Doctoral Thesis

Fiscal Policy in Europe: Taxation, Debt and Direct Democracy with Multiple Jurisdictions

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1 Introduction

Fiscal policy in Europe is carried out in times of increased economic and political integration. Understanding the behavior and the role of states, sub-national governments, courts, companies and citizens in this integrated and interdependent environment is important in order to design optimal public policies and institutions. The field of public economics contributes to this task by analyzing how government policies affect the economy. This thesis adds to different strands of the public economics literature and consists of four self-contained chapters.

The chapters' contributions cover the following topics: fiscal rules, tax competition, tax neutrality and the European Court of Justice, and spillovers in direct democracy. The fiscal policy challenges underlying all these topics originate from the existence of multiple governmental jurisdictions – either in a national or international context. In the chapters at hand, this gives rise to (1) bailout expectations of states within a federation, (2) tax competition between countries, (3) tax neutrality challenges across countries, and (4) interactions in direct democracy between municipalities.

Chapter 2 is on the effectiveness of fiscal rules in general and the debt brake in the German states in particular.[1] The effectiveness is assessed by analyzing how fiscal rules influence deficit expectations of policy makers. In a first step, we introduce a dynamic model in an environment characterized by the lagged implementation of a new rule. In a second step, we analyze a unique survey of members of all 16 German state parliaments, and show that the debt brake's credibility is far from perfect. In addition, we find a robust

[1] This is joint work with Friedrich Heinemann, Eckhard Janeba and Christoph Schröder. The paper has been published by the Journal of Public Economics in October 2016 (Heinemann et al., 2016). My co-author Christoph Schröder also uses this paper in his doctoral thesis (Schröder, 2016). An earlier version of the paper has been circulated as ZEW discussion paper (Heinemann et al., 2014).

asymmetry in compliance expectations between insiders and outsiders (both for in-state vs. out-of-state politicians and the incumbent government vs. opposition dimension).

To put into context, the debt brake in the German states was introduced after decades of accumulation of debt. Federal states built up debt for various reasons, including bailout expectations and missing tax autonomy. These sub-national jurisdictions may rationally expect to be bailed out by the federal government in case of default. This is even more pronounced when federal states are constrained to raise their own tax revenues. Similarly, our results suggest that if taxes are harmonized and common budgets become more frequent, bailout expectations could also prevail at the European level. This is an interesting nexus between studies on fiscal policy in federations (Chapter 2) and in supranational organisations (Chapter 3). Vice versa, giving more tax autonomy to sub-national jurisdictions may induce tax competition within federations similar to tax competition between countries.

Chapter 3 deals with the interaction effects which arise when countries have full tax autonomy.[2] The chapter analyzes European and global tax competition in the context of decreasing corporate taxes in Europe during the last decades. The literature has identified tax competition as one reason for this decline in corporate tax levels. This study analyzes in more detail whether the decline in corporate tax levels in Europe is mainly driven by tax competition between EU member states or whether is it (also) due to pressure from other world regions. The results of this study, which makes use of tax reaction functions applying an instrumental variable approach, indicate that there is evidence for tax competition within Europe, whereas there is no robust evidence that European countries compete with countries from other world regions.

The results can serve as input for further discussions and research on the desirability and design of corporate tax harmonization in Europe. However, as long as there is no far-reaching coordination or harmonization legislation agreed on, the European Court of Justice

[2] An earlier version of this chapter has been circulated as ZEW discussion paper (Streif, 2015).

(ECJ) plays a prominent role in securing a certain degree of coherence and neutrality of tax systems in Europe. While the constitutional treaties leave direct tax jurisprudence in the hand of the member states, they need to adhere to the fundamental freedoms stipulated in the treaties. The ECJ enforces the fundamental freedoms if member states apply discriminatory tax treatments to cross-border economic activity.

Chapter 4 analyzes whether or not the ECJ's decisions indeed increase tax neutrality and therefore contribute to the achievement of the internal market.[3] This is done by considering a ruling from 2006, in which the ECJ limited the applicability of specific tax rules in the EU (controlled foreign company rules; short: CFC rules). They are intended to prohibit multinationals' excessive use of subsidiaries in low-tax countries. We apply the effective tax burden model of Devereux and Griffith (1999) to assess the effects of the ECJ's ruling on tax neutrality. Our results show that the court's restriction of CFC rules and the emergence of low tax regimes for income from intellectual properties (IP boxes) cast doubt on the seemingly positive effects the ECJ has on reducing tax distortions.

Chapter 5 switches the focus to direct democratic institutions and, more specifically, to mimicking behavior across local jurisdictions in direct democracy.[4] This is related to a sizeable literature which studies whether governments strategically interact with each other through learning, coercion, yardstick or fiscal competition, such as tax competition in Chapter 3. This study asks whether – in the presence of direct democratic institutions – spatial interactions among political jurisdictions additionally result from voters' direct democratic activities. The proposed mechanism is that the voters' direct democratic actions can potentially have spillover effects on the actions of voters in neighboring jurisdictions. Utilizing data on German municipalities and applying an instrumental variable strategy, we find that

[3] This is joint work with Rainer Bräutigam and Christoph Spengel. An earlier version of this chapter has been circulated as ZEW discussion paper (Bräutigam et al., 2015).

[4] This is joint work with Zareh Asatryan and Annika Havlik. An earlier version of this chapter has been circulated as ZEW discussion paper (Asatryan et al., 2015).

a jurisdiction's probability of hosting a petition is positively driven by the neighbors' direct democratic activity.

This analysis contributes to the literature on mimicking between jurisdictions and opens up a potentially new explanation why public policies interact across jurisdictions. This is suggested by the literature which shows that direct democracy matters for fiscal outcomes. The recent vote on the Brexit in the United Kingdom illustrates in more general terms how direct democracy in one jurisdiction can have various direct and indirect spillover effects to other jurisdictions.

Finally, ***Chapter 6*** discusses a number of relevant policy implications arising from the chapters' findings.[5]

[5] To a great extent, this chapter directly bases on the joint work cited in this introduction.

2 Fiscal Rules and Compliance Expectations - Evidence for the German Debt Brake

2.1 Introduction

Constitutional fiscal rules have been used for decades in federal countries such as Switzerland and the US states to limit deficits and debts of sub-national jurisdictions (for a survey of current fiscal rules see International Monetary Fund, 2012). On the national level, the euro area debt crisis has triggered a wave of new statutory and constitutional budget constraints. For example, the Fiscal Compact, accepted by 25 EU member states in 2012, has been another milestone for the spread of numerical fiscal constraints where the signatory countries commit to the introduction of national debt brakes (see European Council, 2011).

A key argument in favor of numerical fiscal rules is that they can contribute to credible fiscal strategies, boost borrower reputation and anchor long-run expectations about future government public finances and, ultimately, solvency (International Monetary Fund, 2009). Hence, expectation effects of fiscal rules are a natural yardstick to assess a rule's potential effectiveness in the future. A credible rule affects expectations of very different players both in the private sector (e.g., investors in government bond market) and the public sector (e.g., political decision makers). While a limited literature exists covering private investors' expectation effects and the impact of rules on government bond risk premia (e.g., Heinemann et al., 2014; Iara and Wolff, 2014), analyses on politicians' expectations are completely missing.

We contribute to filling this gap, and to the best of our knowledge, we are the first to examine expectation effects of a fiscal rule for fiscal policy makers themselves. These effects are of direct importance as actual budgetary decisions are more likely to be affected if a rule enjoys credibility with actual policy makers. Expectations of politicians who are

constrained by a rule form a key intermediary step between fiscal rules on the one hand and fiscal outcomes on the other hand. Politicians for whom the fiscal rule credibly shuts down any future deficit financing have to adjust their fiscal policies accordingly.

We analyze the extent to which a deficit rule induces compliance expectations of politicians who are to be constrained by a numerical fiscal target. In addition, we analyze the interaction between a rule's credibility in the eyes of policy makers and the incentive to make fiscal adjustments, where interactions are driven by initial conditions, fiscal shocks, as well as personal and institutional determinants. We thereby contribute to the understanding of the distinction between fiscal rule compliance on the one hand and induced fiscal outcomes on the other hand. This distinction has recently been highlighted in empirical research by Cordes et al. (2015).

Existing studies on the link between fiscal rules and fiscal decisions are only applicable on a concurrent basis (through the use of real time data, see Beetsma and Guiliodori, 2010) or ex-post (i.e. after years of experience with an existing rule; see references below). Our survey method, by contrast, can be employed ex-ante and gives an early indication of the rule's potential effectiveness in the future before data on actual fiscal outcomes become available. Finally, our approach opens the black box of aggregating heterogeneous preferences and expectations of policy makers into fiscal decisions. We study the role of individual characteristics in this aggregation process, such as political ideology, education, and political experience.

To this end, we make use of the specific institutional context of the German debt brake, a fiscal rule which was put into the constitution in 2009 and which restricts the budget deficit of federal and state governments. We explore expectations for the members of all 16 German state parliaments. This setting offers favorable conditions to study the link between state politicians' compliance expectations on the one hand and diverse initial fiscal conditions on the other hand. Moreover, the German debt brake offers a rich dynamic setting which is

characterized by lagged implementation: The rules' binding constraints are phased in over a longer period (for the state level by the year 2020, for the federal government already in 2016). Lagged implementation creates a dynamic decision problem for state parliamentarians who have to decide on the extent and timing of consolidation efforts given substantial fiscal uncertainties over the transition phase.

Our analysis of expectation formation comprises a theoretical and an empirical dimension. Our theoretical model captures the key features of the lagged implementation of a deficit rule and guides the empirical analysis. Decisions on deficits are dynamic by nature and imply a trade-off between instant and future political costs from fiscal consolidation. A fiscal shock occurring over the transition phase accounts for the fiscal uncertainties which characterize a long transition period.

In the model, we analyze the impact of several, policy relevant factors. We show that compliance is more likely i) the lower is the initial deficit, ii) the lower are bailout expectations, iii) the tighter is a fiscal rule in the near future (e.g. through additional state-specific constraints), and iv) the higher is the first round deficit reduction. Furthermore, the model predicts that insiders (defined to be members of parties of the incumbent government or with-in-state parliamentarians) have more optimistic compliance expectations than outsiders (opposition members, out-of-state politicians), when the overall compliance expectation is low. Within the model we analyze two possible explanations, which lead to different testable implications: asymmetric information between insiders and outsiders on the distribution of the fiscal shock, and overconfidence on the side of insiders.

In our empirical analysis, we test the model predictions on the drivers of compliance expectations based on a unique survey of members of all 16 German state parliaments. In the survey we elicited responses for the politicians' expectations on the own state complying with the debt brake by the year 2020, on other states' compliance, and on the likelihood of sanctions or bailout if a state were to violate the new rule in 2020. Since the survey was

non-anonymous, individual characteristics (such as education, party membership, etc.) and state characteristics (such as future need for fiscal consolidation) can be used to systematically study the determinants of compliance expectations. We obtained answers from 639 politicians who provided their compliance expectations for 16 states, which leads to more than 10,000 observations.

The survey not only shows that the German debt brake's credibility among policy makers is far from perfect. It also reveals that the heterogeneity of compliance expectations closely corresponds to our theoretical predictions: states' initial fiscal conditions, specific state fiscal rules and bailout perceptions matter. In addition, there is a robust asymmetry in compliance expectations between insiders and outsiders (both for in-state versus out-of-state politicians and the government versus opposition dimension), when the overall compliance expectation for a state is low. In that case, insiders tend to be significantly more optimistic than outsiders regarding the likelihood of their state's compliance. Based on the guidance of our theoretical model we diagnose overconfidence of insiders (and not noisy information) as driving this asymmetry. Overall, our analysis demonstrates that the credibility of a new national fiscal rule can be strengthened through no-bailout rules, sustainable initial fiscal conditions, and complementary sub-national rules.

Our specific credibility analysis is forward-looking and hence different from the extensive literature which examines the impact of numerical fiscal rules based on aggregate past fiscal performance. The standard approach is the estimation of cross-section or panel models for the selected jurisdictions and their fiscal performance (see, e.g., for the US Poterba, 1996; for Europe Debrun et al., 2008; for OECD countries Dahan and Strawczynski, 2010; and for Swiss cantons Krogstrup and Wälti, 2008; for a comprehensive meta-analysis on that literature see Heinemann et al., 2016). Our theoretical contribution corresponds to a few recent papers which analyze theoretically the role of fiscal rules in a political economy framework, such as Azzimonti et al. (2016). Janeba (2012) considers the role of delay in making a German

type debt brake binding when the fiscal rule itself is credible. The incentives of bailouts in a federal context are considered by Goodspeed (2002). Our survey approach and its empirical implementation benefit from prior surveys of politicians that have been used in recent research by two of the present authors. Heinemann and Janeba (2011) use a survey of members of Germany's national parliament to study ideological bias in tax policy. Janeba and Osterloh (2013) use a survey of mayors in Germany to empirically motivate the spatial structure of local tax competition in a theoretical tax competition model.

The rest of the paper is organized as follows. Section 2.2 sets up the theoretical model and derives comparative statics for the likelihood of compliance with the debt brake. Section 2.3 describes our original survey and provides background information on Germany's political and fiscal system and the debt brake. Our empirical findings are presented and discussed in section 2.4. Finally, section 2.5 concludes.

2.2 A model of fiscal rule compliance

We model the dynamic fiscal decision of an incumbent government to reduce its deficit in order to meet the target of a fiscal rule becoming effective only in the future. Deficit shocks make compliance non-trivial and uncertain. Specifically, we assume that the economy lasts for three periods, $t = 0, 1, 2$, where period 0 is the past, period 1 is the near future when a fiscal shock occurs, and period 2 is the distant future when the fiscal rule becomes binding (i.e., 2020 in the context of the German debt brake). There are two key budgetary decisions to be taken at the beginning of periods 1 and 2. The admittedly simple structure is sufficient to capture the uncertainty about compliance with the debt brake and allows us to derive hypotheses for our empirical analysis.

The main variable of interest is the government deficit d_t. The initial deficit $d_0 > 0$ is exogenous from the viewpoint of the incumbent government in period 1. The fiscal rule requires the government to run (at least) a balanced budget in period 2. If this target is

met, that is, $d_2 \leq 0$, the government obtains (gross) payoff u, which excludes the cost of fiscal adjustment. Otherwise the government is noncompliant and obtains payoff bu, where b is an endogenous variable that reflects the degree of non-compliance and is discussed in more detail below. The difference between u and bu comprises, inter alia, a reputation effect. Policy makers across party lines have high regard for the debt brake, which may reflect the importance of the rule of law in Germany.[6] Violating the constitution is likely to be costly for a state government in terms of reputation and possible consequences.[7] The term bu may also capture a possible bailout when the government does not comply, which we discuss in detail below.

The government can reach the balanced budget in two steps by reducing the deficit in periods 1 and 2 by the amounts r_1 and r_2, respectively, which could be negative. We model deficit reduction in a reduced form without specifying the nature of the fiscal adjustment (i.e., tax increases and/or expenditure cuts). Deficit reduction (increase) is costly (beneficial) for the government in the period when it takes place because government approval ratings or reelection chances are harmed (improved). We focus on the concurrent cost even though the cost of permanent deficit reduction may spill over to future periods. The cost function for permanently reducing the deficit by r is $c(r)$ in the period when the adjustment is made, and has the properties $c(r) \gtreqless 0$ for $r \gtreqless 0$, and $c' > 0$, $c'' > 0$. Strict convexity implies that spreading a given deficit reduction over time is efficient. This assumption seems reasonable given the long time horizon until the debt brake becomes binding for German states and given the high initial deficits in some states at the time of the rule's introduction of the debt brake 2009.

[6] In line with this assumption is the fact that German states typically advertise publicly their efforts on the way to complying with the debt brake.

[7] One might wonder why states agreed to the debt brake in the first place. Two reasons seem to be relevant: First, policymakers who agreed to the debt brake in 2009 are not necessarily in power when the balanced budget requirement becomes binding in 2020. Second, five economically and fiscally weaker states obtain annual transfers until 2019 which made agreement more attractive. See also section 2.3.1 for more details.

The actual deficit in period 1 is a function of the initial deficit d_0, the reduction r_1 undertaken at the beginning of period 1, and a shock $s \in [\underline{s}, \overline{s}]$ that occurs during period 1:

$$d_1 = d_0 - r_1 + s. \tag{2.1}$$

In period 2, after observing the realized value of d_1, the government sets the deficit for period 2 by choosing r_2 so that

$$d_2 = d_1 - r_2. \tag{2.2}$$

By assumption no shock takes place in period 2. The government payoff at the beginning of period 1 is given by

$$U = -c(r_1) + \delta[v - c(r_2)], \tag{2.3}$$

where $v = u$ when the government is compliant in period 2, that is $d_2 \leq 0$, and $v = bu$ when not. Let $\delta \leq 1$ be the discount factor.

2.2.1 Solving the model

We analyze the conditions under which it is in the government's interest (not) to comply with the fiscal target. For the time being we focus on the political decision maker. Later we consider how other individuals (such as opposition politicians or politicians from outside of state) assess the likelihood of compliance. The model is solved from the back.

Period 2

As shown in (2.1), the value of r_2 that is necessary to meet the fiscal target is the result of the deficit reduction effort in period 1, the fiscal shock and the initial deficit. On the one hand, the government may choose to comply and selects $r_2 = d_1 = d_0 - r_1 + s$, which implies

$d_2 = 0$. There is no benefit from over-achieving the fiscal target because deficit reduction is costly. Knowing the value of s, the period 2 payoff for compliance is

$$U_c = u - c(d_0 - r_1 + s). \tag{2.4}$$

If, on the other hand, the government does not comply with the fiscal rule its net payoff, after taking fiscal policy choices into account, is $b(r_2)u - c(r_2)$. We assume that the degree of non-compliance, captured by the function $b(r_2)$, matters. Deviations are costly in terms of public reputation. While small deviations may be interpreted by the public as bad luck or inaccurate measurement, large deviations are likely to be blamed on policy makers. Specifically, we assume that the function $b(r_2)$ is increasing and strictly concave: $b'(r_2) > 0 > b''(r_2)$.

Whether compliance or non-compliance is optimal depends on the net utility of each option after taking fiscal policy choices into account. The optimal level of fiscal consolidation (possibly negative) when not complying is found by maximizing the payoff with respect to r_2. The first order condition reads $b'(r_2)u - c'(r_2) = 0$. The second order condition is fulfilled by assumption on the properties of functions $b(r_2)$ and $c(r)$. Denote the optimal choice by r^*_{2nc}. Assuming that this level is indeed not sufficient to be compliant with the target (i.e., $r^*_{2nc} < d_0 - r_0 + \underline{s}$), the (period 2) net benefit from optimal non-compliance is

$$U_{nc} = b(r^*_{2nc})u - c(r^*_{2nc}). \tag{2.5}$$

A comparison of (2.4) and (2.5) reveals that compliance is preferable to non-compliance if and only if $U_c \geq U_{nc}$, which is equivalent to

$$c(d_1) \leq \Delta u := u - U_{nc} = (1 - b(r^*_{2nc}))u + c(r^*_{2nc}), \tag{2.6}$$

that is, the cost of reducing the deficit to zero under compliance is not higher than the gain from compliance measured by Δu. Condition (2.6) shows that $b(r^*_{2nc}) < 1$ is a necessary condition for compliance to occur because $c(d_1) > c(r^*_{2nc})$. In short, the reputation loss under noncompliance must be sufficiently strong. We make this assumption which seems reasonable in the German context: Even fiscally weak states make some efforts to reach the balanced budget target in 2020 (Detemple et al., 2015) and politicians agree on the desirability of the debt brake .

The cost of deficit reduction $c(r)$ is a monotone function of r. In addition U_{nc} is independent of d_0, r_1 and s. We can therefore invert (2.6) when it holds with equality, and define a critical level of the period 1 deficit for compliance to occur, namely, $d^*_1 = c^{-1}(\Delta u)$. For d_1 less than or equal to d^*_1, the government chooses to be compliant, otherwise not. Using (2.1), the threshold level defines implicitly a maximum level of the deficit shock s, called s^*, that is consistent with $d_2 = 0$:

$$s^* = d^*_1 + r_1 - d_0 = c^{-1}(\Delta u) + r_1 - d_0. \tag{2.7}$$

Instead of stating government compliance in terms of the period 1 deficit (d^*_1), condition (2.7) allows us to restate the condition in terms of the realized value of the shock s: For $s \leq s^*$ the government is compliant, otherwise not. The threshold level $s^* = s(r_1, \Delta u, d_0)$ is a positive function of the additional gain from compliance and the deficit reduction in period 1, but depends negatively on the initial deficit d_0. Recall that r_1 is exogenous from the viewpoint of period 2, but endogenous ex-ante.

The stochastic nature of the government deficit in period 1 makes compliance uncertain. We capture this aspect in the probability of compliance p, viewed from the time before the shock realizes (but after r_1 was chosen). We are interested in the relationship between p and exogenous parameters of the model, such as the initial deficit d_0, the gross gain from

compliance Δu, possible bailout expectations, as well as an additional fiscal rule restricting the maximum deficit level in period 1.

In order to state the probability of compliance and to obtain closed-form solutions we assume that the shock s is drawn from a uniform distribution with support $[\underline{s}, \overline{s}]$ and probability density $S^{-1} = (\overline{s} - \underline{s})^{-1}$. When $s^* \in [\underline{s}, \overline{s}]$, the probability of compliance with the fiscal rule, prior to the fiscal shock, is given by

$$p = p(d_0, r_1, \Delta u, \underline{s}, \overline{s}) = \frac{s^* - \underline{s}}{\overline{s} - \underline{s}} = \frac{c^{-1}(\Delta u) + r_1 - d_0 - \underline{s}}{S} \tag{2.8}$$

The probability p depends on $(r_1, \Delta u, d_0)$ and lies between 0 and 1 under suitable assumptions on the size of d_0 and S.[8] We make those assumptions, as this leads to an empirically relevant setup. The probability p increases (decreases) with the level of period 1 deficit reduction (initial deficit), and the gross gain from compliance:[9]

$$\frac{\partial p}{\partial r_1} = -\frac{\partial p}{\partial d_0} = \frac{1}{S} > 0, \ \frac{\partial p}{\partial (\Delta u)} = \frac{c^{-1'}(\Delta u)}{S} > 0. \tag{2.9}$$

Period 1

At the beginning of period 1 the government chooses r_1 and affects the probability of compliance via (2.8). The expected government payoff is

$$\begin{aligned} E[U] &= -c(r_1) + \frac{\delta}{S}\left[\int_{\underline{s}}^{s^*} (u - c(d_0 - r_1 + s))\, ds + \int_{s^*}^{\overline{s}} U_{nc}\, ds\right] \\ &= -c(r_1) + \delta\left[U_{nc} + p\Delta u - \frac{1}{S}\int_{\underline{s}}^{s^*} c(d_0 - r_1 + s)\, ds\right] \end{aligned} \tag{2.10}$$

[8] First, the probability is strictly positive if $s^* > \underline{s}$, which for given r_0 holds if d_0 and $\underline{s}$ are relatively small. The probability of compliance is less than one when $s^* < \overline{s}$, which holds for relatively high values of the initial deficit d_0 and maximum shock $\overline{s}$.

[9] The sign of the results shown in (2.9) do not depend on assuming a uniform density function for the fiscal shock s. Moreover, for any continuous density function, the government payoff function looks almost identical to (2.10), except for the fact that now the probability density would enter the integral on the right hand side, which makes the subsequent comparative static analysis more difficult.

The first line shows in square brackets the utility (periods 1 and 2) under compliance and non-compliance, respectively. For low levels of $s, s \leq s^*$, the government complies in period 2 by choosing a level of deficit reduction that leads to $d_2 = 0$ (the first integral). For high realizations of $s, s \geq s^*$, the government does not comply (the second integral). Rewriting terms, the second line in (2.10) displays in square brackets the same expression as before, now as the sum of the guaranteed utility under non-compliance and the expected gross gain from compliance, minus the cost of deficit reduction in period 2 when s is sufficiently small ($s \leq s^*$).

First period deficit reduction r_1 affects (2.10) via the cost of effort in period 1 (the first term in (2.10)), the probability of realizing the gross gain of compliance p, and the cost of effort in period 2 under compliance. Recall that the threshold level s^* is a function of r_1. The first order condition with respect to r_1 is

$$\begin{aligned}\frac{\partial E[U]}{\partial r_1} &= -c'(r_1) + \delta\left[\Delta u \frac{dp}{dr_1} - \frac{1}{S}\int_{\underline{s}}^{s^*} \frac{dc(d_0 - r_1 + s)}{dr_1}\, ds - \frac{1}{S} c(d_0 - r_1 + s^*)\frac{ds^*}{dr_1}\right] \\ &= -c'(r_1) + \delta\left[\frac{\Delta u - c(d_0 - r_1 + \underline{s})}{S}\right] = 0.^{10} \qquad (2.11)\end{aligned}$$

Condition (2.11) has the following interpretation: An increase in r_1 increases the marginal cost of deficit reduction in the current period. The marginal benefit of doing so is the discounted increase in the expected gross gain of compliance (due to the increase in the probability of compliance) adjusted for the cost of eliminating the remaining deficit $d_0 - r_1 + \underline{s}$. Recall that S^{-1} represents the increase in the probability of compliance when r_1 is raised marginally. We denote by $\hat{r}_1$ the optimal level of deficit reduction in period 1.

[10] Solutions to (2.11) may indicate maxima or minima depending on the sign of the second-order condition $-c''(r_1) + \frac{\delta c'(d_0 - r_1 + \underline{s})}{S}$. We use techniques from the theory of monotone comparative statics to sign comparative statics effects.

2.2.2 Comparative statics and hypotheses

We now study the determinants of the probability of compliance p from the perspective of period 0, which depends on exogenous model parameters both directly, as shown in (2.8), but also indirectly via the optimal level of initial deficit reduction r_1, as implicitly defined in (2.11). We use insights from the theory of monotone comparative statics to sign the effects (see van Zandt, 2002).[11]

1. Initial deficit: We first analyze the effect of a change in the initial deficit d_0 on period 1 deficit reduction. Based on Remark 5 and Theorem 4 in van Zandt (2002), the expected payoff function (2.10) has the property of strictly decreasing differences in (r_1, d_0)

$$\frac{\partial^2 E[U(r_1, d_0)]}{\partial r_1 \partial d_0} = -\frac{\delta c'(d_0 - r_1 + \underline{s})}{S} < 0. \tag{2.12}$$

Theorem 1 in van Zandt (2002) implies that an increase in the initial deficit lowers deficit reduction in period 1, that is $\frac{\partial \hat{r}_1}{\partial d_0} < 0$. The probability of compliance p (see (2.8)) is also lowered by the direct effect so that the total effect becomes

$$\frac{\partial p}{\partial d_0} = \frac{1}{S}\left(\frac{\partial \hat{r}_1}{\partial d_0} - 1\right) < 0. \tag{2.13}$$

States with a larger initial deficit are less likely to comply with the fiscal rule in period 2 (Hypothesis 1: H1).

2. Bailout expectations: Up to now we did not explicitly address the role of a possible bailout. Suppose a bailout is possible, and consider an increase in the exogenous probability of a bailout. Formally, we capture the bailout probability by interpreting the utility from non-compliance bu as expected utility, which comprises the utility if no bailout occurs and if

[11] Alternatively, assuming that the second order conditions hold for maximization of (2.10), we obtain the same comparative static results.

it does occur. An increase in the bailout probability (for any given level of fiscal adjustment r_2) leads to a higher level of bu, a higher net utility U_{nc} (the indirect effect on optimal deficit reduction in period 1, r^*_{1nc}, can be ignored as a result of the envelope theorem), and thus lower net utility gain Δu. Looking again at the cross partial derivative of (2.10)

$$\frac{\partial^2 E[U(r_1, \Delta u)]}{\partial r_1 \partial(\Delta u)} = \frac{\delta}{S} > 0, \tag{2.14}$$

the expected payoff function has the property of strictly increasing differences in $(r_r, \Delta u)$. An increase in Δu, which is equivalent to a lower bailout probability, leads to an increase in period 0 deficit reduction

$$\frac{\hat{r}_1}{\partial(\Delta u)} > 0. \tag{2.15}$$

Moreover, a lower bailout utility increases the probability of compliance because an increase in Δu raises p both directly and indirectly:

$$\frac{\partial p}{\partial(\Delta u)} = \frac{1}{S}\left(c^{-1'}(\Delta u) + \frac{\partial \hat{r}_1}{\partial(\Delta u)}\right) > 0. \tag{2.16}$$

Higher bailout expectations (= smaller Δu) make compliance with the balanced budget requirement less likely (Hypothesis 2: H2).

3. State fiscal rule in period 1: Some states in Germany have introduced own fiscal rules which constrain fiscal policy prior to 2020. The state rules are often supposed to strengthen the national debt brake. We capture this aspect by allowing for an additional fiscal rule to be already effective in period 1. We assume that the additional fiscal rule is credible, perhaps because there is no one to bail out the government within its state. Yet the fiscal rule may

be of different strictness, which we express in terms of the maximum deficit that is allowed in period 1, $d_0 + \overline{s}$. The upper limit of the deficit in period 1 must obey

$$d_1 \leq \overline{d}_1 = \alpha(d_0 + \overline{s}). \tag{2.17}$$

The parameter $\alpha \in [0, 1]$ represents the strength of the fiscal rule. Lower values of α correspond to a tighter fiscal rule in period 1. Using (2.2) we can reformulate the requirement in (2.17) in terms of initial deficit reduction:

$$r_1 \geq (1 - \alpha)(d_0 + \overline{s}) =: \overline{r}_1. \tag{2.18}$$

A tighter fiscal rule in period 1 requires a (weakly) higher deficit reduction effort in period 1 ($\overline{r}_1$ is decreasing in α). Whether the additional fiscal rule has bite depends on the magnitudes of $\overline{r}_1$ and $\hat{r}_1$, where the latter is the solution to (2.11) and represents the optimal choice of initial deficit reduction in the absence of the additional fiscal rule in period 1. When $\overline{r}_1 > \hat{r}_1$, the new fiscal rule is binding. This result has further ramifications for the probability of compliance with the original fiscal rule in period 2. When the state rule is binding, compliance with the debt brake is more likely because probability p depends positively on r_1.

The likelihood of compliance (weakly) increases in the strength of a credible fiscal rule at state level which restricts the period 1 deficit (Hypothesis 3: H3).

4. Individual Beliefs: Consider the (interim) belief in government compliance during period 1 (before s is realized, but after r_1 is chosen). We wish to compare the beliefs in compliance of two types of politicians: the incumbent government or in-state legislators on the one hand (the "insiders"), and opposition politicians or out-of-state politicians on the other hand (the "outsiders").

The psychological literature (see Moore and Healy, 2008) suggests that a large number of individuals (more than half) believe to perform better than the median which is impossible. In the present context, we model overconfidence as follows: Insiders believe the range of fiscal shocks to be more favorable than outsiders, perhaps due to their self-perceived competency in managing the economy. To capture this, we define the upper and lower bound of the fiscal shock as

$$\overline{s} = s^{max} - \gamma \text{ and } \underline{s} = s^{min} - \gamma \tag{2.19}$$

where s^{max} and s^{min} are the base values of the maximal and minimal shock. A higher value of γ means that the distribution of the fiscal shock shifts lower, leading to a smaller expected value of the shock $E[s] = \frac{s^{max} - s^{min} - 2\gamma}{2}$, but unchanged variance $Var[s] = \frac{(s^{max} - s^{min})^2}{12}$. The inverse density $S = \overline{s} - \underline{s} = s^{max} - s^{min}$ is independent of γ.

