Political Fragmentation and Fiscal Policy

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Abstract

This paper examines the link between political fragmentation and tax policy. A model of government is presented where an n-member coalition chooses revenue and expenditure policies. I derive the response of tax policy to a change in the number of coalition partners. The model predicts that an increase in the number of parties leads to *(i)* lower taxes; *(ii)* lower expenditure; and *(iii)* lower social security transfers. These results are counter to the conventional wisdom that countries with more fragmented governments have larger public sectors. I test the model on a large panel of developed countries, and all three of the model's predictions are supported. My results have coefficients significantly different from, and of opposing signs to, the conventional wisdom. I estimate that moving from a two- to three-party legislature lowers tax revenue by 6.7%, expenditure by 9.5%, and transfers by 5.4%. These results are robust to a host of potentially important variables such as the ideological composition of government, changes in the tax base, and electoral cycle effects.

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1 Introduction

The paper investigates how legislative fragmentation affects the size of government. The conventional wisdom (cf. Weingast *et al.* (1981) Lijphart (1984), Austen-Smith (2000), Milesi-Ferretti *et al.* (2002)) is that a larger number of political parties leads to an increase in a country's taxes, spending, and transfers.

This paper makes both theoretical and empirical contributions that challenge the conventional wisdom. I model the government's choice of tax rates, public good provision, and level of transfers as a function of n coalition partners. Unlike many models that assume an exogenous revenue requirement, the model allows government income and expenditure to be endogenous. The model predicts that an increase in coalition size leads to lower taxes, spending, and transfers. All three of these predictions are supported in data from a large panel of OECD countries. I estimate that moving from a two- to three-party legislature lowers tax revenue by 6.7%, expenditure by 9.5%, and transfers by 5.4%

I first replicate the relationship predicted by the conventional wisdom by excluding country fixed effects. Including fixed effects completely changes the results. Rather than a positive relationship, I find negative and statistically significant coefficients. These results are robust to a host of potentially important variables such as the ideological composition of government, changes in the tax base, and electoral cycle effects.

In 2008 the share of the United States' total government expenditure over GDP was 37% while the average for EU countries was 47%. Electoral incentives facing governments can help explain this variation. The correspondence between politics and taxes is crucial in determining society's preferred size of government. This paper investigates the effect of increased legislative fragmentation (as measured by the seats-weighted number of parties in parliament) on tax policy, and thus the paper contributes to understanding the effects of secular fragmentation. Additionally, the paper has implications for policies to increase the number of political parties, such as the 2011 electoral reform referendum in the UK.

Research on the link between political science and tax policy, and the debate about the 'varieties of capitalism' (Hall and Soskice, 2001), is not new. The empirical work of Lijphart (1984, 1999) showed statistically significant relationships between the number of political parties and tax policies. Lijphart concluded that fragmentation leads to broad, consensus-based coalitions which cause governments to become "kindler, gentler". Although investigating the distinct question about the link between tax policy and electoral systems, Milesi-Ferretti, Perotti and Rostagno (2002) show that the proportionality of electoral systems increases public spending and transfers, and that these results hold even within the subset of proportional representative (PR) systems. Kontopoulos and Perotti (1999) were confident enough that fragmentation increased expenditure to perform a one-sided test on their coefficient of interest.

Theoretical models have drawn similar conclusions. The 'veto player' model (Tsebelis, 2002) focuses on the ability of a coalition of $n \geq 1$ 'veto players' to change a policy. The intersection of sets of desirable policies is defined as the 'winset' for this coalition. It is straight-forward to understand the logic that the winset is decreasing in n. One way to 'grease the wheels' is by increasing the payoffs to veto players, which requires higher taxes in equilibrium. Therefore this alternative framework draws the same conclusion as the conventional wisdom: increasing the number of parties makes agreement more difficult, and thus higher side-payments (political pork) are necessary.

The empirical analysis of this paper contradicts this view. Pettersson-Lidbom (2012) finds similar results from two quasi-experiments in Finland and Sweden. This paper is the first to reach similar conclusions both theoretically and with a dataset on a large number of developed countries. Although the empirical section may not be as cleanly identified as a small quasi-experimental setting, the inclusion of many countries in the analysis reduces concerns about external validity.

