile tax sources. The Irish government created special free trade zones to bring in investment. Since Ireland joined the EU in 1973 the corporate tax rate fell to 10 percent for a limited number of sectors. In 1987 Ireland extended this low tax policy from originally manufacturing and special services to financial services within the international financial service centres in Dublin and at Shannon Airport. This resulted in massive financial inflows. Several tax reductions followed in recent years, from 2000 to 2005 general statutory corporate rates fell from 24 to 12.5 percent in several steps.

The Netherlands and Belgium largely lowered the tax burden for financial services. They charge financial companies with the normal rate but allow them to make deductions of up to 80 percent of their revenues which reduces the effective tax rate in the Netherlands to 7 percent (Mennel and Förster 1999). In a recent corporate tax reform in 2005, Belgium cut statutory tax rates on retained corporate income from 39 to 33 percent without abolishing any of the deduction possibilities diminishing effective tax burdens even further.

Sweden and Austria have given up the principle of synthetic income taxation and tax interest income substantially less than personal income. The move to a dual income tax system in Scandinavian countries underlines the consequences of tax competition. Country studies for Sweden (Mutén 1996, Steinmo 2003a) and Austria (Genser 1996) demonstrate that these tax reforms were also triggered by massive tax evasion in the period prior to the reform and tax revenues actually increased after these reforms. In 2005

Austria implemented another large tax cut for corporate income, tax rates fell from 34 to 25 percent.<sup>2</sup>

Even though top corporate tax rates significantly fell between 1980 and 2004 in all OECD countries, they remain still on average close to 30 percent – far away from a predicted zero tax rate – and vary greatly in 2004 between 36 percent in Canada and 8.5 percent in Switzerland. This distribution of marginal corporate tax rates largely overlaps with the distribution of tax rates in 1975 where top rates on corporate income varied between 8 percent in Portugal and 51 percent in Germany. Corporate tax rates were merely cut at the top end of the distribution. Portugal even increased marginal tax rates on corporate income between 1975 and 1994. In addition, governments mostly followed up capital tax cuts by measures intended to reduce tax credits as well as exemption and deduction possibilities. This widely adopted strategy lead to a surprisingly stable tax burden on capital leaving government revenue from taxing mobile sources largely unchanged (Swank and Steinmo 2002).

Similar developments can be observed for taxation of the immobile factor. While top rates on personal income were mostly decreased along with marginal corporate tax rates, social security contributions rose steadily in most OECD countries burdening the factor labour with higher costs (Genschel 2002).<sup>3</sup> Top personal income rates fell on average in all OECD countries from 64 percent in 1975 to 37 percent in 2004, whereas average

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2 See Ganghof (2000), Dehejia and Genschel (1999) and Genschel (2000) for more complete accounts of tax policy changes

3 Manow and Seils (2000) show that Germany reduced the personal income tax burden while at the same time increasing social security contributions.

effective tax rates (own calculations according to Volkerink and De Haan 2001) on labour in the OECD increased from 29 percent in 1975 to 38 percent in 2004. Gordon Brown, the British Chancellor, for example, presented on March 21, 2007 the new budget for the UK which incorporates a moderate reform of corporate and income taxes. Mr. Brown himself assured his fellow MPs that the reform would be fiscally neutral. With respect to personal income taxes he reaches this neutrality by cutting back the basic tax rate while increasing contributions to the National Health System (NHS) simultaneously.

Still, this overall trend does not diminish the persisting variance in domestic taxation of wage earnings. The distribution of effective tax rates on labour in OECD countries did not alter significantly between 1975 and 2004. Whereas effective labour tax rates in 1975 ranged between 17 percent in Iceland and 47 percent in Sweden, they amounted to 19 percent in Iceland and 55 percent in Sweden in 2004. If anything at all, we can observe a slight upwards shift in effective labour tax burdens. However, the variance of domestic tax rates on immobile sources still remains very large. Burden shifts from capital to labour remained moderate or even insignificant in some countries. This observation strongly contradicts predictions of second generation models which claimed that labour would have to bear the full or at least large parts of the capital tax burden.

These empirical facts indicate that tax competition might not be the only driving force and different domestic settings and constraints impact the governments' taxation decisions.

Figure 2: Mean Top Corporate Tax Rate, Mean Efficient Labour and Capital Tax Rate of 22 OECD Countries

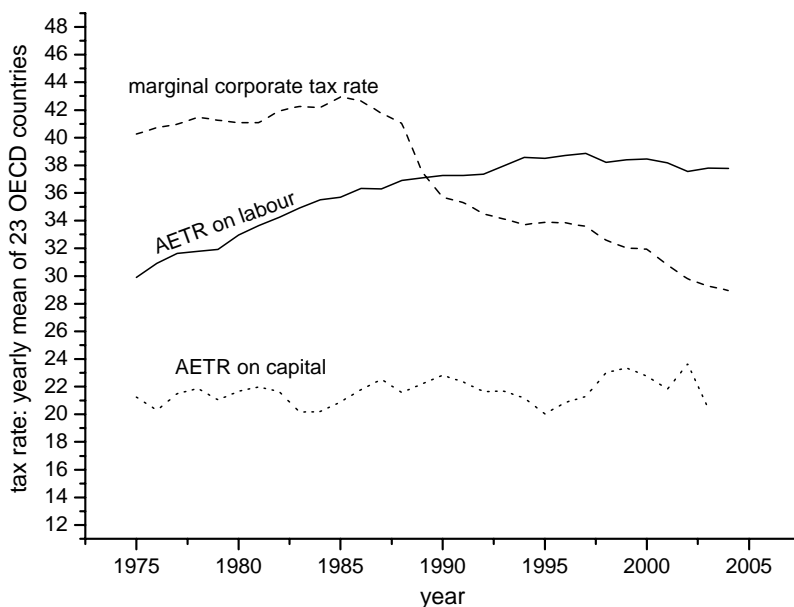


Figure 2 displays the mean top rate on retained profits of corporations and the mean effective labour and capital tax rates (own calculations based on the formula suggested by Volkerink and De Haan 2001) for 23 OECD countries between 1975 and 2004. While top corporate tax rates were successively reduced from the mid-1980s onwards, effective labour tax rates grew steadily. However, effective rates on capital did not decrease significantly. They remained relatively steady over time and rather increased a little since the early 1970s.

The mobility of resources limits the capacity of governments to redistribute income (Stigler 1957). The loss of revenue in corporate tax rates has partly been counterbalanced by an upwards trend in labour tax rates. The shift of the tax burden from capital to labour income results from the fact that labour markets are less integrated than capital markets and labour is less mobile.

Yet, for both, capital and labour tax rates, as well as the tax mix between the two, we can observe a persisting large variance across OECD countries.

### **4. Reaction to Competitive Pressures**

The internationalization of capital markets and the vast abolition of capital controls diminished the discretion of domestic governments with respect to tax policy making and revenue gathering. Because we cannot observe a general downward trend in effective capital taxation and government spending, the question, how policy makers reacted to these international competitive forces, seems highly relevant. Most governments pursued different revenue preserving adjustment strategies to respond to the competitive forces (Ganghof 1999a). Policy makers counterbalance downward pressures on taxes and spending by a policy of tax-cut-cum-base-broadening (Swank and Steinmo 2002, Steinmo 1994) and by fighting international tax evasion (Sinn 1989, 1997).

These strategies have been at least partially successful in limiting revenue losses but also changed the structure of taxation (Ganghof 1999). Governments had to react to international pressures by cutting back the statutory corporate tax rates. However, most countries used base broadening to render these reforms revenue-neutral (Garrett 1998a,c). In addition, given that competitive forces have not only resulted from exit options of capital owners but also from international tax avoidance and evasion especially of multinational enterprises, countries have taken legal and administrative measures to counteract such behaviour (Ganghof 1999a). For example, by 1992 the general investment tax credit was eliminated in all nations that had employed it (Swank 2006).

Since effective tax rates measure the combination of statutory tax rates and tax concessions, they reflect this policy of cutting taxes and simultaneously broadening the tax base. This strategy was possible because statutory tax rates have a signalling function for investors and as such have important effects on the location decisions of real investment as well as the mobile tax bases of multinational enterprises (Ganghof 1999a; Hallerberg and Basinger 1998). Investors and multinationals – in choosing locations – face very complex tax codes and exemption rules. They, therefore, use statutory tax rates as a proxy for effective rates in order to reduce the costs of information gathering. Furthermore, capital owners are uncertain about how their future investment profile enables them to take advantage of tax concessions and relief provisions such as tax credits (BMF 1999: 12, Ganghof 1999a).

The nature of foreign tax credit possibilities causes governments to focus on statutory tax rates. Since multinationals have an incentive to establish subsidiaries in countries with lower or at least equal statutory tax rates than their home country, statutory tax rates play an important role in location decisions. Moreover, statutory tax rates directly affect the declaration of profits by multinationals through transfer pricing and other techniques. Policy makers, thus, prefer to implement statutory tax rates close to those in competitor countries (Ganghof 1999a).

Given that both international investment flows and options for international tax avoidance partly depend on statutory tax rates, governments pursue a policy of tax-cut-cum-base-broadening, especially in corporate taxation. Slemrod (1990, 2004) argues that countries which intended to keep a specific effective tax rate or even decrease effective tax rates are forced to cut statutory tax rates and broaden the tax base in order to keep in line with

tax policy in other jurisdictions. An example for the fact that policy strategies such as tax-cut-cum-base-broadening are common practice is the German corporate tax reform which will become effective in 2008. The German finance minister Peer Steinbrück described this reform as landmark corporate tax reform which will undercut its neighbours and offer companies some of the lowest business taxes in Western Europe. However, as Tanja Krause, a BDI (the German industry federation) tax expert puts it, the nominal tax cuts "appear impressive on paper, but are unlikely to materialise because Mr. Steinbrück is also planning to broaden the tax base, which means the effective tax rates may change only a little" (Financial Times, 12 July 2006).

The discussion of governments' attempts to cope with international competitive pressures lends additional support to the claim that theoretical predictions of a race to the bottom in capital taxation are misleading. Despite the overall downward trend in corporate taxation, the tax burden on capital has not significantly declined over the last three decades.

### **5. Conclusion**

The large number of tax reforms during the last three decades underlines the need of governments to adapt national taxation to international competitive forces. Yet, current processes and changes in tax systems of OECD countries are multi-faceted and feed on each other.

The discussion of trends in tax policies and reactions to competitive pressures has revealed that tax rates on capital and corporate income have been declining over the last three decades. However, a general race to the bottom can be observed neither for statutory corporate tax rates nor for

effective capital tax rates. Governments widely use tax-cut-cum-base-broadening strategies in order to maintain revenue and be able to provide a satisfactory amount of public goods. Even though legal restrictions to capital account transactions have been largely eliminated in most OECD member states, a convergence of capital tax rates to a zero-equilibrium remains far from being met in reality. Average effective labour taxation in OECD countries has increased over the last 30 years indicating at least a partial shift of tax burdens towards immobile factors. However, labour tax rates still vary largely across OECD countries, some governments shifted larger parts of the tax burden towards wage income and others seemed to be unable to do so.

The variance in the observed processes in tax policy making pose important questions and it seems that governments can provide convincing answers if and probably only if research on tax reforms offer models that go beyond partial explanations of isolated aspects. Theories of tax competition should not only explain why tax systems came under stress, but also why adjustments were typically moderate, why governments responded the way they did, and whether the current tax mixes have reached an (almost) equilibrium and are sustainable or whether they are still in transition.



## Chapter 3: Literature

### 1. Introduction

When consumers or production factors are mobile, tax systems in different jurisdictions are not independent of one another. A lower tax rate in one country provides an incentive to locate business activities in this jurisdiction. Of course, if one country is better off by lowering tax rates, we should expect other countries to follow suit. By undercutting the neighbours' tax rates, a country does not only attract additional business activities but at the same time it triggers a downward-spiral of tax rates. As soon as this downward spiral reaches its equilibrium, all domestic tax rates on mobile business activities equal zero. As an unintended side effect, government revenues in all countries sharply decline, and public good provision must be cut back.

This, in a nutshell, is the logic of first generation models on tax competition.<sup>4</sup> More specifically, first generation models assume perfectly mobile capital, a single tax base (mobile capital) and a single tax instrument, and typically two equally-sized countries. If these conditions are met, tax rates on capital will converge to zero.

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4 Zodrow and Mieszkowski (1986) demonstrate in their early model the basic mechanism of tax base competition in the simplest possible way. This model has become the benchmark analysis for much of the later work. For different accounts of first generation models see also Oates 1972, Wilson 1986, Hoyt 1991, Bucovetsky/ Wilson 1991, Chamley 1986, and Lucas 1990. Razin and Sadka (1991) show that tax competition between two infinitely small countries leads to a zero tax rate on capital. They demonstrate that this outcome is even constraint efficient because a coordinated tax policy would still lead to a zero tax rate on mobile capital.

On closer examination, the assumptions underlying first generation models remain far from being realistic and, therefore, we should not be too surprised to observe that the predictions of these early models fell short of becoming true. While tax rates on mobile capital in the OECD world have moderately declined over the last three decades, the current tax rates remain significantly higher than zero percent.<sup>5</sup>

There are three ways to deal with this misfit between the theoretical predictions and empirical evidence:

First, proponents of the first generation models could argue that everything is in order, because these models were never intended to make point predictions on actually implemented tax rates but merely predict the global tendency towards lower tax rates. And this prediction, indeed, can not easily be rejected.<sup>6</sup>

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5 See the more detailed discussion of recent trends and developments in capital taxation in chapter 2.

6 While moderate versions of the tax competition model – versions that predict reductions of taxes on mobile capital – have by and large been confirmed by empirical research (Devereux et al. 2002, Altshuler and Goodspeed 2002), the more radical versions – those predicting convergence of capital systems (Tanzi 1995), and a complete abolition of taxes on mobile capital – found little if any empirical support. Nevertheless, researches widely agree that due to higher capital mobility policy makers are forced to take capital tax rates in other countries into account while deciding upon domestic taxation (Devereux et al. 2002, Altshuler and Goodspeed 2002, Hallerberg and Basinger 1998, 1999, Basinger and Hallerberg 2004, Hays 2003, Plümper et al. 2006). The impact of market liberalization and legal capital mobility on domestic taxation is analyzed in numerous empirical studies without having found a definitive answer yet. The influence of capital mobility on the overall level of taxation remains equally inconclusive (Wilson 1999). Whether legal capital mobility significantly reduces capital tax rates (Rodrik 1997, Garrett 1995, Quinn 1997, Swank 2006), exerts a positive effect on business taxation (Swank 1997), or has no significant effect on capital taxation (Garrett and Mitchell 2001) remains questionable and highly depends on model specification and operationalization of variables. The strategic effect of tax competition finds support in a number of empirical studies. Capital tax rates in competitor countries exert a significant positive effect on domestic capital taxation (Hays 2003, Basinger and Hallerberg 2004, Egger et. al 2005, 2006, Plümper et. al 2006 among others). In addition, trade openness is mainly found to decrease capital taxation (Rodrik 1997, Garrett 1995, Quinn 1997).

Second, critics can assert that the dire predictions of the first generation model result from its apparent simplicity. First generation models obviously cut deep into the real world, and propose a causal mechanism, which can only be true once we carefully control for all other influences on capital taxation. These critics, hence, add additional variables to the first generation models to generate predictions which are closer to reality.

And third, critics can also hold that the assumptions underlying first generation models are unrealistic at best if not wrong. If we relax the assumption of full capital mobility, the equilibrium tax rates tend to be positive. If we also relax the assumption of equally sized countries, equilibrium tax rates remain not only positive but also vary across countries, with the smaller country implementing lower tax rates.<sup>7</sup> Moreover, if we alter the assumption about the behaviour of policy makers from welfare maximization to the more realistic assumption of vote maximization, politicians might have incentives not to implement zero tax rates on capital depending on preferences of the majority of voters.

In short, it looks as if there is much explanatory power to win from making the standard assumptions more realistic. Still, this is not the way in which scholars usually try to explain non-zero tax rates on capital. With very little exceptions, researchers typically choose the second option and add additional explanatory variables to their models. Specifically, second generation models amended earlier approaches by a second tax instrument on immobile factors and incorporated public good provision. These models inherit most of the deficiencies of the first generation literature and,

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<sup>7</sup> For an intuition of this argument see the discussion of asymmetric tax competition in the following section.

### Chapter 3: Literature

unsurprisingly, equally predict a zero tax rate on mobile factors in equilibrium. In comparison, third generation scholars are dedicated to the explanation of non-zero capital taxation.

This chapter reviews these third generation attempts to deal with the unrealistic predictions of the first generation models. More specifically, I discuss three types of models that seek to explain non-zero tax rates on mobile factors. A first type analyses government provision of infrastructure used by capital and argues that capital actually has an interest in paying taxes. These models predict non-zero capital taxes. A second strand of research relaxes the unrealistic assumption of symmetric jurisdictions and claims that tax rates on mobile capital vary with country-size. And the third type of models assumes political, institutional and economic restrictions to reduce capital tax rates. Therefore, these models predict non-zero tax rates on mobile assets and a pattern of tax rates which highly covaries with the pattern of political constraints to cut capital taxes.

The discussion in this chapter reveals that those approaches provide a better account of the patterns in tax rates across countries. While my theory will build upon the discussed approaches, the review also uncovers the major loopholes in the existing work on tax rates which my work seeks to fill. Most importantly, I argue that most of the existing attempts fail to provide a completely convincing account of domestic taxation, simply because these models may 'solve' the non-zero taxation puzzle, but fail to explain a) the absence of convergence in tax rates, b) the shift from capital taxation to higher labour and consumption taxes, and c) the emerging pattern of tax systems across the OECD world.

In the remainder of this chapter I discuss the major strands of the literature on taxation and tax competition. While I only provide a shortened and simplified account of first and second generation arguments, I mainly focus on third generation attempts to account for non-zero capital taxation. I discuss these more recent studies in more detail in order to substantiate my claims about the persisting flaws and deficiencies which provide the motivation for my theoretical model.

### **2. Important Strands of the Literature on Taxation**

The vast literature on tax competition can be divided into three broad categories: The early economic literature on tax competition can be referred to as first generation models. These early models assume that governments only dispose of one policy instrument – a source based tax on mobile capital. More or less implicitly, capital is assumed to be fully mobile. Transaction costs of shifting capital across jurisdictions, therefore, do not exist and – quite unsurprisingly – these models predict that, in equilibrium, tax rates converge to zero.<sup>8</sup> The efficiency hypothesis of globalization states that due to the integration of financial and product markets and international competition, countries lose sovereignty over domestic policy making (Andrews 1994, Lee and McKenzie 1989) which results – in the case of capital taxation – in a race to the bottom of tax rates on mobile bases (Scharpf 1997, Tanzi 1995). This race to the bottom argument has been most explicitly stated by Bruno S. Frey (1990: 89): "In equilibrium, the tax rate on capital in each state will be driven to zero".

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8 Zodrow/ Mieszkowski 1986, Oates 1972, Wilson 1986, Hoyt 1991, Bucovetsky/ Wilson 1991, Cahmley 1986, Lucas 1990, Razin/ Sadka 1991.

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Second generation models take taxation on the immobile factor labour and public good provision into account. The most important results of these studies include a capital tax rate of zero in equilibrium while fiscal authorities shift the tax burden towards labour income. Since it is impossible to replace all capital tax revenue with government income gathered from wage earners these models also predict lower provision of public goods as compared to the closed economy case.<sup>9</sup> The main lesson to be drawn from this literature is that the attempt to redistribute from capital to labour is costly and ineffective if capital is mobile (Sinn 2003).<sup>10</sup>

The question whether the outcome of tax competition improves or reduces a nation's welfare divides the researchers of the second wave. The first group of scholars holds that tax competition produces more efficient results and increases overall welfare because the possibility of tax arbitrage forces governments to provide efficient mixes of taxation and public good provision.<sup>11</sup> In comparison, other researchers deem tax competition to result in inefficient allocation of factors and therefore to reduce social welfare. Scholars in this tradition claim that the fiscal externalities of tax competition create inefficient solutions and public goods are under-provided as compared to the closed economy case where the provision was optimal.<sup>12</sup>

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9 Sinn 2003, Rodrik 1997, Schulze/ Ursprung 1999, Webb 1998, Bretschger/ Hettich 2002, Steinmo 1996.

10 See also MacDougall 1960 and Richman 1963, Perrson / Tabellini 1995, and Quadri 2005 who provides simulation results showing the magnitude of capital tax reductions and burden shift to labour taxation.

11 These models assume governments to be revenue maximizers and are based on Tibout's (1956) model of local competition. For more detailed accounts see Zodrow/ Mieszkowski 1986, Ottaviano/ van Ypersele 2005, Brennan/ Buchanan 1980, Rauscher 1996/ 1998, Edwards/ Keen 1996, Fischel 1975, and White 1975.

12 See Oates 1972, Wilson 1986, Zodrow/ Mieszkowski 1986, Hoyt 1991, Bucovetsky/ Wilson 1991, Chamley 1986, Lucas 1990, Wilson 1986/ 1999, Wilson/ Wildasin 2004, Bucovetsky 1991, Razin/ Sadka 1991, MacDougall 1960, Richman 1963.

The under-provision hypothesis is one of the most frequently cited results in the tax competition literature (Oates 1972, Wilson 1999).<sup>13</sup> Due to fiscal externalities, international tax competition cannot produce efficient outcomes because the externalities cannot be internalized and the allocation of factors across jurisdictions must necessarily be inefficient (Wildasin 1989, Gordon 1983, 1986, Inman and Rubinfeld 1996, Sinn 2003).<sup>14</sup>

The predictions of first and second generation models meet contradictive empirical evidence.<sup>15</sup> Both efficient and statutory capital tax rates remain far from converging to zero. One reason for the apparent gap between theoretical prognoses and observed evidence may well be that it is still too early for tax competition to fully work. However, the attempt of isolating theory from reality checks can hardly be convincing. With almost no remaining capital controls, with an evidently large number of countries with open capital accounts and with low transaction costs of physically moving capital, competitive pressures are unlikely to mount further in the future.

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13 Concerning the under-provision of public goods hypothesis some scholars suggest that if tax competition results in a shift of tax burdens to immobile factors then total government spending does not have to decrease necessarily (Rodrik 1997; Schulze/ Ursprung 1999, Webb 1998; Bretschger/ Hettich 2002, Steinmo 1996, Radaelli 1998). Schulze and Ursprung (1999) and Keen and Marchand (1997) argue that globalization leads to shifts in expenditure structure and revenue generation. Expenditure disadvantages non-productive and immobile groups such as immobile and non-skilled workers, retired people and consumers.

14 For discussion of externalities see also Mintz/ Tulkens 1996, Mintz1999, Huizinga/ Nielsen 1997a,b, Friedlaender/ Vandendorpe 1968, Keen 1989, Hamada 1966, Soerensen 1991, Bucovetsky 1991. Sinn (1997 and 2003) further develops the argument of externality induced inefficiency in his critique of competition between nation-states (systems competition) based on the selection principle. He mainly holds that ideal market conditions tend to exist in private competition but not in competition between states. From his perspective governments have the function to correct deficiencies of the market. In a nutshell the selection principle directs the state to limit itself to the provision of those public goods with decreasing returns to scale. If states are designed according to the selection principle, no efficient competition equilibrium for capital taxes exists and international tax competition must be ruinous and most of the tax burden is shifted to the immobile production factors.

15 See footnote 6

The mismatch between theoretical predictions and empirical observations led to more complex and refined models of taxation and tax competition. These third generation models try to explain the absence of significant reductions in tax revenues collected from taxing mobile capital. Researchers particularly point to different domestic economic, institutional, and political constraints hindering governments from implementing low tax rates on corporate and capital income. They also suggest that the features of different political systems can account for variation in tax systems since they might prevent tax reforms designed to adapt domestic tax policy to international pressures.

### **3. Generation Three Models: Explanations of Non-Zero Capital Tax Rates**

In the following I discuss third generation explanations of non-zero capital taxation in greater depth and show that – despite their departure from first and second generation models – even the most sophisticated third generation models implicitly accept the conclusion of the earliest literature on fiscal federalism and tax competition that a zero capital tax rate marks the welfare maximizing policy outcome when capital is perfectly mobile. The main difference to first and second generation research consists in the inclusion of domestic institutional and economic constraints limiting policy makers in their ability to implement the welfare maximizing strategy. From this perspective, third generation models inherit the deficiencies of first and second generation models because they mostly neglect the fact that governments pursue specific policy goals with taxation. Policy makers, therefore, might not only be constraint by institutional factors in adapting



domestic taxation to international pressures. They might also be unwilling to do so because they need to provide a sufficient amount of public goods and re-distribute income to a certain extent.

### **3.1 Economic Explanations of Non-Zero Taxation**

Existing theories in the economic tradition mainly focus on two aspects: the provisions of infrastructure as a (semi)-private good and asymmetric country-sizes. Additionally, economic accounts of tax policy tend to cling to the assumption of welfare maximizing governments and, therefore, disregard the strategic political goals governments attempt to achieve with taxation.

#### ***3.1.1 Publicly Provided Infrastructure***

Many third generation economic approaches to tax competition argue that a country's tax burden is not the only important factor driving location decisions of capital owners, but the infrastructure provided by governments also exerts an important influence (Wildasin 1986, Wellisch 1995, Oates 1996). If taxes are seen as the price which must be paid for the publicly provided infrastructure, capital owners and investors will accept this cost (Sinn 2003, p. 30). Hence, from the isolated viewpoint of a single country it seems rational to impose at least some capital taxes. Therefore, a race to the bottom does not occur (Oates and Schwab 1988, Wellisch 1995, Oates 1996). If a functioning infrastructure improves the prospects for capital to generate income, it is rational for owners of the mobile factor to pay the tax enabling the government to provide infrastructure. In such a setting the immobile factor would not have to be taxed excessively and overall welfare would still be higher.

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Modelling the capital tax as price for infrastructure is too simplistic, though, because infrastructure can be characterized as an impure public good with only limited rivalry between competing uses. Price setting for consuming one unit is hardly possible and the predictions are, therefore, not valid. To overcome this problem some researchers suggested generalizing the infrastructure argument to the case of congestion costs (Wildasin 1986, Gerber and Hewitt 1987, Boadway 1980, Berglas and Pines 1981). These economists come to a rather optimistic assessment of tax competition, where usage costs can be attributed to capital owners and the equilibrium outcome is not characterized by a race to the bottom.

Yet, predictions heavily hinge on the highly unrealistic assumption that infrastructure is not a public good and governments can determine the cost of using one unit of the good infrastructure. If infrastructure resembles a pure public good with no rivalry in consumption then the immobile factor bears the whole tax burden and no tax is levied to internalize the marginal congestion cost. This outcome equals the simple tax competition model without infrastructure.

Moreover, capital owners must be willing to pay for the usage of infrastructure. This assumption is even more unrealistic and contradicts the underlying logic of tax competition. When capital is fully mobile and governments attempt to attract mobile tax sources by undercutting each others tax rates, they would react in the same way with respect to the price attached to the usage of infrastructure. Capital owners move to jurisdictions with the most favourable conditions. Thus, the race to the bottom prediction would not only apply to tax rates on capital but also to prices for using the provided infrastructure.

Consequently, introducing infrastructure into tax competition models cannot reduce the mismatch between theoretical predictions and empirical developments since the results are purely driven by the assumptions regarding the degree to which infrastructure resembles a public good and the willingness of capital owners to pay the usage costs of infrastructure.

### ***3.1.2 Tax Competition between Unequal Countries***

A second stream of the economic literature relaxes the assumption of symmetric countries competing for mobile capital in order to explain persisting variance in capital tax rates. A symmetric account of tax competition eliminates possible terms of trade effects and a conflict of interest between the competing jurisdictions cannot arise. Therefore, scholars study the effect of differences in country size on capital tax competition (Bucovetsky 1991, Wilson 1991, Peralta and van Ypersele 2005).

Within the asymmetric tax competition model, the small country faces a more elastic tax base and undercuts the tax level of the large country in an asymmetric Nash equilibrium. This implies that the tax base of the small country will be larger than in the closed economy case opening the possibility for the small jurisdiction to gain from tax competition. The cost of capital is less sensitive to tax changes in the large region; the mobile capital reacts less elastic. In equilibrium smaller and more open countries implement lower tax rates and undercut the capital tax rates of their larger neighbours. Since firms in smaller countries employ more capital per unit of labour and hence offer higher wages than in large countries, smaller countries can also substitute some of the loss from capital tax revenue by

higher taxes on wage income as wages tend to be higher (Bucovetsky 1991, Wilson 1991, Kanbur/ Keen 1993).

The predictions of asymmetric tax competition find ample empirical support. All else equal, larger countries tend to impose higher tax rates on mobile capital than small countries (Bucovetsky 1991, Wilson 1991, Kanbur and Keen 1993). Still, convergence remains far from perfect even after controlling for country-size (Plümper and Schulze 1999).

In sum, models incorporating asymmetric competition give a first hint into the direction of capital mobility not being uniform across countries. Yet, the mobility purely depends on the size of a country. It remains empirically unclear what size enables a government to implement a non-zero tax rate on mobile capital. Furthermore, we cannot observe zero tax rates on capital – not even for very small countries. Country size is a time-invariant variable and, therefore, very unlikely to change. However, over the last three decades tax reforms have been implemented in almost all countries, tax rates have changed massively, and tax systems vary largely even between countries of the same size.

### **3.2 Political Explanations of Non-Zero Taxation**

Political science accounts of taxation in comparison are more concentrated on increasing the complexity of first and second generation approaches by adding domestic economic, political and institutional constraints which impede the implementation of very low tax rates on capital. Generation three scholars mostly agree that under full capital mobility the welfare maximizing tax rate on mobile capital turns out to be zero or at least close to zero but domestic constraints keep policy makers from adopting this welfare

maximum. Still, the question which factors hinder policy makers from implementing this equilibrium tax rate divides researchers in political science. As scholars in this tradition are mainly concerned with accounting for the absence of a race to the bottom in capital taxation, they provide only partial explanations which do not consider tax system effects and tax mixes in different countries.

The literature is dominated by the assertion that governments are unable to implement very low tax rates on capital because of domestic institutional constraints. Some researchers in this tradition even argue that tax competition has not limited tax autonomy: Garrett (1998a, p. 823), for example, holds that governments wishing to increase taxation do so. Less radical but in the same tenor Swank (1998, p.691) states that governments have room for pursuing their preferred policy goals and Quinn (1997, p. 541) maintains that governments' capacity is even enhanced by tax competition. These claims underline the argument that policy makers heavily depend on domestic institutional factors which might have an even stronger impact on tax policy making than international competitive pressures.

### ***3.2.1 Economic Factors***

The state of the domestic economy impacts governments' decisions about taxation (Swank 2006, Swank and Steinmo 2002, Rodrik 1997, 1998, Garrett 1998a,c among others). Domestic economic conditions limit the government's ability to largely cut taxes on the mobile factor. High unemployment-rates hinder the shift of taxation to labour or to cut social expenditure (Genschel 2002, Ganghof 2000a,b). Deficit spending is not always an option if budget constraints are severe: The EU stability pact and

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the Maastricht criteria, for example, greatly constrain the creation of large deficits (Ganghof 2000b). In addition, high levels of pre-committed spending and debt compromise the adjustment to tax competition. Governments have to maintain tax revenue even though tax competition renders the taxation of capital more difficult (Genschel 2002).

Consequently, internationalization combined with domestic economic change and budgetary pressures exert a significant impact on domestic policy making. These factors create a system of constraints which limit the possibilities for governments to alter the level and the distribution of tax burdens. Due to the stickiness of public expenditures and substantial public debt in a number of countries, governments only have the chance to cut statutory tax rates while simultaneously increasing the tax base by abolishing tax privileges. In addition, large deficits from the 1970s render tax cuts difficult if not impossible (Ganghof 2000a,b, Swank 2006, Swank and Steinmo 2002 among others).

Other researchers argue that economic integration is accompanied by additional external risks, e.g., sectoral downturns or unexpected losses of income. These risks generate higher demands for public compensation and put pressure on domestic social security systems. Since policy makers cannot cut spending, they are unable to largely reduce tax rates on both mobile and immobile factors. The external risks induced by globalization are especially severe for dependent employed workers. Governments, thus, cannot shift most of the tax burden from capital owners to wage earners. This argument is often referred to as the compensation hypothesis (Rodrik 1998, Hicks and Swank 1992, Garrett 1995, 1998c, Quinn 1997, Swank 1998, Schulze and Ursprung 2002).

Empirical studies testing the effect of economic factors usually support the hypothesis that domestic budget constraints, debt, and the stickiness of government spending push taxation upwards in general and prevent governments from largely lowering tax rates on mobile factors (Swank 2006, Plümper et. al 2006, Swank and Steinmo 2002, Hays 2003). However, the impact of structural unemployment is not as clear cut. It seems rather uncontroversial that higher structural unemployment pushes tax rates on labour upwards (Swank and Steinmo 2002); its effect on statutory corporate and effective capital tax rates remains inconclusive, though (Swank and Steinmo 2002, Swank 2006).

Overall, the well-being of the domestic economy seems to strongly influence domestic decisions on taxation. Most of the studies dealing with economic factors treat them as constraints reducing the ability of governments to adapt domestic taxation to international pressures. This line of argumentation is based on the assumption of sticky public spending due to long-term commitments and past deficits. This rather functionalist logic does not account for the fact that politicians try to reach certain policy goals with taxation and public good provision.

### ***3.2.2 Political Constraints***

In addition to economic constraints, domestic institutional and political factors restrict the ability of governments to adjust capital taxation to international competitive pressures (Hays 2003, Garrett 1998b, Basinger and Hallerberg 2004, Hallerberg and Basinger 1998, 1999, Genschel 2002 among others). Domestic factors can prevent fiscal authorities from adopting the welfare maximum of zero tax rates on mobile sources and shifting large parts of the tax burden towards the immobile factor labour.

Differences in domestic institutions and the political environment might account for different reactions of policy makers to higher international capital mobility.<sup>16</sup>

Theoretical accounts of domestic constraints to tax competition typically assume that the increase of capital mobility due to reductions in legal restriction to capital flows constitutes a common shock to all open economies (Tanzi 1987, Hays 2003, Plümper et al. 2006, Schulze and Ursprung 1999 among others). Some authors, however, emphasize that the adoption of neoliberal tax reforms was rather a consequence of the diffusion of the dominant actor's policy (Swank 2006, Steinmo 2003b), the point of departure being the 1986 US corporate tax reform. The adoption of a neoliberal tax policy is contingent on the domestic political and economic environment, though. Economic factors like trade openness, capital controls, linkage with US markets, and the magnitude of domestic economic stress shape the conditional diffusion of the neoliberal ideal type. Domestic political factors such as a shift of the median voter, party politics, and coordinated vs. uncoordinated labour market institutions limit governments' capability to adopt the leader's policy (Swank 2006, Swank and Steinmo 2002). Learning from the success of the dominant actor additionally fosters diffusion of neoliberal tax policy since the US reform exerts a demonstration effect which decreases the uncertainty about the final outcome.<sup>17</sup>

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16 Steinmo (1993), for example, finds that differences in domestic political institutions had a profound effect on the evolution of tax systems in Sweden, the UK and the US. The tax mix and the tax structure result from the combined effects of international and domestic structural changes.

17 Based on this observation, the strategy of statutory tax cuts plus base broadening elimination of tax exemptions which follows a strict neoliberal economic orthodoxy was labelled the "Washington Consensus" (Swank 2006). Studies following this line of



A number of studies contest the diffusion argument (Basinger and Hallerberg 2004, Plümper et al 2006, Hays 2003, Winner 2005) and deem the combination of common international shocks and specific domestic constraints as being the driving factors of governments' tax policy choices.

Even though scholars are divided with respect to the actual convergence mechanism in place, the underlying arguments nevertheless are very similar. How governments respond to external pressures on national capital taxation highly hinges on domestic economic and institutional settings.

### *3.2.2.1 Veto Players and Party Politics*

Policy reforms tend to induce political costs as they alter the structure of winners and losers from a specific policy. This theoretical approach spilled over into the tax competition literature. Researchers assert that the political costs of tax reforms erase the race to the bottom (Basinger and Hallerberg 2004). Even if we can observe a downward pressure of international tax competition, this pressure is counterbalanced by domestic political institutions (Hays 2003, Hallerberg and Basinger 1998, 1999, Basinger and Hallerberg 2004, Swank and Steinmo 2002, Swank 2006) and voter preferences (Ganghof 1999b, 2004, Genschel 2002). Tax competition, thus, does not necessarily lead to convergence because of domestic trade-offs.

Political costs are most commonly modelled as the number of veto players able to block a reform.<sup>18</sup> The more veto players participate in the political

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argumentation predict that in the long term all nations will move towards the US tax structure but the responsiveness is stronger where linkages with US markets are stronger and uncoordinated market institutions are dominant. The US model diffused to other countries shaped by domestic economic and political constraints (Swank and Steinmo 2002).

18 For a more detailed discussion of the impact of veto players on policy making see Tsebelis 1995, 1999, 2002.

process the higher the costs of altering the status quo and the lower the likelihood of reform (Hallerberg and Basinger 1998, 1999, Basinger and Hallerberg 2004, Genschel 2002, Wagschal 1999a,b). Thus, the higher the number of veto players with different preferences, the smaller the common denominator and the less broad and deep national tax reforms turn out to be. Therefore, veto players with different preferences towards taxation prevent the adaptation of capital tax rates to international competitive levels. As a consequence, political systems with a larger number of veto players influencing the decision making process implement higher tax rates on capital than countries with few or no veto players.

The empirical results with respect to the influence of veto players on tax policies remain rather inconclusive. They neither clearly support nor disconfirm the veto player argument.<sup>19</sup> The contradictive findings most likely result from the disagreement of how to measure preferences of the different veto players and the agenda setter. Not the sheer number of constitutional and legislative veto players seems crucial but the number of veto players with competing preferences (Basinger and Hallerberg 2004).

In addition to the costs of policy reform, politicians face a constituency cost (Basinger and Hallerberg 2004). Parties follow different political ideals and, therefore, have different voter clienteles. In order to satisfy the demands of

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<sup>19</sup> Hallerberg and Basinger (1998, 1999) for example empirically find that countries with only one veto player matched the tax reform of the US in 1986. Yet, the existence of more veto players limits a country's ability to cut taxes accordingly. Furthermore, Wagschal (1999a,b) discovers a rising number of competitive veto players decreased the number and breadth of tax reforms in OECD countries. Contrary to these results Ganghof (1999b) finds no evidence for an impact of the number of veto players on corporate taxes and effective capital tax rates. The difference in the findings might result from the data sets used: While Basinger and Hallerberg (2004) estimate a panel data model with cross-sectional information and observations over time. Ganghof (1999b) analyzes a pure cross-section.

their main clientele and secure the support of their political followers, incumbents implement different policies when controlling the government (Oatley 1999 among others).<sup>20</sup> Right wing parties represent the interests of capital owners, tax capital income overall less, have no incentive to intervene in the domestic economy or redistribute income from richer to poorer parts of the society, whereas leftist governments respond more strongly to wage earners' preferences and try to maintain a large welfare state (Garrett 1995, Garrett and Mitchell 2001, Garrett 1998b). Based on these assumptions, scholars following the political ideology argument predict different tax policy outcomes when the government is dominated by left or right leaning parties. A left-wing incumbent rather redistributes from capital owners to wage earners by implementing higher taxes on capital and not shifting the tax burden towards labour. Right-of-centre governments are expected to implement lower tax rates on corporate and capital income and shift large parts of the tax burden towards more immobile factors such as labour and consumption.<sup>21</sup>

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20 For a more detailed discussion of the partisan argument see Hibbs 1977/ 1992, and in combination with globalization and the welfare state see Allan/ Scruggs 2004, Amable/ Gatti/ Schumacher 2006, Cusack 1997, Alesina 1989/ 1991, Boix 1998/ 2000, Franzese 2002a,b, Iversen 2001, Garrett and Lange 1991, and Kitschelt 1994.

21 Basinger and Hallerberg (2004) empirically show that the tax competition effect is particularly strong and fiscal authorities largely reduce taxes on capital when more right-wing parties are in power and the ideological distance between veto players is small. By contrast, Ganghof (1999b) maintains that total government tax rates present the strategic instruments employed by policy makers. Based on this assumption his results show that the partisan composition of the government had no statistically significant effect on the scope of tax reforms. In a case-study of the Australian tax system Ganghof and Eccleston (2004) argue that the partisan composition of government strongly influenced tax policy.