If incumbent governments or in-state politicians are overconfident, they believe in a higher value of γ than outsiders. We can derive the implications for the probability of compliance by inserting (2.19) into (2.8), then differentiate to find (for given r_1)

$$\frac{\partial p}{\partial \gamma} = \frac{1}{S} > 0. \tag{2.20}$$

Hence at an interim stage in period 1 insiders believe in a higher probability of compliance than outsiders. This effect is reinforced if we consider the *ex-ante* perspective when r_1 is chosen. The effect of γ on period 1 deficit reduction can be signed by looking at the cross-partial derivative to (2.10)

$$\frac{\partial^2 E[U(r_1, \gamma)]}{\partial r_1 \partial \gamma} = \frac{\delta c'(d_0 - r_1 + s^{min} - \gamma)}{S} > 0. \tag{2.21}$$

Hence a higher value of γ makes it more attractive to reduce the deficit in period 1, which in turn increases the probability of compliance even further, an interesting aspect we return to

in the concluding section. *Overconfident insiders believe more strongly in compliance than outsiders.*

Alternatively, we may assume that insiders have more precise information about the range of fiscal shocks than outsiders. Let us assume that the fiscal shock is bounded by

$$\overline{s} = s^{max} + \sigma \text{ and } \underline{s} = s^{min} - \sigma. \tag{2.22}$$

In this case variations in σ leave the expected value of the fiscal shock $E[s] = \frac{s^{max} - s^{min}}{2}$ unaffected, while the variance increases in the parameter σ. Note that $S = \overline{s} - \underline{s} = s^{max} - s^{min} + 2\sigma$ is a function of the shift parameter σ. We assume that outsiders have a noisier signal about the range of the fiscal shock, and thus a larger value of σ. Inserting (2.22) into p and differentiating with respect to σ gives

$$\frac{dp}{d\sigma} = \frac{1 - 2p}{\overline{s} - \underline{s}}. \tag{2.23}$$

Condition (2.23) allows us to rank the beliefs of insiders and outsiders: If insiders believe in compliance with more than 50% probability, $p^{ins} > 0.5$, then outsiders attach a lower probability ($p^{out} < p^{ins}$). If, on the other hand, insiders find compliance less likely than non-compliance ($p^{ins} < 0.5$), outsiders are more optimistic than insiders, that is $p^{out} > p^{ins}$. *In other words, insiders have more extreme views than outsiders when the latter have noisier information than the former.*

Combining the insights from the two alternative setups we formulate our fourth hypothesis:

Insiders (the incumbent government or in-state politicians) are more optimistic about the probability of compliance than outsiders (political opposition or out-of-state politicians) if insiders are either overconfident or if under the noisy information hypothesis insiders consider compliance with the fiscal rule more likely than non-compliance. Insiders are less

optimistic about compliance than outsiders only under the noisy information hypothesis and if insiders believe compliance is less likely than non-compliance. (Hypothesis 4: H4). It is the latter case which allows us to distinguish the two alternative hypotheses empirically. Looking at states with on average low expectations regarding compliance, the finding that insiders are more optimistic than outsiders favors the overconfidence explanation.

2.3 Institutional and survey details

2.3.1 Germany's federal system and the constitutional debt brake

Before we introduce the survey we provide a brief introduction to Germany's electoral, political and fiscal system (for a more detailed description of the German party and electoral system the reader is referred to Roberts, 1988; Poguntke, 1994).

Democracy. Germany is a parliamentary democracy with two chambers at the federal level: the lower chamber called Bundestag, which is elected by all citizens, and the upper chamber called Bundesrat, which represents the 16 German states. The debt brake was approved in 2009 by more than the 2/3 required majority in both chambers in order to change the constitution. At the state level, there exists only one chamber like the lower chamber at the federal level. We surveyed members of these state parliaments, called MSP henceforth.

Fiscal Federalism. The German state features three government layers with partly overlapping areas of policy responsibility: (1) the federal level, (2) the states, and (3) the municipal level. Tax autonomy at the state level is relatively low. Revenues are equalized to a significant degree across states and in addition through vertical tax sharing. Differences in state revenues per capita are reduced via a fiscal equalization system. Through the large degree of revenue sharing the German federal system is closer to being an example of cooperative fiscal federalism rather than competitive federalism (Braun, 2007).

Fiscal Rules. The fiscal rule is the German debt brake ("Schuldenbremse"), which became part of the German constitution ("Grundgesetz") in 2009. The new constitutional rule requires the federal government to run a (cyclically adjusted) budget deficit of no more than 0.35% of GDP starting in 2016 (see Bundesministerium der Finanzen, 2009, for a detailed description). For German states ("Länder") the new rule is more stringent and requires them to run a (cyclically adjusted) zero deficit from 2020 onwards. For the states, no specific path of deficit reduction is defined. However, five states (Berlin, Bremen, Saarland, Saxony-Anhalt and Schleswig-Holstein) receive "consolidation aids" in total of €800 million annually until 2019. In return they are required to reduce their 2010 budget deficit in equal steps until 2020. As a reaction to the new national constitutional rule, several states have introduced own rules echoing or even sharpening the national rule (for a survey see Ciaglia and Heinemann, 2013).

Enforcement . The Stability Council ("Stabilitätsrat") has the task to detect budgetary emergencies at the federal and state level and check compliance with the Fiscal Compact. It represents the federal ministers of finance and economics as well as all state finance ministers. The Council is not allowed to impose monetary sanctions directly. In the case of the five states receiving consolidation aids, the Council is entitled to withhold aids in case of non-compliance. Non-monetary sanctions for all states originate from the possible publicity of the Stability Council's statements or from political costs materializing if a state budget is ruled as unconstitutional by the Federal Constitutional Court.

Economic Performance. Fiscal and economic situations of states are highly diverse (Table 2.1): GDP per capita in Hamburg, for example, is more than twice as large as in most eastern states. Debt to state GDP is particularly high for the city states of Berlin and Bremen (both above 60%). Often high debt levels go hand in hand with large projected fiscal adjustments, as identified by the German Council of Economic Advisors' calculation of consolidation need. One explanation for the nevertheless fairly positive credit ratings is that

bailout expectations exist. The last column of Table 2.1 provides an index for the stringency of individual states' fiscal rules (Ciaglia and Heinemann, 2013), which takes account of the rule's contents, precision, legal basis and enforcement.

Table 2.1: Economic and fiscal indicators

	Population 2011 (in millions)	GDP per capita 2011 (in thousands of €)	Total debt to GDP ratio 2011 (in %)	Need for Consolidation 2011-2020 (in % of GDP)	Bond Rating 2012[a]	Index of stringency of state debt rule
Federal Government	81.84	44.02	49.79[e]	-	AAA[d,e]	
Baden-Württemberg	10.79	34.89	17.16	0.10	AAA[d]	0.62
Bavaria	12.60	35.44	6.79	-0.60	AAA[d]	0.48
Berlin	3.50	28.95	61.64	3.50	Aa1[c]	0.65
Brandenburg	2.50	22.08	35.77	2.10	Aa1[c]	0.51
Bremen	0.66	42.39	73.63	3.40	-	0.64
Hamburg	1.80	52.49	26.86	0.30	-	0.47
Hesse	6.09	37.51	17.28	1.30	AA[d]	0.50
Mecklenburg-West Pomerania	1.63	21.40	29.11	1.70	-	0.46
Lower Saxony	7.91	28.35	25.42	1.30	-	0.55
North Rhine-Westphalia	17.84	31.88	33.22	1.60	AA-[d]	0.45
Rhineland-Palatinate	4.00	28.31	32.49	1.80	AAA[b]	0.69
Saarland	1.01	30.10	41.83	2.80	-	0.70
Saxony	4.14	22.98	9.99	0.60	AAA[d]	0.76
Saxony-Anhalt	2.31	22.43	39.84	2.50	AA+[d]	0.77
Schleswig-Holstein	2.84	25.95	38.57	1.30	AAA[b]	0.77
Thuringia	2.22	21.66	35.04	2.30	AAA[b]	0.66

Notes: [a] from http://www.welt.de/finanzen/article107267058/Bundeslaender-profitieren-von-Deutschland-Bonds.html last access on 23 July 2013; [b] Fitch; [c] Moody's; [d] S&P, [e] referring to federal level alone, not to the aggregate of Germany. Need for consolidation is taken from Sachverständigenrat (2011) and is based on the average budget deficits from 2007 to 2010. It indicates the extent of consolidation necessary to comply with the debt brake by 2020. For that purpose, it takes account of pension obligations and the reduction of transfers from the federal level (Special Purpose Grants) which will both come into effect until 2020. The index of stringency of the debt rule is normalized between 0 and 1, where higher values indicate a more stringent debt rule (Ciaglia and Heinemann, 2013).

2.3.2 The survey among members of state parliaments

Our survey was sent to all 1861 members of the 16 German state parliaments during a period of 14 months in 2011 and 2012. Surveys were conducted approximately at mid-term of an electoral cycle. 639 politicians participated in the survey which resulted in a response rate of 34%. This is a reasonably high rate compared to other surveys among members of parliaments with response rates between 20 and 30% in most cases (for regional parliaments see André et al., 2014; for national parliaments see André et al., 2015). Response rates differ along state and party affiliation (Table 2.2). Possible concerns about the effect of different response rates are dealt with in the econometric analysis below. The survey was non-

Table 2.2: Response rates and survey waves

	Number of MSPs	Number of responses	Response rate	Survey wave[a]	Last state election before survey
Overall	1861	639	34.34%		
Baden-Württemberg	138	77	55.80%	3	3/2011
Bavaria	187	75	40.11%	1	9/2008
Berlin	149	30	20.13%	3	9/2011
Brandenburg	88	19	21.59%	1	9/2009
Bremen	83	18	21.69%	3	5/2011
Hamburg	124	39	31.45%	2	2/2011
Hesse	114	50	43.86%	2	1/2009
Mecklenburg-West Pomerania	71	17	23.94%	3	9/2011
Lower Saxony	152	54	35.53%	1	1/2008
North Rhine-Westphalia	181	51	28.18%	2	5/2010
Rhineland-Palatinate	101	50	49.50%	3	3/2011
Saarland	51	20	39.22%	1	8/2009
Saxony	133	45	33.83%	2	8/2009
Saxony-Anhalt	106	47	44.79%	2	3/2011
Schleswig-Holstein	95	29	30.53%	1	9/2009
Thuringia	88	36	40.91%	1	8/2009

Notes: [a] The first wave (1) took place in March and April 2011, the second wave (2) took place in December 2011 and January 2012, and the third wave (3) took place in April and May 2012.

anonymous, and we are able to match the survey responses with personal characteristics such

as education, committee membership, etc. from public sources and with state characteristics such as GDP per capita, debt, need for fiscal consolidation, etc. (see Table A.1 in the appendix for all variables).

Non-anonymity of responses could lead to untruthful replies. Parliamentarians might be concerned about their perceived loyalty to the own state or official party lines. Fiscal preferences could impact on expectations through a self-serving bias. However, both the survey design and the empirical analysis below substantially reduce the potential resulting bias. In the conduct of our survey, we explicitly guarantee confidential treatment of individual responses. Insofar as the parliamentarians trust this assurance they do not expect that any individual statements become public. In this respect, our confidential survey approach is superior to studies which exploit recorded votes with their unavoidable publicity. Moreover, in the econometric analysis below we take further precautions and explicitly control for several individual characteristics which could drive incentives to hide true expectations (including proxies on debt preferences and the role in government or opposition).

The questionnaire consisted of eight questions covering preferences for revenue autonomy and fiscal equalization, spending preferences as well as questions related to the debt brake (for a full description see Heinemann et al., 2014, in *Perspektiven der Wirtschaftspolitik*). For our study, we focus on the following two questions:

Question to compliance expectation: *Which of the 16 German states will comply with the constitutional debt brake as of 2020 with high probability?*
Each of the 16 states could be ticked individually or options "all" or "none" could be chosen.

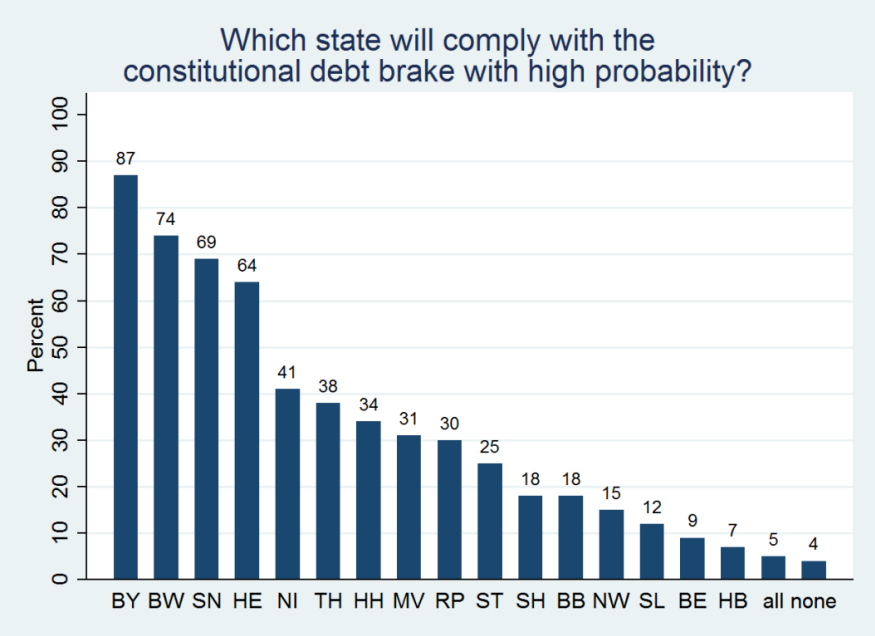
In a second question, we also asked for the consequences of non-compliance:

Question to consequences of non-compliance: *What will happen if German states do not comply with the constitutional debt brake as of 2020?* (multiple answers possible)

- Constitutional courts (on state and federal levels) will enforce budget consolidation
- The constitution will be changed so as to relax the debt brake
- Transfer payments to non-complying states are given, which help to lower the deficit

- There will be sanctions against non-complying states, e.g., lower transfers within the federal fiscal equalization scheme
- There will be ordinary legal or constitutional interventions in non-complying states' budget autonomy
- Merger of states
- Nothing will happen
- Other: _____

Figure 2.1: Expected compliance - average answers with equal weights across states

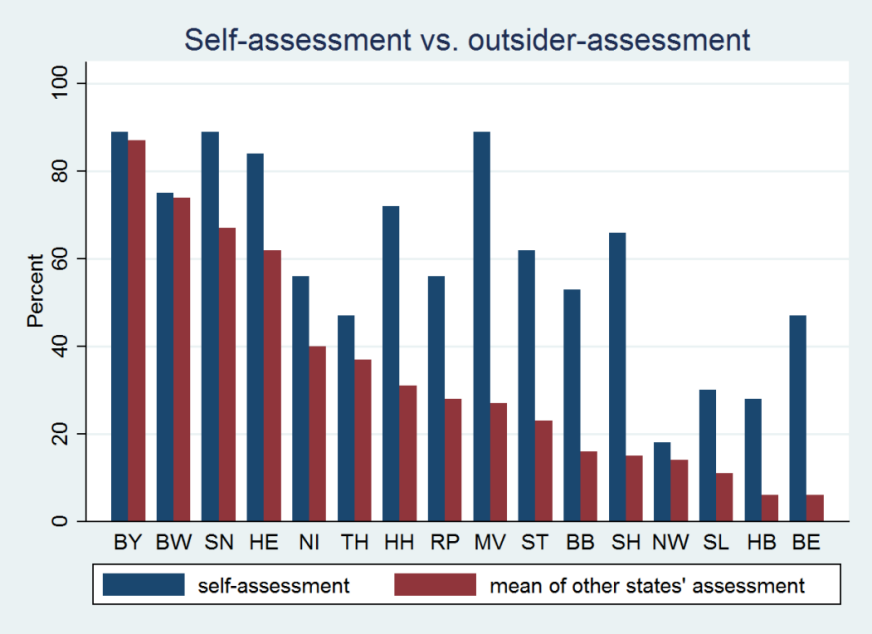


BB=Brandenburg, BE=Berlin, BW=Baden-Württemberg, BY=Bavaria, HB=Bremen, HE=Hesse, HH=Hamburg, MV=Mecklenburg-West Pomerania, NI=Lower Saxony, NW= North Rhine-Westphalia, RP=Rhineland-Palatinate, SH=Schleswig-Holstein, SL=Saarland, SN=Saxony, ST=Saxony-Anhalt, TH=Thuringia

Figure 2.1 indicates that the deficit rule's credibility is imperfect and compliance expectations differ remarkably for different states. While Bavaria is seen as an almost certain case of compliance the prospects of the city states of Bremen and Berlin are highly pessimistic. These expectations obviously correlate closely with current consolidation needs and debt levels (see Table 2.1). Note again that expectations for a particular state i come from legislators in state i and legislators from all other fifteen states $j \neq i$. In addition, a strong asymmetry

emerges for insider/outsider expectations on financially weak states (see Figure 2.2): While MSPs from other states are highly skeptical, a large majority of politicians from economically weaker states expect their state to respect the debt brake's zero deficit cap by the year 2020 (see Table A.2 in the appendix for full information on cross-state expectations).

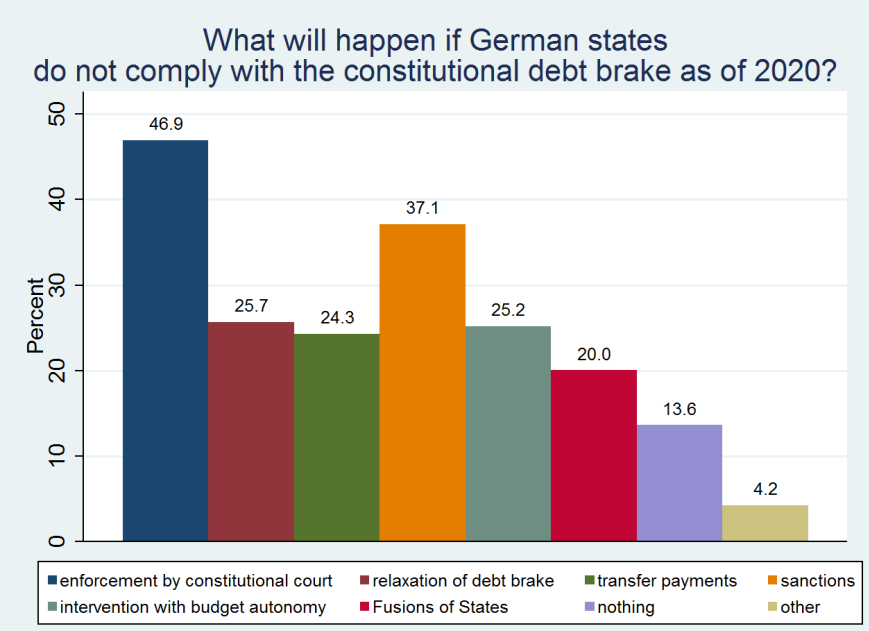
Figure 2.2: Mean assessment of insiders vs. mean assessment of outsiders



State acronyms: See Figure 2.1.
Note: the mean assessment of outsiders is the average answer of outsiders with equal weights across the respective 15 other states (see line "$\phi_{15otherstates}$" in Table A.2 in the appendix)

Figure 2.3 summarizes the results for the non-compliance question: A significant number of politicians expects a strong role of constitutional courts to enforce consolidation or sanction. However, a large fraction of politicians expect the government budget constraint to be soft due to bailout-transfers or a relaxation of the strict debt brake. Overall, these descriptive findings point to the possible relevance of our model's prediction on the role of the initial fiscal situation, bailout expectations or the expected asymmetry between insiders and outsiders. We substantiate the model's explanatory power in the subsequent regression analysis.

Figure 2.3: Expected consequences of non-compliance - multiple answers possible



2.4 Regression analyses

Our theoretical model predicts that compliance expectations of politicians should be related to the initial deficit, or more general, the initial economic and fiscal conditions of the state in question (H1), the individual politician's bailout expectations (H2), the existence and characteristics of state rules which complement the national debt brake (H3), and the individual politician's insider/outsider status (due to either asymmetric information or overconfidence on the side of insiders, H4). We cover these four dimensions as follows (for precise variable information see Table A.1 in the appendix):

- The state characteristics include GDP per capita and the initial budgetary position, i.e. the average budget deficit over the last three years prior to the survey. To test for the robustness of results we replace the average budget deficit by the need for consolidation or total debt to GDP, respectively. The need for consolidation is taken from the German

Council of Economic Advisors (Sachverständigenrat, 2011) and reflects the extent to which states need to consolidate their budgets until 2020 when the debt brake comes into effect.

- For bailout-expectations (H2) we exploit the survey question on the expected consequences of non-compliance (Figure 2.3). From this question we construct an index which captures the individual perception of the strength of the budget constraint. A larger indicator value represents the perception of a stricter budget constraint and lower bailout-expectations.[12]

- For the existence and stringency of a state rule (H3) we use the indicator of Ciaglia and Heinemann (2013) as presented in Table 2.1.

- The insider-outsider-differentiation (H4) has two dimensions: First, we can distinguish between incumbents as insiders and all others, where "incumbents" are defined as members of one of the governing parties in the respective state. Second, we can compare the expectations for a specific state's compliance between in-state and out-of-state legislators. We include both dimensions in our testing.

We enrich this theory-guided choice of variables through the inclusion of further individual and state controls. A growing empirical literature points to the importance of these variables for economic, monetary and fiscal performance (Besley et al., 2011; Göhlmann and Vaubel, 2007; Moessinger, 2014). We take account of the politician's gender, age, education (tertiary degree, type of degree, such as in business/economics), role in parliament (membership in budget committee) and experience (number of years in parliament). To control for a potential self-serving bias or expressive preferences – meaning that respondents might answer what they would like to be true – we include the answers to two more questions from our survey as

[12] Indicator construction is as follows: We add one point if a politician expects one of the "tough" reactions to a state non-complying (i.e. "enforcement through constitutional courts", "sanctions", "intervention in budget autonomy" or "merger of states") and subtract one point for each of these reactions which is not expected. Analogously, we subtract one point for each of the expected "soft" reactions to a state-non complying (i.e. "change of constitution", "transfers" or "nothing") and add one point for each of these reaction which is not expected.

controls. First, we use a politician's view on the (unconditional) desirability of her own state's compliance.[13] Second, we account for each politician's preference for fiscal consolidation.[14]

Additionally, we add party dummies to allow for the impact of ideology which might influence expectations since perceptions of economic constraints can be biased by strong ideological positions (see, e.g., Heinemann and Janeba, 2011, for the perception of globalization constraints on tax policy).

Among state controls we include a dummy for those states receiving consolidation aid and the extent of fiscal equalization transfers received. These variables cover transfer dependency. Finally, we add a dummy for the political orientation of the incumbent government which allows for the possibility that the incumbent's political orientation has an impact on compliance expectations for the respective state.

2.4.1 Baseline results

We estimate a probit model with the compliance expectation as dependent variable (dummy equals 1: Politician expects a state to comply with the debt brake as of 2020; 0: expect a state not to comply). Since we have expectations of 639 politicians on 16 states we can exploit a total of up to 10,224 observations depending on the specification. We cluster standard errors for state pairs. Column (1) in Table 2.3 summarizes our starting point with the full set of control variables. We include fixed effects for MSPs' states of origin to account for the possibility that politicians of particular states may be more or less optimistic in general.

All proxies related to our four hypotheses are highly significant. Signs are in line with the theoretical expectations for the H1-, H2- and H3-related indicators: Compliance expectations

[13] Survey Question: "In 2020, how desirable is it for your Bundesland to comply with the constitutional debt brake?" Answers given on discrete nine point scale ranging from -4 (completely undesirable) to +4 (very desirable).

[14] Survey Question: "Assume that your state's budget exhibits a permanent surplus (after business cycle adjustment). How would you use this surplus?" Answer given by distributing a hypothetical 100€ surplus to different budgetary items such as "higher expenses", "lesser taxes and fees" and "repayment of legacy debt". Here, we use the relative amount allotted to "repayment of legacy debt", which leaves us with a variable ranging from 0 to 100.

for states with unfavorable starting positions (lower GDP per capita or larger deficits) are less optimistic. The belief in bailout-transfers or other relaxations of the fiscal rule (lower index for strength of budget constraint) lowers compliance expectations. A stricter state-specific fiscal rule is correlated with a more favorable view for this particular state. Judged on the basis of average marginal effects, the size of the effects is substantial: A one percentage point higher initial average deficit (H1) lowers the probability that this state is expected to be compliant by about 9 percentage points on average. The difference between a very soft (-7) and very hard (+7) perception of the budget constraint (H2) amounts to an impact of 18 percentage points. And the difference between the weakest (0.45) and strongest (0.78) observable state debt rule (H3) is associated with a probability increase of 24 percentage points that a state is predicted to comply.

H4-related proxies are highly significant for both insider-outsider-dimensions: Insiders (members of a state's governing parties/in-state-MSPs) are more optimistic than outsiders (members of opposition parties/out-of-state-MSPs). The size of the effect is much larger for the in-state vs. out-of-state-dimension (21-22 percentage points) than for the government-opposition-distinction (6 percentage points).

Our theoretical analysis suggests, however, that the existence of more optimistic insiders could be due to overconfidence or noisy information. For a distinction, we deepen our econometric analysis by splitting the sample on the basis of compliance expectations of insiders (Table 2.4).[15] Specifically, we approximate the theory-based probability of compliance of insiders (p^{ins}) by the average compliance expectation of own-state-politicians, as recorded on the diagonal of Table A.2 in the appendix. We follow our theoretical model by splitting the sample into states with $p^{ins} < 0.5$ and states with $p^{ins} > 0.5$. Doing this, we end up with one smaller sample of five "pessimistic" states (see column (1) of Table 2.4) and a larger sample

[15] We have to use sample splits because we cannot estimate interaction effects reliably due to the non-linearity of the probit model used.

Table 2.3: Likelihood of state's compliance - baseline results

Independent Variables	Baseline 1	(1) Average marginal effects	Baseline 2	(2) Average marginal effects
Individual: education				
Tertiary degree	0.006	0.002		
	[0.036]	[0.010]		
Economics/Business degree	0.023	0.006		
	[0.037]	[0.010]		
Individual: parliamentary role				
Member of governing parties in state (H4)	0.207***	0.056***		
	[0.046]	[0.012]		
Member of budget committee	-0.162***	-0.044***		
	[0.039]	[0.010]		
Number of years in parliament	-0.006**	-0.002**		
	[0.002]	[0.001]		
Individual: other demographic variables				
Female	-0.111***	-0.030***		
	[0.032]	[0.009]		
Age in years	0.002	0.001		
	[0.001]	[0.000]		
Individual: preferences and bailout-expectation				
Desirability of own state's unconditional compliance	0.066***	0.018***		
	[0.010]	[0.003]		
Preference for fiscal consolidation (debt reduction)	0.004***	0.001***		
	[0.001]	[0.000]		
Index for perceived strength of budget constraint (H2)	0.046***	0.012***		
	[0.005]	[0.001]		
Individual: party affiliation[a]				
CDU/CSU	-0.111	-0.030		
	[0.068]	[0.018]		
SPD	-0.154**	-0.041**		
	[0.074]	[0.020]		
Green Party	0.091	0.025		
	[0.084]	[0.023]		
Left Party	0.157*	0.042*		
	[0.085]	[0.023]		
Other Parties	-0.115	-0.031		
	[0.113]	[0.031]		
State characteristics[b]				
Average budget deficit over last three years (H1)	-0.326***	-0.088***	-0.567***	-0.098***
	[0.033]	[0.009]	[0.050]	[0.008]
Debt rule index (H3)	2.730***	0.734***	4.005***	0.691***
	[0.289]	[0.076]	[0.400]	[0.067]
GDP per capita	0.027***	0.007***	0.023***	0.004***
	[0.005]	[0.001]	[0.007]	[0.001]
Dummy for consolidation assistance	-0.718***	-0.193***	-1.074***	-0.185***
	[0.089]	[0.023]	[0.128]	[0.022]
Fiscal equalization transfers to GDP	-0.356***	-0.096***	-0.719***	-0.124***
	[0.051]	[0.013]	[0.091]	[0.015]
Government coalition consists of right parties	0.589***	0.158***	0.788***	0.136***
	[0.072]	[0.019]	[0.096]	[0.016]
Cross state dimension				
Own state (H4)	0.801***	0.215***	1.213***	0.209***
	[0.105]	[0.028]	[0.174]	[0.029]
Home state fixed effects	✓	✓		
Person fixed effects			✓	✓
Regression diagnostics				
Observations		10,208		10,224
Pseudo-R^2		0.257		0.519
p-value joint significance of all variables		0.000		0.000
p-value joint significance of all individual variables		0.000		n.a.
p-value joint significance of party-dummies		0.000		n.a.
p-value joint significance of state characteristics		0.000		0.000

Notes: */**/*** denote significance at the 10%/5%/1% level; Standard errors in brackets; *a*: base category is the market oriented liberal democratic party "FDP"; *b*: State characteristics are 2010 data for survey waves 1 and 2, which both took place in 2011, and 2011 data for survey wave 3, which took place in 2012.

of eleven "optimistic" states (see column (2) of Table 2.4). We make use of the subsample for "pessimistic" states to distinguish between the two competing theories which can cause insiders to be more confident than outsiders.

The estimated coefficient for the dummy for own-state evaluation remains significantly positive in both subsamples, indicating that even those politicians from pessimistic states are more confident when it comes to the evaluation of their own state. According to our theory, this finding is only consistent with the explanation based on overconfidence, not noisy information. The finding is robust to splitting the sample on the basis of a stricter rule (i.e. $p^{ins} < 0.34$ and $p^{ins} > 0.66$). The own state dummy enters significantly with a positive sign, thereby confirming our H4 hypothesis on overconfidence.[16] Compared to our baseline regressions, most of the other coefficients remain robust in signs and significance in both samples.

The other control variables in column (1) of Table 2.3 are important to understand the heterogeneity of expectations, as well. The observed education characteristics do not show up significantly. Members of the budget committee view adherence to the debt brake as more difficult. Moreover, a longer parliamentary experience reduces compliance expectation. This finding is not driven by an age effect which is separately controlled for and does not enter significantly in the baseline estimations. Female legislators are significantly more pessimistic than their male colleagues. Party imprint on compliance expectations is moderate: Whereas social democratic politicians seem to be less optimistic than the liberal democrats (i.e. the base category) on average, politicians from the Left Party are significantly more optimistic.

States with a government consisting of right parties (i.e. Christian Democrats and/or FDP) are perceived to have a higher chance of compliance. Consolidation aid does not seem to compensate for the less favorable economic and fiscal conditions of the five related states since the related dummy is significantly negative.

[16] Results are not shown here but are available upon request.