2 Theoretical Model

The research question of this paper is how a change in the size of an n-member coalition affects tax policy. More generally, I ask how the collective outcomes for a group are affected by the size of that group. This setting is well-suited to analysis as a common pool problem.

Most public finance common pool models are driven by the disconnect of taxing power and spending power, cf. Persson and Tabellini (2002). In these models, decentralized units choose expenditure levels and the central government raises taxes to meet the liabilities that fall due. Each decentralized unit, knowing that they will only have to pay a fraction of an additional dollar of expenditure, increases spending.

This approach is equivalent to the usual public finance assumption of governments having to raise an *exogenous* amount of revenue. This assumption rules out the possibility of e.g. governments increasing taxes if spending suddenly becomes more desirable.

I will model the coalition's choice of policy as a common pool problem. However the coalition will simultaneously choose income and expenditure policies, and therefore trade off the marginal benefits and marginal costs of taxation. In this framework taxes and expenditure become *endogenous*.

There are two types of public good, G_1 and G_2. The first are the traditional pure public good that benefits all of society, e.g. national defence, weather forecasts. The second are "local public goods" which are to the benefit of one large group rather than the general public, e.g. agricultural subsidies, social security transfers. A simpler version of the model with a single type of public good, and where taxes are determined residually, can be found in Chapter 7 of Persson and Tabellini (2002).

A government consists of $i = 1, \ldots, n$ political groups. Politician i in government optimizes group i's welfare. This is the sum of the group's after tax income $(1-\tau)Y_i$, an increasing and concave function f of the pure public good G_1, and an increasing and concave function g of group i's local public good G_2. For convenience I assume that all n parties split G_2 equally, but I suspect that the results hold for more general decreasing functions of n. Formally, given a national income M, the politician optimizes the following problem:

$$\max_{G_1, G_2, \tau} (1-\tau)Y_i + f(G_1) + g\left(\frac{G_2}{n}\right)$$
$$\text{s.t. } G_1 + G_2 \leq \tau M$$

This is a tractable formulation that departs from much of the previous literature on policy formation. For instance, the Weingast, Shepsle and Johnsen (1981) 'Law of $1/n$' assumes a norm of reciprocity in US Congress, which "facilitates a process of mutual support and logrolling". This increases inefficient spending in the n number of represented districts. In contrast, I make no such assumption. Rather, this formulation is intuitively very simple: it is a welfare maximization problem. An n-member coalition is formed, this coalition commands a majority, and they agree to maximize the welfare of the groups that comprise the coalition. The assumption of particular norms can of course facilitate alternative equilibrium outcomes. Within the group, no solution can Pareto dominate the outcome offered by this formulation.

Assuming the budget constraint holds with equality, any two choice variables will determine the third. Therefore I define α as the fraction of tax revenue devoted to G_2, and in so doing we can condense the problem into a single maximand in two variables (α and τ) and three parameters (Y_i, M, and n):

$$\max_{\alpha,\tau} \Pi = (1-\tau)Y_i + f\left((1-\alpha)\tau M\right) + g\left(\frac{\alpha\tau M}{n}\right)$$

This leads to the following first-order conditions:

$$\frac{\partial \Pi}{\partial \alpha} : -\tau M f'\left((1-\alpha)\tau M\right) + \frac{\tau M}{n} g'\left(\frac{\alpha\tau M}{n}\right) = 0 \tag{F1}$$

$$\frac{\partial \Pi}{\partial \tau} : -Y_i + (1-\alpha) M f'\left((1-\alpha)\tau M\right) + \frac{\alpha M}{n} g'\left(\frac{\alpha\tau M}{n}\right) = 0 \tag{F2}$$

and the following set of second-order and cross-partial derivatives:

$$\begin{aligned}
\frac{\partial F1}{\partial \alpha} =& (\tau M)^2 f''\left((1-\alpha)\tau M\right) + \left(\frac{\tau M}{n}\right)^2 g''\left(\frac{\alpha\tau M}{n}\right) < 0 \\
=& (\tau M)^2 \left[f''\left((1-\alpha)\tau M\right) + \left(\frac{1}{n^2}\right) g''\left(\frac{\alpha\tau M}{n}\right)\right] < 0 && (1) \\
\frac{\partial F1}{\partial \tau} =& -M\left[f'\left((1-\alpha)\tau M\right) + (1-\alpha)\tau M f''\left((1-\alpha)\tau M\right)\right] \\
&+ \frac{M}{n}\left[g'\left(\frac{\alpha\tau M}{n}\right) + \frac{\alpha\tau M}{n} g''\left(\frac{\alpha\tau M}{n}\right)\right] && (2) \\
\frac{\partial F2}{\partial \alpha} =& \frac{\partial F1}{\partial \tau} \\
\frac{\partial F2}{\partial \tau} =& \left((1-\alpha)M\right)^2 f''\left((1-\alpha)\tau M\right) + \left(\frac{\alpha M}{n}\right)^2 g''\left(\frac{\alpha\tau M}{n}\right) < 0 && (3)
\end{aligned}$$