### *3.2.2.2 Partisanship and the Political System*

The varieties-of-capitalism literature combines the partisan politics argument with other features of the political system such as the strength of labour unions and corporatist decision making (Kitschelt, Lange, Marks and Stephens 1999, Hall and Soskice 2001). The so called coherency thesis postulates two paths to economic performance: First a market economy in combination with minimalist governments as found in the US, the UK and Japan, and second the coordinated market model led by a more interventionist government, e.g. Austria, Denmark, and Finland. These two types of capitalism are seen as coherent and economically efficient. Moreover, no convergence of these two paths is to be expected. Globalization rather reinforces the differences (Garrett 1998a,b,c).

Representatives of this approach further maintain that the existence of left-wing governments combined with corporatist labour market institutions lead to high capital taxation since the government's main interest lies in the redistribution of wealth to its core constituency. The coherence thesis predicts, however, that the left can only successfully implement its agenda in social democratic corporatist systems where they are supported by unions and coordinated wage setting. With political economic coherence the influence of international pressures on partisan redistribution remain weak (Garrett 1995, Garrett and Mitchell 2001).

Hays (2003) builds on the varieties-of-capitalism literature but criticizes its predictions. Most social democratic corporatist countries are characterized by proportional electoral systems and rather large coalition governments. In the words of Lijphart (1999) these countries turn out to be consensus democracies, whereas market-liberal countries normally have plural systems

with single party governments and therefore receive the label majoritarian democracies (Lijphart 1999, Lijphart and Crepaz 1991). Since the median voter in most societies is a wage earner and crucially determines policy outcomes in plural systems, policy makers in majoritarian democracies tax labour by a smaller rate. The opposite holds true for consensus democracies where the majority is constraint in favour of the minority – capital owners – and, thus, capital taxes are on average lower (Meltzer and Richard 1981). In addition, the policy outcomes produced by coalition governments over-represent the preferences of smaller coalition parties (Austen-Smith and Banks 1988, Persson, Roland and Tabellini 2000), so that capital taxes turn out to be significantly lower in consensus democracies.<sup>22</sup>

While the discussion of political and institutional factors provides valuable insights into domestic constraints to tax policy making, all presented approaches suffer from a common flaw. Researchers only focus on the explanation of non-zero capital taxation by including additional variables to the right hand side of their explanatory models without challenging the main assumptions of first and second generation approaches to tax competition. These studies mostly fail to simultaneously analyze taxation of mobile and immobile factors and can, therefore, only provide partial accounts of domestic decision making on taxation.

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<sup>22</sup> Hays combines this arguing with the effect of globalization on capital taxation by modelling political institutions and the size of a country's capital endowment on tax policy. The degree to which the revenue-maximizing tax rate is shifted downward by capital mobility depends on the capital endowment of a country: the drop becomes large for rich and small for poor countries. The main hypothesis following from his theoretical model implies that the impact of increased capital mobility on a country's capital tax rate is proportional to its capital endowment and inversely proportional to the degree to which its political institutions are consensual.

More specifically, an implicit assumption of the veto player reasoning seems to be that only some actors adapted their preferences to the changes in the international system and the increased competitive pressures (Ganghof 1999b). The argument that some players interfere with the attempt of other political actors to implement lower taxes would otherwise not be plausible. If we extend the analysis to tax rates on immobile factors the same causal mechanism should be in place and reforms should be the less probable the more veto players are involved in the political decision making process. Yet, empirical evidence shows that in most countries tax rates on capital and labour develop in opposite directions.

Even though the varieties-of-capitalism literature allows explaining differences in tax policy outcomes by differences in political systems, these explanations are problematic because of the time invariance of most features of political systems. Indeed, factors like electoral arrangements or the corporatist structure have rarely changed in the past. Still, they are used to explain tax systems which were frequently reformed in most OECD countries over the last 20 years (see chapter 2). In addition, the varieties-of-capitalism literature normatively postulates two coherent paths to economic welfare and accordingly categorizes countries into these two groups. However, these two paths are rather ideal types and not necessarily found in reality.<sup>23</sup>

Hays (2003) predicts convergence of capital tax rates to somewhere in the middle of the distribution which is not supported by empirical evidence. The

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<sup>23</sup> Germany for example is rather a corporatist country, yet left wing and right wing governments frequently altered since the early 70ies. Moreover, countries like Germany and Austria, which would belong to the same category according to the varieties of capitalism literature, have indeed very different tax systems, especially the tax rates on corporate income vary greatly.

distributions of tax rates on mobile sources largely overlap in 1975 and 2004 (see chapter 2). His prediction also implies that very low capital tax rates have to rise in order to converge to the centre of the distribution. Empirical findings, however, do not suggest such a development to occur in the future.

Inconclusive empirical results with regard to political constraints such as veto players, partisan politics, and the political system and economic factors like unemployment and growth further indicate that some empirical and theoretical puzzles must still be solved and that we need more than partial explanations of rather isolated aspects of domestic tax policy making.

### **4. Remaining Puzzles**

While first and second generation models generate predictions which remain far from being met by real developments, third generation studies concentrate on the explanation of non-zero capital taxation. These more recent accounts of tax policy making introduce domestic constraints into the right hand side of the explanatory model which alter the predictions of earlier models and, thus, come closer to reality.

Yet, the answers of third generation accounts remain unsatisfactory since they are only partial and inherit some of the deficiencies of the first generation models. In particular, more recent studies of domestic tax policy making try to correct the defects of early models regarding their predictions without scrutinizing the main underlying assumptions. These models merely increase the complexity of first and second generation studies by adding institutional and economic factors which prevent governments from implementing the welfare optimum. As a consequence, the predictions of

third generation models are more consistent with empirical observations concerning capital tax rates. However, the main puzzles remain unsolved because of the failure to challenge the premises of classical tax competition models.

One of the basic assumptions driving most of the prognoses in the tax competition literature is the assumption of complete – or at least very high – capital mobility.<sup>24</sup> Even though empirical studies often include a measure for legal restrictions to capital account transactions, theoretical accounts more often than not define this possibility away. Clearly, this assumption crucially influences model outcomes. If we allow even for a small amount of capital not to be fully mobile, the equilibrium outcome necessarily exceeds zero since governments have an incentive to gather revenue in order to provide a sufficient amount of public goods.

Opportunity for improvement arises from the fact that not only legal restrictions to capital account transactions influence the capital mobility but also actual transaction costs of moving capital and the willingness of capital owners to shift capital to low-tax countries. This aspect of capital mobility remains largely unconsidered but is essential since it determines governments' motivation to engage in international tax competition.

Most studies fail to acknowledge the important fact that politicians attempt to reach certain political goals with taxation such as the provision of public goods and redistribution of income. These political aims drive the decision making process whether or not tax competition renders gathering revenue from mobile capital more difficult. The over-emphasis of international

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<sup>24</sup> Asymmetric tax competition models implicitly assume different degrees of capital mobility. Yet the mobility only can vary between countries and not within a country.



pressures and the tendency to neglect strategic aspects of policy making prevents a more realistic explanation of taxation.

By focussing on domestic constraints which limit the ability of fiscal authorities to implement zero tax rates on capital, researchers reveal important facets of tax competition. Still, they do not take the possibility into account that governments are not only unable to implement the zero-equilibrium but also unwilling to do so.<sup>25</sup> The power of the electorate and the responsiveness of governments to voters in democratic systems stay largely under-estimated.<sup>26</sup> From this perspective, existing explanations of domestic taxation under international tax competition necessarily remain incomplete. The main question is not whether it is desirable, efficient or welfare maximizing if labour subsidizes capital but whether workers still vote for the incumbent government in such a case.

The focus on capital taxation<sup>27</sup> by the majority of third wave scholars allows only a partial explanation of tax policy outcomes as it disregards the distributional consequences of taxation. Since provision of public goods and

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25 Some of the more recent studies of tax policy in political economy give more convincing explanations for actual tax policy outcomes (Basinger and Hallerberg 2004, Hays 2003, Genschel 2002, Swank and Steinmo 2002). Yet, the outlined criticism remains basically valid.

26 Some exceptions do exist: Persson/ Tabellini (1992) and Haufler (2001) argue that when governments maximize the political support from workers and capitalists, differences in the relative strength of these interest groups can result in different optimal tax mixes of wage and capital. Ganghof 2000a,b/ 2004 and Genschel 2002 also hold that from a single voter's view a burden shift of taxation towards the immobile factor implies problematic distributional consequences since capital receives a net subsidy at the expense of immobile taxpayers. This tax symmetry trade-off causes cuts in corporate tax rates to spill over into personal income taxation. In a case study Ganghof (2000a) also suggests that the tax symmetry trade-off mainly explains why German governments have found it very difficult in the past to bring down statutory corporate tax rate in order to adapt to international standards.

27 Exceptions do exist, e.g. Swank and Steinmo (2002) empirically analyze capital and labour taxation. Though, they do not provide a theory simultaneously incorporating the two tax instruments and analyzing distributive consequences.

### Chapter 3: Literature

income redistribution present important policy aims, the simultaneous analysis of capital and labour taxation seems to be crucial in order to adequately capture the decision making process. As I will show, the distributive consequences of taxation play an important role in tax policy choices. Governments consider the whole tax system when making decisions.

These deficiencies inherited by the latest wave of research on taxation have the effect that even though these models generate more realistic predictions with respect to capital tax rates, they do not provide convincing answers to the question why tax rates on capital persist and why tax systems vary greatly across OECD countries.

In the following two chapters I address the identified concerns and try to provide a novel theory which explains actual tax rates on mobile and immobile factors simultaneously. The proposed theoretical model is based on the assumption of opportunistic governments allowing for the direct incorporation of voter preferences such as demands for public good provision and tax symmetry. The careful modelling of the de facto ability and willingness of capital owners to move capital to low-tax jurisdictions permits to provide a more convincing account of governments' incentives to adapt domestic taxation to international pressures.

## **Chapter 4: Towards a Comprehensive Theory of Tax Competition**

### **1. Introduction**

Theories ought to simplify the real world. Yet, little consensus exists on how far this simplification should go. Ockham's razor as well as the widely accepted principle of parsimony both advise scholars to simplify as much as possible, but not more. But how much is 'as much as possible'?

The previous discussion of the literature has revealed that researchers typically face six important modelling decisions:

1. Does the government maximize social welfare, revenues or its political support?
2. Are countries homogeneous or do models allow some form of heterogeneity, for example size differences?
3. Are capital markets perfectly integrated and is capital thus fully mobile?
4. Are governments the only actors or are other actors explicitly incorporated?
5. Do governments command over a single or more than one policy instrument?
6. How many countries are considered in the model, two or more?

We have seen that the three generations of tax competition models can easily be distinguished along these criteria. First generation studies model two welfare maximizing governments, which command over the capital tax rate to compete over a fully mobile capital base. Countries are homogeneous. Second generation models assume two governments in homogeneous

## Chapter 4: Towards a Comprehensive Theory of Tax Competition

countries which command over two tax instruments to compete for perfectly mobile capital. These models disagree on the behavioural assumption underlying government actions: some scholars assume welfare maximization, others revenue maximization. Finally, third generation models either relax the assumption that the government is the sole actor or that countries are homogeneous.

Thus, scholars working on tax competition seem to agree that capital is fully mobile and that there is no necessity to consider a third country. Yet, while the second assumption has little impact on the implications of the model, the consequences of the first are considerable. If capital is imperfectly mobile, separating equilibria emerge in which one government implements lower capital tax rates than the other and neither of the two reduces capital taxation to zero. In other words, relaxing the only crucial assumptions that all recent models hold constant already does the trick and “solves” the puzzle of non-zero tax rates on mobile capital.

But is this assumption of perfect capital mobility realistic? And what about the other assumptions commonly entering tax competition models?

This chapter discusses how scholars should think about taxation in open economies. In short, I argue that a theory of domestic taxation which explains the variation in tax reforms over the last decades, the non-convergence of tax rates, and the moderate shift from capital to labour taxation, must become more realistic. First, the absence of capital controls does not lead to perfect capital mobility. Second, governments consider the whole tax system rather than a single tax rate when they maximize government revenues, aggregate welfare, or political support. Third, countries are not equal, and though simplifying assumptions are always

necessary, the impact of this seemingly innocent assumption on the model's predictions is too significant to be ignored. Finally, opportunistic governments maximize political support in order to stay in office. This crucial behavioural assumption allows the direct incorporation of governments' incentives into the decision making process.

Following from these assumptions I further argue that governments face a political trilemma when choosing domestic tax rates in which they cannot simultaneously reach the three policy goals of 'providing a satisfactory amount of public goods', 'maintaining a solid capital tax base by reducing tax rates on capital income' and 'adhering to societal demands for tax equality'. This line of argumentation implies that we have to analyze the decisional trade-offs politicians face when trying to reach these political aims.

### **2. De Facto Capital Mobility**

During the last 30 years most OECD countries have abolished legal restrictions to capital account transactions. (Lee 1997, Janeba 2000, and Ganghof 2000a). Different measures of legal capital controls provide evidence for a trend towards lower restrictions and higher mobility (Quinn 1997, Lane and Milesi-Ferretti 2001, Miniane 2004) although persisting variance between OECD countries can still be observed (Li and Smith 2002a, b). The difference between domestic legal restrictions and restrictions abroad (Li and Smith 2002 a, b) impacts the size and direction of capital flows. The higher domestic capital restrictions the less able capital is to flee and therefore governments can set higher tax rates on capital. The higher the legal capital mobility in other countries the more mobile tax

bases can be attracted by the domestic government but the competitive pressures grow as well. Thus, if some restrictions still exist, the ability of capital owners to engage in arbitrage is limited and no race to the bottom should occur.

Despite these observations researchers assume the absence of legal capital controls. Even though this assumption seems rather realistic given the trend toward lower restrictions, it does not imply perfect capital mobility. Actual capital mobility has two facets: legal restrictions to capital account transactions and the willingness and ability of domestic capital owners to move capital to jurisdictions providing more favourable conditions. While we can act on the assumption that legal capital controls do not exist, the de facto mobility can greatly vary across countries depending on the ownership and concentration of domestic mobile factors.<sup>28</sup> This observation significantly influences the outcome of tax competition models. In the following, I discuss the sources of variation in de facto capital mobility and the impact it exerts on governments' behaviour and national tax outcomes.

The need of governments to maintain a solid capital basis in order to gather enough revenue and avoid tax asymmetry has two aspects: On the one hand policy makers engage in tax competition in order to attract mobile capital from abroad. Such a strategy increases the taxable domestic capital base and boosts the capital to labour ratio as well as the productivity of the immobile factor. On the other hand, they try to prevent capital from moving to other jurisdictions as this would erode the domestic tax base. As a consequence,

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28 In the literature on tax competition most studies assume perfect capital mobility. Some take differences in legal capital restrictions into account. The influence of the characteristics of domestic capital on capital taxation remains largely un-discussed and – as far as I am aware of – no theoretical model incorporating de facto mobility of domestic capital as a decisive factor exists.

governments are more or less restricted by the de facto mobility of domestic capital.

De facto capital mobility, hence, greatly influences governments' decisions on capital taxation. The more able and willing domestic capital owners are to move capital to low-tax jurisdictions the higher the incentives for governments to engage in international tax competition and to reduce tax rates on corporate income to a competitive level. The actual mobility of domestic capital bases, therefore, largely impacts the ability of governments to simultaneously meet the policy aims of public good provision and tax symmetry. If domestic capital is highly mobile, governments are inclined to reduce tax rates on capital in order to prevent domestic capital from fleeing. This has two consequences: policy makers either must decrease the level of public good provision since revenue from taxing mobile factors at a lower rate declines, or they must shift large parts of the tax burden towards the immobile production factor. Accordingly, reaching both goals at the same time turns out to be more difficult if domestic capital is highly concentrated and, thus, more mobile.

De facto mobility as compared to legal restrictions to capital transactions depicts the actual costs capital owners incur when shifting capital to other locations. These transactions costs result from two different sources. First, relocating production sites and plants induces relatively high costs since it involves not only the physical relocation but also a large amount of administrative and bureaucratic effort: firing and hiring employees, building connections with local infrastructure, transportation, packaging, cooperating with the local bureaucracy and administration etc. In addition to these physical transactions costs, capital owners have to gather information about

tax rates, tax credit structures and exemption rules in other countries in order to decide where to shift capital to.

The ownership structure of domestic capital determines the costs of moving capital through jurisdictions. The higher the concentration of capital the lower the transaction costs of shifting profits to low-tax countries because owners of capital can benefit from economies of scale. The costs of moving capital to another location decrease with the degree of concentration since the costs of information gathering remain stable and do not accelerate with an additional unit of capital to be shifted to a low-tax country. If capital is rather equally distributed throughout society then the costs for capital owners to engage in tax arbitrage increases. In the extreme, were capital is perfectly concentrated, transaction costs approach zero per unit of capital. The ownership-structure of domestic capital therefore translates into de facto capital mobility.<sup>29</sup>

The actual ability of capital owners to shift profit to low tax countries can be empirically observed. Multinationals with high capital concentration use preferential tax regimes as a platform for international tax planning. These large companies with subsidiaries all over the world have the capabilities and means of engaging in large-scale tax arbitrage and avoidance with instruments and strategies such as transfer pricing, thin capitalization, and debt reallocation.<sup>30</sup> They engage in international transfer pricing to

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29 Moreover, large enterprises normally dispose of huge administrative departments which allow for easy gathering and processing of information.

30 Multinational corporations have the capabilities to engage in various tax avoidance strategies such as shifting revenues to low-tax countries by transfer pricing, shifting deductions including interest expense to high-tax countries, and reallocating debts (Zodrow 2006, Stöwhase 2005). Several empirical studies have highlighted that after-tax profitability tends to be higher in low-tax countries, suggesting that multinationals shift profits to such countries (Grubert and Muttin 1991, Harris et al., 1993, Hines and



minimize their global tax liabilities (Grubert and Mutti 1991, Hines jr. 2001). Thus, transfer pricing is used as a tax saving device (Schjelderup and Sorgard 1997).

Multinational enterprises (MNEs), hence, dispose of a much higher de facto mobility. Transaction costs of shifting mobile assets remain low since on the one hand MNEs can easily collect and compare information on foreign tax systems. On the other hand, and what is more important, they can engage in tax avoidance without physically moving production sites but virtually shifting profits and debts to benefit from different tax arrangements. This argument gains support from the finding of abusive transfer pricing to be one of the main determinants of international FDI flows (Azémar et al. 2006).

Tax considerations mainly influence the operations of multinational corporations due to their ability to easily choose between jurisdictions with different tax features. Multinational corporations spend millions every year and employ numerous experts to develop schemes for optimal transfer pricing (Hines jr. 2001). This can be only profitable if capital is highly concentrated, the company has a very large turnover and subsidiaries in countries with different tax structures. Moreover, intra-firm trade of multinational corporations constitutes a large proportion of total international trade. Trade between units of MNEs located in industrial countries is often in final goods. MNEs can change not only the transfer prices but also the volume of their intra-firm trade to shift profits from high to low tax locations (Kant 1989).

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Rice 1994). Overall, most results support the argument that multinational corporations typically engage in international tax avoidance activity.

Medium and small firms do not have the same ability to engage in large-scale tax avoidance strategies. Transaction costs per unit of capital remain much higher as compared to MNEs for several reasons. Firstly, capacities for collecting and comparing information on different foreign tax systems are limited. Secondly, small and medium firms must shift physical capital like production plants since they are less able to virtually shift profits and debts through transfer pricing and other tax avoidance strategies.

The possibilities of tax arbitrage for smaller firms were additionally diminished by actions taken by the EU and the OECD against discriminatory taxation (European Commission 2001, European Council 1998, OECD 1998). These actions mainly include the abstention from preferential taxation of non-residents and – more importantly – not granting tax advantages to firms with no real economic activity in the country ('real seat' doctrine). These strategies aim at preventing the use of mere holdings and letterbox companies in tax havens created in order to reduce the tax burden of a business.<sup>31</sup> Medium and small firms react much less elastically to taxation than multinationals and financial capital because these firms have a home bias, are lumpy investments<sup>32</sup> and moving physical capital becomes more difficult once a location decision taken.

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31 Rammeloo (2001) and Charny (1991) argue that because of the 'real seat' doctrine smaller firms react much less elastic to changes in regulations (including taxation). Cheffins (1997), Edwards (1999), and McCahery/ Vermeulen (2005) claim that the 'real seat' doctrine prevents a Delaware-effect in Europe.

32 Some authors have argued that since the key actors in tax competition are large firms which react not very elastic towards changes in tax burdens abroad, there is no serious pressure on governments to adapt their tax systems (Ganghof 1999a, Swank 1998, 2002, Swank and Steinmo 2002). Investments come only in large increments, they are lumpy (large firms); therefore a large tax difference on corporate taxes is needed to attract lumpy investments, e.g. automobile plants (Black and Hoyt 1989, King, McAfee and Welling 1993). Haupt and Peters (2005) claim that firms have a home bias. Governments thus tend to restrict preferential treatment to foreign residents to increase equilibrium revenue. For policy makers commitment issues arise as firms become

As a consequence, governments in countries with a high share of FDI and multinational corporations are more prone to play the tax competition game. Undercutting foreign capital rates in such a case appears to be reasonable from two perspectives: Foreign capital can be attracted and highly mobile domestic capital is less likely to leave the economy.

Higher de facto mobility of MNEs implies that governments have an incentive to treat mobile foreign capital tax bases more favourably. Within a uniform corporate income tax structure this may lead to investment incentives that are targeted directly or indirectly to foreign firms located in the domestic economy (Zodrow 2006, Gugl and Zodrow 2006). The recent and future base-broadening and statutory rate lowering reforms in several EU countries exemplify this strategy. These reforms disproportionately lower the effective rates for high profitability investments and, thus, reflect fiscal competition mainly focused on highly profitable and mobile multinationals (Devereux, Griffith and Klemm 2002).<sup>33</sup>

The recent British tax reform underlines this trend. In his budgetary speech on March 21, 2007, Gordon Brown announced a fiscally neutral corporate tax reform which follows the tax-cut-cum-base-broadening principle. This reform benefits highly profitable MNEs but disadvantages smaller firms with lower profits and companies with large plants in the UK by cutting back tax credits.

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partially immobile once the location decision is taken. Often initial tax breaks for new firms are granted because the attraction of a large corporation boosts turnover (Wilson 1996, Bond 1981).

33 Another example might be the Alabama-Mercedes case: Rumours have it that Alabama made Mercedes a tax gift whose value equals 30 years of tax payments to persuade it to locate there (Sinn 2003, p. 138).

## Chapter 4: Towards a Comprehensive Theory of Tax Competition

The effects of the de facto capital mobility and the domestic capital structure lead governments to focus more strongly on preventing MNEs from shifting capital to other jurisdictions than attracting capital from abroad. This especially holds true for large countries because the mobile tax base in these jurisdictions tends to be larger than the foreign tax base that can possibly be attracted by engaging in tax competition.

Policy makers in deciding upon public spending and the overall size of the budget need some certainty about the taxes they are able to collect from domestic sources. The possibilities for attracting foreign sources to boost the domestic tax base and increase the productivity of the immobile production factor remain rather uncertain for two reasons. First, underbidding foreign burdens on corporate income requires the evaluation of a multitude of different features of national tax systems in a large number of foreign jurisdictions. Second, policy makers cannot be sure of whether the tax base effect of attracting foreign sources exceeds the tax rate effect of cutting back capital taxation. Thus, whether the overall amount of levied taxes after the tax cut exceeds the status quo or falls short of it remains doubtful. In case the reduction in capital taxes does not lead to an inflow of a sufficient amount of foreign tax bases, governments might even loose from engaging in tax competition because the collected revenue from mobile sources declines.

Accordingly, targeting domestic capital and setting capital tax rates to reduce incentives for mobile capital to leave seems to be a more suitable strategy for national policy makers. The empirical finding that statutory tax rates in parent countries mostly impact the amount of outbound FDI but not FDI inflows, lends strong support to this line of argumentation (Egger et al.

2006). Inbound FDI flows depend to a large extent on revenue induced investment incentives such as publicly provided infrastructure and supply of high skilled workers.

Overall, because governments only dispose of one instrument to tax capital – a source based tax on corporate income – the composition of the domestic capital base is crucial. The larger the share of multinationals, the higher the average elasticity of capital to taxation and the more domestic policy makers have to care about preventing capital from fleeing. As a consequence, in countries with a high share of MNEs governments are more likely to cut back capital taxes and engage in tax competition. Fiscal authorities have to lower tax rates on capital to prevent multinationals from engaging in tax arbitrage, even though this strategy renders the simultaneous achievement of the other two policy aims 'sufficiently high public good provision' and 'maintaining a certain degree of tax symmetry' more difficult.

### **3. Government Behaviour**

Increasing legal mobility of capital changes the international environment in which policy makers choose domestic tax rates. With less legal restrictions to capital account transactions, owners of mobile tax bases can more easily engage in arbitrage and shift capital to jurisdictions with favourable conditions i.e. low tax rates on mobile assets. This opportunity puts domestic governments under pressure since their ability to gather revenue from mobile factors declines. To attract mobile capital governments have to take tax policies of other countries into consideration when deciding upon domestic taxation. Policy makers find themselves in a prisoner's dilemma where competitive undercutting of tax rates on capital results in a downward

spiral and an equilibrium outcome of zero.<sup>34</sup> However, while statutory corporate tax rates have steadily decreased over the last three decades, the empirical literature found no evidence for a race to the bottom in capital taxation.<sup>35</sup>

Still, lower restrictions to capital account transactions and higher de facto capital mobility force governments to take tax policy making in foreign jurisdictions into account. However, they do not incorporate the tax policy of all other countries equally into the decision making process. Policy makers partly base their decisions on the observation of which countries do well in the international competition for mobile tax sources. They learn from successful examples. In this context, governments have a higher interest in fiscal policies of countries which have success in attracting mobile capital since these jurisdictions present the direct competition.

In addition, companies base their location decisions on signals in order to decrease information costs (Ganghof 1999b). While choosing locations, investors and multinationals face very complex tax codes and exemption rules. They use the other investors' location decisions as signal in order to reduce the costs of gathering information about optimal locations. Countries signal that they provide favourable conditions if they attract net capital inflows. Domestic firms, therefore, use the ability of other countries to attract capital as decision making device for their own location choices. Following this logic, governments keep their tax rates closer to successful countries to prevent domestic capital from moving to these jurisdictions

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34 This well known line of argumentation provides the basis for the tax competition literature.

35 See Devereux et al. (2002), Altshuler and Goodspeed (2002), Hallerberg and Basinger (1998, 1999), Basinger and Hallerberg (2004), Hays (2003).

## Chapter 4: Towards a Comprehensive Theory of Tax Competition

By and large, international pressures restrict the room of manoeuvre for domestic policy makers. Governments in open economies – trying to secure re-election – are constricted by an international environment in which countries compete for mobile capital. Competition for mobile factors induces fiscal externalities since the internationally available mobile capital base has limits. The share of mobile capital crossing borders between two countries mainly depends on the difference in capital tax rates between the two jurisdictions. Capital outflows (inflows) reduce (increase) the domestic tax base and affect the government's ability to collect revenue and to implement low tax rates.

International pressures and de facto capital mobility, though, only partially explain the incentives of governments deciding upon domestic taxation. Because governments' largely care about their chances of being re-elected, tax policy making is also driven by preferences of the electorate with regard to public spending, deficits and redistribution of income.

One of the main tasks of the state is the provision of public goods which markets fail to produce. Therefore, governments have to gather revenue from mobile and immobile tax bases. This fact already prevents most policy makers from completely abolishing taxation on capital. Yet, competition for mobile sources might drive governments to shift some of the tax burden from capital to labour in order to maintain revenue and a satisfactory level of public good provision. Government spending is sticky because long term commitments to social security and pension systems prevent large cuts in public spending.

Moreover, economic integration triggers additional external risks such as sectoral downturns or unexpected losses of income, pushing the demand of

large parts of the electorate for insurance against and compensation of these external risks upwards.<sup>36</sup> The pressure on social security systems and in turn on public spending rises. Since spending cannot be significantly reduced, policy makers are unable to largely decrease tax rates both on mobile and immobile factors. The external risks which increase with globalization turn out to be especially severe for dependent employed workers. Since the majority of voters are wage earners, governments are inclined to spend more in order to compensate external risks.

Deficit spending is often not an option either because, first, EU member states have to subject themselves to the EU stability pact. The Maastricht criteria largely prevent new indebtedness. And second, governments are reluctant to create large public deficits because voters interpret public debt as mal-functioning of the domestic economy. Large deficits provide a signal of economic under-performance to the electorate.

Governments find themselves in a political dilemma: On the one hand higher legal capital mobility reduces their ability to collect taxes from mobile factors. On the other hand, policy makers need to supply a satisfactory amount of public goods. At the same time, they face restricted possibilities of shifting the tax burden towards wage earners or increase the public deficit. Thus, the more rigid the budget, the less able governments to reduce tax rates on capital to internationally competitive levels.

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<sup>36</sup> See Rodrik (1998), Hicks and Swank (1992), Garrett (1995, 1998a,c), Quinn (1997), Swank (1998), Schulze and Ursprung (2002).



#### **4. Policy Instruments and Tax Mixes**

If competition for mobile capital restricts the government's ability to gather revenue from mobile bases, it is inclined to shift parts of the tax burden towards more immobile bases such as labour income and consumption in order to maintain public income and public good provision. Hence, budgetary concerns in combination with tax competition pressures can lead to a shift of the tax burden from capital to labour.

Looking at this strategy from a purely welfare-maximizing perspective, it is pareto efficient if wage earners bear the higher tax burden as the net (after tax) labour income remains higher with complementary capital. From a single voter's view, however, this burden shift implies problematic distributional consequences since capital receives a net subsidy at the expense of immobile taxpayers. As a consequence, shifting the tax burden towards wage income creates political costs.

The median voter in most – even capital rich – countries is a wage earner rather than a capital owner and perceives this burden shift as unjust and unfair. It is not in the interest of workers to subsidize capital, even though the productivity of the factor labour would still be higher. The notion of inequality and unfairness leads the majority of the electorate to withdraw political support in case the government attempts to shift large parts of the tax burden towards the immobile factor. Thus, the strength of societal equality demands prevents a large gap between the tax rates imposed on mobile and immobile taxpayers.

How strongly the needs for equality and tax symmetry are enrooted in the society largely depends on the political culture of a country. Long-lasting political practice shapes voters' expectations regarding the equity and

symmetry of the tax system and, hence, influences the utility function of governments. For example, the different development of welfare states may have formed different preferences with respect to compensation of risks and redistribution of income. Social democratic welfare states institutionalized income redistribution from rich to poor via taxation much more strongly than liberal market democracies. The electorate in continental and Scandinavian welfare states, therefore, should demand higher tax symmetry than voters in free market economies.

Based on this argument, we can expect large differences in the demand for tax justice and equality across societies. Indeed, while we can observe increasing inequality in market income, redistribution activities by governments and the distribution of disposable income vary greatly across OECD countries (Beramendi and Cusack 2004). With globalization, wages and salaries have grown more disparate as the skill premium ineluctably increases (Nickell and Bell 1996; Gottschalk and Smeeding 1997, 2000). The observable pattern in pre-tax inequality over the last three decades is consistent for most OECD countries. Without government intervention the inequality in income reached high levels throughout. Even in an egalitarian society such as Sweden, the degree of pre-tax inequality in market outcome is extremely high and close to the inequality levels in the UK and the US (Beramendi and Cusack 2004).

Direct government intervention produces a far more equitable distribution of income. Still, the scope and the breadth of the reduction of market induced inequality differ significantly. The effective levels of redistribution vary dramatically between states such as Sweden (18 % of total income on average) and the US (8 % of total income). In Germany, for example, the

pre-government income inequality increased sharply over the last thirty years – from 0.31 in 1978 to 0.45 in 2002 – but the post intervention disposable income inequality remained constant on a much lower level – 0.24 in 1978 and 0.26 in 2002. The same development can be observed for France and the Netherlands. In comparison, government intervention in countries like the UK and the US appears much less evident and inequality of post-government income rose significantly over the last three decades: from 0.27 to 0.35 in the UK and from 0.30 to 0.38 in the US.<sup>37</sup>

The use of redistributive measures differs across countries and policy makers, depending mainly on persisting institutional settings. Some researchers argue that the degree of unionization and corporate wage setting impact governments' willingness to redistribute income. Unions have an aversion to wage inequality and the stronger the union movement the greater this aversion, especially if low wage earners are included (Hibbs and Dennis 1988, Freeman 1980). The welfare state literature emphasizes the strength of the working class hinging on the extent to which it is organized and able to influence national politics (Esping-Andersen 1990, Korpi 1983, Korpi and Palme 2003, Stephens 1979). Hence, the higher the degree of organization of the working class, the larger the impact on redistributive efforts on the part of the government. The degree of wage coordination is conventionally regarded as a crucial difference between Liberal and Coordinated Market Economies (Hall and Soskice 2001).

Thus, redistributive patterns are strengthened by long lasting features and settings in a specific democracy. These patterns shape voters expectations and demands with respect to equality, redistribution, and tax symmetry. In

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<sup>37</sup> The data are Gini-coefficients obtained from the Luxembourg Income Study Data base.

some societies, therefore, a much more egalitarian legacy prevails and voters' require political intervention in case the market produces high inequality. In liberal market economies, in comparison, the ideal of free market activity without governmental interference dominates preferences of the electorate.

Accordingly, the pressure on governments to implement symmetric tax rates on capital and labour varies with the strength of equality needs in a society. Opportunistic policy makers take electoral demands for tax symmetry into consideration. The higher the equality expectations of voters, the less likely a government is to play the tax competition game hard. In such a case, governments may gain higher voter support from not reducing capital taxation too strongly or cutting back wage taxation accordingly, than they can win from attracting foreign capital bases.

Tax symmetry demands and budget constraints limit governments' ability to cut back capital tax rates and simultaneously shift the tax burden towards the immobile factor. Consequently, in addition to international competitive pressures governments are concerned with maintaining tax revenue in order to provide a sufficient amount of public goods and refrain from high tax asymmetry to avoid voter dissatisfaction.

### **5. Conclusion**

Governments need to raise income from taxing mobile and immobile factors to satisfy the electoral demand for public goods and redistribute income from wealthier to less wealthy parts of the society. To achieve these aims, policy makers must maintain a solid capital tax base despite high capital mobility and international competition for mobile tax sources. In deciding

upon domestic tax policy, governments aim at maximizing voter support under different international and domestic constraints. High legal capital mobility puts domestic policy makers under pressure. They must take tax policy making abroad into account in order to prevent domestic capital from fleeing and possibly attract foreign capital bases.<sup>38</sup> These international forces are attenuated by domestic considerations since governments face budget constraints and try to satisfy societal equality needs by maintaining tax symmetry.

While most of the studies dealing with tax policy making under international competition for mobile bases assume capital to be perfectly mobile and able to move through jurisdictions without transaction costs, de facto capital mobility remains far from being perfect and varies with the domestic ownership structure. If the concentration of capital is high, owners can benefit from economies of scale and costs for shifting capital to other countries decline. Hence, capital owners enjoy a much higher de facto mobility. The actual ability and willingness of capital owners to leave the country impact the government's incentives to engage in international tax competition. A highly mobile domestic capital basis pushes down tax rates on capital.

Even though a zero-equilibrium might mark the welfare optimum, tax rates on capital are unlikely to approach zero because governments attempt to maximize political support. Incumbents need to gather revenue to be able to provide a sufficient amount of public goods.<sup>39</sup> International pressures render

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<sup>38</sup> See Scharpf (1997), Tanzi (1995), Andrews (1994), Lee and McKenzie (1989), Oates (1972), Wilson (1986), Zodrow and Mieszkowski (1986), Hoyt (1991), Bucovetsky and Wilson (1991) among others.

<sup>39</sup> See Rodrik (1998), Hicks and Swank (1992), Garrett (1995, 1998a,c), Quinn (1997), Swank (1998) among others.

collecting taxes from mobile sources more difficult and, therefore, cause policy makers to shift tax burdens towards immobile factors.<sup>40</sup> However, as voters are mostly wage earners, shifting the burden reduces political support. The majority of the electorate has no interest in subsidizing capital, they rather prefer redistribution of income from mobile to immobile factors.<sup>41</sup> Thus, major parts of the electorate care about tax symmetry. How much the tax symmetry trade-off impacts a government's utility function is contingent on the strength of equality expectations enrooted in society.

From a political point of view, domestic policy makers decide upon optimal tax mixes by taking preferences of voters such as demands for public goods and tax symmetry into consideration. International and domestic trade-offs that differ across countries determine the optimal tax policy a government can implement in order to reach the three policy goals of providing a satisfactory amount of public goods, avoiding high tax asymmetry and prevent domestic capital from leaving the economy simultaneously.

In selecting optimal tax rates governments have to find a balance between the different aims and the consequences of the implemented tax policy: different levels of capital and labour tax rates create costs and benefits for different parts of the electorate because of the redistributive conflict between capital owners and wage earners. Tax mixes also influence the size of the tax bases in a world where capital is mobile. Maximizing political support under these trade-offs presents a difficult task.

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40 See Sinn (2003), Rodrik (1997), Schulze and Ursprung (1999), Webb 1998, Bretschger and Hettich (2002), Steinmo (1996) among others.

41 Persson and Tabellini (1992), Haufler (2001), Ganghof (2000a, 2004), Genschel (2002)

## Chapter 4: Towards a Comprehensive Theory of Tax Competition

In sum, governments find themselves in a political trilemma in which they cannot simultaneously achieve the three policy aims of 'maintaining the political optimal level of public good provision', 'reducing tax rates on capital income to internationally competitive levels' and 'avoiding social injustice by implementing a vote-maximizing mix of tax rates on capital and labour'.

The proposed theoretical argument thus differs from existing economic accounts of tax competition with respect to the modelling of governments' domestic political and economic constraints. The model is not based on the assumption that the imperatives of international competition dominate the political process, but I maintain that domestic political factors remain effective and generate decisional trade-offs for policy makers. Without doubt, the need of governments to keep mobile tax bases from leaving the country and attract foreign direct investment impacts policy choices, yet, conditioned on domestic settings. These differences in domestic constraints are the main source for explaining the persistent high variation in taxation across countries.

## **Chapter 5: A Formal Model of Taxation and Tax Competition**

### **1. Introduction**

The previously outlined arguments highlight the interdependence of policy goals governments attempt to achieve with taxation and the decisional trade-offs they face when choosing domestic tax levels. Thereby different pressures work simultaneously and political aims are not always compatible. Competition for internationally mobile tax sources and high de facto capital mobility push tax rates on capital down. At the same time electoral demand for public good provision prevents governments from implementing competitive tax rates on mobile capital and tax symmetry considerations impede the shift of large parts of the tax burden from corporate to wage income.

To be able to examine these different forces simultaneously, I formalize the presented theoretical argument. In analyzing the relationships between tax competition, budget constraints, demands for tax symmetry and the domestic capital structure, I propose a formal theoretical model where incumbents are only interested in their re-election and in order to reach this goal they have to maximize voter support.<sup>42</sup> The policy maker must find the optimal mix of tax burdens on mobile and immobile factors, the level of public spending, and the degree to which societal equality needs are fulfilled.

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<sup>42</sup> For textbook accounts of similar models see Drazen (2000a); Persson and Tabellini (2000, 2002), Mueller (2003), Grossman and Helpman (2001), Persson and Tabellini (1992).



## Chapter 5: A Formal Model of Taxation and Tax Competition

The model combines standard political economy reasoning (Persson and Tabellini 1995, Drazen 2000a) with arguments on tax system effects of capital liberalization. As many models before, I demonstrate that the optimal fiscal policy in open economies in fact differs from the closed economy case because of international tax competition pressures. However, my theoretical model transcends existing models in important aspects. I will show that these international forces do not necessarily lead to a race to the bottom, but are restricted by domestic considerations of governments who face budget constraints, try to satisfy societal equity needs by maintaining tax symmetry and take the domestic structure of capital and de facto capital mobility into consideration.

The theoretical model formalizes this underlying logic by generating a loss function a representative government faces when choosing domestic tax rates. Loss thereby is associated with political support. Implemented political strategies generate costs and benefits for different parts of the electorate, whereby costs enter the loss function positively since they reduce political support and benefits influence the overall loss negatively. The model examines the strategic game between two countries or one country and the weighted influence of the rest of the world, and allows comparing the homogeneous and heterogeneous country case.<sup>43</sup>

I analyze the outcome of the model within a comparative static framework by computing the optimal domestic labour and capital tax rates a government should choose as a reaction to different domestic and international factors. More specifically, I vary the values of 5 crucial

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43 Plümer et. al (2006) analyze a 3 country model by simulation techniques which produce dynamic Markov chain equilibria.

parameters of the model: a) domestic demands for tax symmetry, b) elasticities of labour and different forms of capital to taxation, c) budget rigidities, d) ownership structure of domestic capital, and e) domestic and foreign attractiveness for mobile capital in combination with legal domestic and foreign restrictions to capital flows.