Table 2.4: Likelihood of state's compliance - check H4: sample splits by Table A.2

Independent Variables	$\frac{p^{ins} < 0.5}{(1)}$ Baseline 1 for BE, HB, NW, SL, TH	Average marginal effects	$\frac{p^{ins} > 0.5}{(2)}$ Baseline 1 for BB, BW, BY, HE, HH, MV, NI, RP, SH, SN, ST	Average marginal effects
Individual: education				
Tertiary degree	0.124*	0.022*	-0.036	-0.010
	[0.074]	[0.013]	[0.042]	[0.012]
Economics/Business degree	-0.211***	-0.038***	0.091**	0.027**
	[0.081]	[0.015]	[0.044]	[0.013]
Individual: parliamentary role				
Member of governing parties in state (H4)	0.201**	0.036**	0.217***	0.063***
	[0.099]	[0.018]	[0.056]	[0.016]
Member of budget committee	-0.176**	-0.032**	-0.164***	-0.048***
	[0.083]	[0.015]	[0.046]	[0.013]
Number of years in parliament	-0.011**	-0.002**	-0.005*	-0.001*
	[0.005]	[0.001]	[0.003]	[0.001]
Individual: other demographic variables				
Female	-0.268***	-0.048***	-0.069*	-0.020*
	[0.072]	[0.013]	[0.036]	[0.011]
Age in years	0.003	0.001	0.002	0.001
	[0.004]	[0.001]	[0.002]	[0.000]
Individual: preferences and bailout-expectation				
Desirability of own state's unconditional compliance	0.049***	0.009***	0.073***	0.021***
	[0.019]	[0.003]	[0.013]	[0.004]
Preference for fiscal consolidation (debt reduction)	0.004***	0.001***	0.004***	0.001***
	[0.001]	[0.000]	[0.001]	[0.000]
Index for perceived strength of budget constraint (H2)	0.062***	0.011***	0.043***	0.013***
	[0.011]	[0.002]	[0.006]	[0.002]
Individual: party affiliation[a]				
CDU/CSU	-0.129	-0.023	-0.111	-0.032
	[0.156]	[0.028]	[0.078]	[0.023]
SPD	-0.330*	-0.059*	-0.112	-0.032
	[0.176]	[0.032]	[0.086]	[0.025]
Green Party	0.093	0.017	0.089	0.026
	[0.161]	[0.029]	[0.106]	[0.031]
Left Party	0.165	0.030	0.149	0.043
	[0.179]	[0.032]	[0.098]	[0.029]
Other Parties	-0.156	-0.028	-0.119	-0.035
	[0.202]	[0.036]	[0.140]	[0.041]
State characteristics[b]				
Average budget deficit over last three years (H1)	-0.059	-0.011	-0.627***	-0.182***
	[0.201]	[0.036]	[0.044]	[0.011]
Debt rule index (H3)	4.120**	0.741**	2.509***	0.728***
	[1.719]	[0.310]	[0.293]	[0.082]
GDP per capita	0.010	0.002	-0.004	-0.001
	[0.025]	[0.005]	[0.004]	[0.001]
Dummy for consolidation assistance	-1.155***	-0.208***	-0.695***	-0.202***
	[0.204]	[0.036]	[0.094]	[0.027]
Fiscal equalization transfers to GDP	-0.047	-0.008	-0.901***	-0.261***
	[0.124]	[0.022]	[0.062]	[0.016]
Government coalition consists of right parties	0.069	0.012	0.277***	0.080***
	[0.299]	[0.054]	[0.057]	[0.016]
Cross state dimension				
Own state (H4)	0.491***	0.088***	0.902***	0.262***
	[0.132]	[0.024]	[0.110]	[0.031]
Home state fixed effects	✓	✓	✓	✓
Regression diagnostics				
Observations	3190		7018	
Pseudo-R^2	0.204		0.245	
p-value joint significance of all variables	0.000		0.000	
p-value joint significance of all individual variables	0.000		0.000	
p-value joint significance of party-dummies	0.001		0.007	
p-value joint significance of state characteristics	0.000		0.000	

Notes: */**/*** denote significance at the 10%/5%/1% level; Standard errors in brackets; *a*: base category is the market oriented liberal democratic party "FDP"; *b*: State characteristics are 2010 data for survey waves 1 and 2, which both took place in 2011, and 2011 data for survey wave 3, which took place in 2012. BB=Brandenburg, BE=Berlin, BW=Baden-Württemberg, BY=Bavaria, HB=Bremen, HE=Hesse, HH=Hamburg, MV=Mecklenburg-West Pomerania, NI=Lower Saxony, NW= North Rhine-Westphalia, RP=Rhineland-Palatinate, SH=Schleswig-Holstein, SL=Saarland, SN=Saxony, ST=Saxony-Anhalt, TH=Thuringia

To check for the general validity of our results, we employ various model variants: In column (2) of Table 2.3 we allow for individual fixed effects. This specification accounts for the risk that omitted individual characteristics may bias the results. No substantial differences in the coefficients to the state characteristics emerge.

2.4.2 Robustness of results

The results presented above are robust with respect to the use of different variables capturing state fiscal conditions (see Table A.3 in the appendix): Just like the average deficit, the debt stock and the need for consolidation enter highly significantly and with a negative sign. The impact of almost all other variables remains as in the baseline regressions. Only the coefficients to the fiscal equalization transfers change significance and signs across specifications. We believe that this can be explained by the fact that debt is highly correlated with financial equalization transfers[17], whereas the average deficit is not.

A concern about the validity of our data could originate from sample selection. For our survey, Heinemann et al. (2015) have conducted a unit non-response analysis. They make use of data on the personal characteristics for all 1683 legislators, not only those who responded.[18] According to these results, significant drivers of survey participation are: education (degree in economics or business), budget committee membership, membership in government coalition parties and gender. Thus, our regressions comprise as controls those factors which are important drivers of non-response. This greatly reduces the potential for selection bias (Little and Vartivarian, 2005). As a further robustness check, we employ a weighted regression (see Table A.4 in the appendix). For the weighting, we use the inverse response probability based on party and state affiliation. The essential findings for our four

[17] The correlation coefficient amounts to 0.76.

[18] We do not face severe item non-response but predominantly unit non-response. Item non-response amounts to less than 1% of respondents and is therefore negligible for the survey at hand.

key hypotheses are confirmed. Compared to the non-weighted regression there are only minor changes in the size of average marginal effects.

2.5 Summary

In this paper we have argued that an effective fiscal rule should impact on the expectations and beliefs of those politicians who decide on the government budget. Our study of the debt brake in Germany reveals an imperfect credibility of the fiscal rule and points to highly heterogeneous expectations with respect to sub-national compliance.

We see a key finding in the asymmetric expectations of insiders and outsiders, both for the government versus opposition and the in-state versus out-of-state dimensions. This result might be considered unproblematic, if the governing parties and politicians in the state under consideration were better informed and therefore more trustworthy in their judgments than outsiders. Our empirical findings based on a theoretical model point to a different direction, however. Insiders (in-state politicians, members from governing coalition parties) are more optimistic than outsiders and are likely to be subject to an overconfidence bias. Our theoretical analysis suggests that overconfidence tends to have a self-fulfilling effect. Overconfident insiders underestimate the size of future fiscal shocks (and resulting adjustment costs) and therefore see the benefits from compliance in better reach than outsiders. This in turn creates a larger incentive to consolidate from the beginning. Overconfidence may thus increase the probability of compliance.

The analysis allows to draw tentative conclusions that are relevant for the design of fiscal rules also in the European context. They are presented in the conclusions of this thesis (Chapter 6).

3 Tax Competition in Europe - Europe in Competition with Other World Regions?

3.1 Introduction

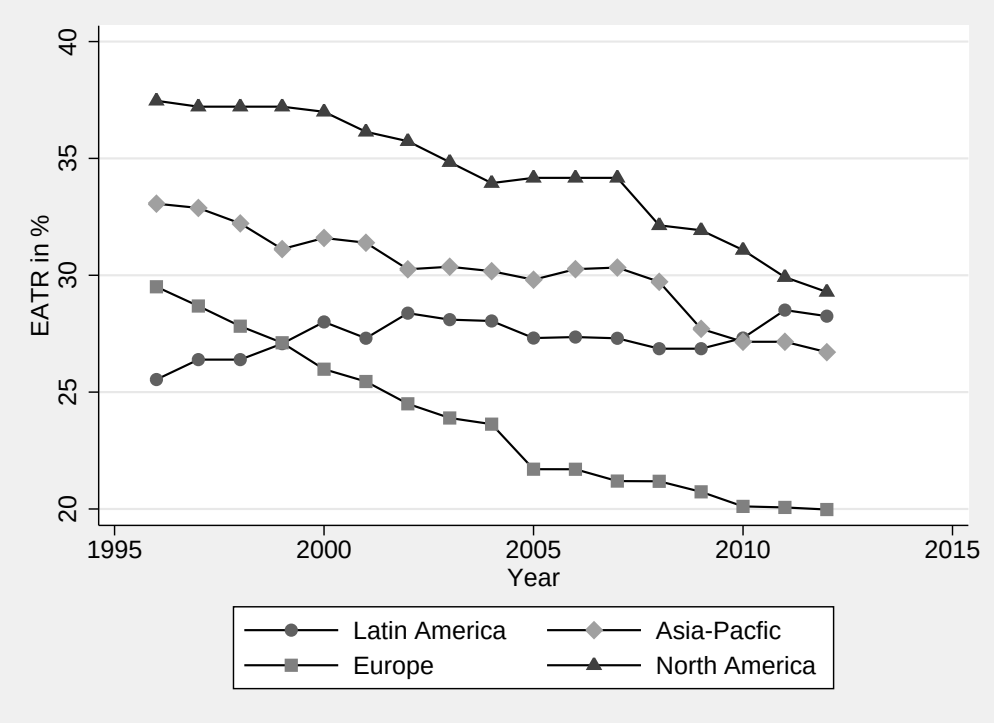
Corporate tax levels have fallen substantially in Europe during the last decades. Figure 3.1 shows the development of the average EATRs for four world regions which are covered in this study: Latin America, Europe, Asia-Pacific and North America. Among these regions, the development of effective tax levels in Europe appears most remarkable. The average European EATR has fallen substantially from approximately 30% in 1996 to approximately 20% in 2012 (see Figure 3.1). The downward trend in taxation levels in Europe is steady over time, however, the decline pre 2005 is more distinct than post 2005. Unlike in other regions, the average EATR in Latin America has risen slightly over the period from 1996 to 2012. In North America and in the Asia-Pacific region the average EATR has fallen, however, less dramatically than in Europe. There is a broad literature which stipulates that the global decline in corporate tax levels is due to tax competition. However, none of these studies explicitly asks the question whether tax competition within these regions is different from tax competition across these regions. Focusing on Europe, this study aims to answer the following question: Is the decline in corporate tax levels in Europe mainly driven by tax competition between EU member states or is it (also) due to pressure from other world regions?

The investigation of this question deserves special attention for helping to assess possible tax harmonization designs in the EU: The desirability of tax harmonization within the EU is linked to the relationship of the EU with third countries and other world regions. In a globalized world, tax competition might not stop at the European border. Tax harmonization would possibly reduce tax pressure within Europe, however, the pressure from outside would

not vanish *if it exists*. By harmonizing their tax systems, member states might lose their flexibility to react to tax changes in countries from other world regions. Schön (2003, p. 28) describes this as the member states putting themselves into a "straitjacket". On the other hand, Schön (2003) remarks that the existence of other economic areas could make harmonization within Europe even more necessary in order to reduce transaction and compliance cost within Europe, and make Europe as a whole, more competitive compared to other world regions. Due to pressure from outside Europe, the positive effects of tax competition (e.g. disciplining public budgets) would still apply in an harmonized system. Complementary to this reasoning, Sørensen (2004) sets up a general equilibrium model in which he distinguishes between global and regional tax coordination. He makes the point, that regional tax coordination might not be desirable when considering third countries. This paper contributes to this discussion by analyzing the extent of tax competition within Europe on the one hand, and between Europe and other world regions on the other hand.

Empirically, the paper follows the classical spatial econometrics approach in the public finance literature. I specify a dynamic panel data model for explaining effective tax levels and apply an instrumental variable approach. When interpreting the results, I take the recent literature on local government interactions into account which shows that applying the standard instruments in tax reaction functions might not control for possible common shocks or spatially correlated (unobservable) effects and therefore can overestimate the strength of strategic interactions (see, e.g., Baskaran, 2014, 2015; Isen, 2014; Lyytikäinen, 2012).

Figure 3.1: Development of effective average tax rates (EATRs)



3.2 Background and literature

3.2.1 Foreign direct investment and regional economic blocs

There are reasons why tax competition between countries of the same regional bloc might be more intense than between countries of different regional blocs.[19] If trade costs within the bloc are low, this may induce countries within the bloc to compete more strongly for FDI than with countries outside the bloc. This in turn can be reflected in the *tax setting behavior* of governments when corporate taxes are not coordinated or harmonized. Governments might want to influence multinational firm's FDI from outside a region which can choose

[19] Regional blocs can be distinct from each other for several reasons: Firstly, distance between countries of the same regional bloc is often smaller than across blocs. Secondly, cultural barriers within a regional bloc are likely to be smaller and consumer preferences to be more similar. And thirdly, countries within a region are likely to have both bilateral trade treaties and free trade area agreements. Also see Motta and Norman (1996) for the term "regional bloc".

to either produce (i) in each country of the region, (ii) produce in one country within the region and use that location as export-platform, or (iii) export its products from its home market (see, e.g., Motta and Norman, 1996). Likewise, companies from within the region need to decide where to locate most efficiently. Decisive factors for this can be trade costs and barriers to FDI within and across regional blocs.

The effects of global regionalism and economic integration on the choice between exporting and FDI have been analyzed in theoretical papers: Motta and Norman (1996) emphasize the relevance and impact that regional blocs have on firms. They show that economic integration within a bloc causes outside firms to invest in the regional bloc. Crucially, firms do not invest equally in each country of the bloc but make use of "intra-regional export platform FDI, with the investing firm supplying the majority of the countries in the regional bloc by intra-regional export" (Motta and Norman, 1996, p. 775). In addition to this "third country" perspective, Motta and Norman (1996) point out that FDI activity of inside firms might actually decrease, since they will choose intra-regional exports instead of dispersed FDI when intra-regional trade costs are sufficiently low. Both these effects intensify tax competition between countries within the regional bloc: Firstly, inside countries have an incentive to compete for the (additional) FDI attracted by the economically integrated area from third countries. And secondly, the less diversified within-bloc FDI makes inside countries compete more intensively for FDI than they would in less integrated areas. Similar implications arise when considering the theoretical FDI papers of Rowthorn (1992), Motta (1992) and Smith (1987).[20] This competition might be reflected in the tax setting behavior of states.

Closely related to the general term "regional bloc" are free-trade areas. Ekholm et al. (2007) analyze the possibility of export-platform foreign direct investment and show that a

[20] Rowthorn (1992) analyzes intra-industry trade and investment under oligopoly and emphasizes the role of market size and trade barriers between countries. Motta (1992) and Smith (1987) model firms' choice between direct investment and exporting.

free trade area can give incentives to multinationals to invest in that area. The model shows that under certain conditions, multinationals would only invest in one of the countries in the free-trade area, and serve the rest of the free-trade area by exports. In line with the theoretical studies, there is strong empirical evidence that free-trade areas attract investments from third countries and that multinationals choose one country within the area as an export-platform (see, e.g., Ekholm et al., 2007, for US multinationals' investment in NAFTA and the EU[21], Blonigen et al., 2007, for US multinationals' investment in the EU, and Blomstrom and Kokko, 1997, for investments in CUSFTA). These empirical studies confirm Motta and Norman's theory-based hypothesis of higher FDI inflows from third countries into regional blocs and less intra-bloc FDI.

With respect to Europe, there is reliable evidence that regional integration has affected FDI and trade flows within and into Europe. Pain (1997), for example, finds that U.K. direct investments into other EU countries have been stimulated by the internal market programme. Crucially, he also identifies some U.K. firms to have diverted their investments from the United States into the EU. This adds an additional aspect and provides micro-level evidence that regional economic blocs do not function independently to third countries.[22] Similarly, Baltagi et al. (2008) argue that the European Agreements on trade liberalization did not only affect trade flows but also FDI. They emphasize the interdependence of allocation decisions and conclude that "a sizable stimulus of investment in one country or region eventually causes a reduction of investment in other countries or regions" (Baltagi et al., 2008, p. 195).

[21] They show that US affiliates in free-trade areas (EU and NAFTA) mainly export within the free-trade area. The paper finds that it is not so much about countries' membership in NAFTA and the EU but more about countries belonging to the same geographical area. They argue that this is likely due to "North American and European locations [constituting] relatively integrated markets independent of the formation of formal free-trade areas through NAFTA and the EU" (Ekholm et al., 2007, p. 789).

[22] Baldwin et al. (1995) also detect investment diversion in the European context.

3.2.2 Tax competition

There are two papers which explicitly draw the relationship between regional economic integration, FDI flows *and* tax interactions. Raff (2004) shows theoretically that FDI is likely to increase in an integrated region and that countries within that region might have an incentive to attract FDI from the rest of the world by a favorable tax environment. The setting reflects the real world in the sense that (i) trade within regional blocs is likely to be less costly than across regions, and (ii) tax policies within regions are hardly harmonized.

Redoano (2014) connects to this reasoning and is closely related to this paper as it also focuses on the European context. Her main hypothesis states that "the lower cost of cross-border FDI between EU member countries, on the one hand, and the lack of tax harmonization programs between members, on the other hand, should cause EU countries to compete more intensively for FDI amongst themselves than with countries outside the EU" (Redoano, 2014, p. 354). Empirically, the hypothesis of more intense tax competition within the EU is confirmed on the basis of a Western European data set.

This paper goes one step further and analyzes how far tax competition within Europe and between Europe and the rest of the world differs. I closely relate to the empirical literature which attempts to identify strategic interactions among countries by using *tax reaction functions*.[23] Devereux et al. (2008) analyse for 21 OECD countries if they compete with respect to their corporate taxes. They find compelling evidence for international tax competition in statutory tax rates. States also seem to interact with respect to the effective tax rates. Although evidence for this is weak. The study does not show whether the results are driven

[23] Besides the empirical studies, the *theoretical strand* of the existing tax competition literature tries to identify conditions under which different possible consequences of tax competition occur (for example a race to the bottom). See, e.g., Zodrow and Mieszkowski (1986), Gordon (1986), Razin and Sadka (1991) and Zodrow (2006). Other papers determine theoretically, in which dimension (e.g. statutory tax rates) countries compete with each other. See, e.g., Haufler and Schjelderup (2000), Devereux et al. (2008), Fuest and Hemmelgarn (2005) and Becker and Fuest (2011).

Descriptive studies have shown how various tax parameters have developed over the last centuries. See, e.g., Elschner et al. (2011), Devereux et al. (2002), Gorter and de Mooij (2001) and Devereux (2007).

by certain country constellations or country clusters and is therefore unable to address the research questions posed by this paper. Egger and Raff (2014) develop a theoretical model which allows for two dimensions of interactions, i.e. interaction in tax rates and tax bases. In their empirical contribution, they show that observed changes in countries' tax rates and bases are a consequence of increased trade integration.

In the European context, Crabbé (2013) shows by means of tax reaction functions that EU15 member states which are geographically close to the new Eastern European member states, react more strongly to the new member states' tax levels than more remote EU15 countries do. Similarly, Davies and Voget (2008) find that the extension of the EU has intensified tax competition. However, these studies do not answer the question whether EU states compete with other world regions. A recent study by Altshuler and Goodspeed (2015) is related to the research question of this paper, as it poses the question whether the US acts as a Stackelberg leader for the European countries. However, their measure for taxation, corporate tax revenues divided by GDP, is vulnerable to cyclical effects within and/or across regions and is only an indirect measure for effective average tax rates. A further study by Overesch and Rincke (2011) also finds strong (weak) evidence for competition in statutory tax rates (effective average tax rates) in Europe. Given that their data only consists of European countries, their paper cannot address the questions raised in this paper, i.e. how far tax competition within Europe and between Europe and the rest of the world differs.

3.3 Empirical methodology

The tax competition literature referred to in section 3.2.2 makes use of tax reaction functions to detect strategic interaction among countries. Tax reaction functions assume that a country's level of corporate taxes is a function of the level of corporate taxes in the other countries. Theoretically, it is possible that country i reacts differently to all other countries. However, most of the literature that uses tax reaction functions makes the assumption that

country i reacts to the average level of corporate taxes of all other countries. This assumption is mainly due to data limitations, since in the case of country specific response possibilities the number of coefficients to be estimated would equal the number of countries. The literature has solved this problem by building an average of the tax levels of all other countries and making an ex-ante choice about the weighting of the countries in this average. Thus, the variable of interest is the weighted average tax level of all other countries (excluding country i) which is called "spatial lag". In this case, only one coefficient is estimated which then captures how country i reacts to the average tax rate of all other countries.[24] In my paper, I use specifications which allow for more than one average in order to detect country constellations and regions which drive the results.

With respect to the weighting scheme, there have been different approaches in the literature, for example theory-based weights like GDP or trade flows. However, these weighting variables might be related to the corporate tax levels themselves and therefore be endogenous. Recently, Klemm and Parys (2012) have used uniform weights and Redoano (2014) distance weights which both circumvent the additional endogeneity problem which other weighting schemes cause. I choose to use both uniform and distance weights in all specifications which constitutes a first robustness test for the results.[25]

Besides the average taxes of the other countries, the tax level of a country might also be determined by its own tax level in the previous period because countries face adjustment costs when changing their effective average tax rate (EATR). Consequently, the EATR adjusts only gradually when exogenous factors change and does not jump into a new equilibrium instantly. Therefore, I specify a dynamic model with the lagged dependent variable as an explanatory variable. Dynamic models have been applied in similar circumstances before, for example by

[24] E.g., Devereux et al. (2008) use one average when testing whether or not there is international tax competition.

[25] As distance measure I use simple geodesic distances provided by the research institute CEPII. I use the inverse distance as weight and row normalize the weights to one.

Cassette et al. (2012) in a local taxation context or by Foucault et al. (2008) in the context of public spending interactions in French municipalities; recently Redoano (2014) applies it when testing for tax competition between countries. The results of this paper show that a government's choice on its country's EATR is highly path-dependent.

In the specification, the EATR of country $i = 1, ..., N$ at time $t = 1, ..., T$ is denoted by τ_{it} where N is the number of countries and T represents the number of time periods. The tax reaction function of state i can be written as (**baseline specification**):

$$\tau_{it} = \gamma\tau_{it-1} + \delta \sum_{j \neq i}^{N} w_{ij}\tau_{jt} + \mathbf{X}_{it}\boldsymbol{\beta} + \rho t_r + \alpha_i + \varepsilon_{it} \tag{3.1}$$

where α_i is a country-specific fixed effect, ρt_r represents a regional linear time trend and ε_{it} is an error term.[26]

The EATR of country i is a function of the average EATR of the other countries, which is represented by the spatial lag term $\sum_{j \neq i}^{N} w_{ij}\tau_{jt}$. Parameter w_{ij} is the weight with which the EATR of country j (τ_{jt}) goes into the average EATR of the other countries when explaining the EATR of country i. X_{it} represents a vector of sensible control variables which vary over time.

The dynamic nature of the specification imposes (internal) validity problems. In an ordinary OLS regression, the country-fixed effect in the error term causes the lagged dependent variable to be upward biased. The problem of endogeneity does not vanish when using fixed- or random-effects OLS estimations (Nickell, 1981). Dynamic panel data estimators tackle this problem by constructing first differenced regression equations. The error term and the first differenced lagged dependent variable are still correlated in such specifications, however,

[26] In the main specifications I do not include time dummies due to their high multicollinearity with the spatial lag (see, e.g., Elhorst, 2010; Klemm and Parys, 2012; Devereux et al., 2008). However, I use regional linear time trends for the four world regions to allow for unobserved factors to vary over time.

this can be circumvented by instrumenting the difference of the lagged dependent variable by lags of its levels (or differences).

With tax reaction functions, there is a second major endogeneity concern: the spatial lag is endogenous by assumption because tax reaction functions explicitly state that countries interact with each other. Thus, the error term of country i is correlated with the spatial lag because country i itself has an influence on the tax setting behavior of the other countries. Previous literature deals with this problem by instrumenting the spatial lag by the (weighted) average covariates of all other countries (i.e. the countries contained in the spatial lag). The literature argues that these covariates qualify as instruments as they are uncorrelated with the error term of country i (exogeneity condition fulfilled) but are correlated with the other countries' tax levels (instruments are relevant).[27] However, recent literature shows that the exogeneity condition could be doubted to be fulfilled in the case of possible common shocks or spatially correlated unobserved effects (e.g. Baskaran, 2014, 2015). The covariates in country j could be correlated with the EATR in country i through a spatially correlated unobserved factor that determines both the covariates and the EATRs. I mitigate this problem by applying country-fixed effects which control for all time invariant (spatially correlated) unobserved factors.

I use system GMM, as proposed by Blundell and Bond (1998), to apply instruments to both the lagged dependent variable and the spatial lag in order to address both endogeneity problems described above.[28] System GMM uses lagged levels for instrumenting current differences and lagged differences for instrumenting current levels. Beside the benefit of using internal instruments, it is also possible to include additional (exogenous) variables as

[27] The covariates of the other countries are averaged by the same weighting scheme which applies to the spatial lag. This approach is also chosen by, for example, Devereux et al. (2008), Davies and Voget (2008), Klemm and Parys (2012) and Redoano (2014).

[28] Klemm and Parys (2012) also recently applied system GMM in the context of tax reaction functions. Furthermore, Madariaga and Poncet (2007) apply this method in the context of FDI spillovers and Foucault et al. (2008) in the context of public spending interactions. Similarly, Cassette et al. (2012) use difference GMM for analyzing local tax competition.

instruments which are not part of the second stage regression specification. This is useful for the setting in this paper in order to use the covariates of the other countries to instrument the spatial lag.[29] In the international tax setting context at hand, system GMM has the additional benefit that it can deal with the only modest adjustments in effective tax *levels* in some countries by taking into account interactions in levels as well as in first differences.

With respect to the assumptions of system GMM, the Hansen J test of overidentifying restrictions allows to check whether the instruments are correlated with the residuals. The null hypothesis that there is no correlation between instruments and residuals cannot be rejected for any of the regressions conducted in the analysis. Furthermore, the Arellano and Bond (1991) statistics on the first and second order autocorrelation of the first-differenced residuals is employed. The second order correlation is relevant since the model is specified in first differences and the autocorrelation in levels needs to be checked.[30]

3.4 Data

Country coverage

The (balanced) panel data underlying the analysis covers 44 countries over the period 1996 to 2012. The data consists of four world regions, namely Europe, North America, Latin America and the Asia-Pacific region. Naturally, the European region makes up for the majority of the 44 countries.[31] For competition in FDI the effective average tax rate (EATR) is the relevant measure as argued by Devereux and Griffith (1998, p. 337) and Devereux and Griffith (2003). Besides statutory tax rates, EATRs also take into account depreciation methods for assets

[29] I restrict the number of instruments by only using one lag in order to keep the number of instruments manageable as suggested by Roodman (2009, p. 124). This lag specification applies to all regressions in the paper. The robust option is used in order to produce results robust to heteroskedasticity and "arbitrary patterns of autocorrelation" within countries Roodman (2009, p. 123).

[30] The null hypothesis of no autocorrelation cannot be rejected at the 5% significance level for the baseline results (Table 3.1) except for one regression.

[31] Tables B.6 and B.7 in the appendix provide information on the countries covered.

and the valuation method for inventories. This is important to measure when governments do not only interact with respect to statutory tax rates, but also use favorable depreciation schemes to become more attractive for FDI.[32]

Development of Effective Average Tax Rates

The dynamics related to the EU enlargement in 2004 deserve special attention. The data shows that the average EATR in Europe has decreased significantly from 1996 to 2012 (Figure 3.1 in section 3.1 and Table B.8 in the appendix). More precisely, the mean EATR of the EU28 has fallen from 29.5% in 1996 to 20.4% in 2012. However, there are substantial differences between the old (EU15) and the new member states (EU13). Throughout time, the mean EATR of the EU15 was higher than the one of the EU13. Additionally, the dynamics of the EATRs were different between the two groups. The new member states lowered their mean EATR drastically until 2004 (year of entry into the EU for the EU10). Afterwards, they kept decreasing their tax rates, however, the downward pace became considerably slower. In contrast, the old member states lowered their mean EATR during the pre-enlargement period less drastically but then slightly increased their downward movement after the enlargement. Empirical studies show that the EU extension is likely to have played a causal role for the observed dynamics (Davies and Voget, 2008; Crabbé, 2013). I will take this into account in the analysis.

Control Variables

For the empirical analysis, I merge the EATR data with a set of time varying control variables. Government consumption expenditure ($Gov't\ Consumption_{it}$) is supposed to reflect the need of a government (or society) to generate tax revenues in order to serve its preferences for the provision of public goods and redistributive policies. In addition, I include

[32] Section B.2.1 in the appendix explains the data sources and computation assumptions.

demographic variables which might have an effect on the tax setting behavior of states, i.e. the share of people living in urban areas ($Urban_{it}$) and the share of dependents as percent of the working-age population ($Dependency_{it}$). To capture the openness of an economy, I borrow a measure used by Overesch and Rincke (2011); it is computed by summing up a country's imports and exports and dividing it by its GDP ($Openness_{it}$). The effect of this openness measure is ambiguous because, on the one hand, the (un-)openness of an economy shows if a government succeeds to attract foreign FDI and, on the other hand, high trade volumes can also indicate that multinationals find it more attractive to serve the market by imports rather than by direct investments as argued in section 3.2. To control for the size of an economy and thus for its possible market power, the GDP (GDP_{it}) of the respective country is included. Table B.5 in the appendix provides descriptive statistics for these covariates and the EATR.

3.5 Results

3.5.1 Main results

Global Tax Competition

The first specification reflects the presented baseline regression in section 3.3, i.e. the EATR of country i is explained by the weighted average EATR of all other countries. The results in column 1 (uniform weighting) and 2 (distance weighting) in Table 3.1 show no evidence for international tax competition. The single spatial lag is neither significant for the uniform weights nor for the distance weights. This contributes to an already ambiguous literature in which some papers find evidence for international tax competition (beyond European tax competition) in a single spatial lag framework (e.g., Devereux et al., 2008) and some papers do not (Davies and Voget, 2008, p. 26 column 2 and 3). The assumption

that states adjust their tax parameters only gradually towards a new equilibrium is confirmed by the high and significant coefficient of the lagged dependent variable in Table 3.1.

The main result, namely that the spatial lag is not positively significant, raises the question if this also holds when I refine my approach and look at more regional tax competition. It is conceivable that the last result is not so much a sign of non-existence of tax competition between countries but more a sign for tax competition taking place rather within regional blocs than across regions as argued in the theoretical part of this paper.