The comparative statics addressing how policy responds to fragmentation will also require differentiating the first-order conditions (F1) and (F2) with respect to n:

$$\frac{\partial F1}{\partial n} = -\left(\frac{\tau M}{n^2}\right)\left(g'\left(\frac{\alpha\tau M}{n}\right) + \frac{\alpha\tau M}{n}g''\left(\frac{\alpha\tau M}{n}\right)\right) \tag{4}$$

$$\frac{\partial F2}{\partial n} = -\left(\frac{\alpha M}{n^2}\right)\left(g'\left(\frac{\alpha\tau M}{n}\right) + \frac{\alpha\tau M}{n}g''\left(\frac{\alpha\tau M}{n}\right)\right) \tag{5}$$

It is instructive at this point to note an assumption of the model. Suppose for now that α were pre-determined and the government's only choice variable were τ. We can see how n affects taxes by computing the sign of $\dfrac{\partial^2\Pi}{\partial\tau\partial n}$, i.e. computing the sign of Equation (5). Clearly $-\frac{\alpha M}{n^2}$ is negative. As g is concave, its first derivative is positive and its second is negative. The sign of the overall derivative thus depends on the sign of $g'\left(\frac{\alpha\tau M}{n}\right) + \frac{\alpha\tau M}{n}g''\left(\frac{\alpha\tau M}{n}\right)$.

There is some ambiguity on this condition. My results require that the sign here is strictly positive. Note that this requirement, that $g'(x) + xg''(x) > 0$, is true for a broad class of concave functions, such as $g(x) = x^\beta$ where $\beta < 0$. To proceed, I assume that $g'(x) + xg''(x) > 0$. Under this assumption we may conclude that Equation (5) is negative: an increase in n will lower taxes. Similar conclusions can be drawn about α from Equation (4).

Comparative statics are of course more complex for the multivariate optimization problem. This requires us to account for cross-partial effects of τ on α, etc. Firstly, given that both of the first-order conditions (F1) and (F2) will equal zero in equilibrium, we can use the Chain Rule to note that:

$$\begin{bmatrix} \frac{\partial F1}{\partial\alpha} & \frac{\partial F1}{\partial\tau} \\ \frac{\partial F2}{\partial\alpha} & \frac{\partial F2}{\partial\tau} \end{bmatrix} \begin{bmatrix} \frac{\partial\alpha}{\partial n} \\ \frac{\partial\tau}{\partial n} \end{bmatrix} = -\begin{bmatrix} \frac{\partial F1}{\partial n} \\ \frac{\partial F2}{\partial n} \end{bmatrix} \tag{6}$$

With these derivatives, we have a system of equations that implicitly define how our variables of interest are affected by n:

$$\begin{bmatrix} \dfrac{\partial \alpha}{\partial n} \\ \dfrac{\partial \tau}{\partial n} \end{bmatrix} = - \begin{bmatrix} \dfrac{\partial F1}{\partial \alpha} & \dfrac{\partial F1}{\partial \tau} \\ \dfrac{\partial F2}{\partial \alpha} & \dfrac{\partial F2}{\partial \tau} \end{bmatrix}^{-1} \begin{bmatrix} \dfrac{\partial F1}{\partial n} \\ \dfrac{\partial F2}{\partial n} \end{bmatrix} \tag{7}$$