The chapter is organized as follow. I first discuss the underlying assumptions. Secondly, I will look at a closed economy model which provides the benchmark to which we can compare the open economy outcome. Tax rates in open economies should differ from those in closed countries because of capital mobility and strategic interactions between governments.

### **2. Assumptions**

The model is based on the assumption of opportunistic governments who maximize political support in order to foster the chances of re-election. Policy makers thereby dispose of two source-based tax instruments to gather revenue: They can set tax rates on mobile capital and immobile labour. In order to minimize their loss function governments have to choose both tax rates in a way to avoid taxing the domestic constituency too heavily, provide a satisfactory amount of public goods without increasing budget deficits, and comply with societal equity needs. Wage earners thereby react less elastically to taxation than capital owners.

In addition, domestic policy makers face an international environment where capital is highly mobile and countries compete to attract mobile capital bases. I model the share of mobile capital crossing borders between two countries as a function of the difference in capital tax rates between the

two countries. I do not assume – as many models of tax competition do – that capital is perfectly mobile but the actual mobility varies across jurisdictions.

Hence, capital in- and outflows depend on several other factors. Capital flows can be legally restricted and restrictions might be different domestically and abroad. Higher domestic capital restrictions prevent domestic capital from leaving the country and, as a consequence, policy makers are able to tax domestic capital at a higher rate. The lower the restrictions to capital transactions abroad, the greater the possibility to attract foreign capital bases. Yet, the competitive pressures on domestic policy makers rise accordingly.

Moreover, since governments only dispose of one source based tax rate on corporate income, the de facto mobility of domestic capital influences decision upon capital tax rates. The more the domestic economy is dominated by MNEs the higher is the overall mobility of domestic capital. Governments have to set lower tax rates on capital income as they have to prevent multinationals from engaging in tax arbitrage. From this also follows that policy makers can play the tax competition game more fiercely. Furthermore, distance and attractiveness of a location impact the actual willingness of capital to move and therefore governments' willingness to engage in tax competition.

Two further underlying assumptions need to be pointed out. First, I assume that capital taxation follows the source principle stating that international factor flows are taxed in the country where the income originates. Even though researchers have shown that the residence principle – taxation occurs in the country where the factor owner resides – would generate less

distortionary and more efficient outcomes, it is much less relevant in practice (Sinn 2003, Bucovetsky and Wilson 1991).<sup>44</sup>

Second, I disregard possibilities of substituting the revenue from these two tax instruments with revenue from other fiscal means like property and commodity taxes. Since I am examining only horizontal tax competition, property taxes are not as relevant as they are mostly gathered at the local level. Furthermore, commodity taxes do not vary much especially not across member states of the European Union. In addition, the revenue gathered from value added and sales taxes in the majority of the countries, analyzed in the empirical section, amounts only to about one third of the revenue collected from personal income and corporate taxation. From this perspective, changing commodity taxes in order to substitute losses in revenue from the two main tax instruments should not provide a viable strategy for most governments. Accordingly, leaving these two sources of revenue out from the analysis does not change the substantial predictions of the formal model.

In sum, governments react to the international environment. Yet, the domestic game between the policy maker and her voters affect the government's ability to engage in international tax competition. Policy

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44 There are several reasons for that: 1. Most double taxation conventions adhere to the residence principle but only apply to interest revenue but not to business profits. 2. Empirical research points to large scale evasion of interest income (Hauffler 2001), widespread evasion of residence-based capital taxes was the main reason for reforms in Scandinavia and Austria towards a dual income tax (Genser, 1996, pp. 76-77). 2. Several studies show that a residence based interest tax is irrelevant from the perspective of international investors – non of the tax is borne by investors (Nöhrbaß and Raab 1990, Eijffinger, Huizinga and Lemmen 1998). 3. One main condition for the residence principle to work is that corporate profits of a foreign subsidiary are taxed in the residence country of the parent upon accrual, even if these profits are not distributed and repatriated. This condition is incompatible with current international law, which regards the foreign subsidiary as an independent legal entity.

makers who face strong domestic restrictions such as high budget rigidities, and strong equality needs enrooted in society have to set higher capital tax rates. This leads in turn to an increase in capital outflows in case the international tax competition is severe and the domestic capital structure is unfavourable.

### 3. The Closed Economy Case

Consider a closed economy  $j$  where citizens dispose over two sources of income: mobile capital  $M$  and income from immobile labour  $N$ . Gross national income  $Y$  is then the accumulation of all individual income from the mobile and immobile factors:  $Y=M+N$ . The government of country  $j$  generates revenue by taxing the income from the mobile base with a rate of  $\tau_{c,j}$  and the income from wage income by  $\tau_{l,j}$ , where  $c$  in the subscripts stands for capital and  $l$  for labour. The government's share of the economy equals  $(\tau_{c,j}M_j + \tau_{l,j}N_j)$ .

Following straightforward political economy modelling, the domestic policy maker minimizes a loss function in which taxation of both income types enters positively so that higher taxation augments governments' loss. Capital and labour owners react with certain elasticities ( $\alpha$  and  $\beta$  respectively) to taxation. In a closed economy we can assume that both factors are equally immobile suggesting  $\alpha = \beta$ .<sup>45</sup> Moreover, voters value the provision of public goods but punish the government for creating large deficits so that an

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45 We could also assume that  $\alpha$  and  $\beta$  stand for different impacts capital owners and wage earners exert on the government as an interest group argument. Hays (2003) for example argues that wage earners have a greater influence on government decisions in majoritarian systems and capital owners in consensus democracies.

increase in the difference between tax based revenue and government spending adds to governments' loss accordingly.

As outlined above, the strengths of societal demands for tax symmetry force fiscal authorities to consider tax equity when deciding upon taxation. The stronger the equality needs, the higher the loss of a government endorsing a large gap between labour and capital taxes. Equation (1) formalizes these different influences and displays a government's loss function in a closed economy:

$$\mathcal{L}_g^j(\tau_{c,j}, \tau_{l,j}) = \tau_{c,j}^\alpha + \tau_{l,j}^\beta + \lambda(\tau_{c,j} - \tau_{l,j})^2 + \left[ G_j - (\tau_{c,j}M_j + \tau_{l,j}N_j) \right]^2 \quad (1)$$

$$0 \leq \lambda, \alpha, \beta \leq 1$$

$\lambda$  denotes the level of equity needs in a society. It depicts how much the difference between the two tax rates influences government's loss in voter support; the larger  $\lambda$  the more policy makers must care about tax symmetry in order to satisfy voters' demands.  $G$  stands for government spending and an increasing gap between public spending and public revenue  $(\tau_{c,j}M_j + \tau_{l,j}N_j)$  impacts the loss positively.

From this equation we can derive the first order condition for the capital and labour tax rate in order to minimize the government's loss. However, the minimization problem can't be solved since  $\tau_{c,j}$  and  $\tau_{l,j}$  appear in an essentially non-linear way in equation (1). From such a complex model, it is impossible to mathematically derive the optimal capital and labour tax rates. To solve the equation, I linearize the relationship between the tax rates and government loss. This can be done without loss of generality by assuming

that rising tax rates reduce government support linearly instead of implying positive but declining marginal costs of taxation.<sup>46</sup>

Equation 2 gives the linearized form of the loss function:

$$\mathcal{L}_g^j(\tau_{c,j}, \tau_{l,j}) = \alpha\tau_{c,j} + \beta\tau_{l,j} + \lambda(\tau_{c,j} - \tau_{l,j})^2 + [G_j - \tau_{c,j}M_j - \tau_{l,j}N_j]^2 \quad (2)$$

From equation (2), it is possible to derive the first and second order conditions for loss minimizing tax rates on capital and labour. One restriction has to be imposed, though. Governments can only minimize the deficit but they cannot save:

$$[G_j - \tau_{c,j}M_j - \tau_{l,j}N_j] \geq 0 \quad (3)$$

the inequality in equation (3) must be satisfied for the model to generate a unique solution.

The first partial derivative of government loss with respect to the tax imposed on the mobile factor gives the first order condition for optimal capital taxation in a closed economy:

$$\frac{\partial \mathcal{L}_g^j}{\partial \tau_{c,j}} = -2(G_j - \tau_{c,j}M_j - \tau_{l,j}N_j) + \alpha + 2\lambda(\tau_{c,j} - \tau_{l,j}) = 0 \quad (4)$$

Setting the first derivative equal to zero and solving for  $\tau_{c,j}$  provides us with the optimal tax on capital a government should choose in order to maximize voter support. The optimal tax depends on government spending, the size of the mobile and immobile bases, equity considerations, the willingness of capital owners to pay taxes ( $\alpha$ ), and the labour tax rate.

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46 We know from logarithm-laws that non-linear relationships can be linearized in parameters without loss of generality.

$$\tau_{c,j}^{opt,closed} = \frac{2G_j M_j - \tau_{l,j} N_j M_j - \alpha + 2\lambda \tau_{l,j}}{2(M_j^2 + \lambda)} \quad (5)$$

Two things can be inferred directly from equation (5). First, we can conclude that – everything else being equal – capital taxation increases with government spending and decreases with the willingness of capital owners to pay taxes because the willingness to pay capital taxes and the size of government spending only appear once in the numerator of the equation. In addition, the smaller the immobile tax base  $N$  a government can rely on to collect revenue, the more the policy maker must, *ceteris paribus*, use the other source of taxes to raise public income and, hence, the higher the optimal capital tax rate.

The second derivative of loss with regard to capital taxation is needed in order to ensure that  $\tau_{c,j}^{opt,closed}$  indeed minimizes the loss function:

$$\frac{\partial^2 \mathcal{L}_g^j}{\partial \tau_{c,j}^2} = 2\lambda + 2M_j^2 > 0 \quad (6)$$

The second derivative in equation (6) is always positive and, therefore, confirms the conclusion that  $\tau_{c,j}^{opt,closed}$  in equation (5) minimizes government's loss and maximizes voter support.

We can follow the same procedure to receive the optimal tax rate to be imposed on the immobile factor. The partial derivative of the loss with respect to labour taxation presents the first order condition for the optimal tax rate:

$$\frac{\partial \mathcal{L}_g^j}{\partial \tau_{l,j}} = -2N_j (G_j - \tau_{c,j} M_j - \tau_{l,j} N_j) + \beta - 2\lambda (\tau_{c,j} - \tau_{l,j}) = 0 \quad (7)$$



Setting the partial derivative equal to zero and solving for  $\tau_{l,j}$  gives the loss minimizing tax rate a government should employ in order to maximize voter support:

$$\tau_{l,j}^{opt,closed} = \frac{2G_j N_j - 2\tau_{c,j} M_j N_j - \beta + 2\lambda \tau_{c,j}}{2(N_j^2 + \lambda)} \quad (8)$$

Since the model is symmetric optimal labour taxation also goes up with government consumption and the willingness of wage earners to pay taxes ( $\beta$ ). In accordance with equation (5) the optimal labour tax rate rises if governments are less able to rely on the mobile tax base  $M$ , that is, if the mobile tax base becomes smaller, *ceteris paribus*.

$$\frac{\partial^2 \mathcal{L}_g^j}{\partial \tau_{l,j}^2} = 2\lambda + 2N_j^2 > 0 \quad (9)$$

The second order condition for a minimum is always positive and proves that the labour tax rate in equation (8) partially minimizes the loss function.

### 3.1 Simulation of Closed Economy Results

Equations (5) and (8) only give partial equilibrium outcomes for optimal capital and labour taxation, whereby each optimal tax rate depends on the other. More specifically, in equations (5) and (8), clear predictions about the influence of the degree of tax symmetry ( $\lambda$ ) on the government's support are not possible because  $\lambda$  appears in the numerator and the denominator of the expression. The same holds true for the impact of the size of the mobile tax base on the optimal capital tax rate and the size of the immobile base on the optimal labour tax rate. Furthermore, the effect of the chosen labour tax

rate on the optimal taxation of the mobile factor is ambiguous since labour taxation enters the numerator of equation (5) positively and negatively, and so does the capital tax rate in equation (8) which reveals the optimal choice of wage taxation. In order to assess the impact of these factors on optimal taxation I simultaneously simulate the dependence of labour and capital taxation on the size of the tax bases and the strength of equality considerations.

Table 1 shows the optimal tax rates on capital and labour contingent upon the size of the tax bases and for different values of  $\lambda$ . The willingness capital owners and wage earners to pay taxes ( $\alpha$  and  $\beta$  respectively) are held constant at the same value of 0.5 and government spending equals 1 throughout all combinations of tax bases and demands for tax symmetry.

*Table 1: The Impact of the Size of the Mobile and the Immobile Tax Bases and the Strength of Tax Symmetry on Optimal Capital and Labour Taxation*

	$\lambda$									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
$M_j / N_j$	Optimal capital tax rate									
0.2/0.8	0.01	0.01	0.1	0.2	0.26	0.3	0.33	0.35	0.36	0.38
0.3/0.7	0.01	0.15	0.27	0.32	0.36	0.38	0.4	0.41	0.42	0.43
0.4/0.6	0.2	0.35	0.4	0.34	0.44	0.45	0.46	0.46	0.47	0.47
0.5/0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
0.6/0.4	0.7	0.6	0.57	0.55	0.54	0.53	0.53	0.52	0.52	0.52
0.7/0.3	0.74	0.65	0.6	0.57	0.56	0.55	0.54	0.54	0.53	0.53
0.8/0.2	0.76	0.66	0.6	0.58	0.56	0.55	0.54	0.54	0.53	0.53
$M_j / N_j$	Optimal labour tax rate									
0.2/0.8	0.76	0.66	0.6	0.58	0.56	0.55	0.54	0.54	0.53	0.53
0.3/0.7	0.74	0.65	0.6	0.57	0.56	0.55	0.54	0.54	0.53	0.53
0.4/0.6	0.7	0.6	0.57	0.55	0.54	0.53	0.53	0.52	0.52	0.52
0.5/0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
0.6/0.4	0.2	0.35	0.4	0.34	0.44	0.45	0.46	0.46	0.47	0.47
0.7/0.3	0.01	0.15	0.27	0.32	0.36	0.38	0.4	0.41	0.42	0.43
0.8/0.2	0.01	0.1	0.1	0.2	0.26	0.3	0.33	0.35	0.36	0.38

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As table 1 depicts, governments tax the abundant factor more heavily. In addition, the labour tax rate increases with the share of the immobile factor in the total tax base, and the optimal capital tax rate goes up if the share of mobile capital in a country is higher. This appears to be perfectly reasonable since in the closed economy case capital cannot easily flee the country. In addition the gap between optimal capital and labour taxation decreases with the degree to which voters' equality demands play an important role in policy making. The tax rate of the over-taxed factor declines if equality considerations become more prominent and the tax rate imposed on the under-taxed factor rises, so that the tax difference declines.

We can draw four *ceteris paribus* predictions from the closed economy case:

1. Optimal taxation of both factors increases with the size of government spending. Governments must avoid deficit spending and therefore have to collect revenue from both tax sources if the demand for public goods remains high.
2. Optimal capital taxation decreases with the willingness of capital owners to pay taxes and optimal taxation of the immobile factor is reduced by the willingness of wage earners to pay.
3. Governments can collect more revenue by taxing the abundant factor more heavily.
4. And the strength of tax symmetry demands enrooted in society diminishes the ability of policy makers to allow for high tax asymmetry.

In the next section I develop a more complex – but also more realistic – model for open economies which accounts for international tax competition. I compare the results of the tax competition case to the benchmark findings

of the closed economy model in order to show how capital mobility and tax competition influence the decisional trade-offs governments face.

#### 4. Taxation in Open Economies

To model the strategic interaction between governments in open countries who engage in tax competition the model has to be augmented by one important aspect: capital is assumed to be (partly) mobile between jurisdictions. From this follows that politicians have an incentive to take capital tax rates in other countries into account in order to attract mobile capital from abroad and prevent domestic capital from fleeing the country. Revenue from taxing capital then increases if the tax reduction effect falls short of the tax base effect resulting from inflow of foreign direct investments. The utility of the government is greater than in the closed economy case only if the inequality in equation (10) holds.

$$\left(\tau'_{c,j} - \tau_{c,j}\right)^{\varphi} M_j < \tau'_{c,j} \sum_{-j=1}^{N-j} \left(\tau'_{c,j} - \tau_{c,-j}\right)^{\psi} M_{-j} \quad (10)$$

The effect of tax competition is captured by the difference in capital tax rates in the domestic economy  $j$  and countries abroad  $-j$ . If the domestic capital rate  $\tau_{c,j}$  is lower than the tax rate on the mobile factor in the rest of the world  $\tau_{c,-j}$  capital flows in. However, in case the domestic tax rate exceeds the tax rate abroad, capital leaves the country. The parameters  $\varphi$  and  $\psi$  can be interpreted as elasticities of domestic and foreign capital – respectively – towards tax differences. They serve mainly the purpose to ensure that the two tax differences are always positive, so that capital flows in when the domestic tax rate undercuts the foreign tax rate and leaves the

economy when the domestic rate exceeds the rate in the rest of the world.

$M_j$  denotes domestic capital and  $M_{-j}$  stands for foreign capital.

Domestic constraints such as budget rigidities and the strength of tax symmetry demands are modelled in the same way as in equations (1) and (2) for the closed economy case. Both higher public debt and higher inequality between the two tax instruments are punished by voters and therefore enter the loss function of the government positively. As in the closed economy model,  $\lambda$  measures the strength of equity needs in country  $j$  and  $G$  measures the level of public spending in country  $j$ . The deficit might increase for two reasons. Policy makers may either spend more without an equivalent rise in tax revenue or spending stays constant and tax revenue declines due to capital flight induced by international tax competition. The willingness of wage earners to pay taxes is captured by the parameter  $\beta$ .

Unlike the closed economy model I introduce two different types of domestic capital bases to account for the degree of capital concentration and the de facto capital mobility.  $M_{1j}$  denotes a more mobile capital base such as multinational enterprises and their subsidiaries, whereas  $M_{2j}$  depicts less mobile firms which are rather medium sized or small and can be characterized by a lower ability to move capital through jurisdictions. Mobile companies  $M_{1j}$  are willing to pay taxes to the degree of  $\alpha_1$  and the less mobile capital basis  $M_{2j}$  accepts taxation with a probability of  $\alpha_2$ .<sup>47</sup> Setting  $\alpha_1 > \alpha_2$  implies that it is easier for multinationals to engage in tax arbitrage and for the mobile capital base  $M_{1j}$  to leave the country if tax rates on capital are lower abroad.

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<sup>47</sup> I linearize the model from the beginning so that  $\alpha_1, \alpha_2$  and  $\beta$  measure the acceptance of taxation by the two capital bases and wage earners and not elasticities.

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This outline of the model captures the argument that the structure of the domestic capital base influences governments' decisions about capital taxation because the ownership structure determines overall de facto capital mobility. I assume that policy makers cannot differentiate between different degrees of mobility of capital since they can only set one corporate tax rate. The overall elasticity of capital is a weighted mean of the two elasticities  $\alpha_1$  and  $\alpha_2$ . The weights depend on the relative shares of  $M_{1j}$  and  $M_{2j}$  in the total capital base. Thus, the higher the share of multinationals the higher the overall mobility of capital and the more vulnerable domestic policy makers are towards tax competition. Capital already reacts to small changes in capital tax rates in other countries and leaves the domestic economy reducing the domestic tax base. Accordingly, governments are not only concerned with attracting foreign capital bases but also with preventing domestic capital from fleeing the economy. The underlying assumption is  $\alpha_1 > \alpha_2 > \beta$ , so that the more mobile tax bases react more strongly to higher tax rates.

Shifting capital still induces costs of arbitrage and transport. Hence, more remote countries should be less attractive for capital owners than more similar and less remote trading places. The further a competitor country is away the higher the transportation costs of moving physical capital, and, thus, the higher the tax difference must be to exert an effect. Consequently, governments are more concerned with tax policies set in nearby countries and bring their own tax policy closer in line with taxation in neighbouring jurisdictions. Distance and attractiveness of a location impact the actual willingness of capital to move. Legal restrictions to capital account transactions limit the ability to move capital through jurisdictions.

Therefore, competitive pressures on governments to lower tax rates on capital should be moderated by these factors. In addition to distance and legal capital controls countries which are able to bring in mobile capital signal attractiveness to capital owners and success to other governments. Consequently, tax rates in these countries should impact the location decision of capital over-proportionally and governments should follow these successful examples more closely.

I model these effects with two parameters:  $\xi$  denotes the attractiveness of a country capturing both location decisions of capital and learning of policy makers.  $\mu$  captures distance and capital restrictions that work both towards hindering capital from moving. Equation (11) presents the loss function for a representative government in an open economy facing a competitive international environment.

$$\min_{\tau_{c,j}, \tau_{l,j}} \mathcal{L}_g^j = \frac{\alpha_1 M_{1j} + \alpha_2 M_{2j}}{M_{1j} + M_{2j}} \tau_{c,j} + \beta \tau_{l,j} + \lambda (\tau_{c,j} - \tau_{l,j})^2$$

$$+ \left[ G_j - \tau_{l,j} N_j - \tau_{c,j} \left( (M_{1j} + M_{2j}) - \left( \frac{\xi_{1-j} M_{1j} + \xi_{2-j} M_{2j}}{\mu_j} \right) (\tau_{c,j} - \tau_{c,-j})^\varphi \right) + \frac{\xi_j M_{-j}}{\mu_j} (\tau_{c,-j} - \tau_{c,j})^\psi \right]^2 \quad (11)$$

$$0 \leq \beta, \alpha_1, \alpha_2, \lambda, \varphi, \psi, \mu, \xi \leq 1 \quad (12)$$

Because of the linearization of the loss function the parameters  $\alpha_1$ ,  $\alpha_2$  and  $\beta$  in equation (11) do not measure the elasticity of capital owners and salary earners towards capital and labour taxation. Instead, they capture the weights these groups put on taxation. These parameters also measure the

ability of the three factors to avoid taxation. This is highest for the mobile tax base  $M_{1j}$ .

Equation (11) combines competitive pressures in international taxation with domestic constraints of governments. Budget rigidity and the strength of voters' equality demands limit the government's abilities to engage in tax competition. The ability of mobile capital to flee the country and the possibility of attracting foreign capital impact the size of the base a government can collect revenue from. Taxing the larger tax base more heavily still remains reasonable in order to reduce deficit spending.

Yet, the size of the mobile capital base does not remain constant and largely depends on how much governments can engage in tax competition in order to bring in capital from abroad and how well policy makers are able to keep capital from leaving their jurisdiction. The latter point hinges on the structure of domestic capital. The ability of the two capital sources  $M_{1j}$  and  $M_{2j}$  to leave the domestic economy is captured by  $\alpha_1$  and  $\alpha_2$ . The fact of  $\alpha_1$  being larger than  $\alpha_2$  recognizes the lower capability of medium and small firms to engage in tax arbitrage. Their ability to move through jurisdictions is modelled by the two attraction parameters  $\xi_{1-j}$  and  $\xi_{2-j}$ , whereby  $\xi_{1-j} > \xi_{2-j}$  indicating that less mobile firms need a larger tax difference to consider physically moving capital whereas multinationals can take profit of small differences via tax arbitrage.  $\xi_j$  denotes the attractiveness of the domestic economy for foreign mobile capital  $M_{-j}$ . Finally,  $\mu_j$  stands for domestic capital restrictions and distance hindering capital from fleeing and  $\mu_{-j}$  for capital restrictions abroad and distance hampering foreign capital to flow into the domestic economy. Overall, the



two ratios  $(\xi_{1-j} + \xi_{2-j})/\mu_j$  and  $\xi_j/\mu_{-j}$  depict the overall ability of capital to move through jurisdictions.

The taxable asset base of the closed economy becomes flexible: it increases when foreign capital flows in, triggered by lower domestic capital taxation. The taxable base declines if domestic capital leaves due to lower tax rates abroad. Governments can only win from the attraction of foreign capital if the positive tax base effect exceeds the negative tax rate effects of cutting back domestic capital taxation.

In terms of government spending, budget constraints become more severe, *ceteris paribus*, when mobile capital leaves the country and grow less problematic in case foreign capital is attracted by lower domestic tax rates.

As in the closed economy model, governments are unable to save but minimize the public deficit:

$$\left[ G_j - \tau_{c,j} \left( (M_{1j} + M_{2j}) - \left( \frac{\xi_{1-j}M_{1j} + \xi_{2-j}M_{2j}}{\mu_j} \right) (\tau_{c,j} - \tau_{c,-j})^\varphi \right) + \frac{\xi_j M_{-j}}{\mu_{-j}} (\tau_{c,-j} - \tau_{c,j})^\psi \right] - \tau_{l,j} N_j \geq 0 \quad (13)$$

Equation (14) generates the first order conditions for the optimal capital tax rate in an open economy:

$$\begin{aligned}
 \frac{\partial \mathcal{L}_g^j}{\partial \tau_{c,j}} &= \frac{\alpha_1 M_{1j} + \alpha_2 M_{2j}}{M_{1j} + M_{2j}} + 2\lambda (\tau_{c,j} - \tau_{l,j}) \\
 &+ 2 \left[ G_j - \tau_{c,j} \left[ \left( M_{1j} + M_{2j} \right) - \left( \frac{\xi_{1-j} M_{1j} + \xi_{2-j} M_{2j}}{\mu_j} \right) (\tau_{c,j} - \tau_{c,-j})^\varphi \right. \right. \\
 &\quad \left. \left. + \frac{\xi_j M_{-j}}{\mu_{-j}} (\tau_{c,-j} - \tau_{c,j})^\psi \right] - \tau_{l,j} N_j \right] \\
 &\times \left[ -M_{1j} - M_{2j} + \left( \frac{\xi_{1-j} M_{1j} + \xi_{2-j} M_{2j}}{\mu_j} \right) (\tau_{c,j} - \tau_{c,-j})^\varphi - \frac{\xi_j M_{-j}}{\mu_{-j}} (\tau_{c,-j} - \tau_{c,j})^\psi \right. \\
 &\quad \left. - \tau_{c,j} \times \left( -\varphi (\tau_{c,j} - \tau_{c,-j})^{\varphi-1} \left( \frac{\xi_{1-j} M_{1j} + \xi_{2-j} M_{2j}}{\mu_j} \right) - \frac{\xi_j \psi M_{-j}}{\mu_{-j}} (\tau_{c,-j} - \tau_{c,j})^{\psi-1} \right) \right] = 0
 \end{aligned} \tag{14}$$

and equation (15) gives the first partial derivative of government loss with respect to labour taxation which is the first order condition for a domestically optimal tax rate imposed on the immobile factor:

$$\begin{aligned}
 \frac{\partial \mathcal{L}_g^j}{\partial \tau_{l,j}} &= \beta - 2\lambda (\tau_{c,j} - \tau_{l,j}) \\
 &- 2N_j \left[ G_j - \tau_{l,j} N_j - \tau_{c,j} \times \right. \\
 &\quad \left[ \left( M_{1j} + M_{2j} \right) - \left( \frac{\xi_{1-j} M_{1j} + \xi_{2-j} M_{2j}}{\mu_j} \right) (\tau_{c,j} - \tau_{c,-j})^\varphi \right. \\
 &\quad \left. \left. + \frac{\xi_j M_{-j}}{\mu_{-j}} (\tau_{c,-j} - \tau_{c,j})^\psi \right] \right] = 0
 \end{aligned} \tag{15}$$

Unfortunately equation (14) is not solvable for  $\tau_{c,j}$ , since  $\tau_{c,j}$  appears in the equation in an essentially non-algebraic way resulting from the two parameters  $\varphi$  and  $\psi$ . In order to evaluate the impact of changes in different parameters on the optimal choice of capital taxation I simulate possible outcomes in the next section.

Obtaining the optimal tax rate for personal labour income, however, is mathematically feasible. Setting the first partial derivative to zero and solving for  $\tau_{l,j}$  gives the optimal labour tax rate in an open economy:

$$\tau_{l,j}^{opt,open} = \frac{\left[ \begin{aligned} & -2M_{-j}N_j\xi_j\tau_{c,j}\mu_j(\tau_{c,-j} - \tau_{c,j})^\psi + 2M_{1j}N_j\tau_{c,j}\mu_{-j} \times \\ & \left( \xi_{1-j}(\tau_{c,j} - \tau_{c,-j})^\varphi - \mu_j \right) + 2M_{2j}N_j\tau_{c,j}\mu_{-j} \times \\ & \left( \xi_{2-j}(\tau_{c,j} - \tau_{c,-j})^\varphi - \mu_j \right) + \mu_{-j}\mu_j(2G_jN_j - \beta + 2\lambda\tau_{c,j}) \end{aligned} \right]}{2\mu_{-j}\mu_j(N_j^2 + \lambda)} \quad (16)$$

From equation 16 we can derive one prediction directly: optimal labour taxation, *ceteris paribus*, increases with government consumption. All other variables appear more than once with different signs or both in the numerator and denominator of the right hand side of equation (16). To capture the effect of the different domestic and international variables simultaneously on capital and labour taxation, I produce simulated results for the combined optimal outcome of tax rates on corporate and wage income for different parameter settings.

Checking the second derivative with respect to  $\tau_{l,j}$  ensures that the calculated optimal labour tax rate in fact minimizes the government's loss function:

$$\frac{\partial^2 \mathcal{L}_g^j}{\partial \tau_{l,j}^2} = 2N_j^2 + 2\lambda > 0 \quad (17)$$

For positive lambda this second derivative always produces positive outcomes proving that  $\tau_{l,j}^{opt,open}$  in equation (16) minimizes the government's loss.

#### 4.1 Simulating Open Economy Predictions

Since the optimal capital tax rate cannot be derived mathematically and the formula for the optimal labour tax rate is rather complex, I simulate the optimal outcomes for taxing the mobile and immobile bases for different

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values of interesting variables. These simulation results are based on a comparative static, always giving the optimal domestic reaction to one specific combination of domestic settings and values of international variables like the foreign tax rate and the size of the mobile tax base that can be attracted from abroad. All simulations employ the settings in equation (11).

Table 2 depicts the parameter values for variables held constant throughout the different simulations.

Table 2: Parameter Settings for Variables Held Constant Throughout Different Simulations

Parameters	Table 3	Table 4	Table 5	Table 6	Table 7
$M_{1j}$	0.2	0.2		0.2	0.2
$M_{2j}$	0.2	0.2		0.2	0.2
$N_j$	0.3	0.3	0.3	0.3	0.3
$M_{-j}$	0.3	0.3	0.3		0.3
$\alpha_1$	0.6	0.6		0.6	0.6
$\alpha_2$	0.3	0.3	0.3	0.3	0.3
$\beta$	0.2	0.2	0.2	0.2	0.2
$\lambda$			0.5	0.5	0.5
$\xi_j$	0.7	0.7	0.5	0.5	
$\xi_{1-j}$	0.5	0.5	0.5	0.5	
$\xi_{2-j}$	0.1	0.1	0.325	0.3	
$\mu_j$	0.5	0.5	0.5	0.5	0.5
$\mu_{-j}$	0.5	0.5	0.5	0.5	0.5
$\varphi$	0.5	0.5	0.5	0.5	0.5
$\psi$	0.5	0.5	0.5	0.5	0.5
$G_j$			1	1	1
$\tau_{c,-j}$	0.2	0.5	0.3		
$\underline{\xi_j}$	1.4	1.4	1	1	
$\underline{\mu_{-j}}$					
$\underline{\xi_{1-j}}$	1	1	1	1	
$\underline{\mu_j}$					
$\underline{\xi_{2-j}}$	0.2	0.2	0.65	0.6	
$\underline{\mu_j}$					

#### 4.1.1 Domestic Factors

The first simulation generates the optimal capital and labour tax rates contingent upon the domestic factors strength of societal equality demands and size of government spending (table 3). Column 2 in table 2 shows the values of the parameters which remain unchanged for this simulation. Notably,  $\alpha_1 > \alpha_2 > \beta$  so that the more mobile capital base reacts more

strongly to higher capital taxation than the less mobile capital base and wage earners exhibit an even less strong reaction towards rising labour tax rates. In addition,  $\xi_{1-j} > \xi_{2-j}$  indicating that less mobile domestic capital requires a higher tax difference to consider moving to another jurisdiction. The more and less mobile capital bases are of the same size and the foreign capital tax rate  $\tau_{c,-j}$  equals 0.2 which can be seen as relatively low and therefore imposing rather high competitive pressures on the domestic economy. Table 3 displays the simulated results for these parameter settings and changing values of public spending and the need for tax symmetry.

*Table 3: Optimal Domestic Capital and Labour Tax Rates Dependent on Government Spending and Strength of Tax Symmetry Considerations in an Open Economy*

	$\lambda$									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
$G_j$	Optimal capital tax rate									
0.55	0.08	0.1	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12
0.6	0.1	0.12	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14
0.65	0.12	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.16
0.7	0.14	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.17	0.17
0.75	0.15	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
0.8	0.16	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.18
0.85	0.16	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
0.9	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
0.95	0.17	0.18	0.18	0.18	0.18	0.18	0.4	0.41	0.41	0.42
1	0.18	0.18	0.18	0.42	0.44	0.45	0.46	0.46	0.47	0.47
$G_j$	Optimal labour tax rate									
0.55	0.32	0.24	0.21	0.19	0.17	0.17	0.16	0.16	0.16	0.15
0.6	0.39	0.29	0.25	0.23	0.21	0.21	0.2	0.19	0.19	0.18
0.65	0.46	0.35	0.3	0.27	0.25	0.24	0.23	0.22	0.21	0.21
0.7	0.54	0.41	0.35	0.31	0.28	0.26	0.25	0.24	0.24	0.23
0.75	0.62	0.46	0.39	0.34	0.32	0.29	0.28	0.27	0.26	0.25
0.8	0.7	0.52	0.43	0.38	0.35	0.32	0.31	0.29	0.28	0.27
0.85	0.78	0.57	0.47	0.41	0.37	0.35	0.32	0.31	0.3	0.28
0.9	0.86	0.62	0.51	0.44	0.4	0.37	0.34	0.32	0.31	0.3
0.95	0.94	0.68	0.55	0.47	0.42	0.39	0.54	0.54	0.52	0.52
1	0.99	0.73	0.59	0.68	0.65	0.63	0.61	0.6	0.59	0.58

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As in the closed economy case both optimal domestic capital and labour tax rates increase with the size of public spending. Yet, the effect is larger for taxation of labour because wage earners are less mobile than capital and react less strongly when the labour tax rate goes up. Moreover, societal equity norms exert a strong impact on both tax instruments. Governments tax capital more heavily if symmetry demands become stronger and labour taxation declines with higher equality expectations resulting in a reduction of the gap between the two tax instruments. Again, this effect is stronger for labour taxation originating from the fact that keeping the domestic capital tax rate below the foreign tax rate of 0.2 is rational for policy makers in order to attract capital. However, if domestic constraints are very strong, if the budget is very rigid and tax symmetry demands are dominant (see the grey shaded area in table 3) undercutting the foreign capital tax rate becomes impossible and would cut government support significantly. As a consequence, the optimal domestic capital tax rate exceeds the foreign rate and the government must significantly raise both capital and labour taxation to compensate for capital outflows. Despite this development, increasing budget rigidities and strong equity demands exert the earlier discussed effects.

In table 4, I analyze the exact same situation but ease the competitive pressure. All parameter setting remain equal to those in table 3, except the foreign capital tax rate which is set to 0.5 instead of 0.2 so that the domestic government does not face severe tax competition.

*Table 4: Optimal Domestic Capital and Labour Tax Rates Dependent on Government Spending and Strength of Tax Symmetry Considerations in an Open Economy*

	$\lambda$									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
$G_j$	Optimal capital tax rate									
0.55	0.16	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
0.6	0.19	0.21	0.21	0.22	0.22	0.22	0.22	0.22	0.22	0.22
0.65	0.22	0.24	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.26
0.7	0.25	0.27	0.28	0.28	0.29	0.29	0.29	0.29	0.29	0.29
0.75	0.28	0.3	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.32
0.8	0.3	0.33	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.35
0.85	0.32	0.35	0.36	0.36	0.37	0.37	0.37	0.37	0.37	0.37
0.9	0.34	0.37	0.38	0.38	0.39	0.39	0.39	0.39	0.39	0.39
0.95	0.36	0.38	0.39	0.4	0.4	0.4	0.4	0.4	0.41	0.41
1	0.37	0.4	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.42
$G_j$	Optimal labour tax rate									
0.55	0.26	0.23	0.22	0.21	0.2	0.2	0.2	0.2	0.19	0.19
0.6	0.33	0.28	0.27	0.26	0.25	0.25	0.24	0.24	0.24	0.24
0.65	0.4	0.34	0.32	0.3	0.3	0.3	0.29	0.29	0.28	0.28
0.7	0.47	0.4	0.37	0.35	0.34	0.34	0.33	0.33	0.32	0.32
0.75	0.54	0.46	0.42	0.4	0.39	0.38	0.37	0.37	0.36	0.36
0.8	0.62	0.51	0.47	0.45	0.43	0.42	0.41	0.41	0.4	0.4
0.85	0.69	0.57	0.52	0.49	0.47	0.46	0.45	0.44	0.43	0.43
0.9	0.77	0.63	0.57	0.53	0.51	0.49	0.48	0.47	0.46	0.46
0.95	0.85	0.69	0.61	0.57	0.54	0.52	0.51	0.5	0.49	0.49
1	0.93	0.75	0.66	0.61	0.58	0.55	0.54	0.53	0.52	0.51

The results from table 3 are mainly mirrored in table 4. Government spending impacts both optimal domestic capital and labour taxation positively with a stronger influence on optimal taxation of the immobile factor since wage earners react less strongly to higher taxation. Furthermore, stronger societal equality demands diminish the gap between the two tax rates by pressuring capital taxation upwards and labour taxation downwards. If tax symmetry demands reach the maximum and budget rigidities are minimal the labour tax rate almost equals the optimal taxation of the mobile base (0.19 and 0.18 respectively). The wedge between taxation of the mobile and immobile bases increases with public spending and decreases



with equity considerations. If the foreign capital tax rate is relatively high (0.5) it remains always rational for the government to undercut this tax rate and induce capital inflows from abroad.

In the next step, I analyze the dependence of optimal taxation on the structure of domestic capital. To do so, I alter the relative sizes of the more mobile domestic tax base  $M1$  and the less mobile base  $M2$ . Additionally, I change the relative willingness of the more mobile firms to pay taxes  $\alpha_1$ . A larger  $\alpha_1$  indicates that these firms react more strongly to higher tax rates and become more willing to engage in tax evasion. Column 4 of table 2 depicts the values of unchanged parameters. Tax symmetry demands are set to a medium level and budget rigidities are relatively high. The attraction parameter for capital inflow  $\xi_j / \mu_{-j}$  is held at a neutral value of 1 whereas  $\xi_{1-j} > \xi_{2-j}$  so that more mobile companies shift capital at smaller tax differences than less mobile firms. The foreign capital tax rate equals 0.3 and is constant for all combinations of capital structure and  $\alpha_1$ .

Table 5 provides the simulation results for changes in the domestic capital structure and the reaction parameter of the more mobile base:

Table 5: Optimal Domestic Capital and Labour Tax Rates Dependent on the Mobility of  $M1$  and the Relative Sizes of the More and Less Mobile Capital Bases

	$\alpha_1$			
	0.4	0.6	0.8	1
$M_{1j} / M_{2j}$	Optimal capital tax rate			
0.5/0.01	0.29	0.28	0.25	0.21
0.4/0.1	0.29	0.28	0.27	0.24
0.3/0.2	0.29	0.28	0.28	0.26
0.2/0.3	0.29	0.29	0.28	0.28
0.1/0.4	0.29	0.29	0.29	0.29
0.01/0.5	0.62	0.61	0.6	0.6
$M_{1j} / M_{2j}$	Optimal labour tax rate			
0.5/0.01	0.51	0.5	0.48	0.45
0.4/0.1	0.51	0.5	0.49	0.47
0.3/0.2	0.51	0.5	0.5	0.49
0.2/0.3	0.51	0.51	0.5	0.5
0.1/0.4	0.51	0.51	0.51	0.51
0.01/0.5	0.76	0.76	0.75	0.75

Two predictions can be immediately drawn from the results in table 5. First, the more strongly the mobile tax base  $M1$  reacts to capital taxation the lower the government's optimal capital tax rate. This effect becomes stronger the larger the more mobile base  $M1$  as compared to the less mobile capital base  $M2$ . Thus, if multinationals and their subsidiaries dominate the domestic economy, governments have to be more careful in setting the capital tax rate and must worry about possible capital outflows due to arbitrage activities. Consequently, the larger the share of more mobile firms the higher the average de facto capital mobility and the lower the optimal domestic capital tax rate. In most situations it is rational for the domestic fiscal authority to undercut the foreign capital tax rate or set a domestic rate close to the foreign rate in order to avoid an outflow of mobile capital. This is especially true if the international tax competition is not too fierce and tax symmetry demands and budget rigidities are not too high.