Regional Tax Competition

In the following, I take regional tax competition aspects into consideration by regressing the EATR of country i on the weighted average EATR of the other countries in the region of country i. The analysis provides no evidence for the existence of general tax competition within regions (column 3 and 4 in Table 3.1). Both the spatial lag of the uniform and the distance specification are not significant at the 10% significance level. This result is relatively remarkable given that European countries make up the majority of the sample. However, when dropping the non-European observations and reducing the sample size, the spatial lag turns significantly positive in the uniform specification (column 5 and 6 in Table 3.1). This indication of tax competition within Europe is confirmed and becomes stronger in the subsequent specifications (see below) and is in line with the literature. However, the details are different: Overesch and Rincke (2011) find evidence for tax competition within Europe, however, only with respect to statutory tax rates. Davies and Voget (2008) also find evidence for tax competition within Europe when looking at the EATR. They use a static model whereas this study confirms the result by means of a dynamic model. Redoano (2014) also shows that there is European tax competition with data which focuses Western European countries.

Table 3.1: Global and regional tax competition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	All Countries		**All Countries**		**European countries**		**European countries**		**European countries**	
VARIABLES	uniform	distance	uniform	distance	uniform	distance	uniform	distance	uniform	distance
Lagged EATR	0.641***	0.595***	0.910***	0.859***	0.804***	0.594***	0.846***	0.918***	0.870***	0.925***
	[0.148]	[0.149]	[0.022]	[0.057]	[0.071]	[0.140]	[0.058]	[0.028]	[0.056]	[0.020]
Spatial Lag	0.407	-0.105								
	[0.299]	[0.302]								
Spatial Lag same region			-0.022	-0.024	0.447**	0.109	0.680***	0.176*	0.754**	0.170*
			[0.084]	[0.044]	[0.197]	[0.252]	[0.197]	[0.096]	[0.294]	[0.092]
Spatial Lag Non-European							0.549*	0.069		
							[0.320]	[0.258]		
Spatial Lag Asia-Pacific									0.345	0.213
									[0.211]	[0.203]
Spatial Lag North America									0.111	-0.240
									[0.319]	[0.251]
Spatial Lag Latin America									0.075	-0.026
									[0.194]	[0.189]
Gov't Consumption (lag)	0.068	0.069	0.029	0.036	0.032	0.026	0.040	0.047*	0.036	0.047**
	[0.051]	[0.058]	[0.026]	[0.028]	[0.041]	[0.075]	[0.034]	[0.026]	[0.029]	[0.024]
Urban (lag)	0.036	0.041	0.012	0.017	0.060	0.109	0.051	0.022	0.045	0.020
	[0.035]	[0.041]	[0.009]	[0.015]	[0.046]	[0.086]	[0.039]	[0.021]	[0.036]	[0.019]
Openness (lag)	0.276	0.457	0.270	0.315	-0.090	-0.527	-0.097	-0.187	0.001	-0.159
	[0.637]	[0.676]	[0.187]	[0.224]	[0.583]	[1.061]	[0.514]	[0.453]	[0.402]	[0.393]
GDP (lag and ln)	0.785**	0.904***	0.234**	0.346**	0.435**	0.729**	0.363**	0.100	0.335**	0.092
	[0.331]	[0.313]	[0.106]	[0.139]	[0.207]	[0.311]	[0.182]	[0.145]	[0.152]	[0.131]
Dependency (lag)	0.088**	0.097**	0.039***	0.047***	-0.042	-0.068	-0.039	-0.019	-0.033	-0.017
	[0.043]	[0.047]	[0.014]	[0.016]	[0.066]	[0.117]	[0.057]	[0.033]	[0.053]	[0.031]
Region Specific Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	704	704	704	704	496	496	496	496	496	496
Number of countries	44	44	44	44	31	31	31	31	31	31
Hansen test P-value	0.621	0.514	0.309	0.494	0.457	0.505	0.400	0.117	0.460	0.738
AR(1) P-value	0.00274	0.00355	0.0227	0.0151	0.0192	0.00978	0.0215	0.0283	0.0216	0.0295
AR(2) P-value	0.0445	0.0618	0.123	0.108	0.0904	0.0672	0.100	0.115	0.0912	0.105

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Tax Competition in Europe - Europe in Competition with other World Regions?

For tax policy in Europe, the question of European tax competition is important. For the desirability and the design of tax coordination or harmonization, however, it is also very relevant whether or not there is evidence that European countries react to effective tax levels of non-European countries as argued in the introduction.

The regressions in column 7 and 8 in Table 3.1 address this question. The EATR of the European countries is regressed on the (weighted) average EATR of the other European countries *and* the (weighted) average EATR of all non-European countries. Consistent with the previous result, the European spatial lag ("Spatial lag same region") is now even more positive and statistically significant for both types of weighting schemes. *However*, evidence for the relevance of the effective tax levels of the non-European countries is weak. The spatial lag for the non-European countries is only significant at the 10% significance level for the uniform weights and not significant at all for the distance weights. When refining this approach and splitting the non-European spatial lag into its regional components, evidence for tax pressure from other world regions on the European countries vanishes altogether. Neither the spatial lag for North America, Latin America nor the Asian-Pacific region shows any statistically significant effect (column 9 and 10 in Table 3.1). This result confirms the FDI papers on economic integration and export-platform FDI. They suggest that economic integration leads to tougher competition for FDI within the integrated area whereas it is not clear if competition between regional blocs intensifies. From the results, it can be cautionary concluded that there does not seem to be evidence for tax pressure on European countries from other world regions. Instead, the fall in effective tax rates in Europe can be attributed to tax competition within Europe.

3.5.2 Robustness of results

Throughout the paper I apply both uniform and distance weights. Both circumvent any additional endogeneity problem which might occur when using weights like trade or FDI flows. Regional interaction effects turn out to be stronger with uniform weights than with distance weights. This hints at the fact that distance does not matter anymore when looking at countries within the same region.[33] However, all main conclusions derived from the results hold for both regression specifications. In the following, I run further robustness checks with respect to time effects and the construction of regional blocs. Additionally, the results are extended to European tax competition considerations.

Construction of Regional Blocs

The FDI literature analyzing export-platform strategies and countries' competition for FDI looks at both "free-trade areas" and "regional blocs", the latter being a more general concept of an integrated economic area. Free-trade areas often constitute an integrated economic area before the formalization through a free-trade agreement as argued by Ekholm et al. (2007). Therefore, the empirical analysis of this paper rather focuses on geographically and economically integrated regions than explicitly considering free-trade areas.

In the case of Mexico, the question arises if it is more integrated with Latin American or with North America (through NAFTA). Therefore, I conduct a sensitivity analysis which affiliates Mexico to North America when analyzing whether there is tax competition within regions. Table B.1 in the appendix confirms that there is no general evidence for tax competition within regions.

With respect to European countries, the paper does not strictly focus on EU membership in the main analysis. Even if a country is not member of the EU or only joined the EU at a

[33] Because of this argument, Klemm and Parys (2012) only use uniform weights when analyzing regional tax competition.

later stage, the European economies show a substantial degree of integration due to privileged free-trade relationships. Consequently, I also include Switzerland, Norway and Turkey in the main analysis which have well-established economic relationships with the EU (e.g. through EFTA in the case of Switzerland and Norway). For robustness I run regressions that rather focus on the EU instead of Europe by excluding the latter three countries. The main results remain valid (Column 3-8 in Table B.1), however, statistical significance for tax competition within Europe becomes slightly weaker.

Time Effects

The main specifications do not include time dummies, since they would be almost identical to the spatial lag. The time dummy would represent the average tax level in a given year. The spatial lag, in turn, also represents the (weighted) average tax level in a given year, except the tax level of the country of the dependent variable. Due to the high multicollinearity between the spatial lag and the time dummy, the spatial lag cannot be interpreted meaningfully in this case (see, e.g., Elhorst, 2010; Klemm and Parys, 2012; Devereux et al., 2008). This is especially true with uniform weighting. The problem might be less severe with distance weights. Therefore, I experiment with time dummies for the distance regressions and present them in Table B.2. Again, there is no evidence for tax pressure from other world regions on Europe. With this perspective, evidence for European tax competition also becomes weaker.

European Considerations

The main results indicate that there is no general tax competition across or within regions. Tax competition seems to be a relatively specific European phenomenon. The description in section 3.4 and the studies by Davies and Voget (2008) and Crabbé (2013) show that the EU enlargement process might have contributed to interaction dynamics. Crabbé (2013) emphasizes the new member states' impact on the old member states which are located

eastward. Similarly, Davies and Voget (2008) argue that tax competition between the EU member states is stronger and that the EU enlargement has intensified tax competition in Europe. When I run the regressions only on the EU15 member states (Table B.3, column 3-4), I find no significant effects and, in a way, the findings of Crabbé (2013) and Davies and Voget (2008) are confirmed. Furthermore, EU28 states seem to react in particular to the new EU13 member states (Table B.3, column 5-6), which confirms the important role the EU13 played in the dynamics of European corporate tax competition.

3.6 Summary

Overall, there is a substantial amount of literature which analyses strategic tax interactions between countries. Especially in the context of the European Union, it has been argued that member states' sensitivity to each other has led to lower effective corporate taxes. The integrated economic area in the EU has arguably promoted this development. The results of the paper support this but, at the same time, do not show evidence for regional tax competition in other world regions than Europe. Furthermore, there is no evidence for tax competition across regions, and more specifically, for the influence of non-European corporate taxes on tax levels of EU member states.

In general, the implied causalities of the results in classical spatial econometrics frameworks have to be interpreted cautiously because the exogeneity condition for the instruments could be violated in case of unobserved common shocks. Recently, Gibbons and Overman (2012), Lyytikäinen (2012), Baskaran (2014), and Isen (2014) show that the strength of detected strategic interactions can be overestimated in that case.[34] In light of this, the result of no inter-regional tax competition gains additional credibility. Although I apply a method which tends to overestimate strategic interactions, only interactions within Europe

[34] These papers analyze interactions at the local level and make use of policy interventions and institutional variations within and/or across borders to identify interaction effects. This is no feasible approach for this study which focuses on the country level.

are found. Overall, only moderately robust evidence for international tax interactions has been provided by the literature so far, which perhaps has to be treated with caution, given the new methodical insights form the studies on local jurisdictions.

The results of this study and the former literature allow to make assessments on the desirability and possible design of corporate tax harmonization in the EU. I present these considerations in the conclusions of this thesis (Chapter 6).

4 Decline of CFC Rules and Rise of IP Boxes: How the European Court of Justice Affects Tax Competition and Economic Distortions in Europe

4.1 Introduction

The long-term goal of the European Union (EU) is to establish and ensure an internal market. The completion of this "area without internal frontiers" should be encouraged by a consistent economic policy in each member state favouring "an efficient allocation of resources" in the European Union.[35] This goal, which is derived from economic theory, calls for a neutral tax system that does not distort investment decisions (e.g. Horst, 1980; Auerbach, 1989). But given the prevailing substantial differences in corporate tax systems in the EU (e.g. European Commission, 2001; Endres et al., 2013; Elschner and Vanboerren, 2010), investment decisions of companies are still significantly distorted by tax considerations until today. This can be explained by the fact that direct tax policy has remained in the hands of the member states (e.g. Graetz and Warren Jr, 2006).[36]

Consequently, the European Court of Justice (ECJ) has had a high impact on tax policy in the EU in the last two decades.[37] With respect to corporate taxation, the court's decisions focus especially on the elimination of discriminatory measures for cross-border investments.[38] Generally, the jurisprudence of the ECJ is intended to contribute to the achievement of the internal market (e.g. De La Feria and Fuest, 2016; Martin Jiménez, 1999; Cordewener, 2006; Syrpis, 2012). The reasoning of the ECJ's decisions in tax matters has been discussed and criticized in the legal literature at length (e.g. Lang, 2002; Bizioli, 2008; Pistone, 2010). Most

[35] Article 26 and 120 of the Treaty on the Functioning of the European Union (TFEU).

[36] The European Commission has announced to relaunch a new proposal for a Common Consolidated Corporate Tax Base (CCCTB) in 2016. See European Commission (2015a).

[37] Until today, more than 250 cases concerning issues in direct taxation have been decided by the ECJ. See European Commission (2015b).

[38] Also see Schreiber and Führich (2009, p. 259) for an overview.

papers argue that the ECJ's jurisprudence lacks clear guidance for the member states when it comes to defining what exactly EU-law compliant tax policy is.

In contrast to elaborated debates in the legal literature, the ECJ's jurisprudence has only scarcely been discussed in the economic literature.[39] In the context of direct taxation, some papers evaluate if the ECJ rather favours capital export or capital import neutrality (Graetz and Warren Jr, 2006; Mason and Knoll, 2012; Schön, 2015; Spengel, 2003, pp. 256-262). The only systematic analysis concerning possible effects of the ECJ's jurisprudence on tax neutrality is provided by De La Feria and Fuest (2016) by means of a theoretical model and two case studies. They show that depending on the reaction of the member states, economic distortions could actually increase due to the ECJ's decisions. Given the important role of the ECJ and its impact on the tax systems, the potential consequences for economic distortions have not been sufficiently investigated yet. The research question at this interdisciplinary edge between economics and law is, whether the ECJ's jurisprudence actually contributes to the reduction of economic distortions caused by the tax systems in the member states or not.

In our paper, we provide an answer to this question based on a landmark decision of the ECJ in 2006. In the Cadbury-Schweppes decision, the court limited the applicability of controlled foreign company (CFC) rules within the EU (European Court of Justice, 2006). Generally, CFC rules are targeted at specific (highly mobile) activities conducted in a foreign low-tax country and aim at taxing such income at the higher home country tax rate. CFC rules have proven to be highly relevant for investment decisions of corporations (Altshuler and Hubbard, 2003; Ruf and Weichenrieder, 2012). But according to the ECJ, CFC rules are only compatible with EU law if they are restricted to "wholly artificial arrangements" that do not unfold any economic activity (e.g. letter boxes). All member states with CFC

[39] There are some analyses on the economic effects of the ECJ jurisprudence in other policy fields, e.g., public health care. See, e.g., Paulus et al. (2002) and Tridimas and Tridimas (2002).

rules had to amend their legislation as demanded by the ECJ. Because of this restriction, CFC rules are of low relevance within the EU and the European Economic Area (EEA)[40] nowadays (Fontana, 2006; Smit, 2014). In line with this, Ruf and Weichenrieder (2013) find increasing investments in low-tax EU countries by German multinationals after the Cadbury-Schweppes decision in 2006.

With respect to tax neutrality in the EU, the general impact of the Cadbury-Schweppes decision cannot be determined a priori. Beside the direct effect of the restricted applicability of CFC rules on tax neutrality, the non-applicability of CFC rules has also widened the possibility for member states to introduce new favourable tax regimes. Before the ruling, member states were restricted from offering favourable tax conditions as the application of CFC rules of another country could eliminate the offered tax incentives. Consequently, this restricted certain forms of tax competition within the EU before the Cadbury-Schweppes decision. We argue that the widened possibilities for attracting foreign investments after the judgement have been promptly used by some countries. The rise of intellectual property boxes (IP boxes) within the EU, which provide a lower effective tax rate to (specific) income from IP, can be seen as a direct consequence of the de-facto abolishment of CFC rules. This is especially true for IP boxes which include acquired IP in addition to self-developed IP. These IP boxes would not have been introduced in the EU without the judgement, since they had not unfolded a significant effect due to CFC rules. Nowadays, IP boxes have proven to influence investment and location decisions of multinationals (Griffith et al., 2014; Alstadsæter et al., 2015).

The judgement and the reactions of the member states constitute an important case that allows us to analyze the role of the ECJ. The Cadbury-Schweppes case is particular

[40] The judgement of the ECJ has also affected the CFC legislation of the member states of the European Economic Area (EEA). As the EEA also pursues the goal of an internal market, we include Iceland, Liechtenstein and Norway in our analysis. See Gudmundsson (2006) for details. We use the term "EU" in the following for the 28 member states and Iceland, Liechtenstein and Norway.

suitable, since it enables us to also take into account "second round effects" of the ECJ jurisprudence - in this case, the emergence of IP boxes. It is the *first* contribution of this paper to analyze whether or not the ECJ contributes to the economic goal of an efficient allocation of resources in the internal market by eliminating tax-induced distortions. By conducting this analysis, we also take a combined view on two areas (CFC rules and IP boxes) that are highly debated in the "Base Erosion and Profit Shifting" (BEPS) project of the OECD (OECD, 2013; OECD, 2015d). This is the *second* contribution of this paper.

In our analysis, we rely on the methodology developed by Devereux and Griffith (1999)[41] which analyzes the influence of taxes on a hypothetical investment project. We implement both CFC rules and IP boxes into the model and compute effective tax rates for domestic and cross-border investments. Similar to previous studies, we use the means and standard deviations of the modelled tax burdens to assess tax-induced economic distortions in the internal market (Devereux and Pearson, 1995; Elschner et al., 2011; Ruiz, 2006). For the time period 2004-2014, we investigate by means of four different (counterfactual) scenarios (with/without CFC rules and with/without IP box regimes) the ECJ's effect on tax neutrality in the internal market.

The remainder of the paper is structured as follows. Section 4.2 gives a detailed overview of CFC rules in the EU member states and how the Cadbury-Schweppes decision in 2006 has impacted them. In addition, we show the main properties of the IP box regimes in the EU. Section 4.3 presents the Devereux-Griffith model and the implementation of CFC rules into the model. Section 4.4 provides results for the different scenarios and discusses their implications. Finally, section 4.5 concludes.

[41] See Schreiber et al. (2002) for additional information.

4.2 CFC rules and IP boxes in the EU member states

In the following, we provide a detailed overview on the properties of CFC rules and IP boxes in the EU member states from 2004 to 2014 which serves to illustrate how CFC rules and IP boxes work, how they were affected by the ECJ's decision, and how they impact the tax burden of investments.

4.2.1 CFC rules

4.2.1.1 Aim and properties of CFC rules

Most countries use CFC rules as anti-avoidance measures against the extensive use of low tax jurisdictions by multinational enterprises (Dahlberg and Wiman, 2013, p. 21; Endres and Spengel, 2015, pp. 339-342).[42] Generally, the separation principle in international taxation enables multinationals to exploit tax differentials across jurisdictions (Graetz, 2003, p. 217). However, if CFC rules apply, profits of a foreign subsidiary are taxed at the higher tax rate of the parent's home country.

A common requirement for CFC rules to be applicable is that the parent company controls 50% or more of the capital of the foreign subsidiary. Otherwise, CFC rules mainly differ with respect to two dimensions. The first dimension is about the *income* which is subject to CFC rules. If the "entity approach" is used, all income that is generated by a foreign subsidiary is subject to the CFC rule whereas the "transactional" approach restricts the CFC rule's applicability to specific kinds of income deemed to be passive (such as royalty or interest income).

The second dimension determines the exact definition of a *low-tax jurisdiction*. Two approaches prevail: If the "threshold approach" is used, a required minimum level of taxation

[42] However, in certain circumstances countries may have incentives to not apply CFC rules since they lower their multinationals' competitiveness abroad. See for example Brauner and Herzfeld (2013, p. 783) for the United States.

is defined by the CFC legislation of the home country. The actual tax burden paid in the foreign country must not fall below a predefined percentage of the hypothetical tax burden which would accrue if the investment was conducted in the parent's home country. In contrast, if the "jurisdictional approach" is used, governments publish official blacklists and/or whitelists that explicitly name countries for which CFC rules apply and/or do not apply. However, most countries which use whitelists additionally require a minimum level of taxation in the source country.

If the CFC rules of the parent's country are triggered by the income of a foreign subsidiary, the tax due is calculated according to the tax law of the parent's country. A tax credit for the tax paid in the foreign country may be granted to avoid double taxation.

4.2.1.2 Implications of the Cadbury-Schweppes decision

In 2006, the ECJ had to decide on the compatibility of the British CFC rules with EU law (European Court of Justice, 2006). In the case at hand, a British multinational (Cadbury-Schweppes) had two subsidiaries in Ireland, one of them receiving substantial amounts of passive income. Before the ECJ's decision, the British CFC rule applied to the income of that Irish subsidiary due to the passive income *and* the fact that the tax paid in Ireland was below the minimum level required by the British CFC rule. The ECJ restricted the applicability of the minimum requirement to wholly artificial arrangements that do not reflect any economic activity, e.g. pure letter boxes. From the ECJ's point of view, it was not proven that the Irish subsidiary was of wholly artificial nature. In this case, CFC rules cannot be justified and are an infringement to the freedom of establishment.

4.2.1.3 Overview of CFC rules and reactions after the judgement

Before and after the judgement (years 2004 to 2014), CFC rules have been applied in ten EU member states and in Norway. In addition, Iceland and Greece have introduced CFC rules in

2009 and 2014, respectively.[43] Table C.2 in the appendix provides a detailed overview of the country-specific CFC rules. Nine countries apply a "threshold approach" to define a low-tax jurisdiction by setting out a minimum requirement for the level of taxation in the source countries. Three countries apply the "jurisdictional approach"; however, these countries also apply a minimum requirement as a subordinate condition.[44] In the time period observed, two countries (Denmark and Italy) changed their approach for defining low-tax jurisdictions.

Apart from the recently introduced CFC regime in Greece, all countries with a threshold approach refer to the actual tax paid in the source country as the relevant tax measure. With regard to the acceptable low level of taxes paid in the source country, there is a wide variety with absolute and relative limits. These limits remain mostly constant over the observed time period. In case CFC rules apply, a tax credit for the foreign tax paid is available in nearly all countries.

As a reaction to the Cadbury-Schweppes judgement in 2006, most member states followed a recommendation of the European Council (2010) and added an exception clause for all EU countries. This restricts the applicability of CFC rules within the EU to "wholly artificial arrangements". Denmark is the only member state that has extended its CFC rules to domestic income after the judgment. For the Danish CFC rule to apply, only the kind of income of the subsidiary is decisive, not the level of taxation.[45]

4.2.2 IP box regimes

Recently, several IP box regimes have emerged within the EU. They offer reduced tax rates for income that can be attributed to intellectual property. After France (2000) and Hungary (2003), ten other European countries have introduced IP box regimes until 2014 (Evers et al., 2015). Some properties of IP box regimes are under on-going review by the EU Commission

[43] Poland has introduced CFC rules in 2015.
[44] Except of Italy until 2010; afterwards it switched to a "threshold approach".
[45] Up to now, it is unclear whether this extension is compliant with EU law. See Koerver Schmidt (2014).

as they might constitute a case of forbidden state aid (e.g. Mang, 2015). Also, the OECD has recently refined its view on the legitimacy of IP boxes in the course of the BEPS project (OECD, 2015a,b).

Evers et al. (2015) give a detailed overview of the properties of IP boxes in Europe and compute effective average tax rates (EATR) for self-developed patents by using the methodology of Devereux and Griffith (1999). In our paper, we model the location choice for an IP holding company that *acquires* patents or licenses. Acquired IP is favoured by IP boxes in Cyprus, France, Hungary, Liechtenstein, Luxemburg and Malta.[46] In all six countries, the IP box rates are at least 50% lower than the normal rates. Cyprus, Liechtenstein and Malta offer very low IP box rates that only amount to 2.5% and 0% respectively.

4.3 Methodology

In this section, we present the Devereux-Griffith methodology and our implementation of CFC rules and IP boxes into the model. The results enable us to analyze the impact of the ECJ's Cadbury-Schweppes decision on tax neutrality.

4.3.1 Devereux-Griffith model and implementation of CFC rules

The model proposed by Devereux and Griffith (1999, 2003) uses the framework of the neo-classical investment theory. It computes the effective tax burden on both a hypothetical marginal and a highly profitable investment project of a company. The corresponding measures are known as the effective marginal tax rate (EMTR) and the effective average tax rate (EATR) respectively. In this paper, we focus on the EATR since this allows us to analyze how taxes influence discrete location decisions.[47] A detailed description of the methodology can be found in the appendix. When computing the EATR, the most important regula-

[46] See Table C.1 in the appendix.

[47] Devereux and Griffith (1998, p. 337) and Devereux and Griffith (2003) show that the EATR is the relevant tax measure for foreign direct investments (FDI).

tions of the national tax regimes are taken into account. This includes nominal corporation tax rates and surcharges as well as regional taxes on profits. In addition, we consider the depreciation rules of patents for tax purposes. Besides domestic investments, the Devereux-Griffith model can simulate cross-border investments. When carrying out these simulations we take withholding taxes on profit repatriation in the source country and the method for avoiding international double taxation in the investor's home country into account. For the implementation of IP boxes we follow Evers et al. (2015) to consider reduced IP box rates and the treatment of depreciation expenses.

Figure 4.1 illustrates the set-up of the model investment more precisely. The investment of the company takes place in a wholly owned subsidiary.[48] The multinational aims at acquiring a patent from a third party in order to administer and exploit it commercially. Theoretically, the acquisition of the patent can be conducted by the parent company or by any foreign subsidiary. Neglecting non-tax factors, the patent will be acquired in the country where the effective tax burden on (royalty) income is the lowest.[49] We assume that the subsidiary receives (royalty) income from the exploitation of the acquired patent. This case unfolds a certain degree of economic activity as the administration and contract negotiations related to IP require skilled employees (as well as some office space and office equipment).[50]

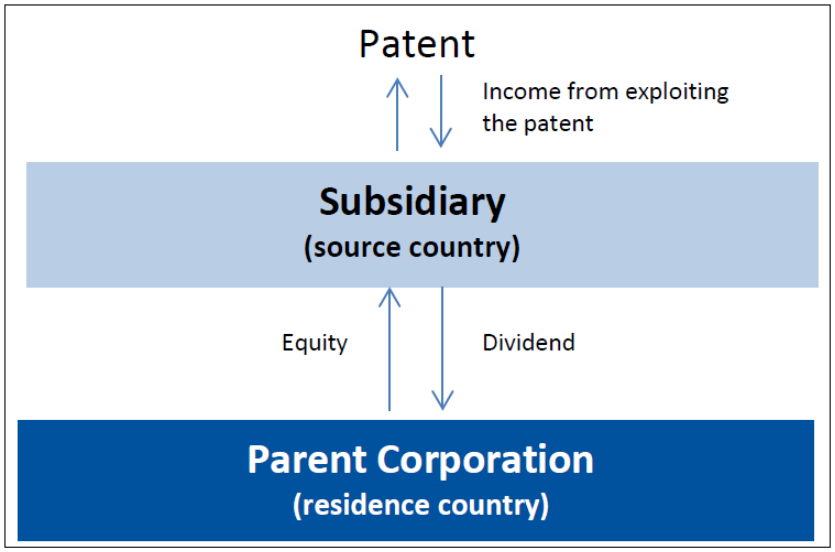
In its judgement, the ECJ stated that only wholly artificial arrangements without any economic activity are allowed to trigger CFC rules. Conversely, this means that before the ruling, CFC rules also aimed at investments which constituted real economic activities like our assumed model investment. That CFC rules have a profound economic impact on

[48] We disregard shareholder taxation since it does not affect decisions of corporations when assuming that there is significant international portfolio investment. Please see Devereux and Pearson (1995, p. 1600).

[49] Exit taxation and transfer prices do not play a role since we model a transaction between third parties.

[50] In fact, national tax laws of IP box countries also require investments to have some economic substance in order to qualify for the IP box provisions. Please also see Huibregtse et al. (2011).

Figure 4.1: Devereux-Griffith model



companies' real activity abroad is empirically shown for Germany by Egger and Wamser (2015) and Ruf and Weichenrieder (2012).

In the model, if the parent itself acquires the patent, the generated profits are only taxed in its home country and the EATR is solely determined by the tax system of the home country. For cross-border investments, taxes at two different levels have to be considered. Additionally, the way of financing the subsidiary plays a role. In the main analysis, we assume that the parent company finances the subsidiary solely by new equity in order to reduce complexity.[51]

The earnings of the investment are taxed at the level of the subsidiary at first. The after-tax profits at the level of the subsidiary are then distributed to the parent company by means of dividend payments. This repatriation might lead to an additional tax burden at the level of the parent company. Here, we consider withholding taxes levied by the source country and the way the residence country taxes the repatriated profits, i.e. how it avoids

[51] We account for other financing possibilities (retained earnings, debt) in the robustness section 4.4.2. The parent company itself is refinanced by 100% equity.

double taxation on foreign-source dividends.[52] If the exemption method applies, the tax level of the source (foreign) country always prevails for the model investment. In that case, the corporate tax level in the residence country does not matter.

This gives multinationals incentives to take foreign countries' taxes into account when deciding about an investment's location. However, minimizing the tax burden of an investment by optimizing the location decision is restricted when CFC rules apply. In that case, taxes on the profits of a foreign subsidiary are calculated according to the tax law of the parent's country. A relief mechanism for the tax paid in the foreign country may be granted in order to avoid double taxation. We consider the possibility that CFC rules apply in the following.

The Devereux-Griffith model computes the EATR for both domestic and cross-border investments. Basically, a cross-border investment from home country H to source country S will bear a tax burden of $EATR^{cb}_{H,S}$ (superscript 'cb' denotes cross-border). To determine whether the CFC rules of H apply for a cross-border investment into S, we need to compare the domestic tax burdens of H ($EATR^{dom}_{H}$) and S ($EATR^{dom}_{S}$). CFC rules apply if the tax burden of an investment in S is lower than the required minimum level of taxation as defined by the CFC rules of H. The minimum level of taxation is determined by a country-specific relative threshold THR_H which relates $EATR^{dom}_{H}$ and $EATR^{dom}_{S}$.[53] THR_H ranges from 50% to 75% in the EU. Formally, a residence country will apply its CFC rules if

$$EATR^{dom}_{S} < EATR^{dom}_{H} \cdot THR_H \tag{4.1}$$

[52] In the EU, double taxation is avoided by the provisions of the parent-subsidiary directive which requires, firstly, the abolishment of withholding taxes and, secondly, the residence country to apply either the exemption or the credit method.

[53] This is the condition for countries with relative thresholds. Germany, Greece and Hungary employ absolute thresholds as shown in Table C.2 in the appendix.

In this situation, the domestic tax rules of H are applied and the cross-border investment is taxed as if it was a domestic investment in H. Generally, the investment bears at least $EATR_H^{dom}$, as the domestic tax rules of H apply. In case H allows for a tax credit for the taxes paid in S, the final tax burden for the cross-border investment exactly equals $EATR_H^{dom}$.[54] Therefore, the final tax burden for a cross-border investment under the consideration of CFC rules ($EATR_{H,S}^{cb,CFC}$) can be written as

$$EATR_{H,S}^{cb,CFC} = \begin{cases} EATR_{H,S}^{cb} & \text{if } EATR_S^{dom} \geq EATR_H^{dom} \cdot THR_H \\ EATR_H^{dom} & \text{if } EATR_S^{dom} < EATR_H^{dom} \cdot THR_H \end{cases} \tag{4.2}$$

If no double taxation relief is granted, the tax burden for the cross-border investment equals the sum of $EATR_H^{dom}$ and $EATR_S^{dom}$.[55]

4.3.2 Scenarios

For a comprehensive analysis of the Cadbury Schweppes decision's effect on the tax neutrality in the EU, we look at both member states' adjustments to their CFC rules as demanded by the ECJ *and* the introduction of new low-tax regimes (IP boxes) in some member states. As argued in section 4.1, the introduction of IP boxes for acquired patents has to be analyzed in the context of the restriction of CFC rules enforced by the ECJ, since this enhanced the effectiveness of the IP box.

In total, we distinguish four different scenarios which are inclined to allow conclusions on the ECJ's effect on economic neutrality within the internal market:

1. CFC–, IP–: CFC rules are not applicable and IP box regimes do not exist
2. CFC+, IP–: CFC rules are in place and IP box regimes do not exist

[54] If CFC rules apply, the taxes paid in S are by definition always lower than the tax burden in H. Therefore, the taxes paid in S can be fully credited.