Our first key comparative static is $\dfrac{\partial \alpha}{\partial n}$, how the proportion of resources for the targeted local public good respond to a change in fragmentation. A positive coefficient here indicates that more 'pork' occurs with more parties. We can calculate the sign of this derivative by applying Cramer's Rule to Equation (7):

$$\frac{\partial \alpha}{\partial n} = - \frac{\dfrac{\partial F1}{\partial n}\dfrac{\partial F2}{\partial \tau} - \dfrac{\partial F1}{\partial \tau}\dfrac{\partial F2}{\partial n}}{\dfrac{\partial F1}{\partial \alpha}\dfrac{\partial F2}{\partial \tau} - \dfrac{\partial F1}{\partial \tau}\dfrac{\partial F2}{\partial \alpha}} \tag{8}$$

The numerator of this comparative static is $\left(\dfrac{\partial F1}{\partial n}\dfrac{\partial F2}{\partial \tau}\right) - \left(\dfrac{\partial F1}{\partial \tau}\dfrac{\partial F2}{\partial n}\right)$. For the first two terms, we know that

$$\frac{\partial F1}{\partial n} = -\left(\frac{\tau M}{n^2}\right)\left(g'\left(\frac{\alpha \tau M}{n}\right) + \frac{\alpha \tau M}{n} g''\left(\frac{\alpha \tau M}{n}\right)\right) \tag{9}$$

$$\begin{aligned} \frac{\partial F2}{\partial \tau} &= ((1-\alpha)M)^2 f''((1-\alpha)\tau M) + \left(\frac{\alpha M}{n}\right)^2 g''\left(\frac{\alpha \tau M}{n}\right) \\ &= (M)^2 \left[(1-\alpha)^2 f''((1-\alpha)\tau M) + \left(\frac{\alpha}{n}\right)^2 g''\left(\frac{\alpha \tau M}{n}\right)\right] \end{aligned} \tag{10}$$

Therefore the product $\dfrac{\partial F1}{\partial n}\dfrac{\partial F2}{\partial \tau}$ equals

$$-\left(\tfrac{\tau M^3}{n^2}\right)\left[(1-\alpha)^2 f''((1-\alpha)\tau M) + \left(\tfrac{\alpha}{n}\right)^2 g''\left(\tfrac{\alpha \tau M}{n}\right)\right]\left[g'\left(\tfrac{\alpha \tau M}{n}\right) + \tfrac{\alpha \tau M}{n} g''\left(\tfrac{\alpha \tau M}{n}\right)\right] \tag{11}$$

For the latter two terms in the numerator, $\dfrac{\partial F1}{\partial \tau}$ and $\dfrac{\partial F2}{\partial n}$, we know that

$$\begin{aligned}\frac{\partial F1}{\partial \tau} =& - M\left[f'\left((1-\alpha)\tau M\right) + (1-\alpha)\tau M f''\left((1-\alpha)\tau M\right)\right] \\ &+ \frac{M}{n}\left[g'\left(\frac{\alpha\tau M}{n}\right) + \frac{\alpha\tau M}{n} g''\left(\frac{\alpha\tau M}{n}\right)\right] \end{aligned} \tag{12}$$

but from (F1) it is clear that $f'\left((1-\alpha)\tau M\right) = \left(\frac{1}{n}\right) g'\left(\frac{\alpha\tau M}{n}\right)$. Substituting this into Equation (12), it follows that

$$\begin{aligned}\frac{\partial F1}{\partial \tau} =& - M\left[\left(\frac{1}{n}\right) g'\left(\frac{\alpha\tau M}{n}\right) + (1-\alpha)\tau M f''\left((1-\alpha)\tau M\right)\right] \\ &+ \frac{M}{n}\left[g'\left(\frac{\alpha\tau M}{n}\right) + \frac{\alpha\tau M}{n} g''\left(\frac{\alpha\tau M}{n}\right)\right] \end{aligned} \tag{13}$$

$$= - M\left[(1-\alpha)\tau M f''\left((1-\alpha)\tau M\right)\right] + \frac{M}{n}\left[\frac{\alpha\tau M}{n} g''\left(\frac{\alpha\tau M}{n}\right)\right] \tag{14}$$

and therefore

$$\frac{\partial F1}{\partial \tau} = (-\tau M^2)\left\{(1-\alpha) f''\left((1-\alpha)\tau M\right) - \left(\frac{1}{n}\right)^2 \alpha g''\left(\frac{\alpha\tau M}{n}\right)\right\} \tag{15}$$