## Chapter 5: A Formal Model of Taxation and Tax Competition

In case the share of the more mobile base M1 becomes small as compared to the less mobile base M2 (grey shaded area in table 5) undercutting the international rate is no longer advisable because small and medium firms react less elastically to tax differences and capital outflows are restricted. Still, the government must counterbalance even the restricted capital outflows by higher tax rates for both mobile and immobile factors.

The case for optimal domestic labour taxation is less straightforward. One would expect lower domestic capital taxes to be compensated by higher taxes on the immobile factor. This is apparently the case since the optimal labour taxes remain always higher than the domestic tax rate on capital. Nevertheless, the optimal taxation of the immobile factor increases with capital taxation because the factor labour reacts much less mobile to taxation and it is always preferable to collect revenue especially when budget constraints are strong. Societal demands for tax symmetry, in addition, only allow for a certain gap between capital and labour taxation. Thus, labour taxes have to fall when an unfavourable domestic capital structure pressures capital taxes downwards. Consequently, optimal taxation of the immobile factor labour does not so much hinge on the size of the more and less mobile capital tax bases but is driven by government spending and equity considerations.

Tables 3 to 5 jointly demonstrate that fiscal externalities induce a tax system effect. Since the mobility of all forms of capital exceeds the mobility of labour and wage earners react less strongly to higher taxation, tax competition leads to a shift of some of the burden to the immobile factor. This trend, however, highly depends on domestic factors such as public spending and the need for tax symmetry.

#### ***4.1.2 International Factors***

In this section, I discuss the influence of international factors on optimal domestic tax policy making. The level of capital tax rates abroad determines the severity of international tax competition. Tax setting in other countries determines how easy it is for domestic policy makers to attract capital and how far they can go to prevent domestic capital from leaving the country. In table 6, I change two international variables, the foreign tax rate imposed on mobile capital and the size of the capital base that can be attracted from abroad. Column 5 in table 2 displays the constant values for the other parameters in the model. Tax symmetry needs are moderate, budget rigidities are rather high, mobile capital reacts strongest to growing taxation, followed by less mobile firms and wage earners, and multinationals require less of a tax difference in order to shift capital abroad than medium and small firms.

Table 6: Optimal Domestic Capital and Labour Tax Rates Dependent on the Capital Tax Rate Abroad and the Size of the Foreign Capital Basis

	$\tau_{c,-j}$									
	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.5	0.6
$M_{-j}$	Optimal capital tax rate									
0.05	0.33	0.33	0.33	0.2	0.25	0.3	0.35	0.4	0.49	0.58
0.1	0.33	0.33	0.33	0.2	0.25	0.29	0.34	0.39	0.48	0.56
0.15	0.33	0.33	0.33	0.19	0.24	0.29	0.34	0.38	0.47	0.54
0.2	0.33	0.33	0.33	0.19	0.24	0.29	0.33	0.38	0.45	0.52
0.25	0.33	0.33	0.33	0.19	0.24	0.28	0.33	0.37	0.44	0.5
0.3	0.33	0.33	0.33	0.19	0.24	0.28	0.32	0.36	0.43	0.49
0.35	0.33	0.33	0.33	0.19	0.23	0.27	0.32	0.35	0.42	0.48
0.4	0.33	0.33	0.33	0.19	0.23	0.27	0.31	0.35	0.41	0.47
0.45	0.33	0.33	0.33	0.18	0.23	0.27	0.31	0.34	0.41	0.46
0.5	0.33	0.33	0.33	0.18	0.22	0.26	0.3	0.34	0.4	0.46
$M_{-j}$	Optimal labour tax rate									
0.05	0.58	0.58	0.57	0.47	0.5	0.53	0.56	0.6	0.65	0.71
0.1	0.58	0.58	0.57	0.47	0.5	0.52	0.56	0.59	0.64	0.69
0.15	0.58	0.58	0.57	0.46	0.49	0.52	0.56	0.58	0.64	0.68
0.2	0.58	0.58	0.57	0.46	0.49	0.52	0.55	0.58	0.62	0.66
0.25	0.58	0.58	0.57	0.46	0.49	0.51	0.55	0.57	0.61	0.64
0.3	0.58	0.58	0.57	0.46	0.49	0.51	0.54	0.56	0.6	0.63
0.35	0.58	0.58	0.57	0.46	0.48	0.5	0.54	0.55	0.59	0.62
0.4	0.58	0.58	0.57	0.46	0.48	0.5	0.53	0.55	0.58	0.61
0.45	0.58	0.58	0.57	0.45	0.48	0.5	0.52	0.54	0.57	0.6
0.5	0.58	0.58	0.57	0.45	0.47	0.49	0.52	0.54	0.56	0.59

For the given domestic settings governments do not always have the ability to undercut tax rates abroad and engage in tax competition. If domestic constraints are too severe the price of playing the tax competition game would be too high with respect to voter support.

The grey shaded area in table 6 demonstrates that a country with relatively high public spending, medium levels of tax symmetry demands and equal shares of more and less mobile companies cannot underbid low foreign tax rates (below 15% in the present example). In this case both capital and labour taxes have to rise significantly above the foreign capital tax rate to compensate the diminution of the mobile tax base caused by capital flight. If

countries engage in tax competition, optimal capital taxation declines in accordance with reductions of tax rates abroad. This effect is the stronger the larger the foreign capital bases. Fiscal authorities tend to undercut foreign capital tax rates the more, the bigger the pie from which they can obtain slices by engaging in tax competition.

The same effect can be observed for optimal domestic labour taxation which is mainly a result of the tax symmetry demands that force labour taxation down if capital tax rates decrease. Moreover, budget rigidities put the screws on governments to generate revenue mostly by taxing wages since wage earners are much less mobile.

In a final stage I analyze the theoretical effect the attraction parameters have on capital flows and domestic taxation.<sup>48</sup> Table 7 shows simulation results for different values of  $\xi_{-j}$  measuring the attractiveness of other countries including the willingness and ability of domestic firms to move capital and  $\xi_j$  depicting the attractiveness of the domestic economy for foreign capital, as well as different foreign capital tax rates. Column 6 in table 2 again displays the parameter settings for the variables held constant throughout the simulations. Because the distance and capital restriction parameters ( $\mu_j$  and  $\mu_{-j}$ ) remain unchanged only  $\xi_{-j}$  and  $\xi_j$  account for differences in willingness and ability to move capital through jurisdictions.

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<sup>48</sup> I combine  $\xi_{1-j}$  and  $\xi_{2-j}$  into one parameter  $\xi_{-j}$  since the two capital bases have the same size and the combined parameter is then just the mean of  $\xi_{1-j}$  and  $\xi_{2-j}$ .

Table 7: Optimal Domestic Capital and Labour Tax Rates Dependent on the Capital Tax Rate Abroad and on the Attractiveness of the Foreign and the Domestic Economy

	$\tau_{c,-j}$									
	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.5	0.6
$\xi_j / \xi_{-j}$	Optimal capital tax rate									
0.9/0.1	0.67	0.67	0.66	0.66	0.66	0.65	0.3	0.33	0.4	0.45
0.8/0.2	0.56	0.56	0.56	0.56	0.55	0.26	0.3	0.34	0.4	0.46
0.7/0.3	0.43	0.44	0.44	0.44	0.23	0.27	0.31	0.35	0.41	0.47
0.6/0.4	0.33	0.33	0.33	0.19	0.23	0.27	0.31	0.35	0.42	0.48
0.5/0.5	0.25	0.25	0.14	0.19	0.24	0.28	0.32	0.36	0.43	0.49
0.4/0.6	0.19	0.19	0.14	0.19	0.24	0.28	0.33	0.37	0.44	0.51
0.3/0.7	0.15	0.1	0.15	0.19	0.24	0.29	0.34	0.38	0.46	0.53
0.2/0.8	0.12	0.1	0.15	0.2	0.24	0.29	0.34	0.39	0.48	0.55
0.1/0.9	0.1	0.1	0.15	0.2	0.25	0.3	0.35	0.39	0.49	0.58
$\xi_j / \xi_{-j}$	Optimal labour tax rate									
0.9/0.1	0.79	0.79	0.78	0.78	0.78	0.77	0.51	0.53	0.56	0.58
0.8/0.2	0.73	0.73	0.73	0.73	0.72	0.49	0.52	0.54	0.57	0.59
0.7/0.3	0.65	0.65	0.65	0.65	0.48	0.5	0.53	0.55	0.58	0.61
0.6/0.4	0.58	0.58	0.57	0.46	0.48	0.5	0.53	0.55	0.59	0.62
0.5/0.5	0.52	0.52	0.43	0.46	0.49	0.51	0.54	0.56	0.6	0.63
0.4/0.6	0.48	0.48	0.43	0.46	0.49	0.51	0.55	0.57	0.61	0.65
0.3/0.7	0.45	0.4	0.44	0.46	0.49	0.52	0.55	0.58	0.63	0.67
0.2/0.8	0.43	0.4	0.44	0.47	0.49	0.52	0.56	0.59	0.64	0.69
0.1/0.9	0.41	0.4	0.44	0.47	0.5	0.53	0.56	0.59	0.65	0.71

The grey shaded area in table 7 depicts instances in which a government cannot engage in tax competition and must maintain capital tax rates well above the international capital tax rate. The reason for this is twofold. On the one hand, domestic restrictions keep policy makers from underbidding foreign capital tax rates if these are very low and tax competition becomes too brutal. On the other hand, governments can impose higher tax rates without losing large parts of the domestic capital base if other countries do not appear to be very attractive and firms have a strong home bias. Yet, the larger the incentive for mobile capital to leave the country the more governments try to match the foreign tax rate in order to prevent capital from fleeing (see columns 2 and 3 in table 7).

Another mechanism can be observed as well: in case fewer domestic constraints and less severe tax competition enable domestic policy makers to undercut the foreign capital tax rate, they do so the higher the attractiveness of the own country and the less able or willing domestic capital is to leave (columns 3 – 10 in table 7). Thus, the stronger the signal of another country displaying its capability to attract FDI, the stronger the tax competition effect for the domestic economy. As a consequence if a domestic government faces a successful country it should adapt its own tax policy much more to the tax policy of this country than to tax policy making in other countries. The simulation results in table 7 also suggest that the government's interest lies mostly in keeping mobile tax bases from leaving the country. The combined effect of tax rates on mobile factors abroad, attractiveness of other countries, and the share of highly mobile capital in the domestic economy shape the severity of tax competition.

### **5. Hypotheses**

The sketched political logic of domestic taxation leads to clear predictions of my theoretical model. These propositions result from the differences in and the simultaneous influence of the strength of domestic budget rigidities, tax symmetry considerations and the ownership structure of the domestic capital base. The following hypotheses can be derived from the formal theoretical model:

H1: Capital tax rates set in other countries exert a positive effect on capital tax rates in the domestic economy (tax competition effect). In addition there is a positive tax competition effect on the domestic labour tax rate.



H2: Foreign attractiveness and the willingness and ability of domestic capital to move increase the tax competition effect. Therefore, policy makers adapt domestic tax policy closer to countries successful in attracting mobile tax bases.

H3: The presence of societal demands for tax symmetry counterbalances the tax competition effect. The stronger the equality needs of the electorate, *ceteris paribus*, the higher domestic capital tax rates, the lower domestic labour tax rates and the smaller the gap between capital and labour tax rates.

H4: Budget rigidities counteract the downward pressure of international tax competition. Higher government spending induces both domestic capital and labour tax rates to rise and has a slight increasing effect on the tax ratio.<sup>49</sup>

H5: A higher domestic share of highly mobile capital increases the *de facto* capital mobility and, thus, exerts a downward pressure on the domestic capital tax rate which widens the gap between capital and labour taxation.

Table 8 gives a summary of all predictions generated by the formal theoretical model. These predictions are put to a quantitative empirical test in the next chapter.

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<sup>49</sup> In a dynamic 3 country model Plümper et. al (2006) even can conclude that a combination of both budget constraints and fairness norms reduces the severity of tax competition (if all governments are constraint) or the ability of countries to compete (if some governments are constraint).

*Table 8: Summary of Hypotheses<sup>50</sup>*

	Capital Taxes	Labour Taxes	Tax ratio Labour/capital
Equity needs	+	--	--
Share of highly mobile capital	-	NA	+
Spending/ budget rigidities	+	++	+
Tax competition	++	+	+
Foreign attractiveness*foreign tax rate	++	+	NA

## 6. Conclusion

The theory presented in this chapter is based on the assumption that governments attempt to reach competing policy goals with two tax instruments at hand. In deciding upon a vote maximizing tax policy, politicians face several decisional trade-offs resulting from domestic demands for public goods and tax symmetry and they are additionally pressured by international competition for mobile capital. Three competing policy aims can be identified: First, the domestic electorate simultaneously favours low taxation and high levels of government spending creating a dilemma for policy makers using tax revenue to provide public goods. Second, since the median voter is a wage earner rather than a capital owner, s/he prefers a more equal distribution of tax burdens. And third, policy makers have to prevent capital from leaving the domestic economy despite international competition for mobile factors.

Because it is impossible for governments to reach these policy goals simultaneously, they choose a combination of tax rates on mobile and

<sup>50</sup> + positive effect, ++ strong positive effect, - negative effect, -- strong negative effect, NA - no predicted effect.

immobile factors and public good provision that minimize their political loss or maximizes their voter support under these constraints.

The degree of budget rigidities and the strength of societal equality needs vary across countries and the severity of tax competition pressures is contingent on legal restrictions to capital transactions and the ability and willingness of capital owners to move capital to other jurisdictions. Based on this logic we can neither expect a race to the bottom in capital taxation nor convergence of national tax systems. From the theoretical reasoning I can rather draw the conclusion that tax rates on mobile capital remain persistently high and optimal domestic tax mixes continue to vary greatly across countries.

The formal theoretical model creates precise predictions on how the different trade-offs governments face impact the choice of domestic tax levels. Policy makers who are confronted with only weak domestic restrictions – low budget rigidities and societal equality demands – and a domestic economy dominated by multinationals and FDI are willing and capable to strongly engage in tax competition. Those countries can largely undercut capital tax rates abroad and benefit from attracting mobile bases. They also can shift large parts of the tax burden towards wage earners since symmetry considerations are not strong. As a consequence, tax rates on capital turn out to be very low and tax rates on wage income increase significantly.

Other domestic policy makers find themselves in a situation of mixed constraints, such as relatively high spending requirements and strong demands for tax symmetry but highly mobile domestic capital. These governments have to raise taxes in order to produce a sufficient amount of

public goods but they are unable to shift taxes from capital to labour. In addition, they need to prevent mobile capital from moving to other jurisdictions. In order to find a balance between these different aims, policy makers might not be able to undercut foreign capital tax rates. Still, they need to keep domestic capital taxation close to tax rates on mobile factors abroad in order to minimize the gap between domestic and foreign capital taxation, so as to limit the incentives for domestic capital owners to engage in tax arbitrage. The effects of tax competition on the domestic tax system remain moderate. Tax rates on capital and labour reach medium levels and so does the gap between the two tax instruments.

Finally, the model also shows that if we can observe high budget constraints and tax symmetry demands in a country accompanied by a favourable domestic capital structure (mainly medium and small firms) and low de facto capital mobility, fiscal authorities are both unwilling and unable to play the tax competition game hard. As firms need high tax incentives to physically move capital and both high spending and equity considerations impede very low tax rates on capital, the benefits from engaging in tax competition remain low and are outweighed by the political support a government can gain from providing larger amounts of public goods and keeping the gap between taxes on capital and labour small.

In sum, the proposed formal theory of tax competition and taxation differs from existing models in various respects. By making the crucial assumptions more realistic, my model is able to explain different developments and trends in domestic taxation over the last decades. First, relaxing the assumption of perfect capital mobility and introducing the concept of de facto capital mobility allows explaining the non-convergence

## Chapter 5: A Formal Model of Taxation and Tax Competition

of tax rates on capital to zero. Second, the simultaneous analysis of tax rates on mobile and immobile sources permits incorporating the distributional conflict between capital owners and wage earners which shapes the incentives of governments on how to choose a specific domestic tax system. And third, analyzing countries which are heterogeneous in several respects helps to explain the emerging pattern of tax policies across OECD countries.

## **Chapter 6: Design of the Empirical Analysis**

### **1. Research Design**

Levels of domestic tax rates on capital and labour are the result of strategic interaction between governments and domestic trade-offs policy makers face while making decisions. This political logic has to be translated into the appropriate statistical model in order to test the underlying mechanisms. Empirical studies on tax competition have dealt with the strategic nature of tax policy making in different ways. First, the majority of statistical analysis does not account for the fact that domestic tax rates on capital depend on foreign tax setting and vice versa (Swank 1997, Swank and Steinmo 2002, Garrett and Mitchell 2001, Garrett 1995, Quinn 1997 among others). Not incorporating this aspect into the econometric model necessarily leads to an upward bias of the estimated domestic effects. Second, a number of studies included the capital tax rate of the United States into the right hand side of the estimation equation in order to evaluate the influence of the dominant actors' policy (Swank 2006). Doing so, however, does not permit to distinguish whether other countries followed the lead of the US or responded similarly to the same exogenous shock. A third group of empirical studies incorporated evenly weighted spatial tax lags into their models (Hays 2003, Winner 2004, Egger et. al 2005). While this approach takes the strategic nature of tax competition into consideration, it does not allow for signalling and learning effects.

The quantitative model I am proposing in the following two chapters accounts for strategic interaction between governments, but allows policy makers to weight tax rates set in other jurisdictions differently. I subject all

predictions generated by the formal model to a rigorous empirical test by examining the hypotheses quantitatively with yearly data for 23 OECD countries over thirty years. The empirical analysis should provide evidence to whether the arguments brought forward find support in the real world.

The statistical model accounts for the strategic nature of the tax competition game by employing a spatial panel data approach where included spatial lags of the dependent variable are instrumented to control for possible endogeneity bias. As Franzese and Hays (2007) argue, including spatial lags is necessary for examining the strategic effects of tax competition. Not incorporating this important aspect leads to upward biased coefficients of domestic effects (Franzese and Hays 2007). Using spatial capital tax lags as an additional explanatory variable, though, creates an endogeneity problem because tax rates on mobile factors in one country hinge on tax rates in other jurisdictions and vice versa. Not taking adequate measures to control for endogeneity might lead to a downward bias of domestic effects (Franzese and Hays 2007). By estimating a two stage least squares (2SLS) model including spatial tax lags instrumented with adequate economic and political variables the econometric model specifically addresses spatial interdependence and possible endogeneity problems.<sup>51</sup>

I do not treat the spatial lag variable as merely nuisance because I am interested in the substantial effects of foreign capital taxation. Accordingly, I employ not only arbitrarily weighted spatial lags but theoretically informed weights following work of Franzese and Hays (2007) and Basinger and Hallerberg (2004). These substantial weights also allow

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51 A detailed discussion of the econometric specification of the 2SLS IV model can be found in the next chapter.

testing the hypothesis that governments learn from countries successful in attracting foreign capital bases. Swank (2004) argues that policy makers learn from the dominant actor – in the context of taxation in the US – which triggered neoliberal tax reforms in OECD countries by its tax reform act of 1986. Swank includes the US capital tax rate to the right hand side of the statistical model in order to test this assertion. Yet, a significant coefficient for this variable can be hardly distinguished from a common shock to all countries initiated by higher capital mobility to which governments reacted differently due to dissimilar domestic settings.

In contrast, I formalize the learning aspect by suggesting that policy makers learn from countries which prove to be successful in attracting mobile capital. Moreover, I suggest that governments care more about policy making in geographically closer jurisdictions. I, thus, use foreign direct investment, the capital formation, GDP per capita (Basinger and Hallerberg 2004) and distance as weights for the spatial lags of capital tax rates.

Most empirical studies only analyze capital tax rates and neglect the effect of international pressure on the tax system and taxation of the immobile factor. As discussed in the theoretical chapters, only a simultaneous analysis of tax rates on mobile and immobile sources can provide a satisfactory account of the emergence of different tax systems across OECD countries. Since the formal model generates predictions not only with respect to capital taxation but also labour taxation and the ratio between labour and capital taxation, I run separate empirical tests for these different dependent variables. I also use different operationalizations of the dependent capital tax rate as to take different aspects of the theoretical predictions into



account. Various sets of political and economic control variables are included to assess the robustness of the estimation results.

In order to examine the predictions with regard to domestic constraints and voter preferences, I incorporate government spending, tax symmetry considerations and measures for the de facto mobility of the domestic capital into the right hand side of the econometric model. Furthermore, I control for political and institutional variables found to exert a significant impact on capital taxation (Hays 2003, Basinger and Hallerberg 2004).

## 2. Case Selection

The empirical analysis employs panel data for 23 OECD countries from 1975 to 2005.<sup>52</sup> I only look at advanced economies for two reasons. First, the theoretical argument is tailored to democratic regimes where the government depends on voter support in order to stay in office. All OECD member states adhere to democratic norms and rules. They are similar enough for the theoretical model to be applicable, yet, divers enough to provide sufficient variance for employing inference-statistical techniques. Second, information needed for calculating efficient tax rates on capital and

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<sup>52</sup> This sample is significant larger than samples used in earlier analyses of domestic taxation especially in terms of included countries. Most studies include 12-14 OECD countries dependent on the endogenous variables used (see Hays 2003, Swank and Steinmo 2002, Basinger and Hallerberg 2004). The 23 countries are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, Norway, New Zealand, Portugal, Spain, Sweden, Switzerland, the UK, and the US. Due to missing values in the OECD National Account Statistics I was unable to compute effective capital tax rates for Japan. The maximal number of observations is 688 for effective labour tax rates, 689 for top corporate tax rates, 638 for effective capital tax rates and 637 for the tax ratio. For Luxembourg and Iceland I could not gather information for some right hand side variables. Italy does not provide information on political variables and for Switzerland no data on legislative polarization and executive constraints was available. Some economic variables only start in 1980 or don't have observations after 2000.

labour are only available in a comprehensive way for OECD member states. Third, adequate data for operationalizing societal demands for tax symmetry as well as the domestic capital structure can be obtained solely for these countries.

I do not take the four new Eastern-European OECD members – Slovak Republic, Czech Republic, Hungary and Poland – into account since for these countries reliable data is only available from 1990 or later. Moreover, governments in these countries still experiment with different tax principles and tax systems, so that changes in tax rates can be caused by other factors than those in the focus of this study which would impede detecting the discussed causal mechanisms. For data availability reasons I also exclude Mexico, Korea and Turkey from the empirical analysis.

With respect to the analyzed time period, including the three decades from 1975 to 2005 is based on theoretical and data availability reasons. From a theoretical point of view, many authors argue that tax competition started with the US corporate tax reform act in 1986 (Swank 2006, Swank and Steinmo 2002, Genschel 2002). However, as empirical facts suggest smaller countries like Ireland and the Benelux states reacted to competitive pressures even earlier. Thus, an earlier starting point seems to be adequate. I choose the year 1975 because data for most variables can be obtained from this year onwards. Furthermore, it is reasonable to expect that domestic factors like budget rigidities and demands for tax symmetry had an influence on tax policy making even before tax competition put domestic tax systems under additional stress. In order to detect whether the choice of the first year has an impact on the empirical results, I alter the starting point successively from 1975 to 1985. The important empirical results remain by

and large unchanged.<sup>53</sup> This finding probably results from the fact that I employ a fixed effects specification where only the within variation is considered and, hence, initial differences between countries become less important.

### **3. Design and Measurement of the Dependent Variables**

Since I want to explain the effects of international tax competition and domestic factors on both the capital taxation and the tax system simultaneously, I analyze labour tax rates, capital tax rates and the ratio of labour taxes divided by capital taxes to account for tax system effects. Estimation results can be contingent on the operationalization of the dependent variable. In order to avoid this problem I employ two different measures to account for taxation of mobile capital: First, I use average effective tax rates as proposed by Mendoza et al. (1994) and further developed by Volkerink and De Haan (2001). And second, I analyze marginal corporate tax rates which can be gathered from the World Tax Database and the OECD.<sup>54</sup>

The discussion of the literature on tax-cut-cum-base-broadening strategies has revealed that capital owners partly base their location decisions on statutory tax rates to reduce information costs. Statutory tax rates serve as a signal for effective tax rates. Tax-cut-cum-base-broadening policies are widely applied by governments in order to react to international tax competition pressures and counterbalance possible revenue losses.

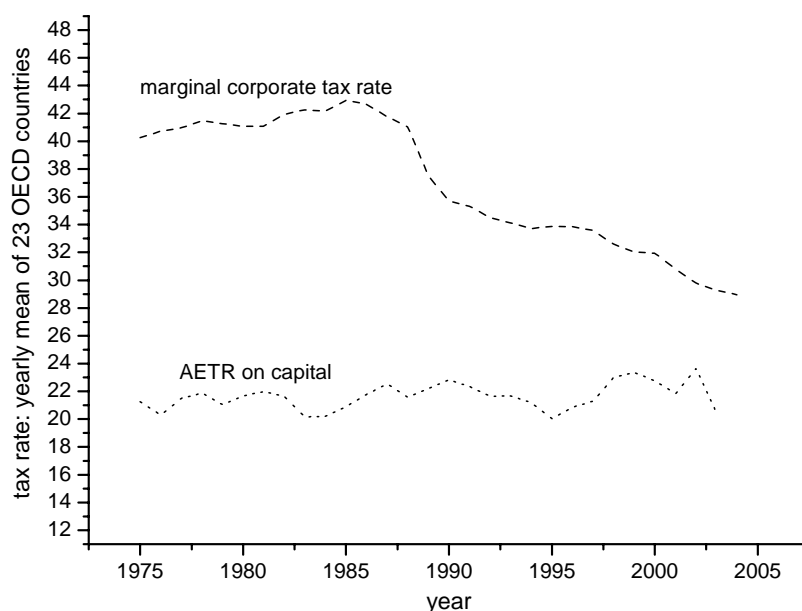
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<sup>53</sup> See robustness tests in Chapter 7, Subsection 4.1.

<sup>54</sup> For cases where data from both sources is available the tax rates correspond perfectly. I, therefore use OECD data mainly to fill in missing values in the data gathered from the World Tax Database.

Consequently, the effect of tax competition for marginal corporate tax rates should be stronger than for effective capital tax rates since effective tax rates account for base broadening strategies such as reducing the possibilities of tax exemptions. Figure 3 depicts this expectation graphically: For the 23 countries in the sample the mean top corporate tax rates show a clear downward trend between the mid-1980s and 2005 whereas the mean effective capital tax rate remains relatively stable over time.

*Figure 3: Mean Marginal Corporate Tax Rate and Mean Effective Capital Tax Rate.*



For operationalizing tax rates on wage income, I follow the suggestion of Volkerink and De Haan (2001) who provide a method to calculate effective tax rates on labour. In this case I do not use marginal personal income tax rates as personal taxes are not only based on wage income but also on capital income, e.g. distributed corporate profits. Accordingly, only average effective tax rates allow a direct comparison between capital and labour tax burdens. Therefore, I also employ average effective labour and capital rates to compute the tax ratio which approximates the implemented tax system.

Effective tax rates are widely used in research on tax competition because they allow not only comparing capital and labour taxation but they also account for tax-cut-cum-base-broadening strategies. Still, the employment of this measure remains not uncontested. Especially information on national tax revenue used to compute effective tax rates is often considered inadequate to capture real taxation. Devereux et al. (2002) give an exhaustive overview over advantages and disadvantages of analyzing effective tax rates. I try to overcome these critiques by using both effective and statutory tax rates to operationalize capital tax burdens.

Mendoza et al. (1994) calculate the average effective tax rates by classifying tax revenues according to the macroeconomic tax base from which they derive – capital, labour and consumption – and then expressing them as a share of this tax base. This ensures that personal tax revenues are considered according to the tax base from which they are gathered and that tax base effects are controlled for. These effective tax rates can be constructed by comparing measures of aggregate post and pre-tax incomes and prices. Volkerink and De Haan (2001) give a detailed overview of different strategies to calculate effective tax rates and discuss advantages and disadvantages of all measures. Building on previous work of Mendoza et al. (1994) they provide a new method and formulas for calculating average effective capital and labour tax rates. I base my own calculations for the 23 countries in my sample on their method and compute effective capital and labour tax rates. All data needed to construct these variables can be obtained

from the OECD Revenue Statistics (various issues) and National Accounts (Volume II, detailed tables, various issues).<sup>55</sup>

Equations (18) and (19) depict the formulas for constructing effective capital and labour tax rates as Volkerink and De Haan suggest:

$$LAB = \frac{\alpha 1100 + 2100 + 2200 + 3000}{CoE + 3000} \quad (18)$$

$$CAP = \frac{(1 - \alpha)1100 + 1200 + 4000 + 5125 + 5212 + 6100}{OS - 3000} \quad (19)$$

where  $\alpha$  denotes the fraction of the revenue from personal income taxation (1100) that can be attributed to (employed) labour income. Consequently,  $(1 - \alpha)$  is the fraction that can be attributed to capital income. However, this information is not available for all countries and years and splitting the personal income tax revenue into capital and labour income presents a major difficulty. Volkerink and De Haan (2001) suggest approximating  $\alpha$  by

$$\alpha^* = \frac{CoE}{OSPUE + CoE} \quad (20)$$

This approach seems to be adequate since for countries allowing for an exact distinction between tax revenue from labour and capital income the correlation coefficient between  $\alpha$  and  $\alpha^*$  equals 0.91. The numerical codes in the formulas correspond to the OECD classification in the OECD Revenue Statistics: 1100 – Taxes on income, profits, and capital gains of individuals; 1200 – Corporate taxes on income, profits, and capital gains; 2100 – Social security contributions of employees; 2200 – Social security

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<sup>55</sup> Different editions of the Revenue and National accounts statistics slightly differ in the provided figures. Volkerink and De Haan (2001) discuss difficulties of the OECD data and provide a guide how to deal with missing data. I follow their suggestions.

contributions of employers; 3000 – Taxes on payroll and workforce; 4000 – Taxes on property; 5125 – Taxes on investment goods; 5212 – Motor vehicle duties, not paid by households; and 6100 – Other taxes solely paid by business. For the OECD National Accounts Mendoza et al. (1994) and Volkerink and De Haan use abbreviations in capital letters: OS – Total operating surplus of the economy; OSPUE – Operating surplus of private unincorporated enterprises; CoE – Compensation of employees which includes wages and salaries plus social security contributions of employers and employees.

As the included categories show, not only direct taxation of capital and labour income enters the calculation of effective tax rates but also social security contributions. The social security contributions payable by employers increase the costs per unit of labour and higher contributions decrease the attractiveness of the location.

Volkerink and De Haan (2001) provide data which is relatively limited in terms of covered countries and years. Effective labour and capital tax rates are calculated until 1996 for nine, respectively eight OECD countries. I calculated effective capital and labour tax rates for 23 OECD countries between 1975 and 2005. Since the data provided by the OECD differs slightly from edition to edition and the definition of revenue and national account categories was changed for later editions, my calculations do not perfectly match the results of Volkerink and De Haan. The correspondence is relatively high, though.<sup>56</sup>

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<sup>56</sup> The correlation between effective capital tax rates constructed by Volkerink and De Haan as well as by me amounts to 0.73 and reaches 0.93 for effective labour tax rates.

#### **4. Empirical Model**

In the previous chapter I have theoretically modelled tax competition as strategic interaction between two countries – or one country and the rest of the world – competing for mobile capital. Specifically, I designed the reaction of the government in country  $j$  to international tax competition pressures and domestic requirements. Since the model essentially formalizes a strategic game between countries, the decision of policy makers about the optimal tax system does not only depend on domestic settings but also heavily hinges on tax policy choices in other jurisdictions. This strategic element of tax competition translates into a regression model where the tax rate of country  $j$  in year  $t$  is regressed on the tax rates in all other economies in year  $t$  in order to account for the described strategic tax competition effect.

Modelling strategic dependence among countries in fiscal policy making results in spatial interdependence and contemporaneous correlation. Given the strategic element of the model, the regression analysis faces a severe endogeneity problem resulting from the fact that the tax rate in country  $j$  depends on tax rates in all  $-j$  jurisdictions and vice versa. The explanatory right hand side variable foreign taxation is not purely exogenous because it covaries with the error term violating one of the GAUSS-MARKOV assumptions and leading to biased estimation results.

Hays and Franzese (2007) reanalyze an empirical study of taxation by Swank and Steinmo (2002) who do not include spatial lags of the dependent variable into the right hand side of the regression model. They demonstrate that not including spatial lags of the dependent variable leads to omitted variable bias resulting in over-estimation of domestic effects. Yet, including



spatial lags into the right hand side induces endogeneity bias resulting in the over-estimation of the international tax competition effect and downward biased coefficients for domestic variables.

There are several solutions to the estimation problem. One can treat the endogeneity bias as pure nuisance and relegate the spatial effect to the error term by using OLS with panel corrected standard errors (Beck and Katz 1995). Or we can include a spatial lag of the error term to the right hand side of the mean equation (Franzese and Hays 2007). Since I am substantially interested in the strategic effect of tax competition, I opt for a two stage least squares instrumental variable approach where the spatial lag of the dependent variable is added to the right hand side of the estimation equation. To overcome endogeneity bias, I instrument the spatial lag with exogenous variables not correlated with the error term. Doing so should provide reliable estimation results and allow a rigorous test of the hypotheses without producing biased coefficients.

As the theoretical model makes predictions about the diffusion path which depends on the attractiveness of a country and the distance between competing jurisdictions, I employ substantially weighted averages of foreign capital tax rates. I follow the suggestions of Basinger and Hallerberg (2004) in determining suitable variables for weighting the spatial tax lags. First, they employ GDP as a weight, arguing that governments pay greater attention to tax policy in larger economies. Second, fixed capital formation is used because states are sensitive to capital stocks which indicate potential rather than actual capital flows. And third, they weight the spatial tax lags by FDI in order to account for the fact that states also consider capital flows.

Based on my theoretical argument, actual capital flows are the most important weight since they provide a signal both to capital owners and policy makers in other countries. Governments adapt their own tax policy closer to countries successful in attracting mobile tax bases and companies deem countries with high foreign capital inflow as potentially attractive locations to shift capital to. Accordingly, I use net FDI inflows as weight for capital taxation abroad. Furthermore, distance seems to be an important factor because physically moving capital to countries farther away induces higher transportation costs.

Even though I include a variety of domestic factors into the right hand side of the estimation equation, the probability remains relatively high that other cultural or institutional variables – unique to each country but immeasurable – influence policy outcomes and are correlated with other right hand side variables. In order to control for country specific effects I include country dummies to the explanatory side of the statistical model. This seems to be appropriate since the Hausman-test (Hausman 1978) indicates that explanatory variables covary with unobserved country specific effects. Not controlling for fixed effects could, therefore, seriously bias the estimation results.

I add country fixed effects despite the widely discussed disadvantages of doing so (Beck and Katz 2001, Plümper et al. 2005, Plümper and Troeger 2007). On the one hand not including fixed effects can induce serious bias if explanatory variables are correlated with the country specific effects. On the other hand including fixed effects can produce highly inefficient and, thus, unreliable point estimates (Plümper and Troeger 2007). Plümper and Troeger (2007) show using Monte-Carlo simulations that fixed effects

estimation can be very inefficient for variables where the between variation is relatively high as compared to the within variation.

Acknowledging the arguments in these debates, I estimate a fixed effects model for two reasons: First, the Hausman-test suggests that not employing fixed effects could bias the estimation results and second, all interesting explanatory variables are characterized by a within standard deviation exceeding the between standard deviation or at least not falling short of it. This suggests that implementing alternative estimation procedures such as the fixed effects vector decomposition technique (*fevd*) proposed by Plümer and Troeger (2007) is not necessary (see table 9 in the next section for descriptive statistics).

Yet, two explanatory variables might be problematic from this perspective: government consumption for which we obtain a between to within ratio (b/w-ratio) of 2.6 and trade openness with a ratio of 3.6. A b/w-ratio of 2.6 characterises a borderline case for using the *fevd* procedure, whereas a ratio of 3.6 provides a clear indication that the *fevd* model could produce more reliable estimation results (Plümer and Troeger 2007). However, the level of the within variation for both variables appears to be relatively high (1.47 for government consumption and 11.62 for trade openness) and Plümer and Troeger (2007) admit that the differences in Root Mean Squared Errors for their proposed *fevd* procedure and a fixed effects model is significant but not large in such a case. Based on these considerations, I use a within transformation for all variables and interpret the coefficients for these two variables with caution. Two other variables in table 9 (chapter 7) have a very high between to within variance ratio: 7.9 for FDI inflows and 11.1 for total population. However, FDI inflows are only used as weight for spatial

lags and I do not directly calculate the effect of FDI inflows on the dependent variables. With regard to the population variable, I employ total population only as an excluded instrument and do not interpret the coefficient in a meaningful way. In addition, the level of within variance for both variables turns out to be relatively high, reducing the inefficiency problem of the fixed effects model.<sup>57</sup>

I estimate all models for capital, labour taxation and the tax ratio in levels,<sup>58</sup> based on the following thoughts: The theory presented in the previous chapters suggests that governments orient their tax policy decisions at levels of tax rates set in other countries. It is not only the case that domestic policy makers react to tax reforms – thus changes in tax rates abroad – but they also slowly adapt the domestic tax rates to tax levels dominating the international competition. Looking at changes would prevent testing this part of the story. Moreover, it would be neither reasonable nor manageable for governments to react to every tax reform implemented in other countries. Yet, they react to the overall level of taxation abroad.<sup>59</sup> From a methodological point of view, using variables in levels allows more leeway in the specification of the appropriate lag structure. Misspecification of the lag structure of independent variables still permits creating reliable estimation results. Estimating models in differences requires a careful specification of the appropriate lag-length for all right hand side variables.

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57 Descriptive statistics for all variables can be found in Table 9, Chapter 7, Subsection 2.

58 Researchers looking at reactions to tax reforms abroad normally employ a differenced dependent variable (Basinger and Hallerberg 2004). In comparison, analysing governments' decisions about actual taxation requires the use of tax rates in levels (Plümper et al. 2006, Hays 2003).

59 From an econometric point of view using levels and not differences reduces the sensitivity of the results to the right lag structure which increases the probability of producing sound regression results (Plümper et al. 2005).

## Chapter 6: Design of the Empirical Analysis

Otherwise the regression coefficients can turn out insignificant and far away from the true relationship (Plümper et al. 2005).

The specification of the empirical model accounts for major problems in the data generating process and the characteristics of the variables, such as spatial interdependence and endogeneity. I am confident that the employed statistical specifications create sound and reliable estimation results which help to shed additional light on the discussion of tax policy making under international pressures. The next chapter discusses the formal aspects of the model specification and the operationalization of the right hand side variables in greater detail and presents the quantitative estimation results which are subsequently discussed in light of the proposed theoretical arguments.

## Chapter 7: Statistical Analysis

The discussion of the research design shows how theoretical concepts are translated into an empirical analysis. The present chapter digs a little deeper into the formal econometric specification of the estimation model and discusses the statistical findings. I proceed as follows: the next section (7.1) presents the detailed econometric specifications of the empirical model. In Section 7.2 follows a thorough description of the employed right hand side variables. In Section 7.3 I present and interpret the empirical findings in several steps, whereby I first discuss baseline models which include only the most important explanatory variables. Several sets of economic and political control variables found to be significant in earlier empirical studies are then included into the statistical model. Section 7.4 discusses the quantitative results in light of the presented theoretical arguments and Section 7.5 summarizes the implications of the statistical analysis and concludes.