[55] This is the case in Hungary and Iceland. For the deduction method which is applied in Spain, the tax burden in the CFC case can be approximated by $EATR_S^{dom} + EATR_H^{dom} - EATR_S^{dom} \cdot EATR_H^{dom}$.

3. CFC–, IP+: CFC rules are not applicable and IP box regimes exist
4. CFC+, IP+: CFC rules are in place and IP box regimes exist

To identify the situations which correspond most with an efficient allocation of resources as stipulated by the European treaties, we rely on concepts that have been employed in previous studies. Devereux and Pearson (1995) analyze the impact of hypothetical corporate tax harmonisation reforms in the EU on production efficiency. Likewise, the European Commission (2001) examines economic inefficiencies induced by corporate taxes in the EU and simulates various hypothetical tax reforms. Elschner et al. (2011) evaluate how economic neutrality has changed over time in the EU. In principle, these studies analyze two dimensions: First, they investigate by how much domestic tax burdens differ from cross-border tax burdens. And second, they show how much cross-border tax burdens vary depending on the source country in case of an outbound investment and the residence country in case of an inbound investment.

With respect to outbound investments, a (parent) corporation can choose to invest in 30 different countries in our setting.[56] In an idealized tax-neutral world, all outbound EATRs would be the same, i.e. the standard deviation of the EATRs of all investment location possibilities would be zero. Furthermore, the outbound EATRs would exactly equal the domestic EATR of the parent country. This would constitute an efficient allocation of resources across countries and so-called *capital export neutrality* (CEN) would be fulfilled. In this case, the pre-tax rates of return for the investment projects of the same investor are identical. Thus, no overall output increase can be achieved by reallocating capital from one country to another.

In terms of inbound investments, there is an additional notion of efficiency, namely *capital import neutrality* (CIN). This concept ensures that different international investors in a specific country face the same after-tax rate of return for investments carried out in this

[56] We consider the 28 EU member states as well as the EEA countries Iceland, Liechtenstein and Norway.

country. Therefore, CIN ensures that domestic capital and inbound capital compete on an equal basis within a country. This is the case when all possible 30 inbound investments into a country bear the same tax burden and when this tax burden equals the one of domestic investors. Technically, the first condition is fulfilled if the EATR's standard deviation for inbound investments equals zero.

We focus on both neutrality concepts, CIN and CEN, similar to previous economic studies (e.g. Devereux and Pearson, 1995; Elschner et al., 2011). This reflects the aim of an optimal international tax structure in general and a level playing field in the EU in particular.[57] Devereux (1993) and Devereux and Pearson (1995) show that it needs both CEN and CIN to achieve production efficiency. The ECJ's jurisprudence broadly corresponds to these concepts insofar as it aims at eliminating discriminatory measures for both outbound and inbound investments (e.g. Graetz and Warren Jr, 2012; Schön, 2015). However, due to general differences in the member states' tax levels and their diverse reactions to the court's rulings, it is unclear if the ECJ's approach of removing discriminatory measures indeed leads to a more level playing field in the EU (De La Feria and Fuest, 2016).

4.4 Results

In this section we present the results for the four different scenarios with respect to both domestic and cross-border EATRs for the years 2004, 2007, 2010 and 2014. These years reflect the situations before and after the ECJ's judgement in 2006 as well as the increasing relevance of IP box regimes in recent years. As argued before, this allows us to take into account the medium- and long-run effects of the ECJ's approach.

[57] The concepts of CEN and CIN have been introduced by Musgrave (1969).

4.4.1 Main results

CFC rules are not applicable and IP box regimes do not exist (Scenario 1)

The first scenario serves as a baseline scenario which disregards CFC rules and IP box regimes. This allows quantifying and disentangling the influence of CFC rules and IP boxes later on. Furthermore, it reflects the analyses of previous studies which, however, look at more general investments (Spengel et al., 2015).

Table 4.1 shows the detailed results for all countries for the years 2004 and 2014. In most countries, the domestic EATR decreases from 2004 to 2014.[58] Overall, the (unweighted) mean domestic EATR decreases from 25.57% in 2004 to 21.69% in 2014. The standard deviation of domestic EATRs decreases from 8.03 in 2004 to 7.70 percentage points in 2014 which indicates a slight convergence in national effective tax levels.

For the cross-border investments, results for the level in EATRs are presented in columns 3 to 6 of Table 4.1. The outbound columns (column 3 and 4) contain all possible outbound locations (i.e. subsidiaries) for a given residence country. This is attained by computing the average over all possible investment locations (30 countries) for a parent company. On the other hand, the inbound columns (column 5 and 6) contain all possible parent locations for a given investment location (i.e. subsidiary). More precisely, we compute the average inbound EATR over all the residence countries for a given source country for the years 2004 and 2014. Analogously to the domestic results, the average outbound and inbound EATRs decline for the vast majority of countries from 2004 to 2014. This is also reflected in the mean figures over all countries (bottom row in Table 4.1): The mean of the average inbound and outbound EATRs decreases from 29.62% in 2004 to 22.97% in 2014. When relating this to national investments, the discrepancy in tax burdens between domestic and cross-border investments turns out to decline significantly to only 1.28 percentage points in

[58] This is in line with previous studies which find a declining trend in effective tax burdens in the EU. See, e.g., Elschner et al. (2011) and Endres et al. (2013).

Table 4.1: EATR for domestic and cross-border cases for 2004 and 2014

EATR	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
			Average				**Standard Deviation**			
	Domestic		**Outbound**		**Inbound**		**Outbound**		**Inbound**	
	2004	**2014**	**2004**	**2014**	**2004**	**2014**	**2004**	**2014**	**2004**	**2014**
Austria	35.91	26.40	25.81	21.53	38.28	28.02	7.67	7.78	5.29	4.91
Belgium	27.43	23.05	28.15	23.13	30.17	23.96	7.66	7.69	5.59	3.44
Bulgaria	19.10	9.79	31.32	22.08	30.58	11.00	7.62	7.50	9.07	3.97
Croatia	18.71	16.98	30.58	22.40	28.03	18.91	10.21	8.40	6.74	4.49
Cyprus	15.84	11.69	27.58	22.54	19.96	12.78	8.22	8.94	7.52	3.89
Czech	26.93	18.27	26.54	21.89	30.12	19.74	7.75	7.66	5.20	4.30
Denmark	24.52	20.03	26.39	21.74	26.67	21.02	7.94	7.82	5.89	3.56
Estonia	28.55	23.06	48.60	40.15	29.55	23.41	5.86	6.18	2.58	1.11
Finland	30.63	21.12	26.55	21.71	33.13	22.11	7.69	7.83	5.59	3.52
France	33.14	40.02	29.27	26.97	35.22	40.64	10.38	6.56	5.06	2.67
Germany	36.81	28.94	28.56	22.81	39.06	29.80	7.85	7.59	4.98	3.21
Greece	36.96	27.46	35.84	22.23	37.77	29.06	2.36	7.39	3.45	3.76
Hungary	20.01	19.42	26.94	21.76	25.22	20.43	7.55	7.82	7.38	3.59
Iceland	16.84	18.71	31.81	23.25	26.20	20.10	9.82	8.64	6.69	3.80
Ireland	13.20	13.20	29.13	22.06	18.94	15.08	4.57	7.53	9.29	5.09
Italy	32.74	21.87	28.68	23.04	36.09	23.42	7.76	7.71	6.56	4.48
Latvia	14.03	14.03	27.12	21.94	19.18	15.09	7.45	7.69	7.58	3.80
Liechtenstein	14.65	8.84	38.53	26.53	23.43	12.49	10.95	10.14	7.56	7.15
Lithuania	12.73	12.73	27.17	21.98	17.47	14.29	7.37	7.64	7.95	4.56
Luxembourg	28.42	27.33	26.59	21.50	31.31	28.25	7.79	7.76	5.45	3.27
Malta	36.96	36.96	35.79	21.18	37.77	37.77	2.35	7.28	3.45	2.89
Netherlands	32.27	23.38	26.31	21.63	33.94	24.34	7.96	7.82	4.99	3.43
Norway	29.57	28.52	28.53	22.39	33.69	29.82	9.08	8.62	6.12	3.82
Poland	17.77	17.77	27.45	21.82	22.23	18.79	6.36	7.79	6.83	3.65
Portugal	29.04	31.68	27.31	22.01	32.74	33.20	7.55	7.33	6.43	4.60
Romania	23.75	15.21	31.45	21.90	32.09	16.26	6.63	7.73	5.46	3.75
Slovakia	17.77	20.58	26.85	21.72	20.90	21.57	7.57	7.83	6.44	3.54
Slovenia	23.38	17.95	27.56	22.70	27.61	19.41	7.58	7.52	6.26	4.32
Spain	38.98	34.79	27.56	22.10	41.53	36.93	8.42	7.42	4.60	4.89
Sweden	24.22	20.29	26.48	21.73	26.49	21.29	7.89	7.82	4.91	3.55
UK	31.68	22.18	31.83	21.67	32.92	23.15	3.07	7.83	3.88	3.48
Mean	**25.57**	**21.69**	**29.62**	**22.97**	**29.62**	**22.97**	**7.38**	**7.78**	**5.96**	**3.89**
Std Deviation	**8.03**	**7.70**								

2014 compared to 4.05 percentage points in 2004. This indicates a move towards a more level playing field in the internal market which does not discriminate between domestic and cross-border investments. However, the average inbound and outbound EATRs of the single countries (column 3-6 in Table 4.1) as well as the means over these averages (bottom row of Table 4.1) mask substantial heterogeneity.

The non-zero standard deviations for in- and outbound investments on a country level (column 7-10 in Table 4.1) indicate substantial differences of cross-border tax burdens depending on the location of the parent and the subsidiary. If CEN held, the standard deviation of outbound investments for a given residence country would be zero (column 8 in Table 4.1 for the year 2014). Consequently, also the mean over these standard deviations should be zero (bottom row of Table 4.1). Similarly, if CIN held, the standard deviation of inbound investments for a given source country would be zero (column 10 in Table 4.1 for the year 2014).

Clearly, CIN and CEN are not fulfilled in 2014 given the non-zero standard deviations for cross-border investments. The mean standard deviation for outbound investments slightly increases from 7.38 in 2004 to 7.78 percentage points in 2014 (bottom of column 7 and 8). At the same time, the mean standard deviation for inbound investments significantly decreases from 5.96 to 3.89 (bottom of column 9 and 10). Taking both neutrality concepts into account, this constitutes a clear strengthening of CIN over time whereas economic distortions for outbound investments remain roughly constant.

These domestic and cross-border figures can be explained by mainly two trends in national and international tax legislation in the EU. First, a general decline of the corporate income tax rates can be observed for almost all countries and especially for countries with initially high tax rates in 2004.[59] This does not only lead to lower and converging domestic EATRs but also induces convergence in EATRs between domestic and cross-border investments.

[59] See, e.g., Spengel et al. (2015, pp. A-1 - A-4).

Second, the decline in cross-border EATRs can additionally be explained by the fact that all countries with credit systems for foreign dividends have moved towards an exemption system in recent years except for Ireland.[60] This also explains the steady decline over time of the inbound standard deviations because the cross-border tax burden is solely determined by the source countries' tax level in case of equity financing. However, domestic EATRs have increased in a few high-tax countries (e.g. France and Portugal) during and after the crisis due to their fiscal needs which explains why the mean of the standard deviations for outbound investments picks up again from 2010 to 2014 (Table 4.2).[61] This development during the crisis is also reflected in the mean of domestic EATRs which does not experience a further decline from 2010 to 2014.

In the following, we consider how cross-border EATRs differ when implementing the other scenarios presented above. On the one hand, this is useful in order to identify and quantify the effects of specific features of the tax systems (e.g. a lower statutory tax rate on IP income). On the other hand, this serves to gather evidence on how helpful the ECJ's Cadbury Schweppes decision was in moving closer to an internal market. We present the summarizing results of the different scenarios in Table 4.2 which shows the means of all countries corresponding to the bottom row of Table 4.1.

CFC rules are in place and IP box regimes do not exist (Scenario 2)

In the second scenario, we assume CFC rules to be in place when computing the EATRs. This allows isolating the general impact of CFC rules on tax neutrality in the EU given the national tax systems in place. The qualitative analysis with regard to CFC rules in section 4.2.1.3 shows that most of the countries enacted an exception clause as a reaction to the court's ruling. Such an exception clause excludes all EU states from the CFC rules'

[60] The last countries that changed their systems to the exemption method were the United Kingdom in 2010 and Greece in 2011. See Spengel et al. (2015, p. A-23).

[61] Seven countries increased their corporate income tax rate from 2010 to 2014 which is in contrast to the development in previous years. See Spengel et al. (2015, pp. A-1 - A-4).

Table 4.2: Development of EATR for domestic and cross-border investments for different scenarios

Year	$\overline{EATR^{dom}}$	$\overline{EATR^{out}}$	$\overline{SD(EATR^{out}_{H,S})}$	$\overline{EATR^{inb}}$	$\overline{SD(EATR^{inb}_{H,S})}$
Scenario 1:	**CFC rules are not applicable and IP box regimes do not exist:**				
2004	25.57	29.62	7.38	29.62	5.96
2007	23.13	25.79	7.58	25.79	5.25
2010	22.00	23.58	7.45	23.58	4.16
2014	21.69	22.97	7.78	22.97	3.89
Scenario 2:	**CFC rules are in place and IP box regimes do not exist:**				
2004	25.57	30.27	6.67	30.27	6.09
2007	23.13	26.64	7.06	26.64	5.85
2010	22.00	24.75	6.67	24.75	5.15
2014	21.69	24.23	7.16	24.23	5.29
Scenario 3:	**CFC rules are not applicable and IP box regimes exist:**				
2004	24.59	28.81	8.02	28.81	6.14
2007	21.95	24.73	8.39	24.73	5.44
2010	18.96	20.67	8.66	20.67	4.44
2014	18.03	19.65	9.07	19.65	4.36
Scenario 4:	**CFC rules are in place and IP box regimes exist:**				
2004	24.59	29.47	7.39	29.47	6.37
2007	21.95	25.62	7.77	25.62	6.08
2010	18.96	22.29	7.42	22.29	5.82
2014	18.03	21.36	7.69	21.36	5.89

Note: $\overline{EATR^{dom}}$ corresponds to the (unweighted) average of the 31 country-specific $EATR^{dom}$. Each country faces 30 outbound and inbound possibilities. $\overline{EATR^{out}}$ ($\overline{EATR^{inb}}$) is the mean over all outbound (inbound) EATRs ($31 \times 30 = 930$ cases). The two remaining columns show the mean standard deviation over the 31 countries for outbound and inbound investments.

applicability in our investment setting. The scenario which we present now, however, neglects the consequences of the judgement and assumes that CFC rules are still applicable in a European context after 2006.[62] This sheds light on the potential relevance of CFC rules over time (given the real development of the domestic tax codes in the EU). Since the applicability of CFC rules depends on the relative difference between domestic and foreign tax levels, CFC rules are likely to play a smaller role in a situation with converging national tax levels.

[62] Only CFC rules with a "threshold approach" (low taxation condition) will be regarded. Therefore, Finland, Hungary, Italy (2004-2009) and Sweden are excluded. Additionally, Spain is not regarded either, as royalty income has not been defined as CFC income until 2015. The robustness section and Table C.4 in the appendix contain results for an extended scenario in which we assume that the CFC rules of these countries are also applicable.

The results for scenario 2 are shown in Table 4.2. Clearly, the mean standard deviation of inbound investments ($\overline{SD(EATR^{inb}_{H,S})}$) is higher when CFC rules apply compared to when they do not apply (scenario 1) and the difference is considerably increasing over time.[63] More precisely, the difference in the standard deviation is increasing from 0.13 in 2004 to 1.40 percentage points in 2014. This result is related to the general trend towards exemption systems which make the impact of CFC rules more pronounced.

If CFC rules apply, the cross-border investment usually bears the same tax burden as the domestic investment in the residence country. Thus, from a source county's perspective, inbound investments bear very different tax burdens depending on the residence country of the parent. This causes $\overline{SD(EATR^{inb}_{H,S})}$ to be high. Conversely, the mean standard deviation of outbound investments ($\overline{SD(EATR^{out}_{H,S})}$) decreases slightly when CFC rules are in place in all years. Taken together, CFC rules in the EU slightly strengthen CEN and clearly harm CIN. Furthermore, CFC rules lead to a further divergence between the mean domestic tax level ($\overline{EATR^{dom}}$) and the mean cross-border tax level ($\overline{EATR^{out}}$ and $\overline{EATR^{inb}}$, respectively) in all years.

CFC rules are not applicable and IP box regimes exist (Scenario 3)

In the third scenario, we consider the emergence of IP box regimes in the EU. IP box regimes differ with respect to their scope of application as discussed in section 4.2.2. In our simulation, we focus on IP box regimes which include acquired patents in order to reflect the model investment into a patent. This scenario is of interest for at least two reasons: First, it reflects the real tax legislation for the years after 2006. Therefore, the scenario provides more accurate effective tax measures for IP investments than usually provided. Second, it enables us to assess the ECJ's ruling as well as possible reform options when comparing it to the other scenarios.

[63] Table C.3 in the appendix contains a detailed overview on the number of countries for which CFC rules apply according to our computations.

A priori, the effect of the IP box regimes on tax neutrality is ambiguous and not predictable. For example, France can be generally classified as a high tax country (applying a main corporate tax rate of 41.93% in 2014) which clearly deviates from the mean EU tax level. The IP box tax rate of 21.34% (2014) puts France's tax level more in line with EU standards. In contrast, Cyprus which generally represents a low tax jurisdiction (main corporate tax rate of 12.5% in 2014) further lowers its tax level to an IP box tax rate of 2.5%. This constitutes a move away from the mean EU tax level. Therefore, it is not clear whether the emergence of IP boxes in some countries leads to more or less tax alignment and neutrality in the internal market.

The empirics in Table 4.2 show that the scenario at hand (CFC-/IP+) performs worse than the baseline scenario (CFC-/IP-) with respect to both CIN and CEN. In 2014, $\overline{SD(EATR^{out}_{H,S})}$ is 1.29 percentage points and $\overline{SD(EATR^{inb}_{H,S})}$ 0.47 percentage points higher when considering IP boxes compared to not considering them. This shows that the current IP box regimes do not foster convergence between member states' tax levels but, in contrast, amplify differences in effective tax burdens. However, IP boxes lower the mean domestic EATR significantly to only 18.03% and the one of cross-border investments to 19.65%.

CFC rules are in place and IP box regimes exist (Scenario 4)

In the fourth scenario, we additionally assume CFC rules to be in place. Put differently, we model the hypothetical case of reintroducing CFC rules in today's tax environment. From Scenario 3 we know that the emergence of IP box regimes is detrimental for CIN and CEN, at least when there are no CFC rules in place. The results of the scenario at hand show that CFC rules are not the perfect solution to overcome the negative effects which IP boxes have on tax neutrality. $\overline{SD(EATR^{inb}_{H,S})}$ is significantly higher (5.89 compared to 3.89 percentage points) than in the baseline scenario (no IP boxes and no CFC rules). With respect to CEN, the reintroduction of CFC rules in 2014 would lower $\overline{SD(EATR^{out}_{H,S})}$ only very little

compared to the baseline scenario - and not at all in the years 2004 and 2007. Also, the reintroduction of CFC rules would lead to a divergence of the mean domestic and mean cross-border EATR.

4.4.2 Robustness of results

The results presented in the previous sections are based on specific assumptions on the applicability of CFC rules as well as on the pre-tax return and the financing of the investment in the model. In the following, we conduct sensitivity analyses for these three dimensions. In a first sensitivity analysis, we check how our results change when relaxing the assumptions for the application of CFC rules. So far, we have taken a rather strict stance on the scope of applicability and excluded countries which follow a jurisdictional approach. Therefore, we have not considered the CFC rules of Finland, Hungary, Italy, Spain and Sweden in our computations. Table C.4 in the appendix shows that our main results remain unchanged when the CFC rules of these countries are considered. The negative effect of IP boxes on CEN and CIN is more pronounced when more countries apply CFC rules.[64]

The EATRs calculated in the previous sections rely on the assumption that the investment yields a pre-tax return of 20%. However, the EATRs are sensitive to changes in the pre-tax return. In particular, they align with the statutory tax rate for very high pre-tax returns (see, e.g., Devereux and Griffith, 1999, p. 22; Schreiber et al., 2002, p. 16). Conversely, for low pre-tax returns, the determination of the tax base (tax depreciation rules) plays a more important role. Tables C.6 and C.7 in the appendix show the results for pre-tax returns of 15% and 25%. For a pre-tax return of 15% (25%), the EATRs are generally lower (higher) and the standard deviations for outbound and inbound investments are higher (lower) compared to a pre-tax return of 20%. The main results are still valid: The introduction of IP boxes

[64] Table C.5 in the appendix contains a detailed overview concerning the number of CFC rules triggered by low taxation levels.

led to a deterioration of CEN as well as CIN and a reintroduction of CFC rules cannot be recommended.

As a third robustness test, the assumption that the subsidiary is entirely financed by new equity is relaxed. Additional financing possibilities might especially be relevant for cross-border investments from low-tax residence to high-tax source countries. In these situations, financing the subsidiary by debt is more beneficial compared to new equity or retained earnings. For robustness, we present results which only consider the most tax efficient source of financing. For this, we compute separate EATRs for each financing option of an investment and choose the most beneficial option. The results in Table C.8 in the appendix show that our main conclusions remain valid. However, the EATRs and the cross-border standard deviations are lower in all scenarios than in the baseline computations. This is due to the aforementioned beneficial debt financing of subsidiaries in high-tax countries.

4.5 Summary

Our paper demonstrates possible negative effects of the ECJ's jurisprudence on the internal market by analyzing the consequences of the Cadbury Schweppes decision. We use the well-known concepts of capital export and capital import neutrality to measure the impact of the judgement on international tax neutrality in Europe. The calculations with the Devereux-Griffith model enable us to disentangle specific features of the tax systems and assess their impact on tax neutrality in the internal market. Interpretations should be drawn cautiously, though, since counterfactual scenarios are run in a *ceteris paribus* fashion. Without the ECJ's Cadbury Schweppes decision, CFC rules would still be in place today and the emergence of IP boxes for acquired patents would have been discouraged. In this counterfactual scenario, we observe an improvement over time in capital import neutrality and only a very slight decrease in capital export neutrality.

The real world scenario (de-facto abolishment of CFC rules and emergence of IP boxes) describes the consequences of the Cadbury Schweppes decision in 2006. Our results do not show a clear dominance of this scenario in comparison to the prejudgement scenario. This dominance would be apparent in an improvement for both capital export and capital import neutrality. However, the judgement only fostered capital import neutrality. At the same time, the increasing divergence of domestic EATRs due to the IP box regimes and the non-applicability of CFC rules harmed capital export neutrality significantly. Therefore, our analysis casts doubt on the assumed positive effects of the ECJ's jurisprudence on the neutrality in the internal market. Overall, further research is needed to relate and harmonise economic and legal concepts of tax neutrality.

The paper and the modelled scenarios allow to assess reform options for CFC rules and IP boxes which are currently discussed by the OECD and the EU. These considerations are presented in the conclusions of this thesis (Chapter 6).

5 Vetoing and Inaugurating Policy Like Others Do: Evidence on Spatial Interactions in Voter Initiatives

5.1 Introduction

A sizeable literature in economics and political science studies the question of how strategic interactions among political jurisdictions affect their choice of public policies. Such interactions may occur horizontally or vertically and between or within countries, in general, because of learning, coercion, fiscal and yardstick competition. The fields of public finance and public economics have put forward several mechanisms that underlie such spatial relationships in the governments' spending and taxing decisions (Revelli, 2005) and in other public sector policies (Brueckner, 2003).

According to the *externality* mechanism, a government may find it optimal to internalize a policy set by another government, say in the field of education or health care, when making its own decision to build more or less schools and hospitals (Case et al., 1993). More generally, local state capacity building can be a strategic choice for jurisdictions when their borders are open (Acemoglu et al., 2015). A particular economic constraint may be due to the *competition* for attracting mobile resources such as labor and capital through fiscal competition (Tiebout, 1956; Wilson, 1999). In a principal-agent framework with incomplete information a decision-maker is additionally subject to *yardstick competition*. Such competition arises if the principals form certain *expectations* in regard to their jurisdiction's (not perfectly observable) performance, for example in the quality of public service provision, by relying on other jurisdictions' (again not perfectly observable, but comparable) performance as a yardstick (Besley and Case, 1995). Furthermore, representatives may *learn* from neighbor's policies and take them into account accordingly (see, e.g., Gilardi, 2010, for learning between OECD countries). Based on theoretical models of policy choice, Volden et al. (2008)

formalize such learning-based *policy-diffusion* mechanisms and Mukand and Rodrik (2005) conceptualize the related idea of *policy experimentation*.

The outcomes of these often competing mechanisms can be similar, however with quite different implications for policy makers. Therefore, significant effort has been put to disentangle these mechanisms (Shipan and Volden, 2008), particularly with an empirical strategy of comparing sub-national jurisdictions within countries (Brueckner, 2003). However, what this literature has in common is that it almost exclusively focuses on economic systems based on a pure representative form of government. Our paper contributes to this literature by studying political systems where decisions can be made also directly by voters through initiatives or other direct democratic instruments. The basic idea is that the voters' actions in vetoing a decision or inaugurating a preferred policy by a binding initiative in their jurisdiction may potentially have spillover effects on the (direct democratic) actions of voters.

Theoretically, the proposed channel can be thought of (groups of) voters as collective decision-makers interacting with each other similar to individuals in the social interactions analysis (Manski, 2000). Of course, voters do have a role to play in a representative system, where, for example, they can "vote with their feet" affecting competition and the implied interactions. Voters can also influence political decisions outside of elections, such as through popular mobilization. In fact, a large literature in political science and sociology argues that such instances of collective action do not take place in isolation, but are often the result of significant spillovers across time and jurisdictions (Snow et al., 2004). Relatedly, our argument is that direct democracy provides a new and legitimate decision-making institution which may or may not be mimicked across jurisdiction. This is the central question we aim to test in this paper.

Regarding the relevance of this question, most of the previous empirical contributions on spatial interaction in public policies concentrate on higher income countries with some level of autonomy in sub-national governance. Many of these countries by now have some kind of

direct democratic institutions at the local level, therefore testing the proposed question of interactions through direct decision-making mechanisms seems timely.

Regarding the empirical design, a central concern with the observed spatial patterns in jurisdictions' policies has been the empirical difficulties in isolating possible common shocks or spatially correlated (unobservable) effects from the real effects of interest (Gibbons and Overman, 2012). Several recent papers rely on arguably more credible identification techniques by utilizing sources of exogenous variation (see, e.g., Lyytikäinen, 2012; Isen, 2014; Baskaran, 2014, 2015), and find that some of the previously documented strong effects could be due to spurious correlations.

Our design focuses on German municipalities from 2002 to 2014, where since the mid-1990s citizens have the power to veto (some of) local governments' decisions and propose certain new policies by launching initiatives (in total around 3,200 for the 13,000 municipalities in the study period). We apply spatial reaction functions, and exploit a plausibly exogenous instrument based on the states' differences in direct democratic laws to identify interactions between municipalities. Following Asatryan (2016), our main instrument for the number of initiatives in the neighboring municipalities is the amount of signatures required for the initiative to be successful. We use municipality fixed effects to control for unobserved constant spatial correlation across municipalities.

Our findings suggest that the probability of observing an initiative in a municipality is positively driven by its neighbors' activity in direct democracy. The results indicate that a one standard deviation increase in the average number of neighbor initiatives increases the probability of having an initiative by 2.13%. This effect is statistically significant over time, and is stronger in towns with relatively more information flows (measured by local newspaper consumption of citizens and total number of commuters across jurisdictions). Additionally, we find evidence that the results are driven by spillovers in similar policy areas. Moreover, our results are robust to various placebo tests.

To put into context, this paper is related to the literature explaining (the extent of) spatial interactions by certain political-economy factors in general, and from the representative versus direct democracy angle in particular. In the theoretical framework of Hugh-Jones (2009) interactions may exist either for policy experimentation (citizens themselves observe the effects of policy) which is possible only in a direct democratic system, or for yardstick competition in representative systems. The theoretical paper by Boehmke (1999) argues that interactions can be more intensive between jurisdictions that have direct democratic systems compared to representative democracies, but this is explained primarily by informational advantages of the former system. In contrast, the empirical study of Schaltegger and Küttel (2002) with Swiss data argues that direct democracy (and fiscal autonomy) significantly increases the level of political competition and, therefore, reduces the scope of policy mimicking. The authors, however, do not analyze the channel that we propose here – that is the potential scope for spillovers through direct democratic institutions. Also, the focus is on referendums, thus, only on the veto-power of direct democracy, while the agenda-setting function of initiatives, which may actually enhance the policy space and not the opposite, is neglected. Hawley and Rork (2015) study spatial determinants of the property tax limit overrides in Massachusetts and demonstrate that a town's likelihood of holding an initial vote increases by 10-15% if a neighboring town has already held a vote at some point in the past. This evidence combined with our findings reinforce the result of strong spatial interactions in direct democratic instruments in two different settings. In contrast to our paper, however, the focus of Hawley and Rork (2015) is again on referendums called by the government, which only allows studying government-level interactions. Furthermore, the referendums analyzed by Hawley and Rork (2015) are about a specific topic (i.e. the property tax limits) whereas our study covers a broader range of policy issues. Finally, Arnold et al. (2015) study the effect of citizen-initiatives on housing supply in the context of the German state Bayern. In order to estimate causal effects, they use a spatial lag

of neighbor citizen-initiatives as an instrument for a municipality's likelihood of launching an initiative. Their first stage regressions are in line with our second stage results.

This paper is organized as follows. Section 5.2 briefly introduces the German institutions of direct democracy and presents some anecdotal evidence on spillover mechanisms. Section 5.3 describes our data and identification strategy, and Section 5.4 presents the results. Conclusions are discussed in Section 5.5.

5.2 Institutions and spillover mechanisms

5.2.1 Germany's local direct democratic institutions

Most German states (in German: Länder) introduced local-level direct democratic institutions in the 1990s after the German re-unification. Baden-Württemberg is an exception with institutions of direct democracy on the local level already established in 1956. Berlin is the last state which introduced laws of direct democracy in 2005.

These institutions enable citizens to launch so-called *citizen initiatives* ("Bürgerbegehren") which are divided into *innovative initiatives* ("Initiativbegehren") and *corrective initiatives* ("Korrekturbegehren"). The latter is used to veto on policies which have been adopted by the city council, while the former allows to launch new policies. For an initiative to be successfully implemented the initiators face several constrains. First, a town-specific amount of signatures has to be collected (*minimum signature requirement*) within a predefined time. If this is achieved, the city council will decide if it wants to realize the issue at hand or not. In case of a negative decision, the next step of the procedure is reached, i.e. citizens vote on the respective issue. Besides a simple majority, some states further require a certain quorum (minimum turnout relative to population) for the vote to be accepted. Another limitation are topic exclusions: topics which directly concern the municipal budgets are not allowed for initiatives in any state (*fiscal taboo*). Moreover, each state has a list of other

prohibited topics (*off-limits issues*) or a list of allowed topics (*positive catalogue*). All states except Bayern and Bremen also demand initiatives to be accompanied by a cost-recovery proposal.[65]

Looking into the data we observe a higher activity of direct democracy in states with less strict institutions. For example, in Bayern, where there are comparatively liberal institutions, around 2,700 initiatives have been launched until 2015. On the contrary, in Baden-Württemberg, where very rigorous regulations are in place, only around 800 initiatives have been launched until 2015.[66] The geographical distribution of the number of initiatives is illustrated in a heat-map in Figure D.1 of the appendix. Table D.1 summarizes the state-level institutions of direct democracy.