Finally,

$$\frac{\partial F2}{\partial n} = -\left(\frac{\alpha M}{n^2}\right)\left(g'\left(\frac{\alpha\tau M}{n}\right) + \frac{\alpha\tau M}{n} g''\left(\frac{\alpha\tau M}{n}\right)\right) \tag{16}$$

Combining these two together, and temporarily omitting arguments of functions for clarity, we get

$$\frac{\partial F1}{\partial \tau}\frac{\partial F2}{\partial n} = \left(\tfrac{\tau M^3}{n^2}\right)(\alpha)\left[(1-\alpha) f''(.) + \alpha\left(\tfrac{1}{n}\right)^2 g''(.)\right]\left[g'(.) + \tfrac{\alpha\tau M}{n} g''(.)\right] \tag{17}$$

Formulating the full numerator as the difference between Equation (11) and Equation (17)

$$\frac{\partial F1}{\partial n}\frac{\partial F2}{\partial \tau} - \frac{\partial F1}{\partial \tau}\frac{\partial F2}{\partial n} = -\left(\tfrac{\tau M^3}{n^2}\right)\left[(1-\alpha)^2 f''(.) + \left(\tfrac{\alpha}{n}\right)^2 g''(.) + \alpha(1-\alpha) f''(.) + \left(\tfrac{\alpha}{n}\right)^2 g''(.)\right] \tag{18}$$

$$= \underbrace{-\left(\frac{\tau M^3}{n^2}\right)}_{<0}\left[\underbrace{(1-\alpha)f''(.)}_{<0} + \underbrace{2\left(\frac{\alpha}{n}\right)^2 g''(.)}_{<0}\right] \tag{19}$$

$$> 0 \tag{20}$$

The denominator of this comparative static is also the difference of two products. In terms of the first product, we know that

$$\frac{\partial F1}{\partial \alpha} = (tM)^2\left[f''\left((1-\alpha)\tau M\right) + \left(\frac{1}{n^2}\right) g''\left(\frac{\alpha\tau M}{n}\right)\right] \tag{21}$$

$$\frac{\partial F2}{\partial \tau} = (M)^2\left[(1-\alpha)^2 f''\left((1-\alpha)\tau M\right) + \left(\frac{\alpha}{n}\right)^2 g''\left(\frac{\alpha\tau M}{n}\right)\right] \tag{22}$$

Omitting the arguments of functions for clarity, we conclude that

$$\frac{\partial F1}{\partial \alpha}\frac{\partial F2}{\partial \tau} = (\tau^2 M^4)\left\{(1-\alpha)^2\left[f''(.)\right]^2 + \left(\tfrac{1}{n}\right)^2\left(\alpha^2 + (1-\alpha)^2\right)\left[f''(.)\right]\left[g''(.)\right] + \alpha^2\left(\tfrac{1}{n}\right)^4\left[g''(.)\right]\right\} \tag{23}$$

In terms of the second product in the denominator, we have already seen from Equation (2) that

$$\frac{\partial F1}{\partial \tau} = (-\tau M^2)\left\{(1-\alpha)f''\left((1-\alpha)\tau M\right) - \left(\frac{1}{n}\right)^2 \alpha g''\left(\frac{\alpha\tau M}{n}\right)\right\} \tag{24}$$

Because $\frac{\partial F1}{\partial \tau} = \frac{\partial F2}{\partial \alpha}$ it follows that $\frac{\partial F1}{\partial \tau}\frac{\partial F2}{\partial \alpha} = \left(\frac{\partial F1}{\partial \tau}\right)^2$. Again omitting the arguments of functions for clarity, we conclude that

$$\frac{\partial F1}{\partial \tau}\frac{\partial F2}{\partial \alpha} = (\tau^2 M^4)\left\{(1-\alpha)^2\left[f''(.)\right]^2 - 2\alpha(1-\alpha)\left(\tfrac{1}{n}\right)^2\left[f''(.)\right]\left[g''(.)\right] + \left(\tfrac{1}{n}\right)^4\alpha^2\left[g''(.)\right]^2\right\} \tag{25}$$

The denominator is equal to Equation (23) less Equation (25). This equals:

$$\frac{\partial F1}{\partial \alpha}\frac{\partial F2}{\partial \tau} - \frac{\partial F1}{\partial \tau}\frac{\partial F2}{\partial \alpha} = \underbrace{\left(\frac{\tau^2 M^4}{n^2}\right)}_{>0} \underbrace{\left[f''\left((1-\alpha)\tau M\right)\right]}_{<0} \underbrace{\left[g''\left(\frac{\alpha\tau M}{n}\right)\right]}_{<0} \tag{26}$$