### 1. Econometric Specification of the 2SLS Model

Tax competition results in strategic interaction between the governments of countries trying to attract mobile tax bases and preventing domestic capital from fleeing. Econometrically these tactical considerations are captured by modelling the decision on the domestic tax rate as reaction function to the mean of all foreign tax rates or a substantially weighted sum thereof and specific domestic variables:

$$\tau_{cjt} = R(\tau_{c,-jt}, X_{jt}), \quad j \neq -j \quad (21)$$

with  $\tau_{cjt}$  being the capital tax rate of country  $j$  at time  $t$ .  $\tau_{c,-jt}$  denotes a vector of capital tax burdens of all other countries  $-j$  at time  $t$  and  $X_{jt}$  describes a vector of domestic variables affecting tax decisions of country  $j$ . The reaction function can be rewritten into an estimation equation to allow the statistical analysis of the empirical model:

$$\tau = \beta W \tau + X \gamma + \varepsilon \text{ or } \tau_{cjt} = \beta \sum_{j \neq -j} \omega_{j,-j} \tau_{c,-jt} + X_{jt} \gamma + \varepsilon_{jt} \quad (22)$$

where  $\tau_{c,-jt}$  on the right hand side stands for the spatial lag of the dependent variable and  $\omega_{j,-j}$  denotes a weighting matrix representing the strength with which capital tax rates in a specific foreign jurisdiction impact the domestic choice.  $\varepsilon_{jt}$  represents the classical identically and independently distributed disturbance term of linear models.  $W$  is a NT\*NT block-diagonal spatial-weighting matrix with elements  $\omega_{j,-j}$ , thus  $\omega_{j,-j} \tau_{c,-jt}$  characterises the weighted spatial lag. The diagonal elements of the off-diagonal T\*T blocks in  $W$  depict the single weights  $\omega_{j,-j}$  that reflect the degree of connection from country  $j$  to  $-j$ . The spatial autoregression coefficient beta reflects the impact of the outcomes in the other ( $j \neq -j$ ) spatial units, as weighted by  $\omega_{j,-j}$ , on the outcome in  $j$ . Hence, beta gauges the overall strength of the spatial dependence whereas the  $\omega_{j,-j}$  describe the relative magnitudes of the diffusion paths or the path of spatial dependence between the countries (Franzese and Hays 2007). The matrix  $\omega_{j,-j} \tau_{c,-jt}$  just gives the entire set of these vector inner-products for all countries  $-j$ .

Some researchers just use arbitrarily weighted spatial lags which in this case would mean that a country's response to other countries' capital tax rates is given by the average foreign capital tax burden:

$$\bar{\tau}_{c,-jt} = \sum_{j \neq -j} \omega_{j,-j} \tau_{c,-jt}, \text{ where } \omega_{j,-j} = \frac{1}{n-1} \text{ and } \sum_{j \neq -j} \omega_{j,-j} = 1 \quad (23)$$

Equation (22) depicts the theoretical result that domestic taxation is a function of domestic political, institutional and economic constraints as well as tax rates implemented in competitor countries. The weighted spatial lag corresponds to the effects of the global economy. To isolate the domestic effects, I include government consumption as percentage of GDP, the strength of societal equality needs and the share of multinationals in the domestic economy – capturing de facto capital mobility – into the right hand side of the regression model.<sup>60</sup>

The inclusion of weighted spatial lags leads to endogeneity bias and therefore an inconsistent estimation of included domestic variables. This problem can be dealt with by instrumenting the spatial lag with suitable exogenous variables. To do so I implement a two stage least squares (2SLS) instrumental variable approach, where in the first step the weighted spatial lag  $W\tau$  is regressed on  $X$  – the included exogenous variables and  $WX$  – the excluded exogenous instrumental variables. In the second step the fitted values  $\widehat{W\tau}$  from the first stage are used as instruments for  $W\tau$ .<sup>61</sup>

Instrumental variable estimation implies regressing the weighted linear combination of the  $\tau$ 's from the right hand side variables of equation (22) on  $X_j$  and on the same linear combination of all  $X_j$ 's. Thus, the instruments used in the first step to produce fitted values of the weighted spatial lag are

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60 An obvious extension would be to incorporate interaction terms between the spatial tax lag and the most important domestic variables. Yet, since I treat the weighted spatial lag as endogenous applying an instrumental estimation this would raise severe estimation problems: The interaction effects and the tax rate of adjacent economies are highly correlated.

61 For details on this procedure see Wooldridge (2002) and Baum et al. (2003).



the domestic control variables included into the final regression model as well as a weighted average of these variables for all other countries  $WX$ . This involves that if we employ a spatial tax lag weighted by FDI, the average of exogenous instrumental variables  $X_j$  must also be weighted by FDI. Or if we weight taxes abroad by distance the  $X_j$  have to be weighted by distance as well.

Within the set of instruments for each regression model, I only use those instrumental variables which pass both the Hansen-Sargan test for over-identification<sup>62</sup> and the redundancy test for instruments (Hall and Peixe 2000). Additionally, the validity of the instruments used in the first stage regression is tested with an Anderson-Rubin F-test for the (joint) significance of the excluded instruments (See Dufour 2003 for details.). In order to decide whether the spatial lags are really endogenous I employ the Wu-Hausman F test (Davidson and MacKinnon 1993) and the Durbin-Wu-Hausman Chi-squared test (Baum et al. 2003). Both tests suggest that arbitrarily and FDI weighted spatial tax lags are indeed endogenous in most of the regression models and that the implementation of an instrumental equation eliminates potential endogeneity problems.

Another problem occurs as the Wooldridge test (Wooldridge 2002) for serial correlation in the idiosyncratic errors of a linear panel data model reveals that the estimation suffers from arbitrary serial correlation. Moreover, the Pagan and Hall (1983) test of heteroskedasticity for instrumental variables estimation as well as the Breusch-Pagan (1979) and Cook-Weisberg (1983) tests for heteroskedasticity in linear regressions

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62 For further discussion, see e.g., Hayashi (2000, 227-228, 407, and 417) and Baum et al. (2003).

indicate that we face arbitrary heteroskedasticity in both stages of the estimation model.<sup>63</sup> To control for these problems I implement heteroscedastic and autocorrelation consistent (HAC) Newey-West type (Newey and West 1987) standard errors and variance-covariance estimates. Doing so accounts for the increased inefficiency of the estimation caused by spatially and/or timely correlated observations of the residuals.

The proposed specification of the econometric model takes the set-up of the theoretical model and its empirical implications seriously and accounts for a variety of problems in the data structure. Therefore, the statistical estimation should provide reliable empirical results adding to our understanding of the domestic political processes of tax policy making.

## **2. Operationalization of Right Hand Side Variables**

Discussing the operationalization and measurement of the explanatory variables included in the empirical model is crucial for testing the main hypotheses and interpreting the estimation results in a meaningful way. This section gives a detailed description of all right hand side variables used in the different statistical models. I discuss the main explanatory variables, the control variables and the excluded instruments in turn.

### **2.1 Main Explanatory Variables**

In order to account for tax competition effects I include instrumented spatial lags of effective capital tax rates into the right hand side of models using effective tax rates as dependent variable and spatial lags of top corporate

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63 See also Koenker (1981), White (1980), Godfrey (1978).

rates for models with marginal tax rates as left hand side variable. The spatial lags are either arbitrarily weighted by just taking averages of all foreign tax rates per year or substantially weighted by FDI, capital formation, GDP per capita or distance. I operationalize FDI as actual net inflows of foreign direct investment as percentage share of GDP to account for the signalling effect. This variable is available from the World Development Indicators (WDI) provided by the World Bank (2006). Capital formation is measured as gross fixed capital formation as percentage of GDP and also available from the WDI and so is GDP per capita. Distance is operationalized as metric distance between capital cities.<sup>64</sup> To use distance as weight, I invert the values so that closer countries get higher weights. This procedure ensures congruence of the expected impacts of both the distance weight and the spatial tax lag which allows a more straightforward interpretation of the results.

The arbitrarily weighted spatial lag should exert a positive effect on both capital tax rates and labour tax rates whereas the theoretical model does not make clear predictions about the effect on the tax ratio. In addition, governments are expected to follow the tax policy of successful countries more closely indicating a positive impact of the FDI weighted spatial lag. For spatial lags weighted with GDP and the capital stock the same holds true. In the theoretical discussion I leave these two weights out but Basinger and Hallerberg (2004) find equally positive coefficients. I expect, however, that governments have a higher interest in actual capital flows and are less interested in less flexible factors such as the capital stock and GDP.

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<sup>64</sup> The dataset was assembled by Kristian Gleditsch. I am very grateful to him for providing the data.

Finally, the tax decisions of countries geographically closer to the domestic economy should exert a greater impact on domestic tax policy making due to lower transportation costs of physically moving capital to these jurisdictions.

The theoretical discussion revealed the three main explanatory factors that shall be put to an empirical test: the structure of the domestic capital which determines average de facto capital mobility, the strength of societal demands for tax symmetry and budget rigidities. Simulations of the formal model suggest that the share of highly mobile capital in the domestic economy puts pressure on governments to prevent this kind of capital from fleeing the country. The more mobile capital base mainly consists of multinational companies and their subsidiaries able to engage in tax avoidance through transfer pricing, debt reallocation and other strategies. I proposed two variables to operationalize this factor: First, the stock of foreign direct investment in a country – as opposed to actual flows of foreign direct investments – seems to be a good approximation of the share of highly mobile capital in an economy. We can obtain data on FDI stocks from the UNCTAD<sup>65</sup>. Moreover, in order to test robustness of the relationship I include the percentage share of multinationals in national turnover which is available from the OECD Globalization database. Based on the predictions of the formal model, we expect a negative effect of the size of the FDI stock and the national share of multinationals on capital taxation and a positive impact on the gap between capital and labour tax rates.

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65 United Nations Conference on Trade and Development (2006): Foreign Direct Investment Database

Including these variables raises the question of the direction of causality and possible endogeneity. The major problem is to empirically distinguish whether capital tax rates are reduced because governments face high de facto mobility of domestic capital bases or whether they are able to attract FDI by reducing capital tax rates. Looking at stock rather than flow variables, resolves the problem at least partially. Stock variables are much stickier than flow variables and should react to changes in tax rates only with a substantial time lag. Since governments can decide at any time to reform taxation and are therefore highly flexible, I expect the direction of causality to go from 'share of highly mobile capital in an economy' to 'governmental decisions about tax rates'. Furthermore, I conduct endogeneity tests (Wu-Hausman and Durbin-Wu-Hausman) for both variables which detect borderline significant endogeneity of both factors if included contemporaneously. Lagging both variables by one year leads to a rejection of the Null-Hypothesis of endogeneity and we can conclude that both variables are at least statistically exogenous.<sup>66</sup>

Societal demands for tax symmetry and their strength cannot be directly observed and we need to find an adequate proxy. I operationalize this factor by initial income inequality in a country and fiscal redistribution to compensate for the observed inequality. Admittedly, this is not a perfect match of equity norms enrooted in a society, yet, these measures give us an idea of how much inequality a society does allow and how much governments feel obliged to decrease the initial inequality. We would expect

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66 Yet, we know that endogeneity tests are very sensitive to specification and produce highly volatile results contingent on included instruments and other features of the model (Sanders 2007).

for example that initial inequality as well as fiscal redistribution is much lower in liberal market economies than in social democratic welfare states.

In particular, I use the pre-tax Gini coefficient measuring income inequality provided by Mahler and Jesuit (2006, Fiscal Redistribution Data Set) which is based on data from the LIS project (Luxembourg Income Study). The Gini coefficient ranges between 0 and 1, whereby 0 indicates complete equality – all members of society dispose of the same share of income – and 1 denotes complete inequality – one individual receives all income. Since this data is only available for 13 OECD countries and up until 2002, I use own calculations with data from the LIS project and the University of Texas Inequality Project (UTIP 2002) to fill in the missing values.

Fiscal redistribution is measured as absolute difference between the Pre-government-intervention and the post-government-intervention Gini coefficients. Government intervention includes taxation and transfers via the social security and pension systems.<sup>67</sup> Based on the theoretical discussion, I expect a contemporaneous effect of demands for tax symmetry on taxation. Hence, I include both variables without a time lag. The initial inequality – the pre-tax Gini coefficient – should exert a decreasing impact on capital taxation, whereas I expect the absolute fiscal redistribution to have a positive effect on capital tax rates. The pre-tax Gini measures how much inequality a society is willing to bare without government intervention, thus the higher the value of the Gini coefficient the lower should be the capital

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<sup>67</sup> I admit that this variable measures output of government intervention and is, therefore, likely to be endogenous to the dependent variables. Yet, this measure does not only account for redistribution via taxes but also via other transfers via pension and social security systems. From this perspective absolute redistribution should present at least some indication for the pressure put on governments by society in terms of equality demands.

tax rate, the higher the expected labour tax rate and the larger the gap between labour and capital taxation. Absolute fiscal redistribution in comparison measures societal needs for government intervention in order to enhance the equity and fairness of the initial income distribution. Therefore, I expect a larger absolute redistribution to reduce labour taxation, push capital taxation upwards and decrease the distance between labour and capital tax rates.

Final government consumption expenditure as percentage share of GDP proxies budget rigidities. I obtain this variable from the OECD National Accounts (OECD 2006). The formal model predicts that government spending pushes both capital and labour taxation upwards and increases the gap between the two tax rates since wage income is burdened more heavily if budget rigidities become high. Lagging the variable one year ensures that governments orient taxation at previous spending and do not spend more because they collected higher tax revenue. The latter relationship is rather implausible since government consumption remains very sticky and largely depends on prior commitments. Endogeneity tests confirm that one year lagged government consumption can be considered as exogenous and estimation results are unlikely to be biased.

### **2.2 Control Variables**

In addition to the main interesting explanatory variables I include some economic, political and institutional control variables that have been found to be theoretically interesting or to exert a statistically significant impact on domestic taxation. I add the one year lagged domestic unemployment rate provided by the World Bank as part of the World Development Indicators

(WDI 2006) which can have different impacts on taxation. On the one hand, high unemployment makes it difficult for governments to shift taxation towards the immobile factor and, therefore, politicians are less likely to engage in tax competition and cut back capital tax rates (Ganghof 2000b). On the other hand high unemployment might create an incentive for wasteful tax competition because governments benefit from the employment effects of additional capital (Huang 1992). Swank and Steinmo (2002) find a significant negative effect of structural unemployment on effective capital tax rates and a positive effect of the unemployment rate on effective labour taxation.

Moreover, I include the one year lagged annual growth rate of GDP (WDI 2006) to account for economic size and wealth effects. Swank and Steinmo's (2002) results indicate a positive marginal significant impact on effective capital tax rates. Basinger and Hallerberg (2004) support these estimates; they get a positive significant coefficient of growth for changes in effective capital tax rates but no effect for central and general rates. Moreover, the impact of economic growth on labour taxation is less straightforward (Swank and Steinmo 2002). The empirical results so far are inconclusive.

I control for the population share of elderly people (over 65 years) because this variable has been found to augment capital taxation significantly, whereas no or no significant effect on labour taxation was detected (Swank and Steinmo 2002). One would expect, however, that the share of old people drives both capital taxation and labour taxation up and also increases tax symmetry as a high dependency ratio exerts pressure on the social security systems, especially on public pension systems. Governments have to collect



sufficient tax revenue to feed money into these systems. This variable is taken from the World Bank's World Development Indicators (2006).

It has been widely argued that the liberalization of capital and product markets accelerate the international competitive pressure. The empirical results connecting trade openness and capital mobility to capital taxation are ambiguous at best (Quinn 1997, Garrett 1995, Rodrik 1997, Swank 1997, Swank and Steinmo 2002, Basinger and Hallerberg 2004, Hays 2003). I analyze the effects of trade openness measured by overall trade as percentage of GDP (taken from WDI 2006) and the impact of capital mobility on capital and labour taxation. The measure for legal capital mobility stems from Quinn (1997) and is called capital account regulation. It ranges between 0 and 4, where 0 stands for a large number of restriction indicating a closed economy, and 4 denotes no restrictions to capital account transactions which means that the country is rather open. Quinn gathered the data from the IMF Annual reports of Exchange Arrangements and Exchange Restrictions.<sup>68</sup> Since Basinger and Hallerberg (2004) also report that lower capital restrictions abroad lead to capital tax reductions, I add the average spatial lag of the 'Quinn-measure' to the right hand side of the empirical model.

In order to be able to reproduce some of the findings in the literature, I examine how several political and institutional variables affect domestic taxation. Most importantly, political scientists often claim that party politics make a difference in taxation (Oates 1972, Hays 2003, Swank 1997 among

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68 I also use the capital mobility measures provided by Miniane (2004) and Lane and Milesi-Ferretti (2001) with essentially the same results; these two measures, however, are available for much fewer observations.

others).<sup>69</sup> Analyzing a partisan variable within my empirical model, hence, seems reasonable. To do so, I construct a categorical variable measuring whether the majority of the government in power is ruled by a left-wing party (1) a centrist party (2) or a right-wing party (3). The data comes from Keefer's (2005)<sup>70</sup> database of political institutions and the Comparative Welfare States Data Set (Huber et al. 1997, updated by Brady et al. 2004). Following Basinger and Hallerberg (2004), I include an arbitrarily weighted spatial lag of this variable to the right hand side of the model as well.

Another well known argument states that veto players can reduce political flexibility and constrict policy makers, preventing reform and political change in general and – as has been argued in the tax competition literature – therefore tax reduction reforms (Hallerberg and Basinger 1999, Basinger and Hallerberg 2004, Wagschal 1999a,b; Genschel 2002). Still, the empirical results remain inconclusive (and Basinger 1999, Basinger and Hallerberg 2004, vs. Ganghof 1999b). To measure not just the number of veto points but the effective restrictions to the policy maker I use the executive constraints variable (xconst) provided by Henisz (2002, 2005) based on Gurr's (1990) specification. This variable operationally refers to the extent of institutionalized constraints to the decision making powers of chief executives. It mainly accounts for the checks and balances imposed by the various players in the decision making process. The measure is based on

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69 Swank (2004), Hays (2003) and Basinger and Hallerberg (2004) generate some empirical support for this hypothesis. Ganghof (2004) shows for the Australian case that the partisan composition of the government strongly influenced tax policy making. Basinger and Hallerberg (2004) even maintain that domestic governments are more or less constraint by the partisanship of governments in other countries.

70 See also Beck et al. (2001).

seven distinctive categories with higher values indicating stronger constraints.

In addition, to operationalize political polarization between parties participating in the decision making process (Basinger and Hallerberg 2004), I employ the polarization measure provided in Keefer's (2005) political institutions database. This variable captures the maximum difference between the ideological position of the chief executive's party and the position of the three largest government parties and the largest opposition party.

Finally, two election variables distinguish between legislative and executive elections and account for possible political business cycle effects, namely that government cut taxes to buy votes before elections (Nordhaus 1975, Alesina 1997, Drazen 2000b). The two variables are coded as dummies displaying a 1 in the year in which a legislative or executive election takes place and 0 otherwise. Election data come from the Keefer et al. data set (World Bank 2005) for the period from 1980 – 2000 and from [www.Electionguide.de](http://www.Electionguide.de) for 2000 – 2005.

Including different sets of control variables into the empirical estimation should allow capturing other influences of domestic tax policy making. Nevertheless, there is always a conflict of objectives when adding more variables to the right hand side of the model. On the one hand, controls should be included in order to reduce omitted variable bias. On the other hand, this also increases multicollinearity between explanatory variables which reduces efficiency of the estimation leading not only to larger standard errors but also to less reliable point estimates. Based on this insight, I add controls successively to the baseline model in order to observe

effects on coefficients and significance levels of the main theoretical interesting variables.

### **2.3 Instruments**

A proper estimation of the 2SLS model requires adequate instruments uncorrelated with the error term but highly correlated with the endogenous variables – the differently weighted spatial lags of the capital tax rate. Following standard tax competition reasoning, I use mainly economic variables known to influence capital taxation as instruments. Since the endogenous right hand side variable is the differently weighted spatial lag of capital taxation, I construct spatial lags of all instruments with according weights. Thus, instruments for the FDI weighted spatial lag are also FDI weighted and in case the spatial capital tax lags are weighted with distance the instruments are as well. Specifically, I employ the spatial lags of the 'Quinn-measure' (Quinn 1997) for capital mobility the pre-tax Gini coefficients (LIS, UTIP), the GDP per capita, Government consumption as percentage of GDP, trade openness and total population (all WDI) as instruments. As mentioned earlier, from this list I only include those instruments into the first stage regression that pass the Hansen-Sargan test for over-identification and the redundancy test for instruments.

Table 9 summarizes the characteristics of all variables used in the different empirical models discussed in the next section.

Table 9: Descriptive Statistics for all Variables Used in the Different Models

Variable	N	Number of Units	T	Mean	Overall SD	Between SD	Within SD	Min	Max
Effective capital tax rate	638	22	29	28.08	12.81	11.42	6.55	2.05	73.53
Effective labour tax	688	23	30	36.02	10.11	9.48	4.07	10.90	60.13
Capital/labour ratio	637	22	29	1.67	1.01	0.80	0.63	0.39	7.50
Top corporate tax	689	23	30	36.53	9.74	7.03	7.17	8	56
Pre tax Gini	697	23	30	0.43	0.03	0.02	0.02	0.35	0.49
Absolute fiscal redistribution	697	23	30	0.16	0.05	0.04	0.03	-0.17	0.28
Elderly people	690	23	30	13.56	2.33	1.87	1.43	7.88	19.67
Government consumption	705	23	31	19.24	3.96	3.76	1.47	9.88	29.94
FDI stock in 1000	674	22	31	87.05	177.31	115.72	135.98	0.02	1625.75
Turnover of multinationals	616	22	28	18.68	9.90	4.99	8.62	1.2	47.95
Unemployment	697	23	30	6.71	4.01	3.20	2.50	0.2	23.9
GDP growth	690	23	30	2.64	2.32	0.84	2.16	-7.28	11.10
GDP per capita	690	23	30	19845	7741.8	6682.13	4142.94	5043.21	48419.3
FDI inflows	650	23	28	3.83	27.46	78.46	9.97	-3.65	551.88
Total population in millions	690	23	30	34.7	55.5	56.5	5.1	0.22	294.00
Capital formation	684	23	30	22.26	3.67	2.55	2.71	15.49	36.29
Capital mobility (Quinn)	632	21	30	11.8	2.3	1.47	1.79	4.5	14
Trade openness	684	23	30	70.38	43.12	42.36	11.62	15.99	288.75
Government partisanship	684	23	30	2.05	0.93	0.45	0.82	1	3
Executive constraints	686	23	30	6.89	0.43	0.36	0.24	5	7
Ideological polarization	642	23	28	1.21	0.90	0.65	0.64	0	2
Executive elections	713	23	31	0.03	0.17	0.06	0.16	0	1
Legislative election	713	23	31	0.29	0.45	0.07	0.45	0	1

### **3. Empirical Results**

The empirical estimation results are presented and discussed in several steps. First, I estimate baseline models for average effective capital tax rates and marginal corporate tax rates with average and FDI weighted spatial lags. These models include the four main theoretically interesting variables – the spatial tax lag, societal demands for tax symmetry, budget rigidities and capital structure – and three economic control variables: the share of elderly people, the unemployment rate, and economic growth. Budget rigidities are measured as the share of government consumption in GDP, tax symmetry demands as pre-tax Gini coefficient and absolute fiscal redistribution and de facto capital mobility is operationalized as the FDI stock and share of multinationals in national turnover. I use both variables to ensure the robustness of the results. In a next step, I estimate equivalent models for the effective labour tax rate and the tax ratio between effective capital and labour rates. For these baseline models I also present and analyze conditional and marginal effects.

I then evaluate the influence of differently weighted spatial lags on capital and corporate rates using distance, GDP per capita and gross capital formation as weighting factors. The impact of capital mobility and trade openness on all four dependent variables is analyzed in a fourth step, whereby I look at domestic capital restrictions and capital mobility abroad separately. Finally, I include several political and institutional variables that have found to be significant in recent research on capital tax competition. Specifically I focus on partisanship of the domestic government as well as governments abroad, executive constraints, legislative polarization, and legislative and executive elections.

### **3.1 Baseline Model**

#### ***3.1.1 Basic Results for Capital and Corporate Taxation***

I employ the effective capital rate and the marginal corporate rate to capture the signalling effect of statutory tax rates and the strategy of tax-cut-cum-base-broadening implemented by many governments in order to maintain a sufficient level of tax revenue. Table 10 displays the estimation results for the baseline model with regard to capital and corporate taxation. Both the Wu-Hausman test for endogeneity of the spatial tax lags and the Anderson statistic for relevance of instrumental variables suggest that the model choice is adequate and coefficients should be free from endogeneity bias. The R-squared is overall relatively high implying a good model fit. Country fixed effects are jointly significant in all models and an exclusion of fixed effects might induce omitted variable bias.

Substantially, the empirical findings support the main theoretical predictions. In particular, the pre-tax Gini coefficient exerts a negative and highly significant impact on both effective capital rates and marginal corporate rates throughout all eight models regardless of the weighting of the spatial lag. The higher the pre-government inequality permitted by a society the lower the taxes on capital. More importantly the other equality variable – absolute redistribution – exerts a significant positive impact on capital and corporate taxation throughout. Thus, if demands for tax symmetry are stronger in a society and voters require a higher level of equality, governments have to factor this societal need into their policy making by increasing redistribution and they do so by not reducing tax rates on capital. Since international tax competition exerts a downward pressure especially on capital taxation, the demand for more equality and higher tax

symmetry counterbalances this effect by putting an upward pressure on capital tax rates. This conforms strongly with the predictions of the formal theoretical model.

The impact of highly mobile capital dominating the domestic economy reveals an equally clear picture. Models 1, 3, 5 and 7 include the one year lagged stock of foreign direct investment and Models 2, 4, 6 and 8 the one year lagged turnover produced by multinationals. Endogeneity tests indicate no problems of including these one year lagged variables. Both, the FDI stock and turnover of multinationals have a negative and significant (except in model 5) effect on capital taxation. Governments have not only to be concerned with attracting mobile capital from abroad to enlarge the domestic tax base, they also try to prevent capital from leaving their jurisdictions to find better conditions elsewhere. Both, effective capital rates and statutory corporate rates are reduced if the share of highly mobile capital in the domestic economy goes up and, thus, the average de facto mobility increases. Multinationals and their subsidiaries can much more easily profit from tax arbitrage and, hence, governments try to provide them with favourable conditions. This has two effects, preventing capital from fleeing allows gathering at least some revenue and a higher capital endowment per unit labour augments the productivity of labour and fosters employment.

If public spending is high governments need to levy tax revenue in order to avoid public deficits. Government spending might remain on high levels due to stickiness of the budget or induced by more severe pressure on social security funds. The need to gather revenue causes governments not to implement tax reducing reforms in order to comply with international



pressures and maintain higher tax rates on capital as compared to countries with lower budget rigidities. Rigid public spending, which is sticky and cannot easily be cut down, reduces the ability of policy makers to engage in international tax competition. The effect for effective rates is larger and more significant because increasing marginal corporate rates might not help to gather the needed revenue and can also create adverse effects. Most large companies do not pay top rates and, therefore, the need to collect taxes makes it necessary to broaden the tax base. In addition, since statutory tax rates serve as signals used by many corporations to decide upon their location, policy makers might be more reluctant to increase marginal corporate rates. This line of arguing is supported by positive and highly significant coefficients for public spending with respect to effective capital tax rates and smaller and even insignificant (models 5 and 6) positive estimates for marginal corporate tax rates.

Because the findings for the spatial tax lag are somewhat different for capital and corporate tax rates, I discuss the two cases separately. First, the effect of the spatial capital lag on effective capital tax rates clearly supports the theoretical predictions. The arbitrarily weighted spatial lag is positive but turns out to be only marginally significant in Model 1 and even insignificant in Model 2. This indicates that governments care about tax policy abroad; however, they cannot take the tax rates of all other countries equally into account. If we weight the foreign effective capital rates by FDI inflows, the coefficient turns out to be highly significant and positive (Models 3 and 4). This finding lends strong support to the idea that policy makers learn from successful players and adapt their own capital tax rates to those in jurisdictions where governments are able to attract mobile capital.

Policy makers also keep domestic tax rates closer to successful countries to prevent capital from moving there. Domestic firms might use the ability of other countries to attract capital as decision making device for their own location choices.

Findings for marginal corporate tax rates appear to be less conclusive. For the arbitrarily weighted spatial lag the coefficient turns out to be positive and highly significant – as theoretically expected – suggesting that the signalling effect is very important for statutory tax rates. The estimated coefficient is very close to 1 (Models 5 and 6) lending evidence to the argument that the nature of foreign tax credit possibilities mainly influences statutory rates: Multinationals have an incentive to establish subsidiaries in countries with lower or at least equal statutory tax rates than their home jurisdiction and policy makers therefore prefer to have statutory tax rates close to those in competitor countries.

Surprisingly, the FDI weighted spatial corporate tax lag negatively impacts marginal corporate tax rates and the relationship turns out highly significant which contradicts the theoretical predictions. We can find a plausible explanation for this empirical finding, though: Governments try to keep their own statutory corporate tax rates very close to the average corporate tax rate in the other countries – as shown by the effect of average corporate tax rates abroad in Models 5 and 6. Yet, they are also more concerned about tax rates in countries which prove to be able to attract foreign capital. Policy makers accordingly try to undercut the statutory rates especially of these jurisdictions and this is the easier the higher the marginal rates abroad. Furthermore, since statutory tax rates mainly serve as a signalling device, policy makers only try to underbid the marginal corporate rates of those

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countries that brought in large amounts of foreign direct investment. Clearly, governments undercut statutory rates of highly successful countries more and care much less about jurisdictions which are unable to attract mobile tax bases.

Table 10: Baseline Models for Average Effective Capital Tax Rates and Top Corporate Tax Rates: Average Spatial Lags and FDI Weighted Spatial Lags

DV: AETR capital, marginal corporate tax rates	Model 1: AETR on capital	Model 2: AETR on capital	Model 3: AETR on capital	Model 4: AETR on capital	Model 5: Top corporate tax rates	Model 6: Top corporate tax rates	Model 7: Top corporate tax rates	Model 8: Top corporate tax rates
<i>Independent Variables:</i>	Arbitrarily weighted spatial lag	Arbitrarily weighted spatial lag	FDI weighted spatial lag	FDI weighted spatial lag	Arbitrarily weighted spatial lag	Arbitrarily weighted spatial lag	FDI weighted spatial lag	FDI weighted spatial lag
Spatial lag (ctax_ <i>j</i> ) or (topcorp_ <i>j</i> )	0.425* (0.244)	0.220 (0.255)	0.015*** (0.004)	0.013*** (0.004)	1.120*** (0.095)	1.188*** (0.101)	-0.006*** (0.002)	-0.007*** (0.002)
Pre-tax Gini	-65.480*** (15.962)	-74.427*** (14.746)	-66.620*** (15.908)	-74.351*** (14.256)	-50.761*** (13.276)	-66.846*** (13.403)	-66.493*** (15.389)	-74.443*** (14.475)
Absolute fiscal redistribution	22.150** (10.218)	29.573*** (9.187)	20.466** (9.999)	26.404*** (8.983)	28.490*** (8.522)	35.825*** (8.317)	38.890** (9.657)	43.481*** (9.088)
Share of highly mobile capital: FDI stock (t-1)	-0.011*** (0.003)		-0.011*** (0.003)		-0.002 (0.003)		-0.012*** (0.003)	
Share of highly mobile capital: turnover of multinationals (t-1)		-0.042* (0.026)		-0.055* (0.031)		-0.041* (0.025)		-0.123*** (0.031)
Budget rigidities (t-1)	1.171*** (0.262)	1.351*** (0.255)	1.212*** (0.294)	1.383*** (0.275)	0.253 (0.225)	0.101 (0.240)	0.741*** (0.289)	0.749*** (0.285)
Share of elderly people	1.987*** (0.404)	1.994*** (0.360)	2.078** (0.420)	1.862*** (0.330)	0.501* (0.293)	1.725*** (0.353)	-1.376*** (0.349)	-0.740** (0.324)
Unemployment (t-1)	-0.418*** (0.136)	-0.455*** (0.133)	-0.473*** (0.150)	-0.480*** (0.143)	-0.088 (0.115)	-0.253** (0.121)	-0.208 (0.149)	-0.281* (0.150)
GDP growth (t-1)	0.610*** (0.143)	0.680*** (0.136)	0.592*** (0.143)	0.598*** (0.135)	0.106 (0.116)	0.064 (0.125)	0.063 (0.149)	0.137 (0.140)

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FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of Obs (No of units) [missing countries] <sup>71</sup>	593 (20) [Ice, Jap, Lux]	577 (20) [Ice, Jap, Lux]	569 (20) [Ice, Jap, Lux]	576 (20) [Ice, Jap, Lux]	635 (21) [Ice, Lux]	599 (20) [Ice, Lux, Jap]	601 (20) [Ice, Lux, Jap]	604 (20) [Ice, Lux, Jap]
F-test (Prob>F)	40.84*** [0.000]	43.87*** [0.000]	31.56*** [0.000]	34.15*** [0.000]	35.62*** [0.000]	34.62*** [0.000]	20.55*** [0.000]	19.13*** [0.000]
Centred R <sup>2</sup>	0.76	0.78	0.78	0.79	0.73	0.73	0.67	0.66
Wu-Hausman test of endogeneity for SL	7.160*** [0.008]	3.664* [0.056]	4.416** [0.036]	4.741** [0.030]	32.469*** [0.000]	21.736*** [0.000]	13.392*** [0.000]	19.130*** [0.000]
Anderson test for identification/relevance of IV	470.85*** [0.000]	386.02*** [0.000]	3265.42*** [0.000]	3249.11*** [0.000]	998.31*** [0.000]	812.19*** [0.000]	4543.50*** [0.000]	4639.86*** [0.000]
Notes: HAC consistent standard errors in parentheses and p-values for test statistics in brackets; *** $p \leq 0.01$ (significant at 1%), ** $p \leq 0.05$ (significant at 5%), * $p \leq 0.10$ (significant at 10%). The intercept is not reported, since it is just the fixed effect of the baseline country.								

71 The differences in the number of observations also depend on the included instrumental variables in the first stage of the regression which is contingent on the redundancy test for IV. If e.g. the spatial lag of capital mobility or the pre-tax gini is included in the first stage the number of observations is smaller than if these variables are not included.

Turning to the interpretation of the control variables, we can conclude that higher unemployment rates decrease capital taxation in all models and the coefficient for unemployment turns out to be significant for effective capital tax rates. This rather sustains the argument that unemployment creates an incentive for governments to engage in tax competition in order to benefit from the employment effects of additional capital (Huang 1992).

Economic growth seems to increase effective and statutory rates. Nevertheless, only the effect on effective capital taxation turns out to be significant, indicating that faster growing economies do not have to engage in wasteful tax competition. The domestic economy is doing well and mobile capital needs higher incentives in terms of tax differences to leave the country.

Finally, the share of elderly people significantly pushes the effective rate on capital upwards supporting the compensation hypothesis. Globalization boosts the demand for public compensation of external risks and puts pressure on the social security systems. Accordingly, governments need to collect more tax revenue in order to finance the higher demand for public goods. In contrast the impact of the dependency ratio on marginal corporate tax rates remains ambiguous. The coefficient is positive for models including arbitrarily weighted spatial corporate tax lags and negative for FDI weighted spatial lags. Because this variable is not of major interest neither for the theoretical nor for the empirical model and the inclusion or exclusion does not change the parameter estimates for other variables in the model, I do not further investigate this change in the direction of the impact. Testing the implications of the formal model for capital tax rates lends strong empirical support to the theoretical predictions. Final tax policy

outcomes depend on a combination of international strategic forces, domestic societal demands, and economic constraints that are simultaneously considered by governments while deciding upon tax policy.

### ***3.1.2 Basic Results for Labour Taxation and the Tax Mix***

The analysis of tax rates on mobile capital lends ample support to the theoretical arguments. Whether this holds true for labour taxation and tax system effects is examined in the present section. Table 12 depicts the empirical findings for labour taxation and tax system effects depending on tax competition and domestic factors. The model specifications are identical to those in table 11. For all models the fit is satisfying and particularly high for labour tax models indicating that the included domestic factors highly account for tax setting with respect to the immobile tax base. Country specific effects are highly significant supporting the inclusion of unit dummies in order to account for unit heterogeneity. The spatial lag of capital tax rates turns out to be endogenous to tax rates on wage income which underlines the need for instrumental variables 2SLS estimation procedures to avoid endogeneity bias.

Capital tax rates abroad exert a positive significant effect on effective labour taxation which is consistent with the predictions of the formal theoretical model. Still, we would theoretically rather expect that policy makers use labour tax rates to compensate for losses from capital taxation if tax competition is severe and governments are able to engage in international competition for mobile capital. To see whether the empirical analysis matches this expectation, I will examine conditional effects of the most interesting explanatory variables and compare the size of the effects for the different dependent variables. Some support for the prediction that

incumbents set higher taxes on labour to counterbalance competition induced cuts in capital taxation can be found in the fact that the spatial capital tax lag increases the tax ratio between labour and capital taxation (Model 11). This finding suggests that labour tax rates exceed tax rates on mobile factors throughout. If tax competition is severe, governments seem to be forced to cut back capital tax rates, though, they do not equally reduce tax rates on wage income in order to counterbalance the revenue loss caused by lower capital taxation.

The strength of societal equity needs produces the expected effects on labour taxation and has strong tax system effects as well. The pre-government income inequality pushes labour tax rates upwards. Since the pre-tax Gini impacts capital taxation negatively the gap between effective labour and capital tax rates amplifies and tax symmetry declines. With more voters being concerned about equality the pressure on governments to compensate for income inequality and to redistribute income increases. Implementation of societal equity needs by policy makers is expressed as absolute fiscal redistribution. Thus, higher equality demands lead to lower labour taxes (Models 9 and 10) and higher capital taxes (table 10) which results in significantly higher tax symmetry (Models 11 and 12). The gap between labour and capital tax rates reduces. The estimated coefficient for absolute fiscal redistribution is negative and significant with respect to both the effective labour tax rate as well as the tax ratio. In line with the theoretical model it seems that societal tax symmetry demands counterbalance tax competition forces. Governments facing stronger equity norms enrooted in society are less able to engage in international tax



competition because they cannot largely shift the tax burden from capital owners to workers.

Higher government spending worsens budget rigidities and the upward pressure on taxation augments. Labour tax rates rise if budget rigidities become stronger; the coefficient turns out positive and highly significant. Governments are less likely to engage in tax competition when facing higher budget constraints. Societal tax symmetry expectations prevent policy makers from shifting most of the tax burden to the immobile factor. Accordingly, the gap between the two tax instruments decreases significantly with the size of government spending (Models 11 and 12). Yet, the prediction of the formal model led us to expect tax symmetry to decline with public spending. As workers' mobility falls short of capital mobility and wage earners react less elastic to higher taxation, the formal model generates the hypothesis that budget rigidities impact labour taxation more strongly and labour has to bear most of the burden. Empirically we can observe tax rates on wage income to be higher throughout (see Figure 2 in Chapter 2). The latitude for pushing labour taxes further up is relatively small even though budget constraints are severe. Therefore, capital taxes increase relatively more with public spending leading to higher tax symmetry.

The empirical results for capital taxation show that the structure of domestic capital strongly influences governments' decisions about effective and marginal capital tax rates. Nevertheless, this does not result in a shift of the tax burden to the immobile factor as suggested by the insignificant estimate for the share of highly mobile capital in the domestic economy in table 11. Still, incumbents do not match a sharp decline in capital taxation with

cutting back tax rates on the immobile factor accordingly. Policy makers allow for growing tax asymmetry if highly mobile capital dominates the domestic economy. They are forced to cut back tax rates on mobile capital if the share of highly mobile firms and the de facto mobility increases but they have to maintain revenue and keep tax rates on wage income on a higher level leading to a larger tax gap and higher tax unfairness (Models 11 and 12).

Turning to the remaining control variables reveals that higher unemployment results in a significant rise of tax rates on wage income. If a larger share of the domestic workforce stays jobless the immobile base that can be taxed diminishes and policy makers raise the tax rate on this factor to compensate for the loss in revenue. In combination with reduced tax rates on the mobile factor – in order to attract capital which might boost employment – this leads to lower tax equity and the gap between labour and capital taxation becomes larger (Models 11 and 12).<sup>72</sup> The positive relationship between unemployment and tax rates on wage income lends support to empirical evidence in the literature on tax competition (e.g. Swank and Steinmo 2002).