5.2.2 Anecdotal evidence and diffusion processes

With these direct democratic institutions in place, the argument is that there is an additional mechanisms at the hands of voters which may be used to (ban) mimic (non-)preferred policies across jurisdictions.[67] Anecdotal evidence from the following cases helps to better understand the idea.

The construction of a new railway station in the city of Stuttgart is an example for direct democratic activity being contagious across jurisdictions. The so-called Stuttgart 21 project calls for deconstructing two wings of a century-old train station, and replacing above-ground tracks with a tunnel system which is supposed to speed up travel times. However, there have been several initiatives which all aimed at stopping the project.[68] This direct democratic

[65] For more detailed information on the history of German institutions of direct democracy see, e.g., Asatryan (2016) and Rehmet et al. (2014).

[66] One of the regulations concern the number of signatures required for an initiative to be successful. Arnold and Freier (2015) and Asatryan et al. (2016) show that the signature requirement affects the number of initiatives.

[67] In practice, these possible interactions can not only occur by mimicking of initiatives but also by less formal means, for example by demonstrations or informal initiatives. In a sense, our results therefore constitute a lower bound estimate for spillover effects in direct democratic activity of citizens.

[68] In 2010, protests against this long-term project accumulated in large demonstrations. See for example an article published in the New York Times:

engagement by the population appears to have had spillover effects on the citizens of other municipalities, for example, in the close-by town of Leonberg where citizens launched an initiative in the same year against the demolition of a public indoor swimming pool and the related plans of building a new swimming pool. One of the initiators of the initiative explicitly stated that their activities have been inspired by the Stuttgart 21 opposition.[69] Besides learning about the *possibility* of conducting initiatives, this case illustrates an additional notion of learning, namely learning about specific (optimal) *policies*.

A similar observation can be made for two other close-by municipalities, Denklingen and Seefeld in the state of Bayern. In Denklingen, there was a long-standing discussion whether to build a new city hall, or to renovate and extend the old one. This led to an initiative against building a new city hall which was accompanied by many newspaper articles about the topic.[70] Shortly afterwards, a very similar discussion arose in Seefeld which then also led to an initiative.

These observations are related to the mechanisms described by the literature on diffusion processes within and across movements.[71] Proximal models stipulate that actors mimic strategies of other people or groups which are spatially or culturally important to them (e.g. Soule, 1995, and Soule, 1997, in the context of student movements). In these settings, diffusion is promoted by *direct* and *indirect* channels. Direct channels refer to the existence of frequent contacts between the actors or even their overlapping engagement in more than

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http://www.nytimes.com/2010/10/06/world/europe/06germany.html?_r=0 A version of this article appeared in print on October 6, 2010, on page A11 of the New York edition with the headline: Germany Pulls Back on Demolition of Stuttgart Rail Station.

69 For example in the regional newspaper "Stuttgarter Nachrichten", which serves subscribers in both municipalities Stuttgart and Leonberg: http://www.stuttgarter-zeitung.de/inhalt.buerger-begehren-die-sanierung-des-sportzentrums.4c32408a-5936-44dd-93b8-5bef9a6a138b.html

70 For example, see the following reports from two regional newspapers which cover both municipalities: http://www.augsburger-allgemeine.de/landsberg/754-Unterschriften-fuer-Rathaus-Stopp-id28639427.html or http://www.kreisbote.de/lokales/landsberg/buergerentscheid-ueber-rathaus-stopp-3354717.html.

71 Please see Snow et al. (2004) in general, and Soule's contribution in this book in particular for a summary on the diffusion research in the field of social movements.

one movement. These direct channels might also occur in the case of direct democracy when, for example, special interest groups spread to close-by municipalities. However, it is also well possible that diffusion takes place by more indirect channels like media coverage (and the consequent informational flows between voters) as described by Snow et al. (2004, p. 295). In the context of race riots in the US, for example, Myers (2000) finds that wider media coverage increases the penetration of riots in neighboring areas. Similarly, Revelli (2008) shows that voters compare their jurisdiction's performance with jurisdictions they share the same local media with. We take such indirect channels into account and test if information flows play a role in mimicking direct democratic activity.

As explained above, initiatives in German towns may address different fields of public policies. Therefore, our empirical setup allows to test not only whether there are spillovers in direct democratic engagement, but also whether these spillovers are solely driven by initiatives within similar policy areas. Parallels can again be drawn with the government-level interaction channels. If governments search for better policies because of yardstick and fiscal competition due to voters looking across borders or threatening to exit, the question is why voters themselves cannot directly implement such policies when direct democratic rights are available.

Following the theoretical arguments and the anecdotal evidence discussed in the introduction and this section, we arrive to the main hypothesis of this work: Complementing a representative system of local governance with some institutions of direct democracy may open a new channel of policy-spillovers across jurisdictions that functions through interactions between (groups of) voters and their actions in exploiting their direct democratic rights. The next sections proceed to a formal analysis of this hypothesis.

5.3 Data and specification

Our data consists of an unbalanced panel of over 13,000 German municipalities across all German states for the years from 2002 to 2014 except of the city states Berlin, Bremen and Hamburg.[72] Table D.1 of the appendix summarizes the data on: state-level institutions of direct democracy,[73] municipality-level data on the frequency of observed initiatives as our dependent variable, and a number of control variables (unemployment rate, population, the share of population above 65 years old, and the sum of the vote shares for the Green Party (Bündnis90/Die Grünen), the Social Democratic Party (SPD) and the Left Party (Die Linke) in the federal elections (denoted by "left share" hereafter)).

The paper tests for spillovers in direct democratic activity by specifying a reaction function (spatial lag model) similar to the approach employed by the literature on tax competition and public budget spillovers (see, e.g., Devereux et al., 2008; Redoano, 2014; Foucault et al., 2008).[74] We specify the following linear probability model with municipality-panel fixed effects in order to test if citizens mimic their direct democratic activities across jurisdictions:

$$d\_p_{it} = \delta \sum_{j \neq i}^{N} w_j p_{jt} + X_{it}\beta_2 + \alpha_{2i} + \mu_{2t} + \varepsilon_{2it} \tag{5.1}$$

where the dependent variable d_p_{it} is a dummy which is one if there was at least one initiative launched by citizens of municipality i in year t. On the right hand side, X_{it} is the set of standard demographic and political controls on municipality level mentioned above; α_{2i} is a municipality fixed effect, μ_{2t} a year dummy, and ε_{2it} an unobserved error term. The

[72] We exclude these special "city states" since initiatives there are either implemented on the level of the state (same as city) or district, both being different than municipalities. The panel is unbalanced because of amalgamations of municipalities.

[73] One of the main differences in direct democratic institutions are the amount of signatures which have to be collected within a predefined time period in order to get to the next step of the direct democratic process. This information is collected from states' respective municipal codes.

[74] More papers employing reaction functions are, e.g., Solé-Ollé (2001); Allers and Elhorst (2005); Leprince et al. (2007); Bordignon et al. (2003); Buettner (2001); Hauptmeier et al. (2012); Davies and Voget (2008); Devereux et al. (2008); Egger and Raff (2014); Overesch and Rincke (2011).

spatial lag ($\sum_{j=1}^{N} w_j p_{jt}$) constitutes the variable of interest which is the average number of initiatives in the neighbor municipalities of i. The same weight w_j is attached to each neighbor municipality j of municipality i. We normalize the sum of these equal weights to one, thus the spatial lag is simply the average number of initiatives in the neighbor municipalities. In the main specification, municipalities within a 50 km radius of municipality i qualify as neighbors. This reflects the idea that spillovers in direct democratic actions are likely to be a rather regional phenomenon and that municipalities beyond 50 km may be on average too far away for having an effect on municipality i, for example due to limited information flows across regions.[75] Consistently, we also exclude municipalities which are close to a country border of Germany.[76] For robustness, we vary the definition of neighbor municipalities by varying the radius from 50 km to 30 km and 70 km, respectively.

Reaction functions like specified in equation (5.1) may be subject to a major endogeneity concern: It is explicitly assumed that the likelihood of having an initiative in municipality i depends on the average number of initiatives in municipality j and vice versa - this makes the spatial lag endogenous by definition. The problem can be mitigated by applying appropriate instruments to the spatial lag. The literature cited above on budget and tax-setting spillovers uses the (weighted) averaged demographic and political control variables of the neighbor municipalities to instrument the spatial lag. However, as argued recently by Baskaran (2014, 2015) this is no golden way out since this approach is not robust to possible common shocks or spatially correlated (unobservable) effects.

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[75] With respect to *direct* exchange between individuals, Mok and Wellman (2007) show that distance matters for interpersonal contact. Also, regional newspapers make up almost 75% of the total sales of daily newspapers in Germany in 2014 (Bundesverband Deutscher Zeitungsverleger e.V., 2015, p. 5). These regional newspapers put a strong emphasis on regional news.

Similarly, the fiscal spillover literature also assumes geographically close jurisdictions to have a greater effect on each other than more remote jurisdictions (e.g. Foucault et al. (2008) in the context of spending interactions between French municipalities and Redoano (2014) with respect to tax competition among European countries.)

[76] We define closeness analogous to the respective neighborhood definition in the different specifications. Border municipalities are not excluded in the spatial lag of municipalities not close to country borders.

Following Asatryan (2016), we address this problem by relying on a plausibly exogenous variable as our main instrument, namely the minimum requirement for the number of signatures which have to be collected within a predefined time. The first-stage specification therefore regresses the spatial lag on the averaged control variables of the neighbor municipalities (including the *signature requirement*) and all of the previous regressors and takes the following form:

$$\sum_{j \neq i}^{N} w_j p_{jt} = \beta \sum_{j \neq i}^{N} w_j X_{jt} + X_{it}\beta_1 + \alpha_{1i} + \mu_{1t} + \varepsilon_{1it} \tag{5.2}$$

Clearly, our main instrument, the signature requirement, is *relevant* for the frequency of initiatives in a municipality (non-zero covariance between $\sum_{j \neq i}^{N} w_j p_{jt}$ and $\sum_{j \neq i}^{N} w_j X_{jt}$). Furthermore, the exogeneity condition is fulfilled since the signature requirement in municipality j has no direct effect on the number of initiatives in municipality i (signature requirement in j is uncorrelated with the error term of the second stage ε_{2it}). This can be safely concluded since the signature requirements are determined by state-laws and not by the municipalities themselves and are, hence, exogenous to the single municipalities. Although set by the states, the instrument does not only vary across states but also by municipalities within states depending on population thresholds. It is measured in percent of a municipality's population and varies between 0.43% in a municipality in Sachsen-Anhalt and 15% in some municipalities in Rheinland-Pfalz, Sachsen and Sachsen-Anhalt (see Table D.1).

To estimate our (second stage) specification we choose a linear probability model (LPM) which allows for a binary dependent variable. The advantages of LPM prevail in our setting, similar to Angrist and Pischke (2008) and Angrist (2001) who argue in favor of the LPM instead of alternative models for which the conditions are likely not to be fulfilled. A probit model would ensure that the fitted values fall between zero and one which is not always the case with LPM; however, curve-fitting grounds and predictions are not decisive in our

context (Angrist and Pischke, 2008, p.80). Furthermore, including fixed effects would make probit estimates inconsistent (Fernéndez-Val, 2009). However, in our model it is crucial to include municipality and time-fixed effects in order to control for unobserved time-invariant municipality factors and common dynamics in direct democratic activity over time.[77] There is a crucial point why our identification strategy could fail if we were not including municipality fixed effects: The signature requirement in municipality j could be correlated with the initiatives in municipality i through a spatially correlated unobserved factor that determines both the minimum signature requirement and initiatives. In particular, neighboring population sizes (which determine the neighbors' signature requirement) could be correlated with spatially correlated unobservables that also affect initiatives in i. We mitigate this potential endogeneity by including municipality-fixed effects.

There is another reason why we use LPM: Employing an instrumental variable approach within the framework of non-linear models would lead to severe additional complexity.[78] However, instrumenting the spatial lag is indispensible for not being taken in by spurious correlation. Throughout our analysis, we cluster standard errors at the county level.

5.4 Results

5.4.1 Main results

Our baseline second stage results are collected in Table 5.1. The main explanatory variable of interest is the spatial lag, i.e. the average number of initiatives in neighbor municipalities within a 50 km radius. As specified above, we instrument this spatial lag on the (state-imposed) signature requirements and the covariates of the neighboring municipalities.

[77] Bazzi and Blattman (2014) and Friedman and Schady (2013) also use LPM in order to be able to include fixed effects.

[78] Angrist and Pischke (2008, p. 80) also put this point forward when arguing in favor of LPM. Beck (2011) discusses the trade-off between LPM and non-linear models.

Table 5.1: Second stage effects of spillovers from neighbors' initiatives

	(1)	(2)	(3)	(4)	(5)
VARIABLE	Citizen initiative dummy				
Spatial lag (neighbor initiatives) in t	0.8714***	0.6446*			
	(0.2691)	(0.3599)			
Spatial lag (neighbor initiatives) in $t-1$			0.8838**		
			(0.4189)		
Spatial lag (neighbor initiatives) in $t-2$				0.9457**	
				(0.4014)	
Spatial lag (neighbor initiatives) in $t-3$					0.0363
					(0.3263)
Signature requirement		-0.1335	-0.1250	-0.1728*	-0.2289**
		(0.1067)	(0.1089)	(0.1000)	(0.0911)
Ln population		0.0075	0.0072	0.0092	0.0062
		(0.0064)	(0.0077)	(0.0106)	(0.0153)
Unemployment rate		0.0435	0.0656**	0.0636*	0.0137
		(0.0272)	(0.0296)	(0.0350)	(0.0389)
Share of population over 65		0.0217	0.0118	0.0144	0.0000
		(0.0292)	(0.0308)	(0.0323)	(0.0352)
Left share		-0.0033	-0.0093	-0.0207*	-0.0253*
		(0.0124)	(0.0130)	(0.0119)	(0.0136)
Observations	101,673	100,481	90,766	80,992	71,164
Number of municipalities	9,944	9,939	9,716	9,432	8,897
Hansen-J p-value	0.570	0.747	0.488	0.189	0.236
Kleibergen-Paap F	18.19	10.54	13.67	18.76	21.18
Kleibergen-Paap LM	49.42	35.97	45.49	59.56	74.83

*** p<0.01, ** p<0.05, * p<0.1

Notes: The table presents results for the second stage estimation of the linear probability model specified in equation 5.1. All regressions include time and municipal fixed effects. Standard errors are clustered at the county level.

The first stage results are reported in Table D.2 of the appendix. Our main instrument, the signature requirement, is statistically significant and negative. This evidence of a negative effect of signature requirements on direct democratic activity is consistent with the existing literature (Arnold and Freier, 2015; Asatryan et al., 2016).

In Table 5.1 we report several tests for the validity of our specification and the strength of our instruments. The Hansen-J overidentification test checks if the instruments are uncorrelated with the error term. All specifications show large p-values which imply that our

instruments are valid. The Kleibergen-Paap LM underidentification statistic tests whether the employed instruments are relevant, the null hypothesis being that they are irrelevant. In addition, the Kleibergen-Paap F statistic tests for weak identification, the null hypothesis being that instruments are weak.[79] The results of the Kleibergen-Paap statistics show that the instruments are sufficiently strong.

In the main results presented in Table 5.1, we obtain a significant and positive estimate for the spatial lag of initiatives which is robust to a number of specifications. After controlling for municipal characteristics and fixed effects, the probability of having an initiative in period t increases significantly when the neighbors host more initiatives (column 2). In column 3-5 of Table 5.1 we substitute the contemporaneous spatial lag by the first, second and third lagged values in order to study whether the spillover effects are persistent over time. Indeed, we observe that the effects hold over time. Spillovers from initiatives one and two years before appear to be even stronger than simultaneous spillovers. This is well possible given the long process of starting an initiative, collecting signatures and, if successful, eventually holding a vote. Also, knowledge about neighboring initiatives might not diffuse instantly and communities might take their time to organize an initiative after observing initiatives in neighbor municipalities. Consistently though, spillover effects vanish when moving even further into the past (column 5).

For the second lag, the estimated coefficient is 0.96, which indicates that the probability of having an initiative increases by 96 percentage points if – on average – all neighbor municipalities have one initiative more. Given that the average number of neighbor municipalities is 460, this implies an unrealistic increase in the number of neigbor initiatives by 460. To aid in interpretability, we compute results that show the effect of a one standard deviation

[79] The test replaces the Cragg-Donald weak identification test in the case of heteroskedastic standard errors.

increase in the number of neighbor initiatives. A one standard deviation increase in neighbor initiatives increases the probability of having an initiative by 2.13 percentage points.

5.4.2 Robustness of results

As robustness test, we depart from our neighborhood definition which considers municipalities within a radius of 50 km. First, we restrict the radius to 30 km and, second, we increase the radius to 70 km (columns 1-8 in Table 5.2). For 30 km, the spatial lag again is significantly positive and persistent over time. Also, the spillover effect fades out after three periods. Compared to the 50 km baseline specifications, the economic effects – put in relation to the standard deviation – are stronger for the 30 km specification. For the second lag, a one standard deviation increase in the average number of neighbor petitions increases the probability of having a petition by 2.77 percentage points. When increasing the radius to 70 km, no spillover effects can be detected. This confirms that spillover effects are regionally restricted, e.g. due to limited information flows across space, and that close-by municipalities are more relevant for each other than further apart ones.

We additionally run a placebo test which generates random initiatives for all municipalities and regresses them on the true spatial lags. For this, the placebo initiative dummy has the same mean as the true initiative dummy. The results are reported in columns 9-12 in Table 5.2. As expected, the spatial lags are all not significant.

As another placebo test we regress the initiative dummy on forwarded spatial lags. The idea is that spillover effects from future initiatives on initiatives today cannot happen. As expected, the effects are insignificant. In Figure D.2 we plot this placebo test together with the effects from Table 5.1.[80]

[80] The effect in t=1 corresponds to the spatial lag in $t-1$, i.e. column 3 in Table 5.1, as we take the neighborhood's perspective in the graph and look how long it will take until the spillover effects happen.

Table 5.2: Robustness of main results to neighborhood-selection and placebo initiatives

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLE	30km				70km				50km: placebo dummy			
Spatial lag (neighbor initiatives) in t	0.5447**				0.6644				0.2572			
	(0.2294)				(0.4050)				(0.3258)			
Spatial lag (neighbor initiative) in $t-1$		0.7709***				0.7237				0.2238		
		(0.2603)				(0.4641)				(0.4181)		
Spatial lag (neighbor initiatives) in $t-2$			0.8958***				0.7281				-0.0073	
			(0.2969)				(0.5772)				(0.3678)	
Spatial lag (neighbor initiatives) in $t-3$				0.0736				-0.2408				0.2773
				(0.2717)				(0.4379)				(0.3813)
Signature requirement	-0.1190	-0.1153	-0.1605**	-0.1993**	-0.1829	-0.1860	-0.2132	-0.2489*	0.0173	0.0121	0.0072	-0.0276
	(0.0815)	(0.0817)	(0.0776)	(0.0776)	(0.1430)	(0.1438)	(0.1459)	(0.1273)	(0.0525)	(0.0519)	(0.0514)	(0.0687)
Ln population	0.0081	0.0064	0.0122	0.0129	-0.0034	-0.0046	-0.0055	-0.0118	0.0012	-0.0024	-0.0074	0.0001
	(0.0059)	(0.0071)	(0.0100)	(0.0139)	(0.0071)	(0.0084)	(0.0113)	(0.0151)	(0.0116)	(0.0143)	(0.0194)	(0.0161)
Unemployment rate	0.0263	0.0495*	0.0527	0.0099	0.0383	0.0515	0.0424	-0.0070	0.0625	0.0656	0.1015	0.0852
	(0.0250)	(0.0284)	(0.0328)	(0.0371)	(0.0360)	(0.0374)	(0.0434)	(0.0502)	(0.0494)	(0.0520)	(0.0629)	(0.0570)
Share of population over 65	0.0306	0.0165	0.0298	0.0221	0.0123	0.0111	-0.0006	-0.0225	-0.0662	-0.0531	-0.0414	-0.0106
	(0.0274)	(0.0293)	(0.0301)	(0.0324)	(0.0352)	(0.0376)	(0.0393)	(0.0430)	(0.0444)	(0.0534)	(0.0570)	(0.0628)
Left share	-0.0046	-0.0089	-0.0203*	-0.0275**	-0.0043	-0.0138	-0.0200	-0.0226	-0.0222	-0.0193	-0.0270	-0.0340
	(0.0110)	(0.0117)	(0.0114)	(0.0134)	(0.0129)	(0.0138)	(0.0131)	(0.0147)	(0.0162)	(0.0185)	(0.0201)	(0.0210)
Observations	117,314	105,869	94,488	83,520	80,867	73,012	65,002	56,688	100,481	90,766	80,992	71,164
Number of municipalities	11,439	11,210	10,725	10,326	8,211	8,011	7,850	7,283	9,939	9,716	9,432	8,897
Hansen-J p-value	0.570	0.293	0.0328	0.248	0.706	0.389	0.0315	0.361	0.321	0.380	0.388	0.288
Kleibergen-Paap F	15.08	13.99	13.14	13.17	6.076	7.886	13.67	17.10	10.54	13.67	18.76	21.18
Kleibergen-Paap LM	44.33	48.30	48.12	51.16	26.19	32.22	44.16	45.85	35.97	45.49	59.56	74.83

*** p<0.01, ** p<0.05, * p<0.1

Notes: The variable "placebo dummy" has the same mean as the true variable and represents randomly generated initiatives. All regressions include time and municipal fixed effects. Standard errors are clustered at the county level.

5.4.3 Extension of results

In this sub-section, we extend our main results by two important empirical tests to shed more light on the spillover mechanisms. Firstly, we ask whether the spillovers are due to learning about the possibility of holding initiatives or due to learning about specific (optimal) policies. Secondly, we are interested to see whether informational channels – such as newspaper circulation or direct personal contacts across municipalities – play a role in these patterns of interactions as it is the case for the diffusion of movements (see section 5.2.2).

Up to now, we have demonstrated that all initiatives in the neighborhood positively affect the likelihood of hosting any initiative. This result allows arguing that the use of direct democratic instruments might have spillovers itself as voters learn about a new political tool they can exercise in general.[81]

In Table 5.3 we advance a step further by dividing the initiatives into three main public policy areas – traffic, economy and infrastructure – over which initiatives can be held. These topics are by far the most frequent ones and jointly cover 83% of all initiatives. We then estimate the baseline regressions with controls and fixed effects both within and across these topics. Two out of three within-topic coeffcients reported on the diagonal of Table 5.3 show significant effects. These results broadly support the hypothesis that the interaction effects are largely driven by spillovers in specific public policies. We do not detect evidence for spillovers across different topics.[82]

Next, we test whether the cross-municipal spillovers in initiatives are conditional on the availability and exchange of information. One of the important spillover mechanisms we

[81] Parallels can be drawn to the literature that studies the cross-border diffusion of democracy (Elkink, 2011), regime change (Brinks and Coppedge, 2006), and riots (Aidt and Franck, 2015).

[82] Due to different topic restrictions depending on the respective municipal codes, there cannot be any mimicking in some specific public policies across neighboring municipalities. Thus, in more homogeneous settings than this one, the mimicking in direct democratic institutions would probably be higher.

Table 5.3: Second stage effects of spillovers from neighbors' initiatives by topic

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	initiative traffic			initiative economy			initiative infrastructure		
Spatial lag traffic	**-0.6820**			-0.0739			-0.4833		
	(0.8684)			(1.1306)			(1.0842)		
Spatial lag economy		0.2073			**0.8442****			-0.0195	
		(0.2129)			(0.4062)			(0.4293)	
Spatial lag infrastructure			-0.1266			0.0984			**0.5985***
			(0.2587)			(0.3272)			(0.3496)
Signature requirement	-0.1132	-0.1158	-0.1154	-0.1359	-0.1598*	-0.1312	-0.2093**	-0.2063**	-0.1806*
	(0.0973)	(0.0946)	(0.1025)	(0.0970)	(0.0943)	(0.1030)	(0.0963)	(0.0956)	(0.1043)
Ln population	-0.0033	-0.0044	-0.0036	0.0074	0.0010	0.0081	-0.0081	-0.0076	-0.0039
	(0.0035)	(0.0033)	(0.0039)	(0.0081)	(0.0073)	(0.0082)	(0.0070)	(0.0064)	(0.0075)
Unemployment rate	0.0168	0.0227	0.0207	0.0032	-0.0033	0.0070	-0.0102	-0.0046	0.0131
	(0.0159)	(0.0217)	(0.0177)	(0.0218)	(0.0251)	(0.0224)	(0.0219)	(0.0261)	(0.0233)
Share of population over 65	0.0090	0.0011	0.0064	0.0042	-0.0155	0.0035	0.0482**	0.0464**	0.0433**
	(0.0174)	(0.0144)	(0.0157)	(0.0233)	(0.0216)	(0.0221)	(0.0229)	(0.0213)	(0.0217)
Left share	-0.0031	-0.0040	-0.0050	-0.0071	-0.0022	-0.0076	-0.0234***	-0.0251***	-0.0263***
	(0.0060)	(0.0050)	(0.0048)	(0.0102)	(0.0092)	(0.0091)	(0.0079)	(0.0076)	(0.0071)
Observations	80,992	80,992	80,992	80,992	80,992	80,992	80,992	80,992	80,992
Number of ags	9,432	9,432	9,432	9,432	9,432	9,432	9,432	9,432	9,432
Hansen-J p-value	0.361	0.424	0.349	0.0825	0.243	0.0664	0.0638	0.0604	0.261
Kleibergen-Paap F	7.552	13.54	25.28	7.552	13.54	25.28	7.552	13.54	25.28
Kleibergen-Paap LM	43.27	42.17	73.47	43.27	42.17	73.47	43.27	42.17	73.47

*** p<0.01, ** p<0.05, * p<0.1

Notes: The table presents second stage estimates of the linear probability model specified in equation 5.1. Spatial lags contain municipalities within a radius of 50 km. We use the spatial lag in $t-2$. All regressions include time and municipal fixed effects as defined before. Standard errors are clustered at the county level.

Table 5.4: Effects of spillovers from neighbors' initiatives by number of newspapers per household and commuters per capita

	(1)	(2)	(3)	(4)
VARIABLE	Citizen initiative dummy			
	local newspapers		**commuters p.c.**	
	below median	above median	below median	above median
Spatial lag (neighbor initiatives)	0.7041	1.1689***	0.4290	0.8436*
	(0.6145)	(0.4409)	(0.5886)	(0.5073)
Signature requirement	-0.1959	-0.0461	-0.0905	-0.2067**
	(0.1407)	(0.0734)	(0.1203)	(0.0951)
Ln population	-0.0023	0.0114	-0.0026	0.0019
	(0.0130)	(0.0156)	(0.0178)	(0.0192)
Unemployment share	0.0293	0.0454	0.0426	0.0654
	(0.0530)	(0.0534)	(0.0537)	(0.0769)
Share of population over 65	0.0196	0.0142	0.0602	0.0670
	(0.0476)	(0.0566)	(0.0578)	(0.0700)
Left share	-0.0205	-0.0210	-0.0619***	-0.0031
	(0.0167)	(0.0207)	(0.0230)	(0.0236)
Observations	37,093	37,109	37,006	36,906
Number of municipalities	3,787	3,637	7,209	6,210
Hansen-J p-value	0.272	0.793	0.763	0.377
Kleibergen-Paap F	19.11	14.50	6.375	27.27
Kleibergen-Paap LM	48.69	40.46	38.91	48.05

*** p<0.01, ** p<0.05, * p<0.1

Notes: The table presents second stage estimates of the linear probability model specified in equation 5.1. All spatial lags contain municipalities within a radius of max. 50 km. We use the spatial lag in $t-2$. All regressions include time and municipal fixed effects. Standard errors are clustered at the county level.

have in mind is one that functions through popular media. Vetoing or inaugurating a certain policy in one municipality may have the most impact on neighboring town's voters when they are sufficiently informed. To test this hypothesis we divide the municipalities according to whether on a per household basis these purchase daily regional newspapers above or below the median town. Regional newspapers are a primary source of information for citizens on local issues.[83] Results for the baseline specifications for the two sub-samples are collected in

[83] We rely on the data on 2008's newspaper circulation by Falck et al. (2014) which in turn rely on data from the German Audit Bureau of Circulations (Informationsgemeinschaft zur Feststellung der

Table 5.4 (column 1-2). Conditional on the town-size and a number of further controls, we find robust evidence of significant spatial interactions in towns with above-median number of newspapers but not for those with below-median newspapers.[84] This exercise reveals that information is one important transmission channel through which spillovers in initiatives spread.

Finally, we test whether more direct channels of information diffusion play a role for direct democratic activities having effects on neighbors. Direct channels refer to personal contacts of citizens from different municipalities. To test this hypothesis we divide our sample according to whether a municipality 'hosts' incoming commuters above or below the median town.[85] Results for the baseline specification for the two sub-samples are collected in Table 5.4 (column 3-4). Conditional on the town-size and a number of further controls, we find robust evidence of significant spatial spillovers into towns with above-median number of commuters per capita but not for those with below-median commuters.[86] This indicates that direct channels of information diffusion between municipalities play a role for spillovers in direct democracy.

5.5 Summary

To the best of our knowledge, previous literature has not yet tested or conceptualized the proposed hypothesis that voters of related jurisdictions may mimic each others behavior through the means of direct democracy. The channels of such interactions may be quite different and complex, going from spillovers in specific policies to the process of learning to exploit direct democratic rights. Further research on the behavior of individuals and,

Verbreitung von Werbeträgern , IVW, 2011). The data provides the annual number of daily newspapers per household for each municipality in 2008.

84 The number of newspapers is not correlated with other variables that affect the probability of hosting an initiative. Means and standard deviations of the control variables are similar for the two sub-samples.

85 We use commuters data from the Federal Statistical Office ("Regionaldatenbank").

86 The number of commuters is not correlated with other variables that affect the probability of hosting an initiative. Means and standard deviations of the control variables are similar for the two sub-samples.

especially, organized groups of individuals in the social interaction analysis may help to shed more light into these and perhaps more interaction mechanisms. However, what this analysis adds to the literature is that it is plausible that mimicking between jurisdictions takes place not only through government-level interactions (learning, coercion, fiscal and yardstick competition), but also through voters' direct actions in vetoing and inaugurating policies through binding-initiatives. Such interactions are, of course, conditional on the existence of institutions of direct democracy, which are currently not any more rare especially in sub-national levels of high-income countries.