As expected, labour taxation significantly rises with the share of elderly people caused by higher pressures on pension systems. However, the latitude for decreasing capital taxes as a reaction to competitive forces, when demands for public compensation grow, appears to be lower. This

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<sup>72</sup> Though, this might not be the right interpretation of the empirical findings. Even though unemployment in the regression analysis is one period lagged and endogeneity tests do not reject the Null of exogeneity, the path of causality remains unclear. Higher labour taxation could increase unemployment (Tullio 1987). Daveri and Tabellini (2000) find that the link between high labour taxes and high unemployment is particularly strong in continental Europe.

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results in a significant decline of tax asymmetry when the share of elderly people increases. Finally, labour taxation does not seem to be contingent on economic growth since the estimates are not significant. We learned from table 10 that effective capital taxation reacts positively to GDP growth resulting in a significant reduction of inequality between the two tax instruments.

*Table 11: Baseline Models for Average Effective Labour Tax Rates and Tax System Effects: Average Spatial Lags and FDI Weighted Spatial Lags*

DV: AETR labour; Tax ratio	Model 9: Labour tax rate	Model 10: Labour tax rate	Model 11: Tax ratio	Model 12: Tax ratio
<i>Independent Variables:</i>	Arbitrarily weighted spatial lag	FDI weighted spatial lag	Arbitrarily weighted spatial lag	FDI weighted spatial lag
Spatial lag (captax_ <i>j</i> )	0.594*** (0.118)	0.007*** (0.002)	0.037** (0.016)	0.00001 (0.0003)
Pre-tax Gini	26.445*** (7.996)	35.102*** (8.306)	3.831*** (1.070)	4.710*** (1.160)
Absolute fiscal redistribution	-8.425* (5.100)	-12.443** (5.162)	-1.219* (0.702)	-1.633** (0.742)
Share of mobile capital (t-1)	-0.001 (0.017)	0.001 (0.018)	0.0005** (0.0002)	0.001*** (0.0002)
Budget rigidities (t-1)	0.588*** (0.126)	0.653*** (0.156)	-0.049*** (0.017)	-0.062*** (0.021)
Share of elderly people	0.306* (0.164)	0.543*** (0.189)	-0.214*** (0.027)	-0.740** (0.324)
Unemployment (t-1)	0.413*** (0.069)	0.316*** (0.080)	0.066*** (0.009)	0.063*** (0.011)
GDP growth (t- 1)	0.014 (0.066)	0.112 (0.075)	-0.047*** (0.009)	-0.054*** (0.010)
FE	Yes	Yes	Yes	Yes
No of Obs (units) [missing countries]	676 (23)	595 (20) [Ice, It, Lux]	629 (21) [Ice, Jap]	554 (19) [Ice, It, Jap, Lux]
F-test (Prob>F)	133.49*** [0.000]	99.01*** [0.000]	50.17*** [0.000]	34.25*** [0.000]
Centered R <sup>2</sup>	0.91	0.91	0.79	0.78
Wu-Hausman test of endog. for SL	31.810*** [0.000]	48.455*** [0.000]	0.000 <sup>73</sup> [0.992]	6.014** [0.015]
relevance of IV	548.377*** [0.000]	3394.026*** [0.000]	505.975*** [0.000]	3149.797*** [0.000]
Notes: HAC consistent standard errors in parentheses and p-values for test statistics in brackets; *** $p \leq 0.01$ (significant at 1%), ** $p \leq 0.05$ (significant at 5%), * $p \leq 0.10$ (significant at 10%). The intercept is not reported, since it is just the fixed effect of the baseline country.				

73 For some models the endogeneity test is not significant, thus the Null of exogeneity cannot be rejected and a simple LSDV model would give more efficient results. Yet, I run OLS estimation for all models where the spatial lag turned out to be exogenous – though this is theoretically implausible – and the results are virtually the same with very slight changes in the size of coefficients. I therefore report for all models the instrumental variables estimation results. From a theoretical perspective this is also more convincing and some studies have shown that endogeneity tests are highly sensible to model specification (Sanders 2007).

The empirical findings in Tables 10 and 11 lend, overall, strong support to the predictions of the theoretical model. International tax competition plays a role in domestic tax policy making and impacts not only efficient capital and marginal corporate tax rates but has also tax system effects. Still, the pressures induced by a change in the international game do not wipe out domestic factors and constraints. Budget rigidities and societal equity demands largely constrain the ability of fiscal authorities to engage in tax competition. Moreover, the ownership structure of the domestic capital base drives governments' decision on how much to engage in tax competition. In case highly mobile capital of multinational corporations dominates the domestic economy, policy makers have a higher incentive to play the tax competition game not primarily to attract capital from abroad but to stop domestic capital owners from shifting capital to other jurisdictions. If domestic firms are less mobile and to a lesser extent able to use tax avoidance strategies, governments can impose higher taxes without fearing an immediate outflow of mobile tax bases.

### ***3.1.3 Marginal Effects of Baseline Results***

The estimation results in Tables 10 and 11 allow us to evaluate the accuracy of the theoretical argument. Nevertheless, we cannot interpret the sizes of the coefficients directly since they are not standardized and dependent variables differ across models. Consequently, it is impossible to compare the strength of the effects for the various endogenous variables. To overcome this difficulty, I graphically assess the conditional effects of the most important explanatory variables for different fixed values of the other right hand side factors. Specifically, I examine the impact of the severity of tax competition operationalized as the spatial tax lag, budget rigidities,

equity needs measured as absolute redistribution, and domestic share of highly mobile capital for the 25<sup>th</sup> percentile, median and 75<sup>th</sup> percentile values of the other independent variables.

Thereby, 25<sup>th</sup> percentile values denote a situation favourable to low taxes. For variables with a positive coefficient, smaller values correspond to such a situation (the 25<sup>th</sup> percentile from below) and for variables with a negative estimate, higher values decrease taxes (25<sup>th</sup> percentile from above = 75<sup>th</sup> percentile). In a high tax environment variables with positive coefficients have higher values (25<sup>th</sup> percentile from above = 75<sup>th</sup> percentile) and for negatively signed variables lower values correspond to such a situation (25<sup>th</sup> percentile from below). For example, if I want to evaluate the conditional impact of societal equality needs on effective capital rates in an otherwise low tax environment, I set budget rigidities to a low value (25<sup>th</sup> percentile) and the domestic share of mobile capital to a comparably high value (75<sup>th</sup> percentile) because the coefficient for this variable is negative. For an otherwise high tax environment I hold government spending constant at a relative high value (75<sup>th</sup> percentile) and the share of mobile capital at a low value (25<sup>th</sup> percentile). In this way I can compare the effects of the most interesting variables on effective capital and labour tax rates, their tax ratio and the marginal corporate tax rates.

The range on the y-axis is equal for all figures so that the steepness of the lines can be directly compared between the different dependent variables. The slope measures the size of the actual effect contingent on the tax environment (low tax, medium tax and high tax environment). The coefficients used to calculate the conditional effects on the dependent variables in Figure 4 are taken from Models 1, 5, 9 and 11 (arbitrarily

weighted spatial lags). For Figures 5 to 8 I use the coefficients from Models 3, 7, 10 and 12 (FDI weighted spatial lags).

### *3.1.3.1 The Influence of Capital Taxation Abroad*

Figure 4 displays the conditional influence of an average weighted spatial capital tax lag on effective capital and labour rates, the tax ratio and marginal corporate rates. Effective tax rates on capital proportionally fall with effective capital tax rates abroad. If tax competition becomes more severe and capital taxes abroad are largely cut back, domestic governments follow the trend (see figure 4a). Nevertheless, domestic capital taxation also highly depends on the domestic environment and whether other factors allow governments to play the tax competition game. The gap between the levels of effective capital taxation in low tax, medium tax or high tax environments remains relatively large as compared to labour and top corporate tax rates (the lines are far apart). Policy makers manage to stay below the average "world" capital tax rate if the domestic environment allows an engagement in international competition (25<sup>th</sup> percentile line). The domestic effective capital tax rate always falls short of the average tax rate abroad if the other explanatory variables take on values which allow policy makers to implement low tax rates (25<sup>th</sup> percentile line). For median values of other variables policy makers can undercut average "world" tax rates if these are not too low. If domestic constraints become relatively strong (75<sup>th</sup> percentile values) governments are unable to successfully engage in tax competition but try to keep the distance to effective capital tax rates abroad as small as possible.

The impact of the spatial capital tax lag on effective labour tax rates is somewhat smaller and the ability or willingness of governments to decrease

taxes on wage income overall declines (see figure 4b). Predicted labour tax rates range between 27 and 45 percent whereas predicted effective capital tax rates range between 2 and 44 percent. Especially if other variables take on values indicating a low tax or medium tax environment, labour taxes are much higher than effective capital tax rates since governments shift the tax burden from mobile to immobile sources or at least do not cut labour tax rates along with capital tax rates. Only if budget rigidities, societal demands for equality and other domestic constraints become strong, effective capital and labour tax rates take on comparably high values (compare p75 line, figures 4a and 4b).

This relationship is also captured by the impact of tax competition on tax asymmetry (see figure 4d). As predicted, the tax gap becomes larger when capital tax rates abroad are higher. Overall tax unfairness, however, increases sharply when domestic constraints are low and allow governments to engage in tax competition (p75 line in figure 4d). In such a case, tax rates on capital are largely cut back but taxes on wage income stay comparably high. The tax ratio approaches 1 (p25 line in figure 4d) – tax rates on capital and labour are equal – in case domestic constraints such as electoral demands for tax symmetry and public good provision prevent fiscal authorities from playing the tax competition game hard.

Marginal corporate tax rates heavily react to statutory tax rates in other countries (see figure 4c). Though, undercutting the average "world" tax rate is only possible if the domestic environment is very favourable to international competition (p25 line in figure 4c). That is, when public demand for equality and public good provision is weak and highly mobile capital dominates the economy. Otherwise, governments keep the domestic



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marginal corporate tax rate very close to the mean top corporate rate abroad. This finding lends strong support to the argument that the nature of foreign tax credit possibilities forces governments to hold statutory rates close to those in other jurisdictions, yet, the incentives to undercut foreign statutory tax rates on corporate income are much lower.

Figure 4: The Conditional Influence of Capital Tax Rates Abroad

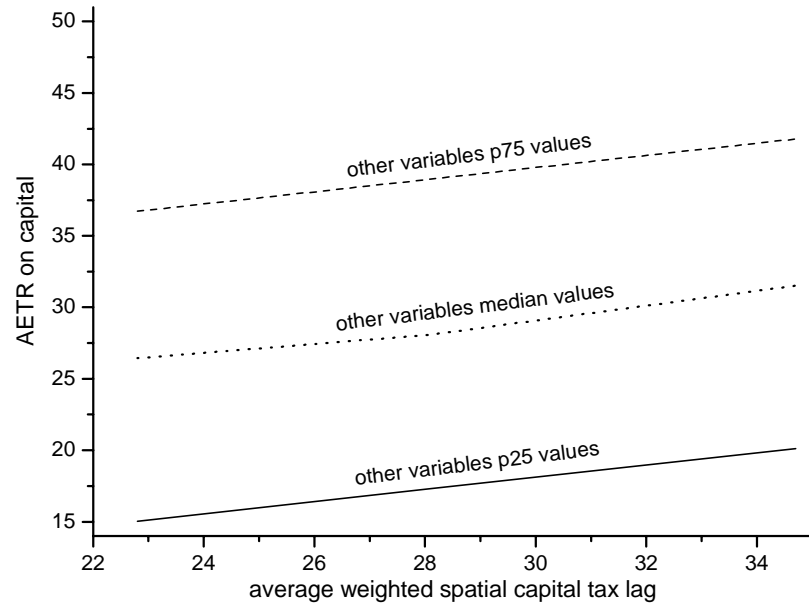


Figure 4a: AETR on capital

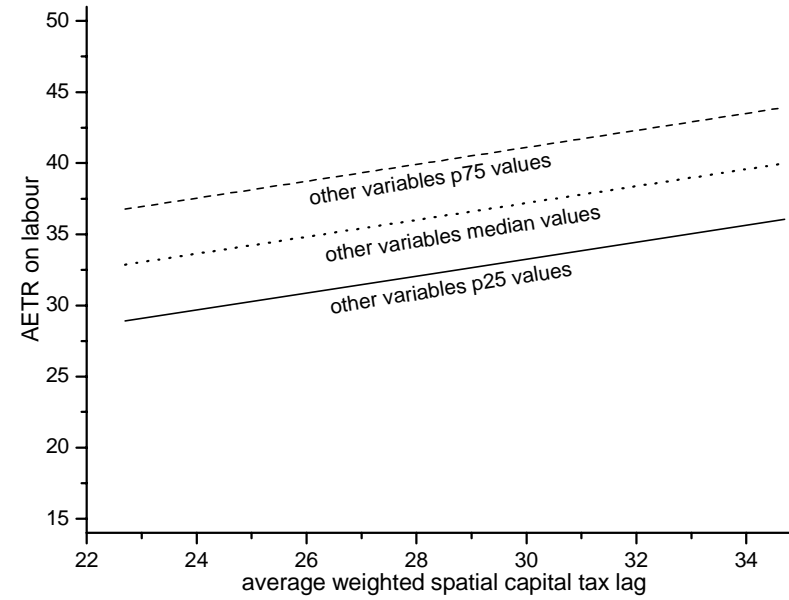


Figure 4b: AETR on labour

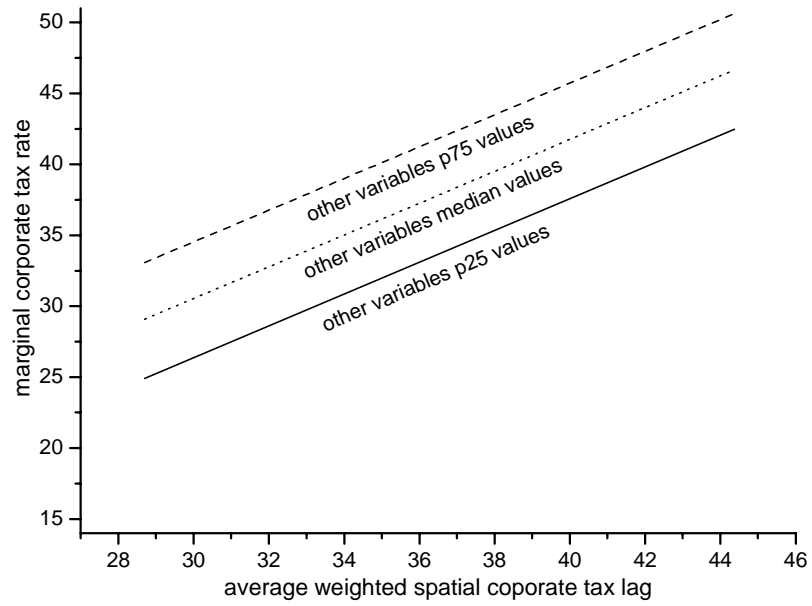


Figure 4c: Marginal corporate tax rate

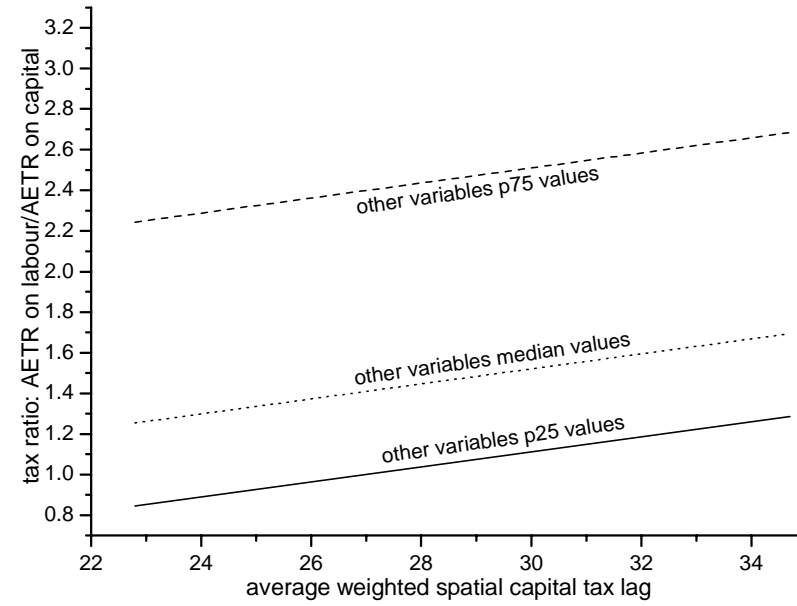


Figure 4d: Tax ratio

*3.1.3.2 The Impact of Societal Demands for Tax Symmetry*

Figure 5 allows comparing the conditional impact of equality needs enrooted in society on effective tax rates, their ratio and top corporate rates. Societal demands for tax symmetry exert a strong positive effect on effective capital taxation (figure 5a); the more governments are forced by the electorate to redistribute from richer parts of the society to poorer, the higher the capital tax rates. The lines for low, medium and high tax environments are relatively far apart indicating that other factors – domestic and international – have a strong influence on the level of capital taxation as well. Labour taxes in comparison decline with societal demands for tax symmetry, even though governments become less willing or able to push labour taxes far down (figure 5d). Figure 5d displays the tax system effects of equity needs, graphically supporting this fact. Societal equality demands strongly impact tax symmetry: the more important equality and justice become in a society, the closer grow tax burdens on the mobile and immobile factor. Only in case equity needs take on the maximal value and all other factors (budget rigidities, competitive pressures, and the de facto mobility of domestic capital) support high tax symmetry the tax ratio approaches 1, so that labour and capital tax rates converge. If other variables allow governments to engage in tax competition and increase the tax burden on wage income at the same time, e.g. a high share of domestic mobile capital and low budget rigidities, the tax asymmetry is relatively high (75<sup>th</sup> percentile line in figure 5d) but still strongly decreases with the strength of societal demands for equal taxation and redistribution.

Marginal corporate tax rates react heavily to symmetry considerations (figure 5c). The lines steeply slope upwards; the stronger the equality

expectations of voters, the higher are the marginal corporate rates implemented by governments. It seems that statutory rates serve not only as signal for foreign capital owners, but policy makers also use statutory rates to signal to their domestic electorate that they take their demands for equality seriously. Statutory corporate rates can be cut back or pushed up without substantially changing the effective tax burden on capital because decision makers can simultaneously broaden the tax base or grant tax concessions.

In general, voters' expectations with respect to tax symmetry strongly impact governments' decisions concerning the domestic tax system. The majority of the electorate is unwilling to bear the costs of tax competition and subsidize capital owners. The more voters care about tax symmetry, the more policy makers adapt their tax policy to this societal demand in order to prevent the decline of electoral support.

Figure 5: The Conditional Influence of Societal Equality Needs

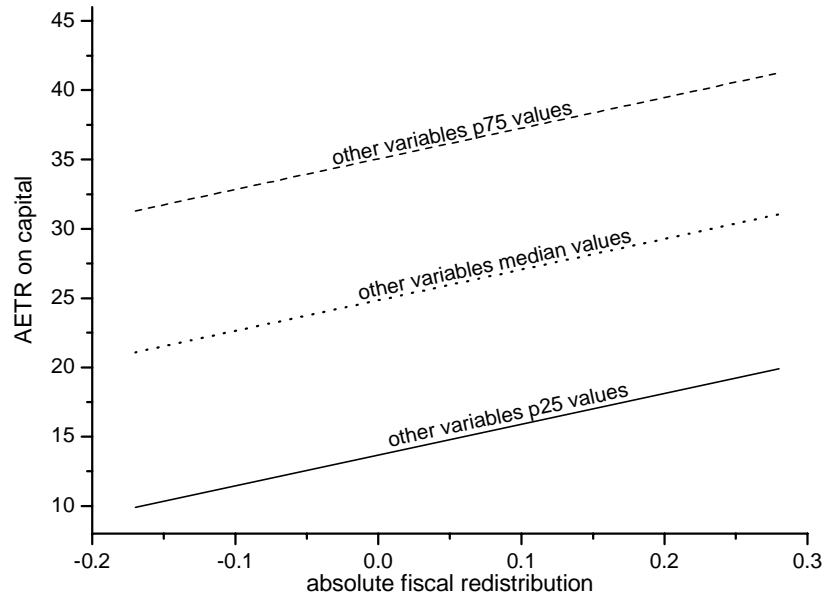


Figure 5a: AETR on capital

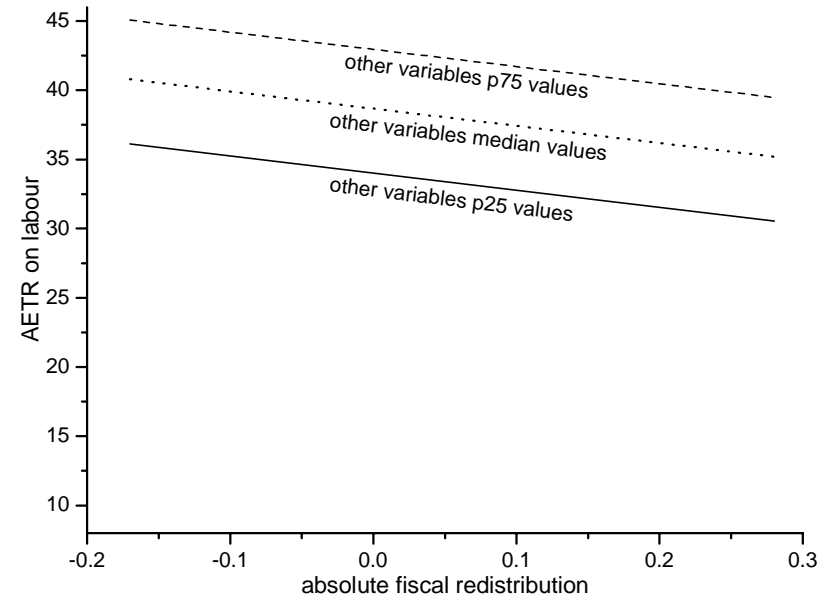


Figure 5b: AETR on labour

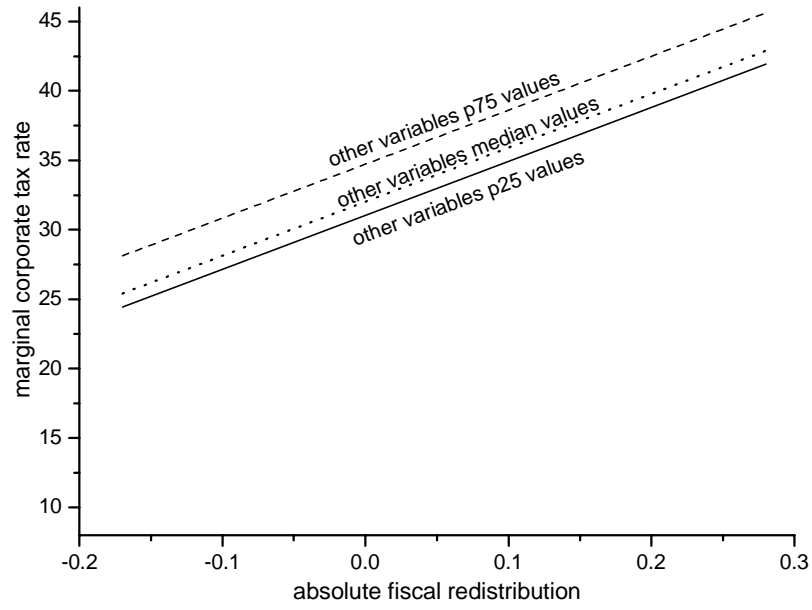


Figure 5c: Marginal corporate tax rates

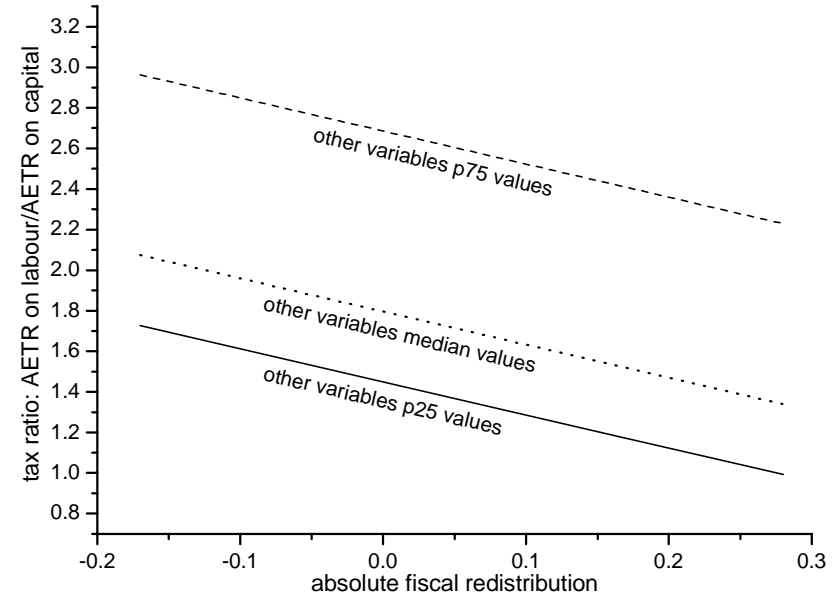


Figure 5d: Tax ratio

### *3.1.3.3 De Facto Capital Mobility*

Figure 6 depicts the conditional effect of average de facto capital mobility in an economy. Since effective labour taxation does not react significantly to the domestic capital structure (table 11) I do not provide a graphical account for this relationship. Both effective capital rates and marginal corporate rates heavily depend on the share of highly mobile capital in the domestic economy (figures 6a,c). The more multinationals and FDI dominate the domestic economy, the higher the actual ability of capital owners to move assets to low-tax jurisdictions, and the lower both the effective tax burden on the mobile factor and the statutory rate on corporate income. Fiscal authorities are not only concerned with attracting foreign capital but more so with keeping multinationals from shifting their capital and paying taxes elsewhere. Yet, governments have more latitude for adapting efficient rates which range between 2 and 40 percent than to change marginal rates ranging between 20 and 42 percent. Seemingly, statutory corporate rates serve governments mainly to send signals to capital owners abroad. Multinationals and FDI located in the home country care more about the effective tax burden imposed by the domestic government.

As effective capital tax rates react heavily to the share of multinationals in the domestic economy, the ownership structure of domestic capital affects tax symmetry as well. To the same degree capital taxation decreases with the share of highly mobile capital, tax asymmetry increases because labour tax rates are not cut back accordingly. Hence, if a domestic economy faces high de facto capital mobility because it is dominated by multinationals and their subsidiaries, tax equity declines sharply. Policy makers have to provide favourable conditions for highly mobile capital in order to avoid capital



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arbitrage and loss of revenue. In addition, a higher capital to labour ratio boosts productivity of labour resulting in higher wages and higher tax revenue from the immobile base.

Figure 6: The Conditional Influence of the Share of Highly Mobile Capital

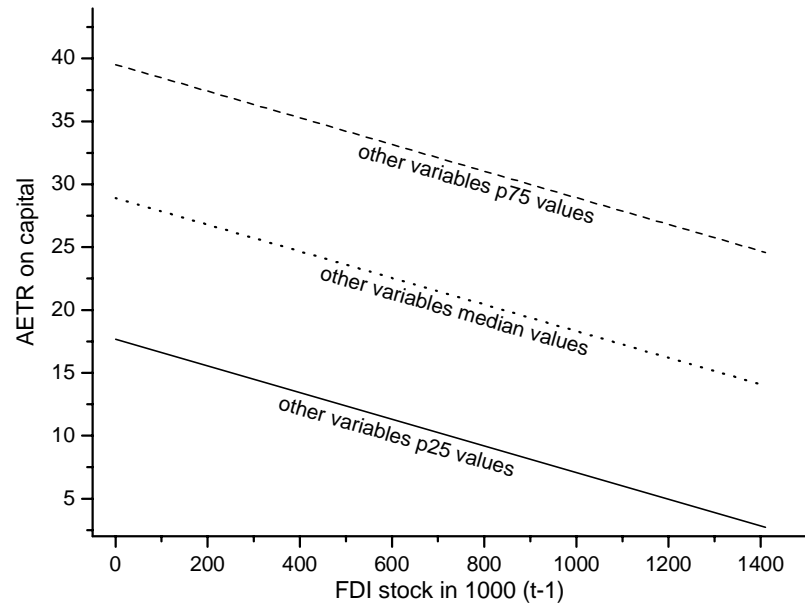


Figure 6a: AETR on capital

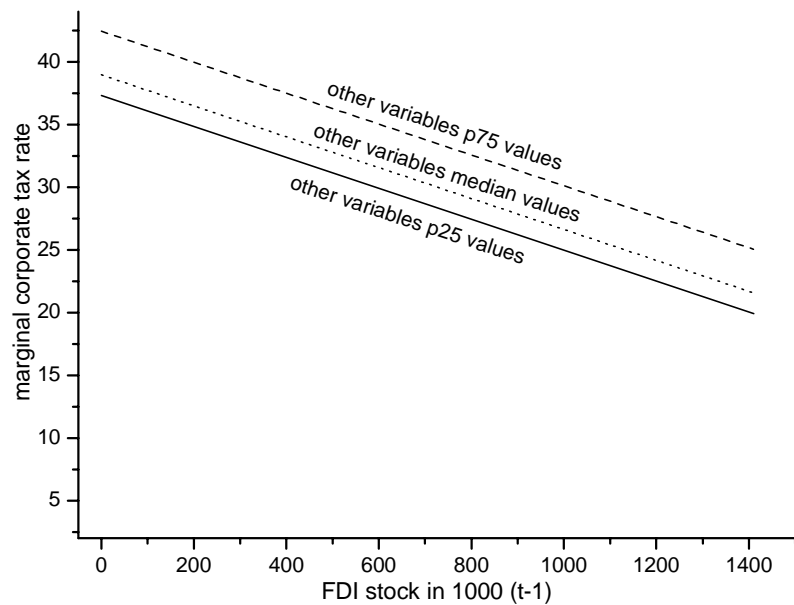


Figure 6c: Marginal corporate rates

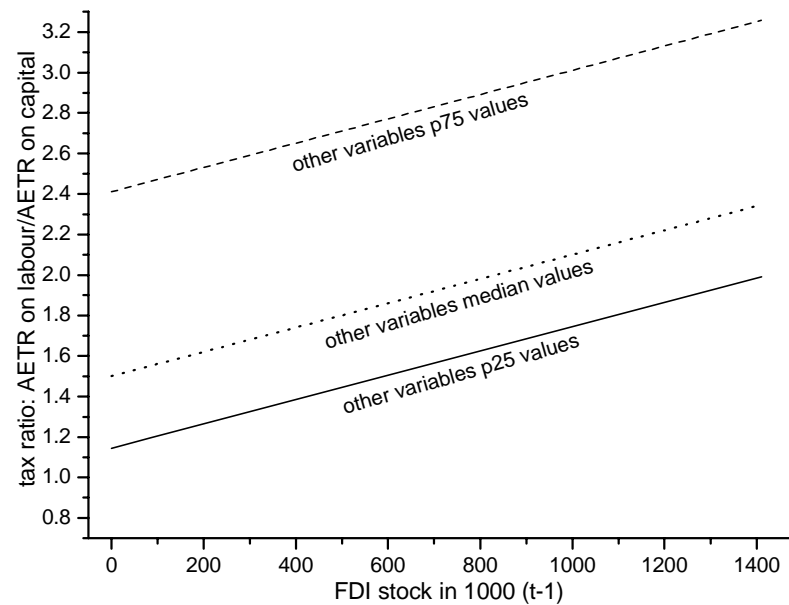


Figure 6d: Tax ratio

*3.1.3.4 Budget Rigidities*

A highly rigid budget increases a government's need to collect more revenue from all tax bases in order to prevent high public deficits. Figure 7 gives a graphical presentation of the conditional effect of government spending on the different tax instruments. A very rigid budget strongly affects effective capital tax rates (figure 7a). Policy makers cannot engage in tax competition and cut effective capital tax rates to a degree which would allow underbidding tax rates abroad. For high government spending, tax rates on the mobile factor stay relatively high as well.

The effect appears to be less distinct for labour taxation (figure 7b). Incumbents cut back the tax rates on the immobile factor much less, even though low government spending would allow decreasing tax rates on wage income more. This leads to high tax inequality (Figure 7d) when government spending remains rather low and much higher tax symmetry if public spending approaches high levels since both tax bases then must be heavily taxed to avoid deficit spending. If the budget becomes more rigid, this results in rather steep downward sloping tax asymmetry. Clearly, the leeway to raise tax rates on wage income, when the demand for public spending goes up, is much more restricted than for taxing the mobile factor more heavily. Contrary to the prediction of the formal model, if the budget is highly rigid taxes on labour grow not as much as tax rates on capital. Still, if public spending stays at a very low level, governments can engage in tax competition and largely cut back tax rates on capital income, while taxes on wage income remain at a comparably high level. Since dependently employed workers are much less flexible than capital owners and therefore

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react much less elastic to tax differences, governments substitute revenue loss caused by low capital tax rates with higher labour tax rates.

Marginal corporate tax rates react much less to budget constraints than effective capital rates do (figure 7c). Statutory rates are perceived as a signal and governments rather keep them close to statutory rates abroad. Moreover, most corporations manage to avoid paying marginal tax rates. Hence, only broadening the tax base increases revenue. This affects the effective tax burden on capital but not the top corporate tax rates.

Figure 7: The Conditional Influence of Budget Rigidities

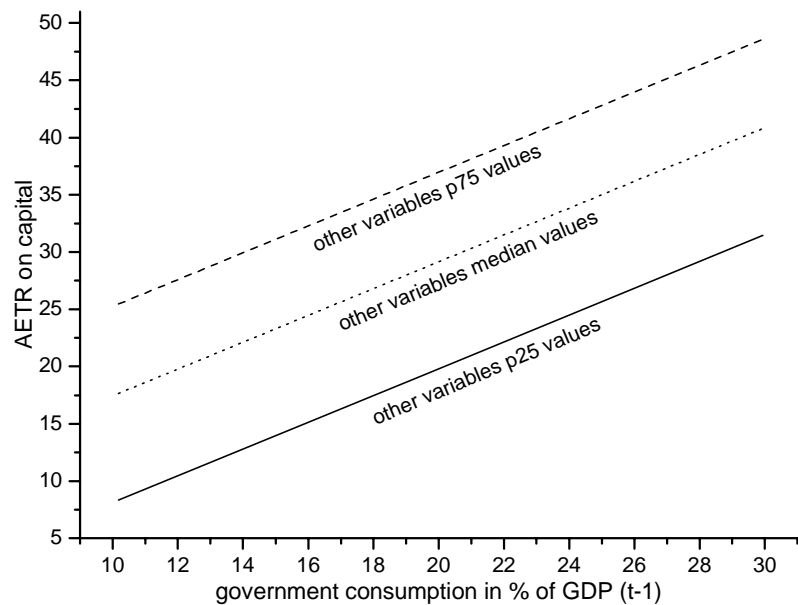


Figure 7a: AETR on capital

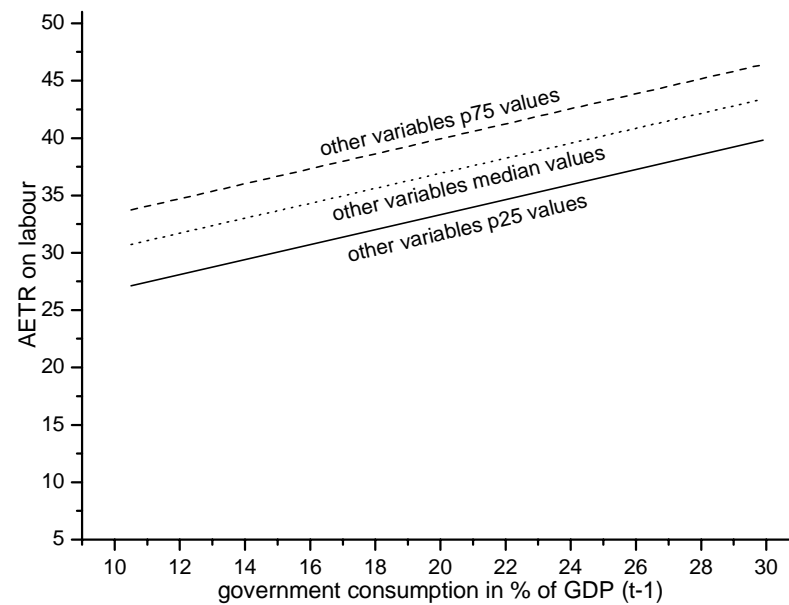


Figure 7b: AETR on labour

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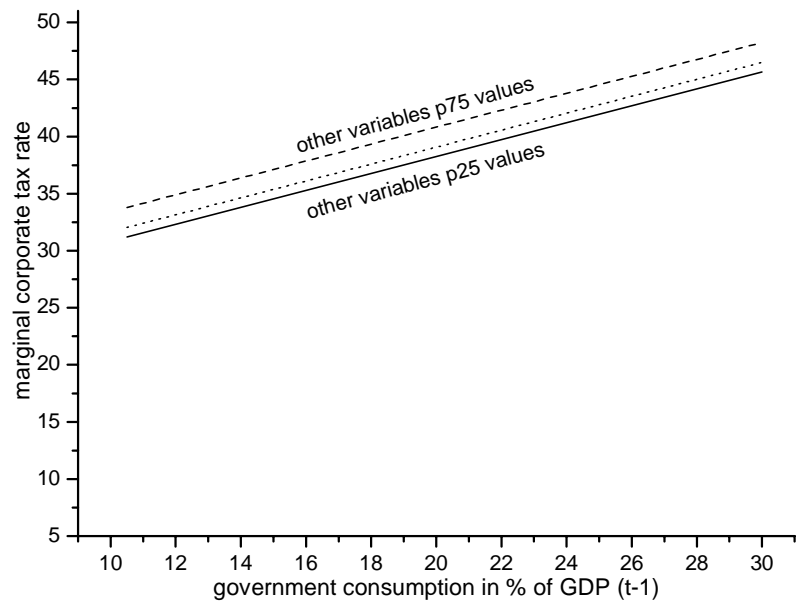


Figure 7c: Marginal corporate tax rates

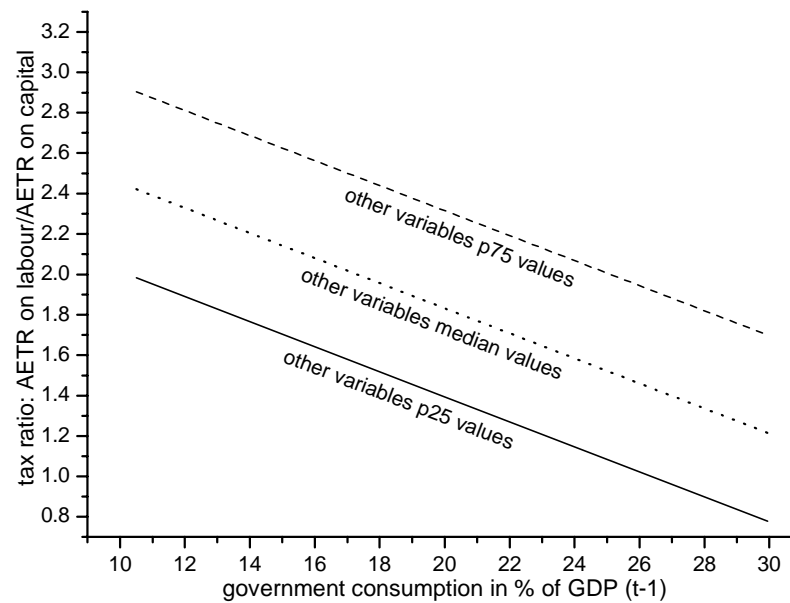


Figure 7d: Tax ratio

*3.1.3.5 The Attractiveness of Foreign Jurisdictions*

Finally, figure 8 allows comparing the size of the conditional influence of the spatial capital tax lag weighted by actual FDI inflows. The upwards sloped lines in figure 8a suggest that fiscal authorities keep effective capital tax rates close to capital rates in jurisdictions successful in attracting mobile capital. The effect is relatively strong but the large gap between the low, medium and high tax environment lines supports the argument that other domestic conditions strongly constrain governments willingness and ability to engage in international competition for mobile capital. If we compare the effect of the arbitrarily weighted spatial capital tax lag in Figure 4a with the effect of the FDI weighted spatial lag in Figure 8a, we observe a stronger impact on domestic capital taxation of the latter variable. This underlines the theoretical prediction of governments being more concerned with effective capital tax rates in foreign jurisdictions capable of attracting mobile tax bases. Accordingly, fiscal authorities adapt domestic effective capital tax rates closer to the tax policy implemented by successful policy makers in other countries.

The impact of the FDI weighted capital tax lag on labour taxation is much weaker (figure 8b). Nevertheless, the overall higher level of tax rates on wage income indicates that governments tax the immobile factor more heavily if they engage in tax competition in order to compensate revenue losses.

As already discussed with respect to table 10, it is rather surprising to find a negative conditional impact of the FDI weighted corporate tax lag on domestic marginal corporate rates (figure 8c). In figure 4c we can observe that statutory rates are adapted very closely to mean "world" corporate rates.



Combining this observation with figure 8c we might conclude that overall governments try to keep their statutory rates very close to statutory rates in other countries. However, if a jurisdiction successfully attracts foreign capital then undercutting this statutory rate makes sense but is only manageable if the tax rate there is not too low. From this perspective, governments only underbid the marginal corporate rates of countries that attracted high shares of foreign mobile capital bases and do not consider the statutory tax rates in other jurisdictions at all.

Figure 8: The Conditional Influence of FDI Weighted Spatial Capital Tax Lag

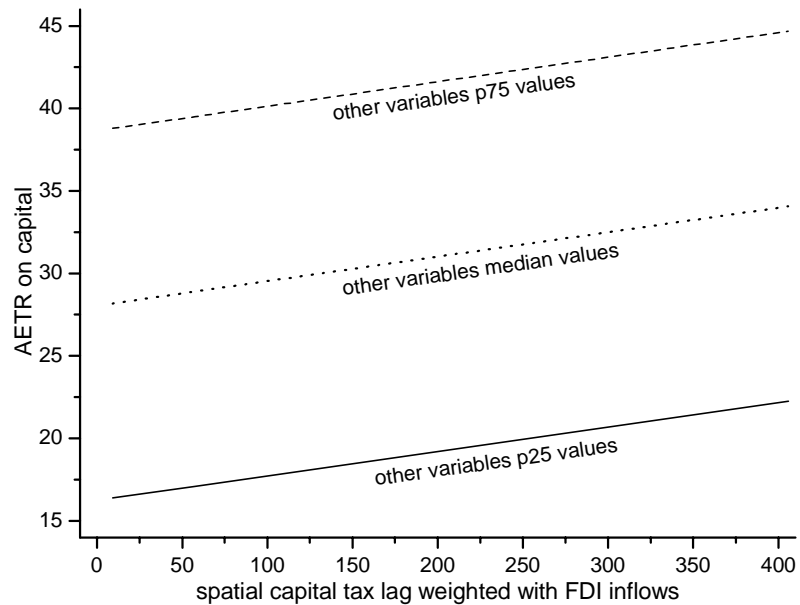


Figure 8a: AETR on capital

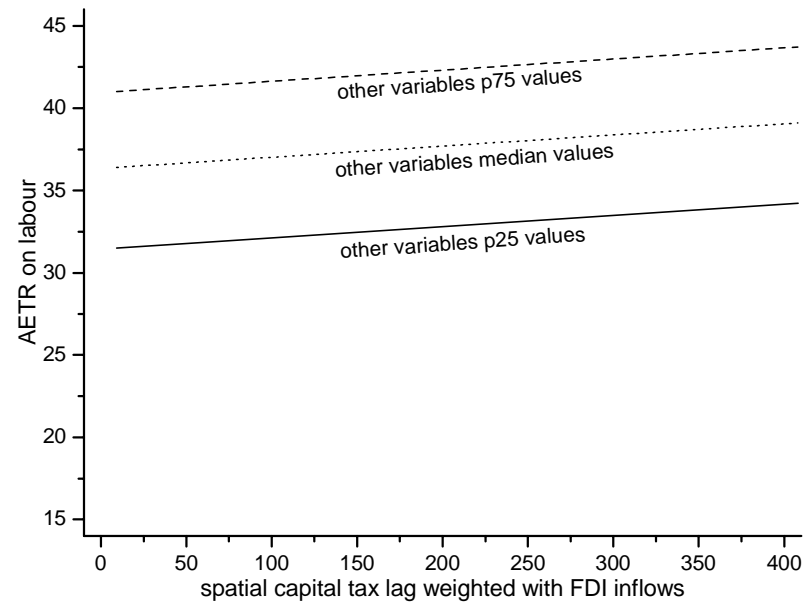


Figure 8b: AETR on labour

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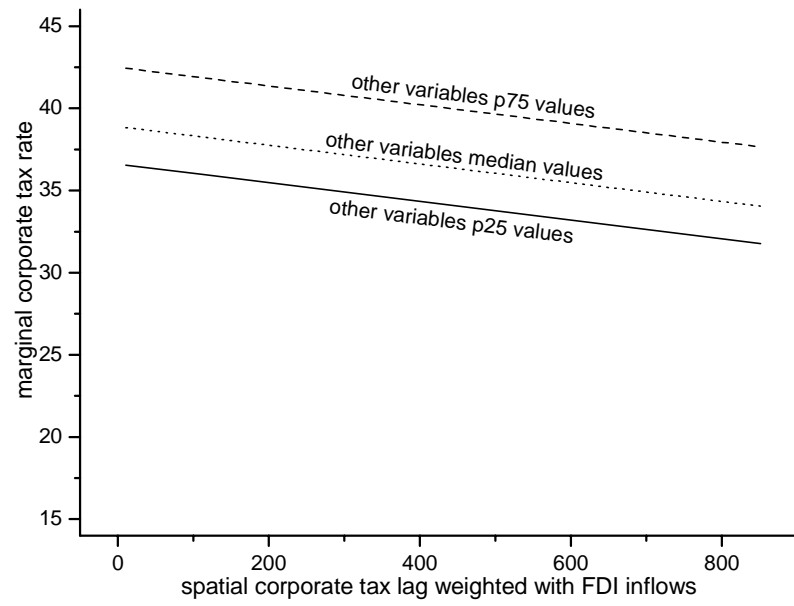


Figure 8c: Marginal corporate tax rates

The graphical depiction of the conditional effect of the main interesting variables gives a much clearer picture of the empirical mechanisms in place. The impact of voters' tax symmetry expectations and the structure of domestic capital bases, thereby, reveal the closest match with theoretical predictions. Unmistakably, the empirical analysis suggests that domestic settings constrain governments in their ability and willingness to compete with other countries for mobile bases.

In the subsequent sections I extend the empirical baseline model by adding different sets of control variables to the right hand side of the estimation equation. The inclusion of controls serves two purposes: first, scrutinizing the robustness of the parameter estimates for the main explanatory variables and second, examining the strength of other theoretical arguments brought forward in existing studies on taxation.

### **3.2 Different Weights of Spatial Lags**

To examine the robustness of the estimation results with respect to the theoretically most interesting variables, I successively include other factors to the right hand side of the empirical model found to be important in the literature on taxation. First of all, I consider other substantial weights for the tax competition variable. Based on the work of Basinger and Hallerberg (2004) I use gross capital formation and GDP per capita as weights for the spatial lags of effective capital and marginal corporate tax rates. In addition – as the theoretical discussion suggests – distance seems to be a factor affecting location decisions of mobile capital and governments' perceptions of which country's tax policy has to be taken into consideration when deciding upon domestic taxation. Other included right hand side variables

correspond to those in the baseline models in Tables 10 and 11. The effects of the main explanatory and control variables remain unchanged. Sizes and significance levels of the interesting coefficients are virtually the same as in the discussed baseline models suggesting robustness of the empirical findings.

Differently weighted spatial lags have no significant impact on governments' choices of effective capital tax rates, regardless whether we model the diffusion path by distance, GDP or gross capital formation. Accordingly, we may conclude that effective tax rates are mainly adapted to average effective capital tax rates abroad and that policy makers mostly bring the domestic tax policy in line with capital taxation in countries successful in attracting mobile tax sources.

Marginal corporate tax rates, in comparison, appear to react significantly to differently weighted spatial lags. In line with theoretical expectations the distance weighted spatial corporate tax lag has a positive significant estimate rendering evidence to the argument that tax policy in nearby countries is more important for domestic policy making. Fiscal authorities more closely align domestic statutory rates with statutory rates in geographically closer jurisdictions since transportation costs for physically moving capital to close countries are much lower. The positive but insignificant coefficient for distance weighted effective capital tax rates abroad (Model 13) additionally supports this conclusion.

Basinger and Hallerberg (2004) argue that fixed capital formation indicates potential rather than actual capital flows and politicians also react sensitively to capital stocks abroad. This notion seems to be supported by the positive significant impact of the capital stock weighted spatial

corporate tax lag. Even though the estimate for spatial lags of effective capital tax rates remains statistically insignificant, the effect points into the same direction allowing the conclusion that not only actual capital flows impact policy decisions on capital tax rate but also potential sources for attracting mobile capital. Though, policy makers seem to adapt mostly statutory tax rates to those in countries disposing of large capital stocks.

Basinger and Hallerberg (2004) also hold that governments pay greater attention to tax policies in larger economies. Yet, we find a significant negative coefficient for the GDP weighted spatial lags which does – on a first glance – contradict the authors' hypothesis. However, domestic policy makers may closely focus on tax policy in larger countries. We know from the discussion of asymmetric tax competition that larger states implement higher capital tax rates. The small negative coefficient therefore suggests that it is easier for fiscal authorities to undercut corporate tax rates in larger countries provided that corporate tax rates there are on average higher than in smaller jurisdictions.

In sum, the analysis of different substantial weights, which potentially influence the strategic interaction between governments competing for mobile tax bases, further underlines the assertion that policy makers do not take the tax policy of all other jurisdictions equally into account. They rather draw on other factors as additional decision making devices. Actual FDI flows appear to best explain how fiscal authorities learn from successful examples and adapt domestic taxation to tax policy set in countries able to attract large capital inflows.

Table 12: differently weighted spatial lags: effective capital and marginal corporate tax rates

DV: AETR capital, marginal corporate rate	Model 13: Capital tax rate	Model 14: Capital tax rate	Model 15: Capital tax rate	Model 16: Corporate tax rate	Model 17: Corporate tax rate	Model 18: Corporate tax rate
<i>Independent Variables:</i>	Distance <sup>74</sup> weighted SL	GDPPC weighted SL	Capital stock weighted SL	Distance weighted SL	GDPPC weighted SL	Capital stock weighted SL
Spatial lag (captax_ <i>j</i> ) or (corptax_ <i>j</i> )	266.546 (222.170)	-0.00001 (0.00004)	0.003 (0.005)	972.807*** (100.031)	-.00003*** (0.000006)	0.036*** (0.004)
Pre-tax Gini	-57.396*** (15.696)	-57.087*** (15.967)	-60.417*** (15.832)	-57.285*** (13.751)	-40.603*** (15.259)	-58.207*** (13.349)
Absolute fiscal redistribution	17.125* (10.007)	17.080* (10.108)	18.032* (10.139)	35.603*** (8.873)	25.845*** (9.644)	26.893*** (8.407)
Share of highly mobile capital (t-1)	-0.008*** (0.003)	-0.008** (0.003)	-0.008*** (0.003)	-0.008*** (0.003)	-0.009*** (0.003)	-0.009*** (0.003)
Budget rigidities (t-1)	0.859*** (0.255)	1.134*** (0.260)	1.171*** (0.261)	0.172 (0.230)	1.112*** (0.251)	0.286 (0.227)
Share of elderly people	2.359*** (0.338)	2.569*** (0.407)	2.344*** (0.346)	-0.693*** (0.256)	-1.010*** (0.295)	0.882*** (0.295)
Unemployment (t-1)	-0.456*** (0.137)	-0.385*** (0.141)	-0.434*** (0.135)	-0.146 (0.122)	0.154 (0.135)	-0.082 (0.121)
GDP growth (t-1)	0.477*** (0.134)	0.690*** (0.143)	0.638*** (0.143)	-0.030 (0.115)	0.112 (0.131)	-0.021 (0.123)
FE	Yes	Yes	Yes	Yes	Yes	Yes
No of Obs (No of units) [missing countries]	647 (21) [Ice, Jap]	593 (20) [Ice, Jap, Lux]	593 (20) [Ice, Jap, Lux]	679 (22) [Ice]	635 (21) [Ice, Lux]	617 (21) [Ice, Lux]
F-test (Prob>F)	48.20***	41.36***	41.19***	29.22***	25.10***	31.16***

<sup>74</sup> Distance is measured as 1 divided by actual distance, so that closer countries get a higher weight. This is necessary in order to be able to interpret the coefficient of the distance weighted spatial tax lag.

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Centered R <sup>2</sup>	[0.000] 0.79	[0.000] 0.77	[0.000] 0.77	[0.000] 0.69	[0.000] 0.66	[0.000] 0.72
Wu-Hausman test of endogeneity for SL	0.593 [0.442]	0.901 [0.343]	0.596 [0.441]	29.042*** [0.000]	1.290 [0.256]	0.251 [0.617]
Anderson test for identification/ relevance of IV	181.347*** [0.000]	656.088*** [0.000]	764.751*** [0.000]	1115.569*** [0.000]	1263.014*** [0.000]	919.605*** [0.000]
Notes: HAC consistent standard errors in parentheses and p-values for test statistics in brackets; *** p≤0.01 (significant at 1%), ** p≤0.05 (significant at 5%), * p≤0.1 (significant at 10%). The intercept is not reported, since it is just the fixed effect of the baseline country.						



### 3.3 Capital Restrictions and Trade Openness

The discussion of previous empirical findings on the effect of legal capital mobility and trade openness on domestic taxation revealed very ambiguous results dependent on sample size and operationalization of the two concepts.<sup>75</sup> Table 13 includes the level of domestic restrictions on capital as well as average capital mobility abroad<sup>76</sup>, and trade per GDP to the right hand side of the estimation equation. In line with Basinger and Hallerberg (2004) I find that higher capital mobility abroad leads to a significant downward pressure on effective capital and marginal corporate tax rates, whereas a reduction in domestic capital restrictions exerts a significant positive effect on both tax rates (Models 19 and 20). Based on these empirical results, we may conclude that greater overall fiscal liberalization in the "world" pushes domestic capital taxation downwards because competitive forces become stronger and the possibilities for attracting foreign direct investments increase as well. This is also consistent with the simulation results for the formal open economy model. From table 7 in Chapter 5 the prediction can be deduced that policy makers have a higher incentive to engage in tax competition and undercut foreign capital tax rates if the prospect of attracting mobile tax bases is promising.

A decline in domestic capital restrictions provides better opportunities for tax avoidance for domestic firms through the shift of mobile capital. Policy

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75 The influence of capital mobility remains inconclusive (Wilson 1999). Rodrik (1997), Garrett (1995), Quinn (1997) and Swank (2004) empirically find that capital mobility significantly reduces capital tax rates. Swank's (1997) results show that capital restrictions exert a positive effect on business taxation. And Garrett and Mitchell (2001) find no significant effect for capital mobility on capital taxation.

76 Both variables are based on the measure provided by Quinn (1997).

makers counterbalance this trend by raising domestic capital tax rates in order to maintain public revenue. The level of domestic capital restrictions does not significantly affect labour taxation but significantly decreases the gap between the tax rates on mobile and immobile factors due to the upward pressure on domestic capital taxation. This finding supports most theoretical accounts of the effect of capital mobility in the extant tax competition literature. Foreign capital mobility, though, leads governments to raise tax rates on wage income which sustains the argument that stronger competitive forces caused by international financial liberalization lead policy makers to shift the tax burden from capital to labour which results in a tax system effect. The positive significant coefficient of foreign capital mobility for the tax ratio further suggests a burden shift and tax system effects.

The impact of trade openness completes this picture: Higher economic openness leads to reductions in effective capital tax rates, a shift of the tax burden to the immobile factor and significantly increases the tax asymmetry. Apparently, it is not the actual strategic interaction between countries – measured as spatial capital tax lags – but the potential for competitive pressures which leads to a shift of the tax burden from mobile to immobile factors. Governments use these changes in international financial markets to rationalize and justify higher tax rates on wage income.

All main explanatory variables, the spatial capital tax lag, budget rigidities, societal equality needs, and domestic capital structure maintain their expected effects on the four dependent variables. This also holds true for the control variables with one exception: The coefficient for the share of elderly people in the labour tax model (21) changes signs and becomes insignificant.

*Table 13: The Influence of Capital and Trade Openness on Effective Capital and Labour Tax Rates, the Tax Ratio of Labour to Capital Tax Rates and Marginal Corporate Rates*

DV: AETR capital, labour; Tax ratio; Corp tax rate	Model 19: Capital tax rate	Model 20: Top corporate rate	Model 21: Labour tax rate	Model 22: Tax ratio
<i>Independent Variables:</i>	FDI weighted SL	FDI weighted SL	FDI weighted SL	FDI weighted SL
Spatial lag (captax_ <sub>-j</sub> ) or (corptax_ <sub>-j</sub> )	0.020*** (0.004)	-0.007*** (0.002)	0.002 (0.002)	-0.001** (0.0003)
Pre-tax Gini	-53.872*** (15.312)	-38.386*** (12.929)	17.810** (7.729)	5.020*** (1.173)
Absolute fiscal redistribution	16.687* (9.524)	26.503*** (7.954)	-2.871 (4.655)	-2.101*** (0.718)
Share mobile capital (t-1)	-0.005* (0.003)	-0.005* (0.003)	-0.003 (0.002)	0.0002 (0.0002)
Budget rigidities (t-1)	0.951*** (0.259)	0.352 (0.228)	0.689*** (0.141)	-0.042** (0.021)
Share of elderly people	2.386*** (0.452)	1.077*** (0.293)	-0.218 (0.188)	-0.211*** (0.035)
Unemployment (t-1)	-0.359*** (0.135)	0.056 (0.124)	0.137* (0.075)	0.057*** (0.011)
GDP growth (t-1)	0.527*** (0.136)	0.015 (0.120)	0.069 (0.066)	-0.049*** (0.010)
Cap. mobility (Quinn)	0.951*** (0.281)	0.646*** (0.244)	0.160 (0.147)	-0.115*** (0.023)
SL Capital mobility	-1.752*** (0.421)	-3.524*** (0.343)	1.157*** (0.022)	0.147*** (0.031)
Trade openness (t-1)	-0.069* (0.038)	0.007 (0.036)	0.065*** (0.022)	0.011*** (0.003)
FE	Yes	Yes	Yes	Yes
No of Obs (No of units) [missing countries]	569 (19) [Ice, It, Jap, Lux]	604 (20) [Ice, Lux, Jap]	595 (20) [Ice, It, Lux]	556 (19) [Ice, It, Jap, Lux]
F-test (Prob>F)	41.63*** [0.000]	32.59*** [0.000]	128.07*** [0.000]	36.41*** [0.000]
Centered R <sup>2</sup>	0.79	0.74	0.93	0.80
Wu-Hausman test for SL	0.845 [0.358]	16.203*** [0.000]	0.256 [0.613]	0.372 [0.542]
Anderson test for relevance of IV	3539.079*** [0.000]	4572.270*** [0.000]	3713.357*** [0.000]	3435.494*** [0.000]
Notes: HAC consistent standard errors in parentheses and p-values for test statistics in brackets; *** p ≤ 0.01 (significant at 1%), ** p ≤ 0.05 (significant at 5%), * p ≤ 0.10 (significant at 10%). The intercept is not reported, since it is just the fixed effect of the baseline country.				

### **3.4 Political and Institutional Explanations**

In a last step, I add some political and institutional variables to the right hand side of the model to account for characteristics of the political system and partisan effects. Specifically, I introduce the political colour of the largest government party as well as the average partisanship of foreign governments taking possible indirect foreign constraints on domestic tax policy making into consideration (Basinger and Hallerberg 2004). In addition, I include procedural and institutional restrictions to the power of the executive, the maximal polarization between positions of legislative and executive parties, and dummy variables for legislative and executive elections to account for possible electoral business cycle effects. Table 14 presents the empirical results.

First to note, the estimates for the important theoretical variables remain stable and mostly replicate the findings from the baseline model (Tables 10 and 11). Still, including all variables induces problems of inefficiency due to collinearity of some of the concepts. As a consequence, the significance levels for all variables in the full models drop, although the size and direction of the coefficients are mostly unchanged. We can infer that tax competition impacts domestic policy making but the willingness and ability of governments to play the tax competition game is restricted by domestic conditions, especially societal demands for tax symmetry, the structure of the domestic capital and budget rigidities.

Turning to the discussion of the included political variables, we detect that neither elections nor ideological polarization significantly affect domestic tax policy making. The coefficients are found to be statistically insignificant for all dependent tax rates and the tax ratio. Executive constraints exert a

positive significant effect on effective tax rates on capital and wage income as well as on marginal corporate taxation supporting the findings and arguments of others (Hallerberg and Basinger 1999, Wagschal 1999a,b) stating that institutional constraints and veto players hinder governments from implementing large tax cuts intended to adapt capital taxation to internationally competitive levels. More and higher executive constraints prevent the implementation of reforms which in this case include reforms of the national tax system. Because the effect is somewhat stronger for capital than for labour tax rates, tax asymmetry decreases with the strength of executive constraints.

Partisanship of domestic and foreign governments represent the last variables to be considered. The colour of the national government, surprisingly, but in line with Basinger and Hallerberg (2004), exerts no or almost no significant impact on domestic decisions upon taxation. Partisanship of the domestic policy maker only affects the effective capital tax rates with a relatively low significance level. Specifically, more right wing governments appear to implement lower effective tax rates on the mobile factor which confirms expectations in the literature holding that right wing governments on average tax and spend less than left wing policy makers (Garrett 1995 among others). Since the coefficient turns insignificant when more political variables are included (Model 24) the support remains weak

The political colour of governments abroad seems to have a stronger impact on domestic taxation, yet the direction of the influence is somewhat ambiguous. Conforming to the empirical results of Basinger and Hallerberg (2004), my results reveal that the higher the number of countries governed

by right-wing parties, the larger the negative effect for domestic effective capital tax rates. Domestic policy makers appear to expect right-wing governments abroad to cut effective capital taxes more strongly than left-wing policy makers in power. And they, therefore, follow the overall political trend. Though, the estimate for marginal corporate tax rates turns out to be significantly positive contradicting the stated argument. One can hardly think of a convincing explanation for the finding that domestic governments increase marginal corporate tax rates if more states are led by right-wing governments, especially since we cannot find a significant coefficient for partisanship of domestic leaders on corporate taxation. The spatial lag of partisanship does not significantly influence labour taxation which in combination with the effect on effective capital tax rates leads to greater tax asymmetry when right-wing parties dominate governments abroad.

Institutional constraints to executive policy making are the only political factor exerting a consistent effect on all dependent variables. Higher constraints hamper the implementation of tax reducing reforms and the effect turns out to be strongest for capital taxation. The more the executive is constraint by other political actors and institutional factors, the less able governments are to adapt tax rates to international competitive levels. Still, the effect for labour taxation remains much smaller and less significant, so that the tax gap increases if more restrictions to the executive are in place.

Overall, the inclusion of political and institutional variables does not or only marginally add to the explanatory power of the empirical model. The R-squared for labour taxation and the tax ratio do not grow at all as compared to the models in table 13 and for capital taxation this goodness of fit

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measure increases only by 1 percent, even though in table 14 six additional explanatory variables are added to the right hand side of the estimation equation. Although political and institutional constraints might slightly limit the discretion of governments over tax policy making, the factors, on which governments base their – opportunistic and rational – choice of tax instruments – tax rates abroad, the structure of the domestic capital, societal demands for equity and public spending – dominate decisions upon the domestic tax system.

Table 14: The Effect of Political and Institutional Variables

DV: AETR capital, labour, tax ratio, marginal corporate rate	Model 23: Capital tax rate	Model 24: Capital tax rate	Model 25: Corporate tax rate	Model 26: Corporate tax rate	Model 27: Labour tax rate	Model 28: Labour tax rate	Model 29: Tax ratio	Model 30: Tax ratio
<i>Independent Variables:</i>	FDI weighted spatial lag	FDI weighted spatial lag	FDI weighted spatial lag	FDI weighted spatial lag	FDI weighted spatial lag	FDI weighted spatial lag	FDI weighted spatial lag	FDI weighted spatial lag
Spatial lag (captax_-j) or (corptax_-j)	0.012*** (0.004)	0.011** (0.004)	-0.006*** (0.002)	-0.006*** (0.002)	0.002 (0.002)	0.002 (0.002)	-0.0001 (0.0003)	0.00001 (0.0004)
Fairness: Pre-tax Gini	-44.090*** (15.362)	-33.186** (14.254)	-47.196*** (12.729)	-41.160*** (12.727)	16.680** (7.452)	11.308* (6.584)	4.233*** (1.127)	3.672*** (1.174)
Fairness: Absolute fiscal redistribution	13.139* (7.452)	6.997 (8.843)	31.315*** (7.805)	28.253*** (7.933)	-2.020 (4.593)	-0.673 (4.729)	-1.674** (0.697)	-1.094* (0.634)
Share of highly mobile capital (t-1)	-0.005* (0.003)	-0.004* (0.003)	-0.004* (0.002)	-0.004* (0.002)	-0.003 (0.002)	-0.003 (0.002)	0.001 (0.002)	0.002 (0.002)
Budget rigidities (t-1)	1.191*** (0.267)	1.135*** (0.272)	0.049 (0.234)	-0.020 (0.252)	0.708*** (0.131)	0.710*** (0.143)	-0.064*** (0.019)	-0.085*** (0.021)
Share of elderly people	2.249*** (0.452)	1.959*** (0.408)	1.288*** (0.289)	1.008*** (0.299)	-0.193 (0.173)	-0.263 (0.179)	-0.205*** (0.033)	-0.163*** (0.036)
Unemployment (t-1)	-0.346** (0.137)	-0.398*** (0.133)	0.075 (0.123)	0.012 (0.124)	0.121* (0.069)	0.148** (0.071)	0.052*** (0.010)	0.064*** (0.010)
GDP growth (t-1)	0.453*** (0.136)	0.431*** (0.137)	0.116 (0.119)	0.061 (0.124)	0.075 (0.066)	0.060 (0.070)	-0.045*** (0.010)	-0.047*** (0.011)
Capital mobility (Quinn)	0.894*** (0.280)	1.246*** (0.289)	0.786*** (0.241)	1.128*** (0.252)	0.148 (0.131)	0.173 (0.143)	-0.110*** (0.020)	-0.146*** (0.023)
SL Capital mobility	-1.402*** (0.437)	-1.791*** (0.418)	-3.927*** (0.347)	-4.236*** (0.365)	1.190*** (0.215)	1.221*** (0.232)	0.126*** (0.032)	0.148*** (0.035)
Trade openness (t-1)	-0.049 (0.038)	-0.022 (0.042)	-0.020 (0.035)	-0.025 (0.036)	0.068** (0.018)	0.071*** (0.019)	0.010*** (0.003)	0.008*** (0.003)
Partisanship of	-0.518* (0.267)	-0.453 (0.272)	-0.027 (0.234)	0.091 (0.252)	-0.183 (0.131)	-0.105 (0.143)	0.011 (0.019)	-0.015 (0.021)



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government	(0.317)	(0.319)	(0.281)	(0.287)	(0.157)	(0.166)	(0.023)	(0.023)
SL Partisanship of government	-4.786*** (1.537)	-2.654* (1.693)	5.438*** (1.200)	4.240*** (1.340)	0.439 (0.752)	0.329 (0.878)	0.410*** (0.112)	0.454*** (0.134)
Executive constraints		3.534*** (1.154)		1.696* (1.052)		1.102* (0.606)		-0.295*** (0.090)
Legislative polarization		0.252 (0.431)		-0.587 (0.371)		-0.276 (0.218)		0.024 (0.035)
Executive elections		0.913 (1.262)		-0.198 (1.168)		0.739 (0.645)		-0.058 (0.107)
Legislative elections		0.065 (0.424)		-0.309 (0.381)		-0.306 (0.207)		0.001 (0.034)
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of Obs (No of units) [missing countries]	566 (19) [Ice, It, Lux, Jap]	507 (18) [Ice, It, Lux, Jap, Swi]	602 (20) [Ice, Lux, Jap]	539 (19) [Ice, Lux, Jap Swi]	592 (20) [Ice, It, Lux]	528 (19) [Ice, It, Lux, Swi]	553 (19) [Ice, It, Lux, Jap]	489 (18) [Ice, It, Lux, Jap, Swi]
F-test (Prob>F)	39.65*** [0.000]	35.69*** [0.000]	32.74*** [0.000]	17.28*** [0.000]	125.51*** [0.000]	100.23*** [0.000]	42.42*** [0.000]	35.64*** [0.000]
centered R <sup>2</sup>	0.80	0.81	0.76	0.66	0.93	0.93	0.80	0.81
Wu-Hausman test of endogeneity for SL	1.938 [0.165]	4.830** [0.028]	0.294 [0.588]	0.740 [0.390]	0.323 [0.570]	0.827 [0.363]	1.012 [0.315]	0.754 [0.386]
Anderson test for identification/ relevance of IV	3364.02*** [0.000]	3040.10*** [0.000]	4786.11*** [0.000]	4285.31*** [0.000]	3523.76*** [0.000]	3135.58*** [0.000]	3268.31*** [0.000]	2882.01*** [0.000]

Notes: HAC consistent standard errors in parentheses and p-values for test statistics in brackets; \*\*\*  $p \leq 0.01$  (significant at 1%), \*\*  $p \leq 0.05$  (significant at 5%), \*  $p \leq 0.10$  (significant at 10%). The intercept is not reported, since it is just the fixed effect of the baseline country.

## **4. Robustness of the Empirical Results**

The discussion of the empirical results in the previous section already highlights that the estimates of the most interesting explanatory variables are robust to the inclusion of different sets of control variables. In order to further examine robustness of the estimated coefficients, I subject the empirical findings to a more rigorous test. As already mentioned, the choice of the starting year for the quantitative analysis has the potential to alter the estimation results. Moreover, single observations or the inclusion (exclusion) of specific countries might drive the empirical findings.

### **4.1 Impact of the Starting Year**

First, I test whether a change of the first year included exerts a significant effect on the substantial results. I, therefore, alter the first observation for the baseline models from 1975 to 1980 and 1985. Table 15 depicts the quantitative findings for effective capital and marginal corporate tax rates, whereas table 16 shows the results for labour taxation and tax system effects.

With respect to capital and corporate tax rates the estimates remain relatively stable both in size and significance levels regardless of the chosen starting point. The coefficient for the one year lagged FDI stock – measuring the share of highly mobile capital – turns insignificant when we pick 1985 as a starting point of the analysis. Size and direction of the effect remain the same. The share of MNEs in the domestic economy – another operationalization of de facto capital mobility – has a stable negative significant impact on effective capital rates as well as marginal corporate

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taxation. Two other domestic factors, budget rigidities and prevalence of societal equality considerations significantly increase capital taxation regardless of the selected starting year. Overall, the main hypotheses with regard to the effect of domestic settings on governments' decisions about effective capital and marginal corporate taxation are confirmed by the results in table 15.

Table 15: Effect of Different Starting Years on Capital and Corporate Taxation

DV: AETR capital, marginal corporate tax rates	Model 31: AETR on capital	Model 32: AETR on capital	Model 33: AETR on capital	Model 34: AETR on capital	Model 35: Top corp. tax rates	Model 36: Top corp. tax rates	Model 37: Top corp. tax rates	Model 38: Top corp. tax rates
<i>Independent Vars.:</i>	1980	1980	1985	1985	1980	1980	1985	1985
SL: FDI*(ctax_-j) or (topcorp_-j)	0.015*** (0.004)	0.013*** (0.004)	0.015*** (0.004)	0.015*** (0.004)	-0.005** (0.002)	-0.006*** (0.002)	-0.004** (0.002)	-0.005*** (0.002)
Pre-tax Gini	-43.408** (18.119)	-36.907** (16.205)	-44.973** (18.614)	-34.566** (16.436)	-67.661*** (17.608)	-68.094*** (16.170)	-57.928*** (18.846)	-52.63*** (16.274)
Absolute fiscal redistribution	15.863* (9.945)	14.323* (8.987)	20.989** (10.565)	18.162** (9.065)	37.723*** (10.865)	37.111*** (10.024)	30.088*** (11.040)	29.427*** (9.660)
FDI stock (t-1)	-0.007** (0.003)		-0.003 (0.003)		-0.010** (0.004)		-0.004 (0.004)	
turnover of multinationals (t-1)		-0.050* (0.030)		-0.044* (0.026)		-0.109*** (0.033)		-0.119*** (0.032)
Budget rigidities (t-1)	1.469*** (0.351)	1.661*** (0.320)	1.949*** (0.396)	2.182*** (0.354)	1.257*** (0.349)	1.023*** (0.326)	1.121*** (0.425)	0.756** (0.365)
Share of elderly people	2.395*** (0.456)	2.144*** (0.341)	2.334*** (0.487)	2.223*** (0.369)	-1.832*** (0.385)	-1.244*** (0.332)	-1.915*** (0.449)	-1.399*** (0.361)
Unemployment (t-1)	-0.351** (0.171)	-0.378** (0.159)	-0.355** (0.183)	-0.425** (0.169)	-0.172 (0.174)	-0.313* (0.166)	0.054 (0.195)	-0.290* (0.176)
GDP growth (t-1)	0.615*** (0.173)	0.620*** (0.160)	0.819*** (0.189)	0.808*** (0.171)	0.191 (0.171)	0.174 (0.163)	0.313* (0.195)	0.319* (0.173)
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of Obs	455	461	365	366	488	492	393	392
F-test (Prob>F)	23.48*** [0.000]	25.71*** [0.000]	23.27*** [0.000]	26.06*** [0.000]	14.98*** [0.000]	15.69*** [0.000]	11.84*** [0.000]	15.38*** [0.000]
Centred R <sup>2</sup>	0.77	0.79	0.79	0.81	0.67	0.68	0.66	0.71

Notes: HAC consistent standard errors in parentheses and p-values for test statistics in brackets; \*\*\* p ≤ 0.01 (significant at 1%), \*\* p ≤ 0.05 (significant at 5%), \* p ≤ 0.10 (significant at 10%). The intercept is not reported, since it is just the fixed effect of the baseline country.

Changing the starting year for models of labour taxation and tax ratio does not change the substantial results either (see table 16). Demands for tax symmetry significantly decrease effective tax rates on labour income, even though the pre-government intervention Gini-coefficient turns out to be insignificant in case the first observation is changed to 1985 (Model 40). More importantly, fiscal redistribution reduces tax rates on labour and has also a significant negative impact on the tax ratio regardless of the selected starting point.

Public spending significantly increases tax rates on wage income and decreases the gap between taxation of the mobile and immobile factors. Independent of the analyzed time period, higher de facto mobility of domestic capital goes along with a larger gap between capital and labour taxation. Compared to the baseline models in tables 9 and 10, the estimated coefficients for the other control variables, unemployment, GDP growth and share of elderly people do neither change in size nor in significant levels. Models of labour taxation and tax system effects can even explain more variance if we exclude earlier years from the analysis.

Table 16: Effect of Different Starting Years on Labour Taxation and the Tax System

DV: AETR labour; Tax ratio labour/capital	Model 39: Labour tax rate	Model 40: Labour tax rate	Model 41: Tax ratio	Model 42: Tax ratio
<i>Independent Variables:</i>	Starting year: 1980	Starting year: 1985	Starting year: 1980	Starting year: 1985
SL: FDI*(ctax_-j)	0.005** (0.002)	0.003* (0.002)	-0.000 (0.000)	-0.000 (0.000)
Pre-tax Gini	20.580** (8.575)	10.199 (8.817)	2.962** (1.322)	4.113*** (1.299)
Absolute fiscal redistribution	-12.714** (5.184)	-9.709** (5.000)	-1.380* (0.812)	-2.021*** (0.748)
Share of highly mobile capital: FDI stock (t-1)	-0.000 (0.001)	-0.000 (0.002)	0.001* (0.000)	0.002* (0.001)
Budget rigidities (t- 1)	0.396** (0.171)	0.408** (0.196)	-0.118*** (0.026)	-0.138*** (0.027)
Share of elderly people	0.579*** (0.184)	0.367* (0.206)	-0.198*** (0.034)	-0.163*** (0.034)
Unemployment (t- 1)	0.330*** (0.084)	0.285*** (0.002)	0.055*** (0.012)	0.059*** (0.013)
GDP growth (t-1)	0.170** (0.082)	0.178** (0.090)	-0.061*** (0.013)	-0.074*** (0.013)
FE	Yes	Yes	Yes	Yes
No of Obs	478	383	441	352
F-test (Prob>F)	87.60*** [0.000]	85.60*** [0.000]	27.64*** [0.000]	29.98*** [0.000]
Centred R <sup>2</sup>	0.93	0.94	0.79	0.82
Notes: HAC consistent standard errors in parentheses and p-values for test statistics in brackets; *** p ≤ 0.01 (significant at 1%), ** p ≤ 0.05 (significant at 5%), * p ≤ 0.10 (significant at 10%). The intercept is not reported, since it is just the fixed effect of the baseline country.				

## 4.2 Outliers and Influence of Single Countries

Not only the time period under observation but also the inclusion of specific cases or countries might drive the estimation results. Jackknife analyses are especially suited to test whether the estimated coefficients hinge on single observations or cases. A jackknife model estimates as many regressions as observations by leaving one observation out at a time. Jackknife coefficients and standard errors depict the mean of all estimated models for each

excluded observation. In case the jackknife coefficients and standard errors are close to the original results, we can conclude that the empirical findings do not crucially depend on outlier cases. Table 17 provides the jackknife results with respect to the baseline models (tables 9 and 10) for effective capital and labour tax rates, marginal corporate rates and the tax ratio between tax rates on capital and labour.

All jackknife coefficients and standard errors are very close to the original estimates indicating that outlier cases do not drive the empirical findings as the reported estimates depict the means of all replications. In parentheses we find the standard deviations of the distribution of coefficients and standard errors over all replications. The standard deviations of the coefficients should be close to the mean standard errors, and this holds in most cases true. As a consequence, we can be fairly sure about the reliability of the presented empirical results.

Table 17: Jackknife Coefficients and Standard Errors for Baseline Models

Jackknife results	Model 43: AETR on capital	Model 44: Top corp tax rate	Model 45: AETR on labour	Model 46: Tax ratio
<i>Independent Variables:</i>	Upper cell: jackknife mean coefficient (jackknife SD)			
	Lower cell: jackknife mean SE (jackknife SD)			
SL: FDI*(ctax_-j), (topcorp_-j)	0.015*** (0.006) 0.004*** (0.000)	-0.006*** (0.002) 0.002*** (0.000)	0.007*** (0.002) 0.002*** (0.000)	0.000 (0.000) 0.000*** (0.000)
Pre-tax Gini	-66.620*** (14.685) 15.908*** (1.453)	-66.492*** (14.545) 15.389*** (1.388)	35.102*** (9.278) 8.306*** (0.710)	4.710** (2.020) 1.160*** (0.097)
Absolute fiscal redistribution	20.466* (12.301) 9.999*** (2.074)	38.890*** (9.869) 9.657*** (1.880)	-12.443* (7.551) 5.162*** (1.011)	-1.633** (0.853) 0.742*** (0.146)
Share of highly mobile capital: FDI stock (t-1)	-0.011*** (0.003) 0.003*** (0.001)	-0.012*** (0.004) 0.003*** (0.000)	0.001 (0.001) 0.002*** (0.000)	0.001*** (0.000) 0.000*** (0.000)
Budget rigidities (t-1)	1.212*** (0.267) 0.294*** (0.020)	0.741*** (0.211) 0.289*** (0.020)	0.653*** (0.128) 0.156*** (0.009)	-0.062*** (0.023) 0.021*** (0.001)
Share of elderly people	2.078*** (0.344) 0.420*** (0.033)	-1.376*** (0.309) 0.349*** (0.029)	0.543*** (0.158) 0.189*** (0.014)	-0.178*** (0.025) 0.031*** (0.003)
Unemployment (t-1)	-0.473*** (0.105) 0.150*** (0.012)	-0.208* (0.127) 0.149*** (0.009)	0.316*** (0.064) 0.080*** (0.005)	0.063*** (0.011) 0.011*** (0.001)
GDP growth (t-1)	0.592*** (0.136) 0.143*** (0.009)	0.063 (0.131) 0.140*** (0.009)	0.112 (0.072) 0.075*** (0.004)	-0.054*** (0.012) 0.010*** (0.001)
FE	Yes	Yes	Yes	Yes
No of Replications	569	601	595	554
Notes: *** $p \leq 0.01$ (significant at 1%), ** $p \leq 0.05$ (significant at 5%), * $p \leq 0.10$ (significant at 10%). The intercept is not reported, since it is just the fixed effect of the baseline country.				