If this reasoning is true, then it is important to recognize and quantify such interactions, because direct democracy matters for policy-outcomes. Studies traditionally concentrating on US and Switzerland, but more recently also extending to Germany and other countries, find empirical support that direct democratic instruments affect policies in the public sector in general, and fiscal decisions in particular (see, e.g., for the US Marschall and Ruhil, 2005; and for Switzerland Feld and Matsusaka, 2003). For Germany, Asatryan et al., 2014 find that direct democratic activity affects the level of local tax rates and changes their composition. Although, we find evidence for spatial spillovers in initiatives, it is left to future work to assess to what extent such mimicking behavior drives policy outcomes such as the level and composition of taxes.

6 Conclusions

This thesis studies different topics in the field of public economics and relies on various methods and data sources. The four chapters are in the areas of fiscal rules, tax competition, tax neutrality and the European Court of Justice, and spillovers in direct democracy. While the chapters are self-containing, they all emphasize the influence which (governmental) jurisdictions have on each other. By focusing on different layers of government, the thesis hints to parallelisms between the settings. The findings of the chapters have a number of relevant *policy implications* which are discussed in the following.

Chapter 2 allows to draw two tentative conclusions that should be taken into account in the design of fiscal rules also in the European context. *First*, a weak initial fiscal situation is a burden for a fiscal rule's credibility from the perspective of policy makers. This corresponds to the empirical observation that fiscal rules are often introduced subsequent to a phase of successful consolidation in order to lock-in earlier adjustment efforts (International Monetary Fund, 2009). Otherwise, the phasing-in of a new rule should be paralleled by attempts to remove or at least reduce the problem of unsustainable budgetary legacies such as high initial debt.

Second, sub-national fiscal rules are a helpful complement to a national rule in a federal context like Germany where states have substantial spending and deficit autonomy. This points to the potential credibility effects of consistent and mutually reinforcing fiscal rules across different layers of government in general. It remains a question for further research as to whether the experience of the German case also applies to the European context, for example, for the emerging parallelism of rules at the European Union level (Stability and Growth Pact) and the national level (induced by the European Fiscal Compact).

Chapter 3 and the related literature show that the desirability of corporate tax harmonization in the EU remains questionable. *First*, the descriptives and empirics do not

make a convincing case for an outright harmonization of corporate taxes. It is unclear how strong strategic interactions among EU member states really are and whether or not Europe experiences a "race-to-the-bottom". In addition, tax revenues have not fallen in line with statutory tax rates (see, e.g., European Commission, 2014; Devereux and Loretz, 2012).

Second, from a normative perspective, it is unresolved if complete tax harmonization is the first best solution to tax competition. On the one hand, the empirical results indicate that tax competition with other regions is unlikely to be very strong, which would make regional tax harmonization a valid option (Sørensen, 2004). On the other hand, the economic advantages of harmonization need to be traded off against the disadvantages coming from political economy factors like governments being Leviathans (see, e.g., Brennan and Buchanan, 1980; Baskaran and Lopes da Fonseca, 2014).

Also, there are alternative solutions to tax competition which are milder than complete tax harmonization. The EU Commission has put forward a Common Consolidated Corporate Tax Base (CCCTB) and a Common Corporate Tax Base (CCTB).[87] Both systems would arguably reduce compliance costs for corporations and make the EU as a whole more competitive and attractive for international investment (Lang et al., 2013, p. 75).[88] At the same time, member states could still set their own tax rates and preserve some degree of tax autonomy.

Chapter 4 allows to assess reform options discussed in the OECD's reports on 'Base Ersosion and Profit Shifting' (BEPS) regarding controlled foreign company rules (CFC rules)

[87] The full Draft Council Directive on a Common Consolidated Corporate Tax Base (CCCTB) from 2011 is available for download under: `http://ec.europa.eu/taxation_customs/resources/documents/taxation/company_tax/common_tax_base/com_2011_121_en.pdf`
Information to the CCCTB re-launch in 2015 can be found under: `http://europa.eu/rapid/press-release_MEMO-15-5174_de.htm`
Please also see the Bolkestein Report (European Commission, 2001) and Spengel et al. (2012) for an economic analysis of company taxation in the internal market and the CCTB, respectively, as well as Fuest (2008) for a critical analysis of the EU Commission's original Draft Council Directive.

[88] Also see point 4 of the Preamble of the Proposal for a Council Directive on a Common Consolidated Corporate Tax Base (CCCTB), COM(2011) 121/4.

and intellectual property boxes (IP boxes). *First*, CFC rules could be strengthened and de-facto reintroduced. In fact, Action 3 of the OECD's BEPS project was intended to develop proposals for effective CFC rules. Although the final report on Action 3 acknowledges the legal problems of reintroducing CFC rules in the EU, the OECD argues that these obstacles can be overcome (OECD, 2015c, pp. 17-18). In our computations for this reform scenario, we observe an improvement for capital export neutrality but not for capital import neutrality. The desirability of this option of reform is therefore questionable. This supports the European Commission's recent proposal to strengthen CFC rules only with respect to third countries.[89]

Second, IP boxes for acquired patents could be abolished. This goes into the direction of the nexus approach proposed by the final report of Action 5 in the BEPS project. It would limit the extent to which returns from acquired IP would be applicable for the lower IP box tax rate (OECD, 2015a; OECD, 2015b, pp. 26-28). Our scenario for such a reform shows very desirable properties because both capital export *and* import neutrality would be strengthened. Based on these results, we would recommend that member states completely abolish IP boxes for acquired IP in their national laws. This would help to achieve more tax neutrality in the internal market.

Chapter 5 points to a new channel of spatial interactions across jurisdictions through voters' direct democratic activities. The study finds that a jurisdiction's probability of hosting an initiative is positively driven by the neighbors' direct democratic activity. This effect persists over time and is stronger in towns with relatively more information flows (measured by local newspaper consumption of citizens and total number of commuters across jurisdictions). Additionally, we find evidence that the results are driven by spillovers in similar policy areas.

[89] Please see Article 8 of the European Commission's 'Proposal for a Council Directive laying down rules against tax avoidance practices that directly affect the functioning of the internal market' (European Commission, 2016).

Given the results of this study, it is well possible that *mimicking behavior* ultimately affects *fiscal outcomes*. This is suggested by the literature which shows that direct democratic decisions affect fiscal outcomes. Recently, Asatryan et al. (2014) have extended this literature to Germany. They find that direct democratic activity can affect the level of local tax rates. Also, voters indirectly shift the weight from taxes which apply to many taxpayers (property tax) to taxes targeted at fewer taxpayers (business taxes). When considering mimicking in direct democratic actions, this could give rise to tax interactions across jurisdictions which previously have solely been explained by learning, coercion, yardstick or tax competition. Future work should assess in more detail to what extent interactions in policy outcomes are caused by mimicking behavior in direct democracy.

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Appendices

A Appendix to Chapter 2

Fiscal Rules and Compliance Expectations - Evidence for the German Debt Brake

Table A.1: Individual and state variables

Variable	Unit	Explanations
Education:		
Tertiary degree	Dummy	Degree from university or polytechnic
Economics/Business degree	Dummy	Tertiary education in business or economics
Parliamentary role:		
Member of governing parties in state	Dummy	Member of one of the ruling parties
Member of budget committee	Dummy	Deals with state government budget
Number of years in parliament	Discrete	Calculated as 2011/2012 minus year of parliament entry (interruptions taken into account)
Other demographic variables:		
Female	Dummy	Member of parliament is female
Age in years	Discrete	Calculated as 2011/2012 minus year of birth
Preferences and bailout-expectation:		
Desirability of own state's unconditional compliance	Discrete	Survey Question: "In 2020, how desirable is it for your Bundesland to comply with the constitutional Debt Brake?" Answers given on discrete nine point scale ranging from -4 (completely undesirable) to +4 (very desirable)
Preference for fiscal consolidation (debt reduction)	Continuous	Survey Question: "Assume that your state's budget exhibits a permanent surplus (after business cycle adjustment). How would you use this surplus?" Answer given by distributing a hypothetical 100€ surplus to different budgetary items such as "higher expenses", "lesser taxes and fees" and "repayment of legacy debt". This variable uses the relative amount allotted to "repayment of legacy debt" and thus ranges from 0 to 100.
Index for perceived strength of budget constraint	Discrete	Measure ranging from -7 to +7, with higher values indicating a higher expectation of the debt brake being enforced in case of non-compliance, see footnote 12 in chapter 2.

Table A.1: Individual and state variables (cont.)

Variable	Unit	Explanations
Party affiliation:		
CDU/CSU	Dummy	Member of Christian Democratic or Christian Social Party, center-right party
FDP	Dummy	Member of Free Democratic Party (not included into regressions since it serves as base category), most market oriented party favoring small government and low taxes
Green Party	Dummy	Member of Green Party, center-left with focus on environmental issues
Left Party	Dummy	Member of Left Party, uniting former communists in East Germany and disappointed Social Democrats from the left wing
SPD	Dummy	Member of Social Democratic Party, center-left party
Other	Dummy	Member of other Party
State characteristics:		
GDP per capita	Continuous	Gross domestic product per capita, in thousands of Euros, source: German Statistical Office
Need for consolidation	Continuous	In % of GDP, consolidation needed to comply with debt brake by the year 2020, source: Sachverständigenrat (2011)
Total debt to GDP	Continuous	Total debt divided by gross domestic product, in %, source: German Statistical Office
Three year average budget deficit to GDP	Continuous	Weighted average of the last three budget deficits (weights: first lag: 0.5, second lag: 0.3, third lag: 0.2) divided by gross domestic product, in %, source: German Statistical Office
Index of stringency of state debt rule	Continuous	Normalized between 0 and 1, larger values indicating stricter rule, source: Ciaglia and Heinemann (2013)
Dummy for consolidation assistance	Dummy	Takes the value of 1 for states receiving consolidation assistance
Fiscal equalization transfers to total spending	Continuous	Total net intra-state transfer payments divided by total spending, in %, sources: Federal Ministry of Finance, German Statistical Office
Government coalition consists of right parties	Dummy	Takes the value of 1 for a purely right-leaning government (coalition), a value of 0.5 for a mixed government coalition and a value of 0 for a purely left-leaning government (coalition)
Cross state dimension		
Own state	Dummy	Takes on the value of 1 if the state to be evaluated it the home state of the respondent

Table A.2: Cross-state compliance expectations

		Evaluated states																
		BB	BE	BW	BY	HB	HE	HH	MV	NI	NW	RP	SH	SL	SN	ST	TH	∅
Evaluating states	BB	53	5	68	89	0	58	53	11	37	16	32	5	11	68	16	37	35
	BE	27	47	83	87	13	80	50	43	60	23	37	27	23	70	40	63	48
	BW	5	0	75	94	1	58	22	16	17	9	19	8	4	71	5	19	27
	BY	3	3	59	89	3	53	21	4	25	5	17	7	4	61	5	32	24
	HB	28	17	83	89	28	72	44	44	67	28	44	22	22	72	44	39	47
	HE	16	8	62	82	8	84	32	24	40	16	22	14	14	64	22	38	34
	HH	26	13	77	79	5	67	72	36	49	21	41	13	8	59	26	33	39
	MV	11	6	78	83	6	59	44	89	28	6	18	6	11	83	17	33	36
	NI	4	0	74	91	2	57	24	19	56	11	26	11	6	54	20	26	30
	NW	8	6	69	84	2	55	12	25	47	18	31	12	6	63	22	33	31
	RP	18	4	80	82	8	68	32	24	40	18	56	16	8	68	26	44	37
	SH	10	7	66	86	10	55	17	24	38	10	21	66	10	52	28	31	33
	SL	25	10	95	100	10	85	50	25	55	15	35	25	30	60	30	40	43
	SN	11	0	67	80	2	42	11	29	20	0	13	4	0	89	16	42	27
	ST	28	7	79	86	10	55	31	48	38	17	31	21	21	76	62	48	41
	TH	22	11	67	97	11	69	22	31	47	19	33	28	11	89	28	47	40
$\emptyset_{MSP}$		15	7	72	87	6	62	30	26	38	13	28	15	9	68	22	36	
$\emptyset_{State}$		18	9	74	87	7	64	34	31	41	15	30	18	12	69	25	38	
$\emptyset_{15\ other\ states}$		16	6	74	87	6	62	31	27	40	14	28	15	11	67	23	37	
# of times where outsiders are more optimistic than insiders		0	0	7	5	0	1	0	0	2	5	0	0	0	0	0	2	

Note: Figures are in percent and indicate the share of MSPs who expect that the evaluated state will be compliant. $\emptyset_{MSP}$ indicates the average over all MSPs. $\emptyset_{State}$ indicates the unweighted average over the state figures.

Table A.3: Likelihood of state's compliance - robustness checks 1 (alternative variables for H1)

Independent Variables	(1) Baseline 1 (with total debt)	(1) Average marginal effects	(2) Baseline 1 (with need for consolidation)	(2) Average marginal effects
Individual: education				
Tertiary degree	0.006	0.001	0.004	0.001
	[0.036]	[0.010]	[0.036]	[0.010]
Economics/Business degree	0.024	0.006	0.025	0.007
	[0.038]	[0.010]	[0.037]	[0.010]
Individual: parliamentary role				
Member of governing parties in state (H4)	0.198***	0.052***	0.211***	0.056***
	[0.045]	[0.012]	[0.045]	[0.012]
Member of budget committee	-0.164***	-0.044***	-0.163***	-0.044***
	[0.039]	[0.010]	[0.039]	[0.010]
Number of years in parliament	-0.006**	-0.002**	-0.006**	-0.002**
	[0.002]	[0.001]	[0.002]	[0.001]
Individual: other demographic variables				
Female	-0.111***	-0.029***	-0.110***	-0.029***
	[0.032]	[0.009]	[0.032]	[0.008]
Age in years	0.002	0.001	0.002	0.001
	[0.001]	[0.000]	[0.001]	[0.000]
Individual: preferences and bailout-expectation				
Desirability of own state's unconditional compliance	0.068***	0.018***	0.067***	0.018***
	[0.011]	[0.003]	[0.010]	[0.003]
Preference for fiscal consolidation (debt reduction)	0.004***	0.001***	0.004***	0.001***
	[0.001]	[0.000]	[0.001]	[0.000]
Index for perceived strength of budget constraint (H2)	0.046***	0.012***	0.046***	0.012***
	[0.005]	[0.001]	[0.005]	[0.001]
Individual: party affiliation[a]				
CDU/CSU	-0.112	-0.030	-0.112	-0.030
	[0.069]	[0.018]	[0.069]	[0.018]
SPD	-0.155**	-0.041**	-0.156**	-0.042**
	[0.074]	[0.020]	[0.074]	[0.020]
Green Party	0.088	0.023	0.090	0.024
	[0.085]	[0.022]	[0.084]	[0.022]
Left Party	0.155*	0.041*	0.159*	0.042*
	[0.085]	[0.022]	[0.084]	[0.022]
Other Parties	-0.123	-0.033	-0.113	-0.030
	[0.115]	[0.031]	[0.114]	[0.030]
State characteristics[b]				
Total debt to GDP (H1)	-0.051***	-0.014***		
	[0.005]	[0.001]		
Need for consolidation (H1)			-0.402***	-0.108***
			[0.047]	[0.012]
Debt rule index (H3)	1.131***	0.299***	1.975***	0.528***
	[0.328]	[0.087]	[0.291]	[0.077]
GDP per capita	0.021***	0.006***	0.006	0.002
	[0.005]	[0.001]	[0.005]	[0.001]
Dummy for consolidation assistance	-0.152	-0.040	-0.738***	-0.197***
	[0.116]	[0.031]	[0.104]	[0.027]
Fiscal equalization transfers to GDP	0.096*	0.025*	-0.082*	-0.022*
	[0.054]	[0.014]	[0.048]	[0.013]
Government coalition consists of right parties	0.177**	0.047**	0.591***	0.158***
	[0.077]	[0.021]	[0.073]	[0.019]
Cross state dimension				
Own state (H4)	0.789***	0.209***	0.770***	0.206***
	[0.089]	[0.024]	[0.103]	[0.027]
Home state fixed effects	✓	✓	✓	✓
Regression diagnostics				
Observations	10,208		10,208	
Pseudo-R^2	0.266		0.259	
p-value joint significance of all variables	0.000		0.000	
p-value joint significance of all individual variables	0.000		0.000	
p-value joint significance of party-dummies	0.000		0.000	
p-value joint significance of state characteristics	0.000		0.000	

Notes: */**/*** denote significance at the 10%/5%/1% level; Standard errors in brackets; *a*: base category is the market oriented liberal democratic party "FDP"; *b*: State characteristics are 2010 data for survey waves 1 and 2, which both took place in 2011, and 2011 data for survey wave 3, which took place in 2012.

Table A.4: Likelihood of state's compliance - robustness checks 2 (weighting by inverse response probability based on party and state affiliation)

Independent Variables	(1) Baseline 1 (weighted regression)	(1) Average marginal effects	(2) Baseline 2 (weighted regression)	(2) Average marginal effects
Individual: education				
Tertiary degree	0.011	0.003		
	[0.040]	[0.011]		
Economics/Business degree	0.050	0.014		
	[0.041]	[0.011]		
Individual: parliamentary role				
Member of governing parties in state (H4)	0.169***	0.046***		
	[0.045]	[0.012]		
Member of budget committee	-0.176***	-0.048***		
	[0.043]	[0.012]		
Number of years in parliament	-0.013***	-0.004***		
	[0.003]	[0.001]		
Individual: other demographic variables				
Female	-0.126***	-0.035***		
	[0.036]	[0.010]		
Age in years	0.006***	0.002***		
	[0.002]	[0.000]		
Individual: preferences and bailout-expectation				
Desirability of own state's unconditional compliance	0.062***	0.017***		
	[0.010]	[0.003]		
Preference for fiscal consolidation (debt reduction)	0.004***	0.001***		
	[0.001]	[0.000]		
Index for perceived strength of budget constraint (H2)	0.048***	0.013***		
	[0.006]	[0.002]		
Individual: party affiliation[a]				
CDU/CSU	-0.125*	-0.034*		
	[0.068]	[0.019]		
SPD	-0.239***	-0.065***		
	[0.074]	[0.020]		
Green Party	0.033	0.009		
	[0.087]	[0.024]		
Left Party	0.260***	0.071***		
	[0.100]	[0.027]		
Other Parties	-0.475***	-0.130***		
	[0.158]	[0.043]		
State characteristics[b]				
Average budget deficit over last three years (H1)	-0.310***	-0.085***	-0.556***	-0.110***
	[0.032]	[0.009]	[0.051]	[0.010]
Debt rule index (H3)	2.623***	0.719***	3.929***	0.779***
	[0.294]	[0.079]	[0.408]	[0.079]
GDP per capita	0.025***	0.007***	0.023***	0.005***
	[0.005]	[0.001]	[0.007]	[0.001]
Dummy for consolidation assistance	-0.693***	-0.190***	-1.044***	-0.207***
	[0.086]	[0.023]	[0.129]	[0.025]
Fiscal equalization transfers to GDP	-0.332***	-0.091***	-0.681***	-0.135***
	[0.047]	[0.013]	[0.089]	[0.017]
Government coalition consists of right parties	0.598***	0.164***	0.792***	0.157***
	[0.071]	[0.019]	[0.097]	[0.019]
Cross state dimension				
Own state (H4)	0.843***	0.231***	1.295***	0.257***
	[0.121]	[0.033]	[0.201]	[0.039]
Home state fixed effects	✓	✓		
Person fixed effects			✓	✓
Regression diagnostics				
Observations	10,208		9,104	
Pseudo-R^2	0.249		0.448	
p-value joint significance of all variables	0.000		0.000	
p-value joint significance of all individual variables	0.000		n.a.	
p-value joint significance of party-dummies	0.000		n.a.	
p-value joint significance of state characteristics	0.000		0.000	

Notes: */**/*** denote significance at the 10%/5%/1% level; Standard errors in brackets; *a*: base category is the market oriented liberal democratic party "FDP"; *b*: State characteristics are 2010 data for survey waves 1 and 2, which both took place in 2011, and 2011 data for survey wave 3, which took place in 2012. Weighting based on inverse response probabilities which in turn are based on party and state affiliation.

B Appendix to Chapter 3

Tax Competition in Europe - Europe in Competition with Other World Regions?

B.1 Robustness Results

Table B.1: Global and regional tax competition - robustness checks 1 (regional blocs and free trade areas)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All Countries (NAFTA)		**EU28 Countries**		**EU28 Countries**		**EU28 Countries**	
VARIABLES	uniform	distance	uniform	distance	uniform	distance	uniform	distance
Lagged EATR	0.907***	0.863***	0.764***	0.519***	0.834***	0.922***	0.862***	0.932***
	[0.024]	[0.053]	[0.091]	[0.163]	[0.069]	[0.033]	[0.067]	[0.023]
Spatial Lag same region	-0.037	-0.013	0.487**	0.140	0.666***	0.158	0.809**	0.156
	[0.068]	[0.044]	[0.222]	[0.315]	[0.218]	[0.112]	[0.325]	[0.098]
Spatial Lag Non-European					0.522	0.060		
					[0.339]	[0.273]		
Spatial Lag Asia-Pacific							0.307	0.162
							[0.226]	[0.219]
Spatial Lag North America							0.202	-0.184
							[0.339]	[0.264]
Spatial Lag Latin America							0.046	-0.055
							[0.208]	[0.208]
Gov't Consumption (lag)	0.026	0.035	-0.029	-0.075	-0.001	0.026	0.004	0.027
	[0.026]	[0.027]	[0.065]	[0.105]	[0.052]	[0.039]	[0.044]	[0.035]
Urban (lag)	0.012	0.016	0.081	0.149	0.061	0.023	0.052	0.021
	[0.009]	[0.015]	[0.059]	[0.106]	[0.047]	[0.025]	[0.044]	[0.021]
Openness (lag)	0.308	0.331	-0.273	-0.926	-0.203	-0.144	-0.075	-0.131
	[0.198]	[0.234]	[0.703]	[1.308]	[0.578]	[0.508]	[0.459]	[0.411]
GDP (lag and ln)	0.246**	0.341**	0.527**	0.889**	0.394**	0.111	0.362**	0.092
	[0.112]	[0.136]	[0.241]	[0.350]	[0.192]	[0.137]	[0.164]	[0.125]
Dependency (lag)	0.044***	0.051***	-0.053	-0.098	-0.044	-0.019	-0.038	-0.017
	[0.013]	[0.014]	[0.092]	[0.167]	[0.073]	[0.041]	[0.068]	[0.036]
Region Specific Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	704	704	448	448	448	448	448	448
Number of countries	44	44	28	28	28	28	28	28
Hansen test P-value	0.456	0.569	0.537	0.320	0.411	0.200	0.480	0.844
AR(1) P-value	0.0230	0.0158	0.0187	0.00894	0.0221	0.0305	0.0223	0.0332
AR(2) P-value	0.123	0.110	0.0724	0.0529	0.0868	0.101	0.0767	0.0948

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table B.2: Global and regional tax competition - robustness checks 2 (time effects)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	All Countries		**All Countries**		**European countries**		**European countries**		**European countries**	
VARIABLES	uniform (baseline)	distance	uniform (baseline)	distance	uniform (baseline)	distance	uniform (baseline)	distance	uniform (baseline)	distance
Lagged EATR	0.641***	0.808***	0.910***	0.907***	0.804***	0.619***	0.846***	0.922***	0.870***	0.923***
	[0.148]	[0.086]	[0.022]	[0.043]	[0.071]	[0.126]	[0.058]	[0.026]	[0.056]	[0.029]
Spatial Lag	0.407	0.186								
	[0.299]	[0.134]								
Spatial Lag same region			-0.022	0.038	0.447**	0.009	0.680***	0.117	0.754**	0.043
			[0.084]	[0.029]	[0.197]	[0.297]	[0.197]	[0.111]	[0.294]	[0.075]
Spatial Lag Non-European							0.549*	-0.026		
							[0.320]	[2.006]		
Spatial Lag Asia-Pacific									0.345	-5.576
									[0.211]	[3.501]
Spatial Lag North America									0.111	0.624
									[0.319]	[3.251]
Spatial Lag Latin America									0.075	3.428
									[0.194]	[4.054]
Gov't Consumption (lag)	0.068	0.032	0.029	0.015	0.032	0.025	0.040	0.047*	0.036	0.048**
	[0.051]	[0.037]	[0.026]	[0.025]	[0.041]	[0.072]	[0.034]	[0.028]	[0.029]	[0.023]
Urban (lag)	0.036	0.019	0.012	0.015	0.060	0.106	0.051	0.022	0.045	0.023
	[0.035]	[0.020]	[0.009]	[0.010]	[0.046]	[0.076]	[0.039]	[0.019]	[0.036]	[0.016]
Openness (lag)	0.276	-0.145	0.270	0.072	-0.090	-0.418	-0.097	-0.115	0.001	-0.002
	[0.637]	[0.338]	[0.187]	[0.163]	[0.583]	[1.020]	[0.514]	[0.367]	[0.402]	[0.296]
GDP (lag and ln)	0.785**	0.365**	0.234**	0.205*	0.435**	0.733*	0.363**	0.121	0.335**	0.153
	[0.331]	[0.182]	[0.106]	[0.109]	[0.207]	[0.378]	[0.182]	[0.135]	[0.152]	[0.122]
Dependency (lag)	0.088**	0.058**	0.039***	0.045***	-0.042	-0.075	-0.039	-0.020	-0.033	-0.020
	[0.043]	[0.026]	[0.014]	[0.013]	[0.066]	[0.109]	[0.057]	[0.030]	[0.053]	[0.028]
Region Specific Time Trend	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Time Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	704	704	704	704	496	496	496	496	496	496
Number of countries	44	44	44	44	31	31	31	31	31	31
Hansen test P-value	0.621	0.329	0.309	0.480	0.457	0.535	0.400	0.994	0.460	1.000
AR(1) P-value	0.00274	0.00903	0.0227	0.0140	0.0192	0.0129	0.0215	0.0230	0.0216	0.0246
AR(2) P-value	0.0445	0.0752	0.123	0.0966	0.0904	0.0648	0.100	0.0979	0.0912	0.0972

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table B.3: European Union considerations

	(1)	(2)	(3)	(4)	(5)	(6)
	EU28 Countries		**EU28 Countries**		**EU28 Countries**	
VARIABLES	uniform	distance	uniform	distance	uniform	distance
Lagged EATR	0.867***	0.750***	0.821***	0.644***	0.683***	0.481***
	[0.056]	[0.088]	[0.085]	[0.126]	[0.123]	[0.166]
Spatial Lag EU15	0.303	0.093	0.317	0.040		
	[0.342]	[0.227]	[0.524]	[0.295]		
Spatial Lag EU13	0.163*	0.143			0.309**	0.291*
	[0.084]	[0.112]			[0.129]	[0.175]
Gov't Consumption (lag)	0.002	-0.016	-0.010	-0.048	-0.047	-0.082
	[0.049]	[0.058]	[0.060]	[0.081]	[0.072]	[0.104]
Urban (lag)	0.048	0.081	0.060	0.111	0.106	0.168*
	[0.041]	[0.054]	[0.052]	[0.081]	[0.075]	[0.100]
Openness (lag)	-0.110	-0.333	-0.144	-0.470	-0.467	-0.886
	[0.505]	[0.747]	[0.594]	[0.997]	[0.886]	[1.263]
GDP (lag and ln)	0.307**	0.474*	0.399**	0.710**	0.642*	0.979**
	[0.137]	[0.254]	[0.191]	[0.285]	[0.342]	[0.460]
Dependency (lag)	-0.039	-0.051	-0.036	-0.061	-0.077	-0.111
	[0.059]	[0.090]	[0.073]	[0.126]	[0.120]	[0.173]
Observations	448	448	448	448	448	448
Number of countries	28	28	28	28	28	28
Hansen test P-value	0.825	0.682	0.527	0.663	0.476	0.604
AR(1) P-value	0.0233	0.0213	0.0189	0.0139	0.0227	0.0167
AR(2) P-value	0.0899	0.0763	0.0691	0.0752	0.0614	0.0433

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

B.2 Data

B.2.1 Computation of EATR

The concept of Devereux and Griffith (1998, 2003) models a hypothetical investment project of a company and allows to compute the tax burden on this investment.[90] The model allows to include the most relevant tax provisions for corporations of a country.[91] Nominal corporation tax rates, local taxes on profits and surcharges are included. In addition, real estate, property and net-wealth taxes are considered. The computations also consider the depreciation rules for buildings and machinery and the valuation method for inventories. Overall, the modelled investment is assumed to be financed by a mix of new equity, retained earnings and debt. In case of debt financing the possibility of interest deductability is taken into account. Table B.4 states the assumptions with respect to the underlying economic parameters.

Table B.4: Assumptions for EATR computation

Category	**Assumption**[92]
Types of assets	industrial buildings (0.28%), machinery (0.5%), inventories (0.22%)
Source of finance	retained earnings (33.33%), new equity (33.33%), debt (33.33%)
True economic depreciation (declining balance)	Buildings: 3.1% Machinery: 17.5%
Inflation Rate	2%
Real interest rate	5%
Pre-tax rate of return	20%

[90] Please also see European Commission (2001) for explanations and applications of the model.

[91] Taxation at the level of the shareholder is not taken into account because it does not affect decisions of corporations when assuming that there is significant international portfolio investment, see e.g., Devereux and Pearson (1995, p. 1660).

[92] The weights for the assets are the same as used by Davies and Voget (2008). All other parameters are in line with the effective tax rate studies of ZEW Mannheim.

B.2.2 Control Variables

Table B.5: Descriptive statistics

Variable	Unit	Mean	Std. Dev.	Min	Max	Obs.	Source
EATR	Percent	25.8	7.7	8.3	47.9	748	ZEW/Oxford
Controls:							
GDP (ln)	USD in Bill.	26.2	1.7	22.3	30.3	748	Worldbank
Gov't Consumption	% of GDP	18.0	4.5	5.7	29.8	748	Worldbank
Urban	Percent	71.8	14.5	26.8	97.5	748	Worldbank
Dependency	Percent	49.2	5.1	36.0	66.9	748	Worldbank
Openness	(exports + imports)/GDP	0.9	0.5	0.2	3.9	748	Worldbank

The control variables have been used in comparable settings:
Government Consumption: Davies and Voget (2008) and Redoano (2014)
Urban: E.g., Devereux et al. (2008) and Davies and Voget (2008)
Dependency: Davies and Voget (2008), Redoano (2014); implicitly in Overesch and Rincke (2011) and Crabbé (2013).
GDP: E.g., Egger and Raff (2014).