In panel data analyses, cases – and in the present study countries – represent the crucial units prone to drive estimation results. Based on this observation,



the exclusion of single observations – as in the basic jackknife model – might not provide much additional information. A country-wise jackknife estimation, hence, should offer a more reliable robustness test. For each of the baseline models (3, 7, 10 and 12 in tables 9 and 10) I run 23 single regressions excluding all observations for one country at a time.<sup>77</sup> From a first glance at the results, we may draw the conclusion that the estimated coefficients for the main explanatory variables in all baseline models remain highly stable in size, direction and significant levels regardless of which country is excluded.

Nevertheless, some noteworthy deviations can be observed (grey shaded cells). On average, effective capital tax rates increase with the demand for redistribution and tax symmetry (see table A1 in the Appendix). In case we drop Germany and Greece from the regression model the estimated coefficient becomes smaller, though the direction of the effect does not change and the coefficient turns out to be statistically significant. From this follows, that apparently tax symmetry considerations have a stronger impact on capital taxation in Germany and Greece and are on average somewhat less important in other countries. This finding is consistent with case studies on Germany providing anecdotic evidence for the claim that German policy makers were unable to adapt domestic capital taxation to competitive pressures because of societal demands for tax symmetry (Ganghof 2000a).

Another interesting observation can be made with respect to the reaction of governments to de facto capital mobility and the domestic capital structure. On average governments have higher incentives to engage in tax competition if domestic capital is highly concentrated and MNEs dominate

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<sup>77</sup> I relegate the country-wise jackknife results to the appendix in order to save space.

the economy. This is supported by the significant negative impact of the share of highly mobile capital on marginal corporate and effective capital tax rates throughout. Interestingly, in case we exclude the US from the regression, the coefficient of FDI stock increases by factor three indicating that non-US governments react more heavily to de facto mobility of domestic capital and US fiscal authorities are much less constraint by the domestic capital structure. This might be caused by the specific federal structure in the US, where state governments are much more concerned with providing investment friendly conditions for domestic firms than the federal government. The same effect can be observed for the tax ratio (table A4).

By and large, subjecting the empirical findings to different kinds of robustness tests reveals a high stability of the regression results. Thus, on average, the main conclusions drawn from the quantitative analysis seem to be independent of different model specifications, the inclusion of different sets of control variables, and the analysis of various time periods and country samples. The small deviations found are consistent with existing case study evidence.

### **5. Discussion of Empirical Results in Light of the Theory**

Overall the empirical findings are in line with the implications of the theoretical model. Domestically set tax policies in OECD countries over the last three decades seem to be the result of opportunistic policy making. Governments want to reach different policy goals like public good provision and income redistribution with taxation. In achieving these aims, they are constraint by domestic and international trade-offs. Therefore, politicians decide upon the optimal – vote maximizing – tax mix in light of

international competitive pressures, domestic demand for public good provision and tax symmetry, and the de facto mobility of domestic capital sources. The actual tax rates and tax mixes we can observe in OECD countries originate from a careful and difficult balancing of these different domestic and international trade-offs. This is not to say that the integration of international capital markets and the resulting increase in competitiveness does not affect domestic policy making. Still, these forces are not dominant for the majority of countries but they add to the difficulty of deciding upon tax rates which maximize political support. Moreover, we can find some evidence that policy makers do not take taxation of capital in all other countries equally into account. They mainly adapt the domestic tax rates to capital taxation in countries proved to be successful in attracting foreign capital bases. Different constellations of domestic needs and demands, though, shape the ability and willingness of governments to engage in international tax competition.

The theory does not only make predictions about capital tax rates but also about taxation of wage income and the gap between capital and labour tax rates. Since governments use both instruments in order to reach their political goals, this is very important. Not accounting for effects of tax competition and domestic settings on the whole national tax system only provides a partial picture. The empirical results show that all theoretically interesting factors which influence capital taxation also strongly impact the domestic tax mix. This especially holds true for domestic equality needs which heavily influence the symmetry of tax rates imposed on capital and labour. Because taxation implies distributional consequences and governments can use the one tax instrument to substitute for the other, not

looking at capital and labour taxation simultaneously omits important aspects of domestic tax policy making. For example, strategic interaction between governments operationalized as capital tax rates abroad does not necessarily cause governments to shift the tax burden from capital to labour. While tax rates on capital decline when other countries cut back their tax rates, labour tax rates move in the same direction. Nevertheless, the level of wage taxes remains in most cases higher so that the gap between the two tax instruments gets larger.

If we include legal capital mobility abroad into the empirical analysis we can observe the widely predicted and expected effect. Higher foreign capital mobility causes policy makers to cut back domestic capital tax rates. In turn, they compensate this tax reduction by higher tax rates on wage income and enlarge the gap between the two tax measures. Perceived international pressure leads to a shift of the tax burden rather than actual strategic interaction between countries competing for mobile sources. Domestic factors such as equality needs, however, have a direct effect on the tax system. Higher demands for symmetry lead to a convergence in tax rates on corporate and wage income.

Several empirical findings stand out: Effective capital taxation and marginal corporate tax rates are by and large affected equally by tax competition and domestic factors with some notable exceptions. Governments adapt marginal corporate tax rates much closer to tax rates abroad, whereas incumbents try to undercut effective capital tax rates in other countries more strongly if domestic constellations allow. Statutory corporate tax rates play a major role in the international tax credit system and governments try to keep statutory rates very close to foreign statutory tax rates. From this also

follows that policy makers care mostly about effective capital taxation in countries with a high FDI inflow because these countries prove to be successful in attracting mobile bases and, therefore, are the strongest competition. In comparison, policy makers only can undercut moderately high statutory tax rates of successful countries. They only attempt underbidding the marginal corporate tax rates of highly successful jurisdictions and do not pay much attention to the statutory rates in other countries.

Both marginal corporate and effective capital tax rates increase with the strength of budget rigidities. Yet, effective capital rates are affected more strongly by high public spending since governments need to effectively collect revenue from corporate income which is only possible if the effective taxation approaches high levels because company owners easily can avoid paying marginal rates.

In contrast, societal equality needs are rather fulfilled by higher statutory corporate tax rates as governments use these statutory rates as an easy signal for voters showing their compliance with societal demands. The structure of effective tax rates appears much too complicated to be easily seen through by the electorate. Multinationals in the domestic economy and the share of highly mobile FDI push both effective capital and statutory corporate tax rate equally down as theoretically expected. No effect can be detected, though, for labour tax rates, which supports the theoretical predictions as well.

Simulation results of the formal model suggest that domestic factors such as public spending and equity demands, in particular, have a stronger effect on labour taxation than on capital tax rates. The empirical findings sustain the

expectation that equality needs decrease labour tax rates and the gap between capital and labour taxation, yet, the effect appears less strong than predicted. Also, budget rigidities overall increase tax rates on wage income but affect capital taxes more strongly. This implies that the latitude to change tax rates on capital seems larger than to push labour taxation further up if budget constraints are very severe. In case governments face a highly rigid budget, both capital and labour tax rates remain at comparably high levels. If the demand for public goods goes down and governments have more discretion, they tend to cut back tax rates on mobile bases, especially if they face severe competitive pressures, and keep tax rates on wage income on a higher level to maintain revenue. This strategy is possible since workers are much less flexible in their location choices than capital owners. If spending is high and cannot be reduced by incumbents, this governmental approach to taxation also leads to a smaller gap between labour and capital tax rates.

To allow an easy comparison between the hypotheses created by the formal theoretical model and the empirical findings, table 18 gives a summary of the results. Most theoretical predictions could be confirmed by the quantitative data analysis. This enables us to infer that the theoretical model on average captures well the mechanisms underlying domestic tax policy making. The main discrepancy between theory and empirics lies in the size of the effects of the two domestic factors equality needs and electoral demand for public goods. Both variables were predicted to have a stronger effect on labour taxation than on capital taxation. Although the empirical analysis confirms the direction of the effects, statistical results also suggest that taxes on wage income are less flexible than taxes on mobile sources.

This leads to a decreasing tax ratio if the domestic budget is highly rigid because governments cut back capital tax rates more strongly if government spending is reduced accordingly.

Furthermore, the negatively signed coefficient for FDI weighted marginal corporate tax rates abroad runs opposite to the theoretical model. The effect for effective capital tax rates, though, closely matches the formally generated predictions. Since statutory rates are mainly used to send signals to owners of potential mobile sources, governments attempt to underbid statutory rates in the most successful jurisdictions.

*Table 18: Comparison of Theoretical Predictions and Empirical Findings*

		Capital Taxes	Labour Taxes	Tax ratio Labour/Capital
Equity needs	Prediction	+	--	--
	Estimate	++	-	--
Share of highly mobile capital	Prediction	-	NA	+
	Estimate	--	NA	++
Spending/ budget rigidities	Prediction	+	++	+
	Estimate	++	+	-
Tax competition	Prediction	++	+	+
	Estimate	++	+	+
Foreign attractiveness*foreign tax rate	Prediction	++	+	NA
	Estimate	+ +/ -	+	NA

The inclusion of additional political and institutional control variables does not influence the validity of the substantial results. Neither can they explain significantly more variation in domestic tax policy making. More importantly, most political constraints seem to have no or an inconsistent effect on domestic policy making. Only institutional constraints to the executive hinder governments from implementing large tax cuts. This is consistent with theoretical accounts arguing that higher institutional constraints prevent policy change in general.

In sum, with some minor deviations the empirical findings render strong evidence to the theoretical argument brought forward. Incumbents opportunistically choose optimal tax mixes facing different domestic and international trade-offs. The quantitative results also lend support to the prediction of persistently high capital taxation and variance in national tax systems.

### **6. Conclusion: Empirical Analysis**

The presented empirical analysis provides strong evidence for the theoretical arguments laid out in Chapters 4 and 5. The proposed econometric model and its specification seem to be well suited to account for the estimation problems caused by the strategic nature of the tax competition game. Including spatial capital tax lags operationalizes this strategic interaction between governments. A two stage least squares instrumental variables approach eliminates possible endogeneity bias which the inclusion of spatial lags induces. The instruments are carefully selected and all pass the relevance test (Hall and Peixe 2000). Country fixed effects solve the potential problem of correlated unit specific effects and I treat inefficiencies resulting from contemporaneously and periodically correlated error terms by estimating a heteroskedasticity and autocorrelation consistent variance-covariance matrix. After having removed possible sources of bias and inefficiency, the quantitative analysis should produce sound and reliable estimation results.

By and large the empirical findings support the hypotheses derived from the theory and the formal model. Undeniably, the quickly progressing integration of financial and goods markets altered the international



environment in which governments decide upon taxation. Tax rates set in other countries and the abolishment of restrictions to capital transactions abroad force governments to adapt their own tax policy to these competitive pressures. Yet, downward spiraling capital taxes cannot be observed and convergence of national tax systems remains far from being perfect. Quite to the contrary, domestic tax mixes differ greatly. Domestic conditions shape the ability and willingness of governments to engage in international tax competition.

Specifically, governments facing strong demands for publicly provided goods and, therefore, a rigid budget, are unable to play the tax competition game hard. They must gather sufficiently large amounts of tax revenue in order to satisfy voters' demands for public goods and simultaneously prevent deficit spending. Consequently, these incumbents cannot largely cut back tax rates neither on immobile nor on mobile tax bases. Similarly, in case equality needs root strongly in society, and voters expect largely symmetric tax rates on corporate and wage income, governments, even though faced with competition for mobile factors, are unwilling to cut back capital tax rates, keep labour tax rates on a higher level or even shift the tax burden towards labour if the budget is rigid. This strategy would clearly diminish the electoral support for the incumbent.

Finally, the incentives for governments to compete for capital grow if the domestic economy is dominated by FDI, multinationals and their subsidiaries. In this case governments face a domestic capital base with a high de facto mobility. Both the theoretical model and the statistical estimates suggest that policy makers mostly engage in international tax

competition by underbidding capital tax rates in other jurisdictions in order to keep capital owners from declaring profits elsewhere.

In sum, the variance in capital taxation and national tax systems should persist in the future unless domestic constellations converge as well which cannot be expected. Zero tax rates on mobile capital are unlikely to be implemented even in very small countries with low domestic restrictions and highly mobile capital bases as not all countries can or want to engage in tax competition. This eases the competitive pressures for governments able and willing to compete for capital and prevents downward spiralling of capital tax rates induced by competitive undercutting of tax rates in rival countries. Very strong domestic constraints even cause some governments to completely back out of the tax competition game which leads to less severe competition over all. Since governments need to take voter preferences with respect to deficit spending and tax symmetry into account, international tax competition does not fully dominate domestic tax policy making.

## Chapter 8: Twisted Politics

Since the markets for goods and services, skilled labour and capital are not longer dominantly *domestic* but increasingly *international*, the business of politicians has arguably become more difficult. Parties competing for votes in order to win elections now need to understand how to please the interests of voters without losing sight of their countries international economic 'competitiveness'.

The logic of 'twisted politics' applies first and foremost to tax policies. Taxation is the stone with which politicians typically try to catch most of their birds: taxes shall ensure a fair and just division of income, reduce poverty not only of the country's citizens but in many countries around the globe, also help saving the global environment, increase the incentive to have children, and so on. At the very same time, taxation is also the instrument used by politicians to create an economic environment which generates business opportunities, fosters economic growth, and secures the country's attractiveness for international investors. Indeed, 'twisted politics' is a game with far too few stones for far too many birds.

'Twisted politics', thus, is a story of trade-offs. Governments cannot simultaneously reach all political goals they need to achieve in order to ensure the continuous support of their constituents. Politics is all about finding compromises – compromises not so much between the government and opposition, not so much between the agenda setter and the veto players, but rather compromises between policy goals which at the first glance all look similarly important.

This research has explored some of the trade-offs governments face when they simultaneously try to offer an attractive location for international

investors, maintain tax fairness, and produce a sufficient amount of public goods. With tax policies being twisted, policy makers need to respond flexibly to domestic demands and international constraints to achieve their policy goals and stay in office. The increase in capital mobility has beyond doubt reduced the government's ability to collect revenue from mobile sources, but at the same time the demands from voters have not been relaxed. Voters still vote with their wallets as much as footloose capital 'votes' with its feet.

Accordingly, globalization and market integration caused governments to adjust the national tax systems. However, early doom theories predicting that governments lose all policy autonomy have not been met in reality, simply because these models ignored the domestic constraints governments face. But with politics being twisted, governments can neither maximize their support solely based on domestic considerations, nor can they simply maximize the attractiveness of their country for global investors. Of course, this is a trivial truth, but one that is more often ignored than accepted in the rapidly growing literature on tax competition.

More substantively, my dissertation makes three contributions to this literature. My argument that policy makers face a trilemmatic choice when setting domestic taxes is perhaps the most obvious contribution. Governments cannot simultaneously reach the three policy goals of providing a satisfactory amount of public goods, reducing tax rates on the mobile factor to globally competitive levels and at the same time implementing a tax mix of tax rates on capital and labour which maximizes political support by adhering to societal demands for equality.

My second contribution consists in relaxing the assumption of perfectly integrated capital markets. Reducing legal restrictions to capital transactions does not necessarily imply full capital mobility. De facto capital mobility rather depends on the willingness and ability of capital owners to move capital through jurisdictions. I have argued that transaction costs are influenced by the ownership structure and concentration of capital. Actual capital mobility, therefore, falls short of being perfect and varies highly across countries.

Both, the notion of the trilemma and that of de facto capital mobility contribute to solving the puzzle of non-zero capital taxation. Specifically, my model generates several hypotheses which find strong support in the empirical evidence gathered through a rigorous statistical analysis.

I believe the empirical model is my third contribution to the literature. The statistical model takes the problems of the data generating process such as contemporaneous interaction, endogeneity and unit heterogeneity fully into account. The strategic nature of the tax competition game is directly modelled through spatial dependence of national tax policy setting.

Based on the theoretical predictions and empirical findings, we should not expect full convergence of capital tax rates and an equilibrium capital tax rate of zero is neither theoretical nor empirical sustainable. From this also follows that domestic tax mixes and national tax systems should not converge neither in the near nor in the far future.

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Appendix

## **Appendix**

## Appendix

Table A1: Country-wise Jackknife Model for Effective Capital Tax Rates

Jackknife per country	DV: AETR on capital								
Country left out:	Independent Variables:								
	SL, FDI weighted	Pre-tax Gini	Absolute fiscal red.	FDI stock (t-1)	Budget rigid. (t-1)	Elderly people	Unemployment (t-1)	GDP growth(t-1)	R <sup>2</sup>
Australia	0.016*** (0.004)	-59.876*** (17.202)	18.283* (10.384)	-0.010*** (0.004)	1.515*** (0.349)	1.756*** (0.372)	-0.470*** (0.152)	0.701*** (0.163)	0.78
Austria	0.018*** (0.005)	-65.959*** (17.024)	18.543* (10.642)	-0.010*** (0.003)	1.386*** (0.311)	1.892*** (0.438)	-0.475*** (0.154)	0.600*** (0.150)	0.77
Belgium	0.015*** (0.004)	-73.755*** (16.499)	26.071** (10.568)	-0.010*** (0.003)	1.158*** (0.298)	2.308*** (0.437)	-0.494*** (0.153)	0.579*** (0.147)	0.76
Canada	0.015*** (0.004)	-63.114*** (16.312)	23.732** (9.965)	-0.012*** (0.003)	0.963*** (0.301)	2.455*** (0.442)	-0.465*** (0.150)	0.609*** (0.146)	0.77
Denmark	0.016*** (0.005)	-64.848*** (16.749)	19.643* (10.580)	-0.011*** (0.003)	1.260*** (0.303)	2.020*** (0.434)	-0.475*** (0.156)	0.600*** (0.151)	0.78
Finland	0.014*** (0.005)	-67.374*** (16.552)	21.645** (10.275)	-0.010*** (0.003)	1.310*** (0.307)	2.032*** (0.435)	-0.474*** (0.160)	0.602*** (0.150)	0.76
France	0.015*** (0.005)	-68.275*** (16.587)	22.021** (10.406)	-0.012*** (0.004)	1.091*** (0.305)	2.187*** (0.443)	-0.484*** (0.154)	0.573*** (0.148)	0.78
Germany	0.017*** (0.004)	-54.665*** (16.353)	16.233* (10.777)	-0.010*** (0.003)	0.875*** (0.290)	2.239*** (0.410)	-0.366** (0.147)	0.467*** (0.142)	0.80
Greece	0.011*** (0.004)	-64.829*** (15.249)	15.559* (9.672)	-0.008*** (0.003)	1.290*** (0.286)	1.541*** (0.418)	-0.526*** (0.143)	0.550*** (0.141)	0.80
Iceland	0.015*** (0.004)	-66.620*** (15.908)	20.466** (9.999)	-0.011*** (0.003)	1.212*** (0.294)	2.078*** (0.420)	-0.473*** (0.150)	0.592*** (0.143)	0.78
Ireland	0.016*** (0.005)	-65.287*** (16.330)	19.327* (10.528)	-0.011*** (0.004)	1.280*** (0.317)	2.032*** (0.436)	-0.510*** (0.162)	0.624*** (0.162)	0.76
Italy	0.015*** (0.004)	-66.620*** (15.908)	20.466** (9.999)	-0.011*** (0.003)	1.212*** (0.294)	2.078*** (0.420)	-0.473*** (0.150)	0.592*** (0.143)	0.78
Japan	0.015***	-66.620***	20.466**	-0.011***	1.212***	2.078***	-0.473***	0.592***	0.78

Appendix

Luxembourg	(0.004)	(15.908)	(9.999)	(0.003)	(0.294)	(0.420)	(0.150)	(0.143)	
	0.015***	-66.620***	20.466**	-0.011***	1.212***	2.078***	-0.473***	0.592***	0.78
Netherlands	(0.004)	(15.908)	(9.999)	(0.003)	(0.294)	(0.420)	(0.150)	(0.143)	
	0.016***	-85.257***	22.478**	-0.010***	1.136***	2.368***	-0.458***	0.543***	0.78
New Zealand	(0.005)	(16.030)	(10.170)	(0.003)	(0.298)	(0.430)	(0.157)	(0.145)	
	0.015***	-67.790***	20.921**	-0.010***	1.387***	1.979***	-0.522***	0.634***	0.78
Norway	(0.005)	(16.763)	(10.391)	(0.003)	(0.307)	(0.430)	(0.155)	(0.150)	
	0.016***	-62.476***	20.511**	-0.010***	1.385***	1.936***	-0.487***	0.615***	0.79
Portugal	(0.004)	(16.120)	(10.003)	(0.003)	(0.297)	(0.423)	(0.150)	(0.144)	
	0.013***	-64.833***	24.117**	-0.009***	0.812***	1.651***	-0.240*	0.555***	0.78
Spain	(0.004)	(16.261)	(9.990)	(0.003)	(0.308)	(0.421)	(0.152)	(0.144)	
	0.015***	-68.995***	21.934**	-0.011***	1.200***	2.112***	-0.469***	0.590***	0.77
Sweden	(0.005)	(17.409)	(10.548)	(0.004)	(0.309)	(0.475)	(0.171)	(0.150)	
	0.012***	-71.998***	26.620***	-0.010***	1.460***	2.009***	-0.606***	0.642***	0.80
Switzerland	(0.004)	(15.407)	(9.623)	(0.003)	(0.293)	(0.407)	(0.148)	(0.140)	
	0.015***	-65.167***	19.405**	-0.011***	1.232***	2.048***	-0.479***	0.603***	0.78
United Kingdom	(0.005)	(16.248)	(10.167)	(0.003)	(0.304)	(0.429)	(0.153)	(0.148)	
	0.014***	-63.057***	16.957*	-0.011***	1.174***	2.167***	-0.498***	0.563***	0.77
United States	(0.004)	(16.155)	(9.969)	(0.004)	(0.298)	(0.419)	(0.152)	(0.146)	
	0.015***	-59.811***	12.999*	-0.028***	1.103***	2.735***	-0.500***	0.532***	0.78
	(0.004)	(16.075)	(7.998)	(0.006)	(0.290)	(0.437)	(0.148)	(0.148)	

Notes: HAC consistent standard errors in parentheses; \*\*\* p≤0.01 (significant at 1%), \*\* p≤0.05 (significant at 5%), \* p≤0.1 (significant at 10%). The intercept is not reported, since it is just the fixed effect of the baseline country. All estimations include country fixed effects.

## Appendix

Table A2: Country-wise Jackknife Model for Marginal Corporate Tax Rates

Jackknife per country	DV: marginal corporate tax rate								
Country left out:	Independent variables:								
	SL, FDI weighted	Pre-tax Gini	Absolute fiscal red.	FDI stock (t-1)	Budget rigid. (t-1)	Elderly people	Unemployment (t-1)	GDP growth(t-1)	R <sup>2</sup>
Australia	-0.005*** (0.002)	-63.813*** (16.498)	39.547*** (10.015)	-0.011*** (0.004)	1.002*** (0.336)	-1.525*** (0.302)	-0.195 (0.151)	0.140 (0.153)	0.67
Austria	-0.005*** (0.002)	-53.585*** (15.268)	32.469*** (9.535)	-0.012*** (0.003)	0.947*** (0.282)	-1.509*** (0.335)	-0.230* (0.142)	0.131 (0.153)	0.70
Belgium	-0.006*** (0.002)	-71.656*** (16.175)	43.141*** (10.308)	-0.012*** (0.003)	0.747** (0.297)	-1.332*** (0.364)	-0.194 (0.154)	0.072 (0.146)	0.67
Canada	-0.006*** (0.002)	-69.023*** (16.148)	38.610*** (9.901)	-0.012*** (0.003)	0.829*** (0.303)	-1.406*** (0.369)	-0.217 (0.152)	0.064 (0.147)	0.67
Denmark	-0.005*** (0.002)	-68.540*** (15.890)	36.500*** (10.033)	-0.012*** (0.003)	0.790*** (0.292)	-1.477*** (0.354)	-0.206 (0.152)	0.063 (0.146)	0.68
Finland	-0.007*** (0.002)	-68.744*** (15.213)	42.918*** (9.446)	-0.011*** (0.003)	1.022*** (0.286)	-1.325*** (0.338)	-0.216 (0.150)	0.039 (0.140)	0.69
France	-0.006*** (0.002)	-69.217*** (15.667)	41.945*** (9.811)	-0.011*** (0.003)	0.836*** (0.291)	-1.360*** (0.355)	-0.150 (0.149)	0.098 (0.141)	0.68
Germany	-0.005*** (0.002)	-63.939*** (16.063)	43.802*** (11.376)	-0.011*** (0.003)	0.461* (0.271)	-1.282*** (0.344)	-0.112 (0.150)	-0.015 (0.141)	0.67
Greece	-0.006*** (0.002)	-71.861*** (15.727)	37.160*** (9.904)	-0.012*** (0.003)	0.694** (0.299)	-1.334*** (0.363)	-0.224 (0.152)	0.088 (0.147)	0.68
Iceland	-0.006*** (0.002)	-66.492*** (15.389)	38.890*** (9.657)	-0.012*** (0.003)	0.741*** (0.289)	-1.376*** (0.349)	-0.208 (0.149)	0.063 (0.140)	0.67
Ireland	-0.004** (0.002)	-56.599*** (14.631)	30.233*** (9.379)	-0.013*** (0.003)	0.569** (0.287)	-1.316*** (0.333)	-0.427*** (0.150)	0.123 (0.137)	0.71
Italy	-0.006*** (0.002)	-66.492*** (15.389)	38.890*** (9.657)	-0.012*** (0.003)	0.741*** (0.289)	-1.376*** (0.349)	-0.208 (0.149)	0.063 (0.140)	0.67
Japan	-0.005*** (0.002)	-67.979*** (15.808)	39.259*** (10.051)	-0.011*** (0.004)	0.822*** (0.296)	-1.731*** (0.425)	-0.183 (0.152)	0.110 (0.144)	0.68

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Luxembourg	-0.006*** (0.002)	-66.492*** (15.389)	38.890*** (9.657)	-0.012*** (0.003)	0.741*** (0.289)	-1.376*** (0.349)	-0.208 (0.149)	0.063 (0.140)	0.67
Netherlands	-0.006*** (0.002)	-75.963*** (15.600)	39.845*** (9.859)	-0.012*** (0.004)	0.677** (0.295)	-1.208*** (0.359)	-0.175 (0.157)	0.061 (0.143)	0.68
New Zealand	-0.006*** (0.002)	-68.182*** (16.377)	40.480*** (10.063)	-0.012*** (0.003)	0.639** (0.303)	-1.324*** (0.357)	-0.146 (0.155)	0.023 (0.148)	0.68
Norway	-0.006*** (0.002)	-68.536*** (16.034)	40.046*** (9.938)	-0.012*** (0.003)	0.716** (0.301)	-1.355*** (0.361)	-0.216 (0.153)	0.068 (0.145)	0.66
Portugal	-0.005*** (0.002)	-72.266*** (16.314)	40.338*** (10.010)	-0.012*** (0.003)	0.792** (0.318)	-1.370*** (0.361)	-0.208 (0.157)	0.093 (0.147)	0.68
Spain	-0.006*** (0.002)	-52.758*** (16.357)	36.251*** (9.943)	-0.013*** (0.003)	0.632** (0.298)	-1.711*** (0.371)	-0.270* (0.161)	-0.015 (0.144)	0.69
Sweden	-0.005*** (0.002)	-60.105*** (15.277)	38.066*** (9.533)	-0.012*** (0.003)	0.815*** (0.298)	-1.563*** (0.348)	-0.122 (0.152)	0.054 (0.141)	0.69
Switzerland	-0.006*** (0.002)	-64.823*** (15.699)	38.019*** (9.806)	-0.012*** (0.003)	0.764*** (0.298)	-1.391*** (0.354)	-0.210 (0.152)	0.070 (0.144)	0.53
United Kingdom	-0.006*** (0.002)	-59.833*** (15.706)	34.571*** (9.738)	-0.011*** (0.004)	0.663** (0.294)	-1.361*** (0.353)	-0.192 (0.153)	0.067 (0.143)	0.67
United States	-0.005*** (0.002)	-64.809*** (15.429)	32.027** (9.598)	-0.036*** (0.006)	0.771*** (0.286)	-0.826** (0.353)	-0.276* (0.147)	0.038 (0.142)	0.70

Notes: HAC consistent standard errors in parentheses; \*\*\* p≤0.01 (significant at 1%), \*\* p≤0.05 (significant at 5%), \* p≤0.1 (significant at 10%). The intercept is not reported, since it is just the fixed effect of the baseline country. All estimations include country fixed effects.

## Appendix

Table A3: Country-wise Jackknife Model for Effective Labour Tax Rates

Jackknife per country	DV: AETR on labour								
Country left out:	Independent variables:								
	SL, FDI weighted	Pre-tax Gini	Absolute fiscal red.	FDI stock (t-1)	Budget rigid. (t-1)	Elderly people	Unemployment (t-1)	GDP growth(t-1)	R <sup>2</sup>
Australia	0.007*** (0.002)	32.784*** (9.014)	-12.388** (5.373)	0.0003 (0.002)	0.476*** (0.185)	0.714*** (0.161)	0.327*** (0.081)	0.054 (0.085)	0.90
Austria	0.006** (0.002)	31.325*** (8.721)	-11.571** (5.387)	0.001 (0.002)	0.567*** (0.162)	0.610*** (0.192)	0.322*** (0.081)	0.131* (0.077)	0.91
Belgium	0.007*** (0.002)	38.528*** (8.594)	-15.560*** (5.434)	0.001 (0.002)	0.662*** (0.158)	0.515*** (0.193)	0.306*** (0.081)	0.113 (0.077)	0.91
Canada	0.007*** (0.002)	30.574*** (8.490)	-14.628*** (5.138)	0.002 (0.002)	0.813*** (0.159)	0.336* (0.193)	0.324*** (0.079)	0.152** (0.079)	0.91
Denmark	0.006*** (0.002)	29.253*** (8.525)	-8.762* (5.315)	0.002 (0.002)	0.645*** (0.157)	0.538*** (0.189)	0.344*** (0.081)	0.105 (0.077)	0.91
Finland	0.006*** (0.002)	37.186*** (8.474)	-12.950** (5.204)	0.001 (0.002)	0.619*** (0.161)	0.518*** (0.191)	0.277*** (0.083)	0.117 (0.077)	0.91
France	0.007*** (0.002)	35.528*** (8.677)	-12.319** (5.375)	0.001 (0.002)	0.625*** (0.162)	0.570*** (0.197)	0.303*** (0.082)	0.105 (0.077)	0.91
Germany	0.006*** (0.002)	38.527*** (8.899)	-19.498*** (6.320)	0.001 (0.002)	0.709*** (0.162)	0.520*** (0.193)	0.299*** (0.082)	0.101 (0.078)	0.91
Greece	0.007*** (0.002)	34.475*** (8.839)	-14.403*** (5.348)	0.001 (0.002)	0.664*** (0.163)	0.474** (0.197)	0.298*** (0.082)	0.117 (0.079)	0.91
Iceland	0.007*** (0.002)	35.102*** (8.306)	-12.443** (5.162)	0.001 (0.002)	0.653*** (0.156)	0.543*** (0.189)	0.316*** (0.080)	0.112 (0.075)	0.91
Ireland	0.006*** (0.002)	41.837*** (8.030)	-9.905** (5.121)	0.001 (0.002)	0.850*** (0.158)	0.538*** (0.183)	0.189** (0.081)	0.150** (0.074)	0.92
Italy	0.007*** (0.002)	35.102*** (8.306)	-12.443** (5.162)	0.001 (0.002)	0.653*** (0.156)	0.543*** (0.189)	0.316*** (0.080)	0.112 (0.075)	0.91
Japan	0.007*** (0.002)	35.456*** (8.061)	-9.338* (5.074)	-0.001 (0.002)	0.557*** (0.151)	1.039*** (0.217)	0.261*** (0.077)	0.019 (0.073)	0.91

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Luxembourg	0.007*** (0.002)	35.102*** (8.306)	-12.443** (5.162)	0.001 (0.002)	0.653*** (0.156)	0.543*** (0.189)	0.316*** (0.080)	0.112 (0.075)	0.91
Netherlands	0.008*** (0.002)	20.733*** (7.953)	-10.487** (4.989)	0.003* (0.002)	0.674*** (0.151)	0.670*** (0.184)	0.306*** (0.080)	0.086 (0.072)	0.92
New Zealand	0.008*** (0.002)	36.634*** (8.643)	-12.169** (5.298)	0.001 (0.002)	0.626*** (0.161)	0.544*** (0.191)	0.331*** (0.082)	0.128* (0.077)	0.91
Norway	0.007*** (0.002)	37.363*** (8.570)	-12.577** (5.263)	0.001 (0.002)	0.708*** (0.161)	0.517*** (0.193)	0.312*** (0.081)	0.131* (0.077)	0.91
Portugal	0.006*** (0.002)	34.868*** (8.487)	-8.193* (5.100)	0.002 (0.002)	0.383** (0.164)	0.429** (0.186)	0.445*** (0.081)	0.041 (0.075)	0.91
Spain	0.007*** (0.002)	29.153*** (8.899)	-10.198* (5.337)	0.001 (0.002)	0.660*** (0.162)	0.658*** (0.203)	0.355*** (0.089)	0.130* (0.077)	0.91
Sweden	0.007*** (0.002)	36.357*** (8.413)	-11.811** (5.197)	0.001 (0.002)	0.614*** (0.164)	0.463*** (0.191)	0.339*** (0.083)	0.103 (0.076)	0.89
Switzerland	0.007*** (0.002)	34.801*** (8.462)	-11.942** (5.239)	0.001 (0.002)	0.649*** (0.161)	0.547*** (0.192)	0.315*** (0.081)	0.115 (0.077)	0.91
United Kingdom	0.006*** (0.002)	44.399*** (8.564)	-15.898*** (5.223)	0.002 (0.002)	0.612*** (0.160)	0.519*** (0.190)	0.354*** (0.082)	0.137* (0.077)	0.91
United States	0.007*** (0.002)	35.116*** (8.665)	-12.739** (5.333)	-0.003 (0.003)	0.686*** (0.161)	0.636*** (0.200)	0.310*** (0.081)	0.107 (0.079)	0.90

Notes: HAC consistent standard errors in parentheses; \*\*\* p≤0.01 (significant at 1%), \*\* p≤0.05 (significant at 5%), \* p≤0.1 (significant at 10%). The intercept is not reported, since it is just the fixed effect of the baseline country. All estimations include country fixed effects.

Appendix

Table A4: Country-wise Jackknife Model for the Tax Ratio of Effective Capital and Labour Tax Rates

Jackknife per country	DV: Tax ratio								
Country left out:	Independent variables:								
	SL, FDI weighted	Pre-tax Gini	Absolute fiscal red.	FDI stock (t-1)	Budget rigid. (t-1)	Elderly people	Unemployment (t-1)	GDP growth(t-1)	R <sup>2</sup>
Australia	-0.000 (0.000)	4.471*** (1.194)	-1.575** (0.753)	0.001** (0.000)	-0.069*** (0.027)	-0.177*** (0.027)	0.063*** (0.010)	-0.058*** (0.011)	0.76
Austria	-0.000 (0.000)	4.215*** (1.199)	-1.503** (0.762)	0.001** (0.000)	-0.083*** (0.031)	-0.160*** (0.031)	0.064*** (0.011)	-0.052*** (0.010)	0.77
Belgium	0.000 (0.000)	4.988*** (1.214)	-1.902** (0.791)	0.001** (0.000)	-0.056*** (0.022)	-0.201*** (0.033)	0.067*** (0.011)	-0.053*** (0.011)	0.78
Canada	-0.000 (0.000)	4.451*** (1.126)	-1.937** (0.758)	0.001*** (0.000)	-0.044** (0.022)	-0.209*** (0.034)	0.064*** (0.011)	-0.052*** (0.011)	0.77
Denmark	-0.000 (0.000)	4.263*** (1.211)	-1.450* (0.780)	0.001** (0.000)	-0.065*** (0.022)	-0.176*** (0.032)	0.064*** (0.011)	-0.056*** (0.011)	0.78
Finland	0.000 (0.000)	4.673*** (1.179)	-1.720** (0.747)	0.001** (0.000)	-0.066*** (0.022)	-0.169*** (0.031)	0.064*** (0.011)	-0.057*** (0.011)	0.74
France	0.000 (0.000)	5.003*** (1.217)	-1.818** (0.777)	0.001** (0.000)	-0.058*** (0.022)	-0.187*** (0.033)	0.063*** (0.011)	-0.054*** (0.011)	0.78
Germany	-0.000 (0.000)	3.112*** (1.210)	-1.226* (0.888)	0.001*** (0.000)	-0.045** (0.021)	-0.183*** (0.031)	0.060*** (0.011)	-0.045*** (0.010)	0.79
Greece	0.000 (0.000)	4.565*** (1.157)	-1.538** (0.742)	0.001** (0.000)	-0.069*** (0.022)	-0.155*** (0.032)	0.065*** (0.011)	-0.050*** (0.011)	0.78
Iceland	0.000 (0.000)	4.710*** (1.160)	-1.633** (0.742)	0.001** (0.000)	-0.062*** (0.021)	-0.178*** (0.031)	0.063*** (0.011)	-0.054*** (0.010)	0.78
Ireland	-0.000 (0.000)	5.313*** (1.159)	-1.308* (0.760)	0.001** (0.000)	-0.055** (0.022)	-0.170*** (0.031)	0.051*** (0.011)	-0.054*** (0.011)	0.78
Italy	0.000 (0.000)	4.710*** (1.160)	-1.633** (0.742)	0.001** (0.000)	-0.062*** (0.021)	-0.178*** (0.031)	0.063*** (0.011)	-0.054*** (0.010)	0.78
Japan	0.000 (0.000)	4.710*** (1.160)	-1.633** (0.742)	0.001** (0.000)	-0.062*** (0.021)	-0.178*** (0.031)	0.063*** (0.011)	-0.054*** (0.010)	0.78



Appendix

Luxembourg	0.000 (0.000)	4.710*** (1.160)	-1.633** (0.742)	0.001** (0.000)	-0.062*** (0.021)	-0.178*** (0.031)	0.063*** (0.011)	-0.054*** (0.010)	0.78
Netherlands	0.000 (0.000)	5.440*** (1.186)	-1.687** (0.762)	0.001** (0.000)	-0.058*** (0.022)	-0.193*** (0.032)	0.063*** (0.012)	-0.052*** (0.011)	0.78
New Zealand	0.000 (0.000)	4.650*** (1.209)	-1.591** (0.763)	0.001** (0.000)	-0.078*** (0.022)	-0.171*** (0.031)	0.067*** (0.011)	-0.059*** (0.011)	0.79
Norway	0.000 (0.000)	4.648*** (1.195)	-1.717** (0.755)	0.001** (0.000)	-0.068*** (0.022)	-0.176*** (0.032)	0.063*** (0.011)	-0.055*** (0.011)	0.78
Portugal	0.000 (0.000)	4.926*** (1.066)	-2.492*** (0.661)	0.0004* (0.0002)	-0.009 (0.020)	-0.138*** (0.027)	0.033*** (0.010)	-0.041*** (0.009)	0.81
Spain	0.000 (0.000)	4.447*** (1.274)	-1.573** (0.782)	0.001** (0.000)	-0.063*** (0.023)	-0.173*** (0.035)	0.066*** (0.012)	-0.052*** (0.011)	0.77
Sweden	0.000 (0.000)	5.315*** (1.103)	-2.116*** (0.702)	0.001** (0.000)	-0.090*** (0.021)	-0.179*** (0.029)	0.077*** (0.010)	-0.060*** (0.010)	0.80
Switzerland	0.000 (0.000)	4.640*** (1.187)	-1.562** (0.756)	0.001** (0.000)	-0.062*** (0.022)	-0.178*** (0.031)	0.063*** (0.011)	-0.054*** (0.011)	0.77
United Kingdom	0.000 (0.000)	5.110*** (1.227)	-1.755** (0.769)	0.001** (0.000)	-0.065*** (0.023)	-0.181*** (0.032)	0.066*** (0.011)	-0.054*** (0.011)	0.76
United States	-0.000 (0.000)	4.466*** (1.205)	-1.215* (0.733)	0.002*** (0.000)	-0.062*** (0.022)	-0.220*** (0.033)	0.066*** (0.011)	-0.054*** (0.011)	0.77

Notes: HAC consistent standard errors in parentheses; \*\*\* p≤0.01 (significant at 1%), \*\* p≤0.05 (significant at 5%), \* p≤0.1 (significant at 10%). The intercept is not reported, since it is just the fixed effect of the baseline country. All estimations include country fixed effects.