B.2.3 Dataset

Table B.6: Dataset European countries

Country	Country
Austria	Latvia
Belgium	Lithuania
Bulgaria	Luxembourg
Croatia	UK
Cyprus	Malta
Czech Republic	Netherlands
Denmark	Norway
Estonia	Poland
Finland	Portugal
France	Romania
Germany	Slovakia
Greece	Slovenia
Hungary	Spain
Italy	Sweden
Ireland	Switzerland
	Turkey

Table B.7: Dataset Non-European countries

Country	Country
North America:	
USA	Canada
Asia-Pacific:	
Australia	Korea
New Zealand	Japan
China	India
Indonesia	
Latin America:	
Mexico	Argentina
Brazil	Chile

Table B.8: Mean EATRs in Europe over time

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
EU15	31.4	31.1	29.7	29.4	29.2	28.8	28.6	28.4	27.9	26.9	26.3	25.4	26.3	25.3	24.5	24.3	24.3
EU13	27.3	26.9	26.4	26.0	23.4	22.4	21.2	19.9	19.8	16.5	17.7	17.8	16.4	16.6	16.0	16.0	15.9
EU28	29.5	29.1	28.1	27.8	26.5	25.9	25.2	24.5	24.1	22.0	22.3	21.8	21.7	21.2	20.5	20.5	20.4
EU28 +3	29.5	29.1	28.2	27.5	26.3	25.8	25.1	24.5	24.2	22.1	22.1	21.7	21.6	21.2	20.5	20.5	20.4

C Appendix to Chapter 4

Decline of CFC Rules and Rise of IP Boxes: How the European Court of Justice Affects Tax Competition and Economic Distortions in Europe

C.1 The Devereux-Griffith model for calculating effective average tax rates

The methodology of Devereux and Griffith uses the framework of the neoclassical investment theory developed in the seminal papers of Jorgenson (1963), Samuelson (1964) and King and Fullerton (1984). Devereux and Griffith (1999) analyse the impact of taxes on an additional investment project (in our case acquiring a patent) that temporarily increases the capital stock of the company by one unit. For the investment, the company has to pay 1 unit in period t and earns $p+\delta$ units in period $t+1$. The term p denotes the real financial return of the investment and δ is the one-period economic depreciation of the investment. The inflation rate is denoted by π. The investment is dissolved in period $t+1$ which gives the company additional funds of $(1-\delta)\cdot(1+\pi)$. For the formulae's base case, it is assumed that the investment is financed by retained earnings. Assuming a nominal interest rate i (and real interest rate r), the pre-tax net present value (NPV) of this investment project in period t is given by:

$$R^{*} = -1 + \frac{1}{1+i} \cdot \left[(p+\delta)\cdot(1+\pi) + (1-\delta)\cdot(1+\pi)\right] = \frac{p-r}{1+r} \tag{C.1}$$

If corporate taxes are introduced, two modifications occur. First, the return $(p+\delta)\cdot(1+\pi)$ is taxed at the tax rate τ . Second, the company benefits from tax savings due to depreciation allowances for corporate income tax purposes whose net present value is A for the whole lifetime of the acquired asset. The after-tax NPV of the investment project is:

$$R^{dom} = -(1-A) + \frac{1}{1+i} \cdot \left[(p+\delta)\cdot(1+\pi)\cdot(1-\tau) + (1-\delta)\cdot(1+\pi)\cdot(1-A)\right] \tag{C.2}$$

The Effective Average Tax Rate ($EATR$) for a domestic investment is expressed as:

$$EATR^{dom} = \frac{R^{*} - R^{dom}}{\frac{p}{1+r}} \tag{C.3}$$

If the investment is conducted via a subsidiary in a source country S, the parent in the home country H receives the investment's after-tax NPV as a dividend. Apart from corporate

taxation in S, taxes on dividends have to be taken into account (σ_{HS}).[93] The NPV for the cross-border investment with a parent company in H and a subsidiary in S is:

$$R_{HS}^{cb} = -(1-A_S)\cdot(1-\sigma_{HS})+\frac{1-\sigma_{HS}}{1+i}\cdot\left[(p+\delta)\cdot(1+\pi)\cdot(1-\tau_s)+(1-\delta)\cdot(1+\pi)\cdot(1-A_S)\right] \quad \text{(C.4)}$$

Equation (C.4) assumes that the subsidiary finances its investment with retained earnings. In the base case of our computations, we assume financing with new equity. Following Devereux and Griffith (1999, p. 45) and Spengel et al. (2015, p. B-16), the subsequent term has to be added to equation (C.4) when financing with new equity:

$$F_{HS}^{cb,NewEquity} = -\frac{i\cdot\sigma_{HS}}{1+i} \quad \text{(C.5)}$$

In our robustness section, we additionally consider to finance the investment by debt. In this case, the parent in H receives interest payments i. Any remaining profits of the subsidiary are distributed as dividends to the parent. The parameter ω_{HS} comprises how cross-border interest payments are treated tax-wise. Following Devereux and Griffith (1999, p. 45) and Spengel et al. (2015, p. B-16), the subsequent term has to be added to equation (C.4) for computing the NPV of a debt financed cross-border investment:

$$F_{HS}^{cb,Debt} = -\sigma_{HS} + \frac{\sigma_{HS}\cdot[1+i\cdot(1-\tau_S)]-i\cdot\omega_{HS}}{1+i} \quad \text{(C.6)}$$

[93] See Spengel et al. (2015, p. B-15) for details how exemption and credit systems affect equation (C.4).

C.2 Additional Tables

Table C.1: IP boxes in EU/EEA countries for acquired IP from 2004 to 2014

Country	**Date of implementation**	**IP box rate in 2014 (%)**	**Main rate in 2014 (%)**	**Treatment of current expenses**
Cyprus	2012	2.5	12.5	Net income
France	2000	21.34	38.93	Net income
Hungary	2004	9.5	20.86	Gross income
Liechtenstein	2011	2.5	12.5	Net income
Luxembourg	2008	5.84	29.22	Net income
Malta	2010	0	35	Not deductible

Information on IP boxes is taken from Evers et al. (2015). The slight differences in the main rates can be explained by a different consideration of local taxes and surcharges. Our main rates are the same as reported in the publication of Spengel et al. (2015) conducted on behalf of the European Commission.

It should be noted that IP boxes differ with respect to the treatment of current expenses (e.g. depreciation). Hungary applies the "gross income approach" which means that expenses can be deducted at the normal tax rate whereas the corresponding income is only taxed at the reduced IP box rate. In contrast, the other countries apply the "net income approach" in which case expenses also have to be deducted at the IP rate. We take this difference into account.

Table C.2: CFC Rules in EU/EEA countries from 2004 to 2014

Country	Years	Applicability of CFC Rules					CFC Income and Relief for Double Taxation			Reaction to ECJ decision (year)
		Approach	Definition of Low Taxation			Unconditional Exclusion of EU/EEA-countries (irrespective from ECJ decision)	Approach	Taxation in Home Country	Availability of Tax Credits	
			Subsidiary Location	Parent Location	Threshold					
Denmark	2004-2006	Low Taxation	actual tax paid	hypothetical tax paid	75%	no	Transactional (including Royalties)	Aggregation with Parent's Income	yes	
	2007-2014	–				no	Entity	Aggregation with Parent's Income	yes	Extension to national situations (2007)
Finland	2004-2008	Jurisdictional	(actual tax paid)	(hypothetical tax paid)	60%	yes (tax treaty countries)	Entity	Separate Taxation	yes	
	2009-2014	Jurisdictional	(actual tax paid)	(hypothetical tax paid)	60%	yes (no EU/EEA country on blacklist)	Entity	Separate Taxation	yes	EEA-clause (2009)
France	2004-2005	Low Taxation	actual tax paid	hypothetical tax paid	66.67%	no	Entity	Aggregation with Parent's Income	yes	
	2006-2014	Low Taxation	actual tax paid	hypothetical tax paid	50%	no	Entity	Aggregation with Parent's Income	yes	EEA-clause (2005)
Germany	2004-2014	Low Taxation	actual tax paid		25%*	no	Transactional (including Royalties)	Aggregation with Parent's Income	yes (limited)**	EEA-clause (2008)
Greece	2014	Low Taxation	income tax rate		13%*	no	Entity	Aggregation with Parent's Income	yes	EEA-clause (2014)

Table C.2: CFC Rules in EU/EEA countries from 2004 to 2014 (cont.)

Country	Years	Applicability of CFC Rules					CFC Income and Relief for Double Taxation			Reaction to ECJ decision (year)
		Approach	Definition of Low Taxation			Unconditional Exclusion of EU/EEA-countries (irrespective from ECJ decision)	Approach	Taxation in Home Country	Availability of Tax Credits	
			Subsidiary Location	Parent Location	Threshold					
Hungary	2004-2010	Jurisdictional	(actual tax paid)		10.67%*	yes (tax treaty countries)	Entity	Aggregation with parent's income if the CFC income is distributed to the parent	no	EEA-clause (2008)
	2011-2014	Jurisdictional	(actual tax paid)		10%*	yes (tax treaty countries)	Entity	Aggregation with parent's income if the CFC income is distributed to the parent	no	
Iceland	2010-2014	Low Taxation	actual tax paid	hypothetical tax paid	66.67%	no	Entity	Aggregation with Parent's Income	no	EEA-clause (2010)
Italy	2004-2009	Jurisdictional				yes (only very specific EU situations in blacklist)	Entity	Separate taxation (at least 27%)	yes	
	2010-2014	Low Taxation	actual tax paid	hypothetical tax paid	50%	no	Entity	Separate taxation (at least 27%)	yes	EEA-clause (2010)
Norway	2004-2014	Low Taxation	actual tax paid	hypothetical tax paid	66.67%	no	Entity	Separate taxation	yes	EEA-clause (2007)
Portugal	2004-2014	Low Taxation	actual tax paid	hypothetical tax paid	60%	no	Entity	Aggregation with Parent's Income	yes	EEA-clause (2012)
Spain	2004-2014	Low Taxation	actual tax paid	hypothetical tax paid	75%	no	Transactional***	Aggregation with Parent's Income	no (tax is only deductible)	General Exemption (2003); EEA-clause (2008)

Table C.2: CFC Rules in EU/EEA countries from 2004 to 2014 (cont.)

Country	Years	Applicability of CFC Rules					CFC Income and Relief for Double Taxation			Reaction to ECJ decision (year)
		Approach	Definition of Low Taxation			Unconditional Exclusion of EU/EEA-countries (irrespective from ECJ decision)	Approach	Taxation in Home Country	Availability of Tax Credits	
			Subsidiary Location	Parent Location	Threshold					
Sweden	2004-2014	Jurisdictional	(actual tax paid)	(hypothetical tax paid)	(55%)	yes (only very specific EU situations in blacklist)	Entity	Aggregation with Parent's Income	yes	EEA-clause (2008)
United Kingdom	2004-2012	Low Taxation	actual tax paid	hypothetical tax paid	75%	no	Entity	Separate taxation	yes	EEA-clause (2007)
	2013-2014	Low Taxation	actual tax paid	hypothetical tax paid	75%	no	Transactional	Separate taxation	yes	

* Germany, Greece and Hungary have an absolute limitation in place.
** The tax credit is restricted to the corporate income tax (local profit tax is excluded).
*** Royalties are included from 2015 on.
Information is mainly gathered from the "European Tax Handbooks" which are published every year by the International Bureau for Fiscal Documentation (IBFD, 2014). Additional information regarding CFC regimes has been collected from two special issues of the International Fiscal Association (2001, 2013) and two publications of Deloitte (2012, 2014).

Table C.3: Number of countries for which CFC rules are applied (with narrow CFC application)

Country	Scenario 2 No IP Boxes				Scenario 4 IP Boxes implemented			
	2004	**2007**	**2010**	**2014**	**2004**	**2007**	**2010**	**2014**
Denmark	8	12	13	13	9	13	16	15
Finland	0	0	0	0	0	0	0	0
France	11	7	7	13	1	1	3	6
Germany	15	18	19	22	16	19	22	25
Greece	0	0	0	4	0	0	0	7
Hungary	0	0	0	0	0	0	0	0
Iceland	0	0	3	3	0	0	6	6
Italy	0	0	5	2	0	0	8	6
Norway	10	12	13	12	12	13	16	15
Portugal	11	13	16	22	12	14	19	25
Spain	0	0	0	0	0	0	0	0
Sweden	0	0	0	0	0	0	0	0
UK	13	15	16	7	14	16	19	10

Table C.4: Results for extended application of CFC rules

Year	$\overline{EATR^{dom}}$	$\overline{EATR^{out}}$	$\overline{SD(EATR^{out}_{H,S})}$	$\overline{EATR^{inb}}$	$\overline{SD(EATR^{inb}_{H,S})}$
Scenario 2:	**Extended CFC rules are in place and IP box regimes do not exist:**				
2004	25.57	31.13	6.51	31.13	7.07
2007	23.13	27.67	6.89	27.67	7.00
2010	22.00	25.60	6.56	25.60	6.29
2014	21.69	24.99	7.10	24.99	6.53
Scenario 4:	**Extended CFC rules are in place and IP box regimes exist:**				
2004	24.59	30.46	7.10	30.46	7.38
2007	21.95	26.76	7.48	26.76	7.32
2010	18.96	23.36	7.15	23.36	7.09
2014	18.03	22.37	7.40	22.37	7.26

Finland, Hungary, Italy (2004-2009) and Sweden (2004-2014) exclude EU/EEA-countries due to double tax treaties or the use of blacklists/whitelists. In this extended scenario, we abstract from these restrictions and assume that CFC rules are applicable in an EEA context. Additionally, royalties constitute CFC income in Spain from 2015 on. We assume in this extended scenario, that CFC rules have been applicable to royalty income since 2004.

Table C.5: Number of countries for which CFC rules are applied (broad CFC definition)

Country	Scenario 2 No IP Boxes				Scenario 4 IP Boxes implemented			
	2004	**2007**	**2010**	**2014**	**2004**	**2007**	**2010**	**2014**
Denmark	8	12	13	13	9	13	16	15
Finland	8	7	7	3	9	9	11	6
France	11	7	7	13	1	1	3	6
Germany	15	18	19	22	16	19	22	25
Greece	0	0	0	4	0	0	0	7
Hungary	0	2	3	2	0	2	5	5
Iceland	0	0	3	3	0	0	6	6
Italy	5	7	5	2	6	9	8	6
Norway	10	12	13	12	12	13	16	15
Portugal	11	13	16	22	12	14	19	25
Spain	20	22	20	22	21	23	23	25
Sweden	2	4	5	2	3	5	8	6
UK	13	15	16	7	14	16	19	10

Table C.6: Results for a pre-tax return of 15%

Year	$\overline{EATR^{dom}}$	$\overline{EATR^{out}}$	$\overline{SD(EATR^{out}_{H,S})}$	$\overline{EATR^{inb}}$	$\overline{SD(EATR^{inb}_{H,S})}$
Scenario 1:	**CFC rules are not applicable and IP box regimes do not exist:**				
2004	25.32	29.54	7.56	29.54	6.21
2007	22.79	25.55	7.80	25.55	5.47
2010	21.63	23.28	7.74	23.28	4.34
2014	21.29	22.62	8.00	22.62	4.05
Scenario 2:	**CFC rules are in place and IP box regimes do not exist:**				
2004	25.32	30.17	6.86	30.17	6.32
2007	22.79	26.46	7.21	26.46	6.08
2010	21.63	24.52	6.93	24.52	5.39
2014	21.29	23.99	7.34	23.99	5.59
Scenario 3:	**CFC rules are not applicable and IP box regimes exist:**				
2004	24.29	28.68	8.29	28.68	6.39
2007	21.53	24.43	8.81	24.43	5.67
2010	18.52	20.30	9.01	20.30	4.62
2014	17.60	19.28	9.32	19.28	4.53
Scenario 4:	**CFC rules are in place and IP box regimes exist:**				
2004	24.29	29.35	7.65	29.35	6.62
2007	21.53	25.39	8.07	25.39	6.35
2010	18.52	21.98	7.74	21.98	6.07
2014	17.60	21.05	7.95	21.05	6.13

Note: $\overline{EATR^{dom}}$ corresponds to the (unweighted) average of the 31 country-specific $EATR^{dom}$. Each country faces 30 outbound and inbound possibilities. The two columns $\overline{EATR^{out}}$ and $\overline{EATR^{inb}}$ show the mean over all cross-border EATRs ($31 \times 30 = 930$ cases). The two remaining columns show the mean standard deviation over the 31 countries for outbound and inbound investments.

Table C.7: Results for a pre-tax return of 25%

Year	$\overline{EATR^{dom}}$	$\overline{EATR^{out}}$	$\overline{SD(EATR^{out}_{H,S})}$	$\overline{EATR^{inb}}$	$\overline{SD(EATR^{inb}_{H,S})}$
Scenario 1:	**CFC rules are not applicable and IP box regimes do not exist:**				
2004	25.71	29.67	7.31	29.67	5.81
2007	23.34	25.93	7.51	25.93	5.12
2010	22.22	23.76	7.34	23.76	4.06
2014	21.93	23.18	7.70	23.18	3.79
Scenario 2:	**CFC rules are in place and IP box regimes do not exist:**				
2004	25.71	30.32	6.61	30.32	5.95
2007	23.34	26.76	7.03	26.76	5.72
2010	22.22	24.90	6.57	24.90	5.02
2014	21.93	24.39	7.11	24.39	5.18
Scenario 3:	**CFC rules are not applicable and IP box regimes exist:**				
2004	24.78	28.89	7.89	28.89	5.98
2007	22.20	24.91	8.20	24.91	5.31
2010	19.22	20.90	8.50	20.90	4.34
2014	18.29	19.87	8.98	19.87	4.26
Scenario 4:	**CFC rules are in place and IP box regimes exist:**				
2004	24.78	29.55	7.27	29.55	6.21
2007	22.20	25.77	7.63	25.77	5.94
2010	19.22	22.48	7.28	22.48	5.69
2014	18.29	21.54	7.64	21.54	5.76

Note: $\overline{EATR^{dom}}$ corresponds to the (unweighted) average of the 31 country-specific $EATR^{dom}$. Each country faces 30 outbound and inbound possibilities. The two columns $\overline{EATR^{out}}$ and $\overline{EATR^{inb}}$ show the mean over all cross-border EATRs ($31 \times 30 = 930$ cases). The two remaining columns show the mean standard deviation over the 31 countries for outbound and inbound investments.

Table C.8: Results for optimal financing of subsidiary (retained earnings, new equity or debt)

Year	$\overline{EATR^{dom}}$	$\overline{EATR^{out}}$	$\overline{SD(EATR^{out}_{H,S})}$	$\overline{EATR^{inb}}$	$\overline{SD(EATR^{inb}_{H,S})}$
Scenario 1:	**CFC rules are not applicable and IP box regimes do not exist:**				
2004	25.57	26.70	6.50	26.70	4.52
2007	23.13	23.44	6.51	23.44	3.97
2010	22.00	21.67	6.43	21.67	3.39
2014	21.69	21.21	6.52	21.21	3.25
Scenario 2:	**CFC rules are in place and IP box regimes do not exist:**				
2004	25.57	27.50	5.91	27.50	5.05
2007	23.13	24.42	6.02	24.42	5.06
2010	22.00	22.89	5.73	22.89	4.70
2014	21.69	22.52	5.93	22.52	5.03
Scenario 3:	**CFC rules are not applicable and IP box regimes exist:**				
2004	24.59	25.93	7.17	25.93	4.64
2007	21.95	22.46	7.42	22.46	4.10
2010	18.96	19.07	7.84	19.07	3.55
2014	18.03	18.23	8.21	18.23	3.54
Scenario 4:	**CFC rules are in place and IP box regimes exist:**				
2004	24.59	26.73	6.59	26.73	5.24
2007	21.95	23.49	6.81	23.49	5.28
2010	18.96	20.74	6.71	20.74	5.35
2014	18.03	20.02	6.88	20.02	5.48

Note: $\overline{EATR^{dom}}$ corresponds to the (unweighted) average of the 31 country-specific $EATR^{dom}$. Each country faces 30 outbound and inbound possibilities. The two columns $\overline{EATR^{out}}$ and $\overline{EATR^{inb}}$ show the mean over all cross-border EATRs ($31 \times 30 = 930$ cases; each case represents the most beneficial financing option). The two remaining columns show the mean standard deviation over the 31 countries for outbound and inbound investments.

D Appendix to Chapter 5

Vetoing and Inaugurating Policy Like Others Do: Evidence on Spatial Interactions in Voter Initiatives

Figure D.1: Geographical distribution of initiatives in German towns from 2002 to 2014

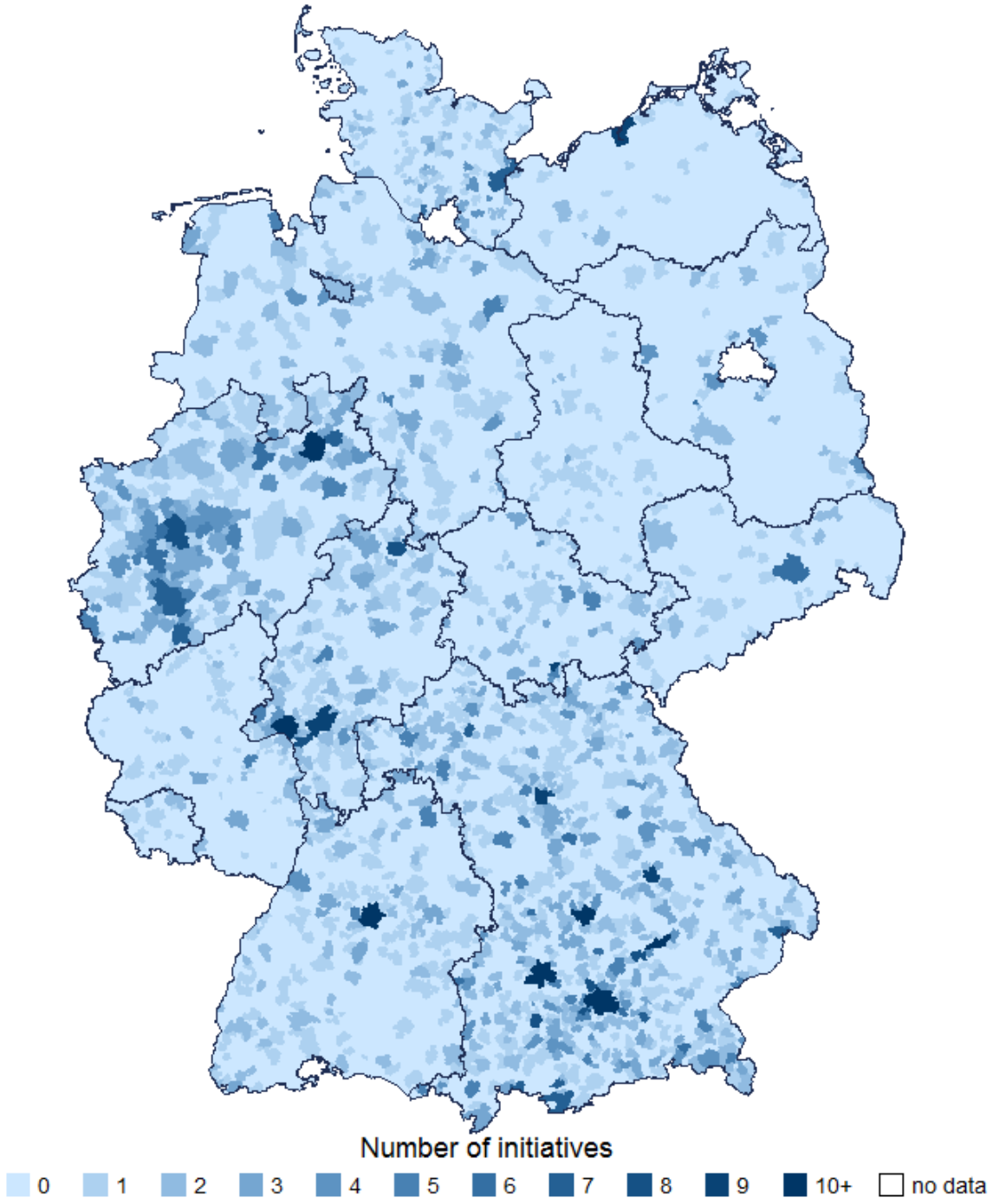


Table D.1: Institutions and summary statistics across states, 2002-2014

STATE	Year direct democracy adopted	Signature requirement (mean) in % of pop.	(min-max)	Number of initiatives	Total annual population (mean)	Unemployment rate (mean)	Share of population over 65 (mean)	Left share (mean)	Number of towns in the sample
Baden-Württemberg	1956	0.0983	(0.0333-0.1)	256	9671	0.0335	0.181	0.378	1112
Bayern	1995	0.0983	(0.03-0.1)	1272	6083	0.0350	0.181	0.295	2056
Brandenburg	1993	0.1	(0.1)	80	5514	0.120	0.206	0.602	929
Hessen	1993	0.0985	(0.03-0.1)	250	14160	0.0492	0.201	0.484	430
Mecklenburg-Vorpommern	1993	0.0997	(0.0196-0.1)	49	1975	0.134	0.188	0.507	1829
Niedersachsen	1996	0.0999	(0.0708-0.1)	223	7671	0.0563	0.200	0.487	1061
Nordrhein-Westfalen	1994	0.080	(0.03-0.1)	426	45121	0.0577	0.191	0.446	406
Rheinland-Pfalz	1994	0.130	(0.0601-0.15)	102	1748	0.0412	0.201	0.434	2311
Saarland	1997	0.1	(0.1)	13	19777	0.0532	0.217	0.527	52
Sachsen	1990	0.1433	(0.1-0.15)	116	8552	0.108	0.225	0.428	1042
Sachsen-Anhalt	1990	0.1417	(0.0043-0.15)	109	3215	0.137	0.205	0.565	2311
Schleswig-Holstein	1990	0.0999	(0.04-0.1)	232	2519	0.0504	0.192	0.468	1142
Thüringen	1993	0.0887	(0.034-0.1)	131	2396	0.091	0.202	0.511	1032

Notes: The data on observed initiatives (column: 5) is available at `http://www.mehr-demokratie.de/bb-datenbank.html`. The data on the signature requirement (columns: 3-4) is collected from the municipal codes. The control variables in columns 6, 8 and 9 come from the Federal Statistical Office ("Regionaldatenbank"). The data on unemployment (column 7) is taken from the Bundesagentur für Arbeit.

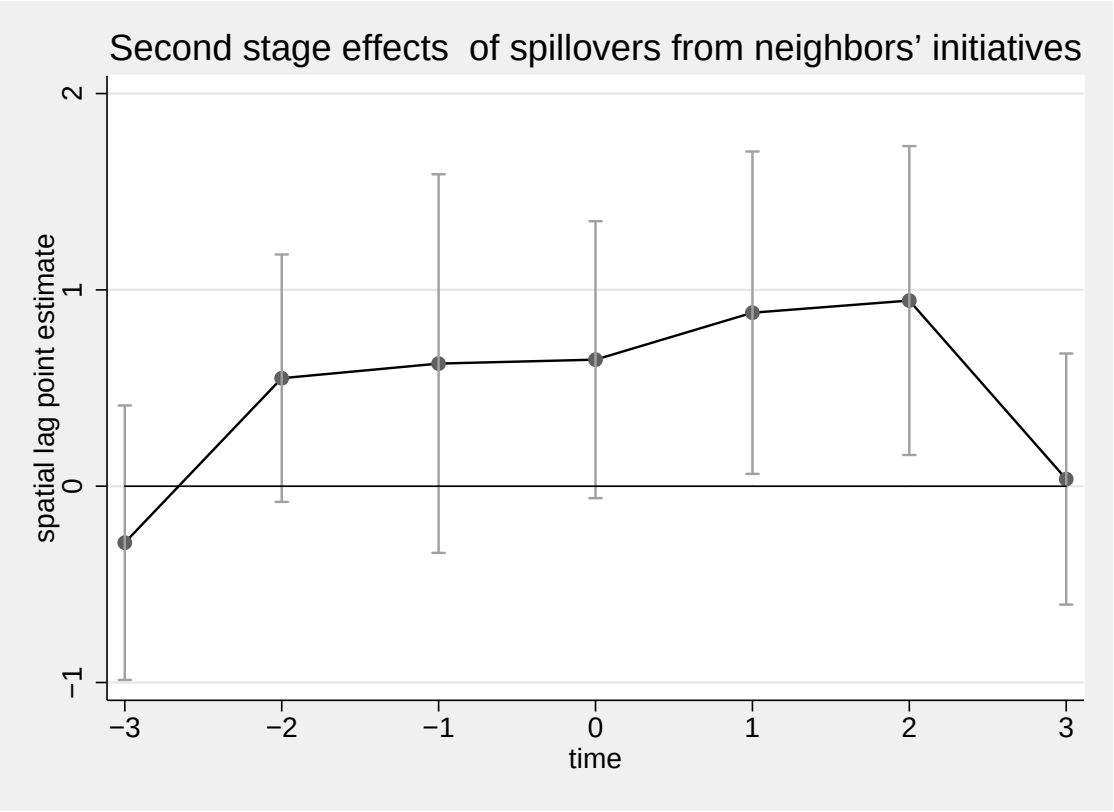
Table D.2: First-stage results of Table 5.1 - determinants of citizen-initiatives

	(1)	(2)	(3)	(4)	(5)
VARIABLE	Spatial lag citizen initiatives				
	t		$t-1$	$t-2$	$t-3$
$\sum_{j\neq i}^{N}(w_j \times$signature requirement $j)$	-0.1233***	-0.1366***	-0.0677***	-0.1374***	-0.1876***
	(0.0169)	(0.0341)	(0.0245)	(0.0185)	(0.0306)
$\sum_{j\neq i}^{N}(w_j \times$ln population $j)$	0.0022	0.0051*	0.0017	-0.0017	-0.0014
	(0.0032)	(0.0030)	(0.0032)	(0.0025)	(0.0026)
$\sum_{j\neq i}^{N}(w_j \times$unemployment share $j)$	-0.0876***	-0.0812**	-0.1363***	-0.1095***	-0.1706***
	(0.0308)	(0.0315)	(0.0310)	(0.0331)	(0.0419)
$\sum_{j\neq i}^{N}(w_j \times$share of population over 65 $j)$	0.1997**	0.1423	0.1669*	0.3585***	0.3222**
	(0.0866)	(0.0872)	(0.0950)	(0.1021)	(0.1426)
$\sum_{j\neq i}^{N}(w_j \times$left share $j)$	-0.0125	-0.0149	-0.0032	0.0121	-0.0092
	(0.0107)	(0.0135)	(0.0108)	(0.0132)	(0.0139)
Signature requirement i		0.0222	-0.0319	0.0007	-0.0007
		(0.0320)	(0.0253)	(0.0223)	(0.0265)
Ln population i		0.0025	0.0040*	0.0022	-0.0006
		(0.0019)	(0.0024)	(0.0027)	(0.0035)
Unemployment rate i		-0.0044	0.0092	-0.0036	0.0457***
		(0.0085)	(0.0093)	(0.0115)	(0.0150)
Share of population over 65 i		0.0037	0.0063	0.0119	0.0081
		(0.0048)	(0.0063)	(0.0077)	(0.0087)
Left share i		-0.0048*	-0.0041	0.0061	0.0009
		(0.0026)	(0.0033)	(0.0052)	(0.0052)
Observations	102,878	101,670	90,990	81,283	71,701
R-squared	0.0763	0.0790	0.0811	0.0844	0.0964
Number of municipalities	11,149	11,128	9,940	9,723	9,435

*** p<0.01, ** p<0.05, * p<0.1

Notes: The table presents the results for the OLS first stage estimation of the model specified in equation 5.2. All regressions include time and municipal fixed effects. Standard errors are clustered at the county level.

Figure D.2: Spillover effects over time



This graph shows the point estimates with 95% confidence intervals of the spatial lag estimated from equation (5.1). Spatial lags contain municipalities within a radius of 50 km. All regressions include time, municipal fixed effects and the control variables as defined before. Standard errors are clustered at the county level.

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