Putting this all together we find that

$$\frac{\partial \alpha}{\partial n} = -\frac{\underbrace{-\left(\frac{\tau M^3}{n^2}\right)}_{<0}\left[\underbrace{(1-\alpha)}_{>0}\underbrace{f''\left((1-\alpha)\tau M\right)}_{<0} + 2\underbrace{\left(\frac{\alpha}{n}\right)^2}_{>0}\underbrace{g''\left(\frac{\alpha\tau M}{n}\right)}_{<0}\right]}{\underbrace{\left(\frac{\tau^2 M^4}{n^2}\right)}_{>0} \underbrace{\left[f''\left((1-\alpha)\tau M\right)\right]}_{<0} \underbrace{\left[g''\left(\frac{\alpha\tau M}{n}\right)\right]}_{<0}} \tag{27}$$

$$= \frac{(1-\alpha)f''\left((1-\alpha)\tau M\right) + 2\left(\frac{\alpha}{n}\right)^2 g''\left(\frac{\alpha\tau M}{n}\right)}{(\tau M)\left(f''\left((1-\alpha)\tau M\right)\right)\left(g''\left(\frac{\alpha\tau M}{n}\right)\right)} \tag{28}$$

$$\therefore \frac{\partial \alpha}{\partial n} < 0$$

As suggested by the univariate example, this coefficient is negative. Both numerator and denominator are positive, and the negative sign before the fraction ensures a negative relationship.

The next key comparative static is $\frac{\partial \tau}{\partial n}$, how the tax rate responds to a change in fragmentation. A positive coefficient indicates that taxes go up when the number of parties increases.

$$\frac{\partial \tau}{\partial n} = -\frac{\frac{\partial F1}{\partial \alpha}\frac{\partial F2}{\partial n} - \frac{\partial F1}{\partial n}\frac{\partial F2}{\partial \alpha}}{\frac{\partial F1}{\partial \alpha}\frac{\partial F2}{\partial \tau} - \frac{\partial F1}{\partial \tau}\frac{\partial F2}{\partial \alpha}} \tag{29}$$

Note that the denominator here is the same as derived above, which simplifies the computation. The numerator also contains terms that we have simplified. From Equation (1) we know that

$$\frac{\partial F1}{\partial \alpha} = (\tau M)^2\left[f''\left((1-\alpha)\tau M\right) + \left(\frac{1}{n^2}\right) g''\left(\frac{\alpha\tau M}{n}\right)\right] \tag{30}$$

From Equation (5) we know that

$$\frac{\partial F2}{\partial n} = -\left(\frac{\alpha M}{n^2}\right)\left(g'\left(\frac{\alpha\tau M}{n}\right) + \frac{\alpha\tau M}{n} g''\left(\frac{\alpha\tau M}{n}\right)\right) \tag{31}$$

Therefore their product equals

$$\frac{\partial F1}{\partial \alpha}\frac{\partial F2}{\partial n} = -\left(\frac{\alpha\tau^2 M^3}{n^2}\right)\left[f''(.) + \left(\frac{1}{n}\right)^2 g''(.)\right]\left[g'(.) + \frac{\alpha\tau M}{n} g''(.)\right] \tag{32}$$

From Equation (4) we know that

$$\frac{\partial F1}{\partial n} = -\left(\frac{\tau M}{n^2}\right)\left(g'\left(\frac{\alpha\tau M}{n}\right) + \frac{\alpha\tau M}{n} g''\left(\frac{\alpha\tau M}{n}\right)\right) \tag{33}$$

From Equation (2) we know that

$$\frac{\partial F2}{\partial \alpha} = \frac{\partial F1}{\partial \tau} = (-\tau M^2)\left\{(1-\alpha) f''((1-\alpha)\tau M) - \left(\frac{1}{n}\right)^2 \alpha g''\left(\frac{\alpha\tau M}{n}\right)\right\} \tag{34}$$

Therefore their product equals.

$$\frac{\partial F1}{\partial n}\frac{\partial F2}{\partial \alpha} = \left(\frac{\tau^2 M^3}{n^2}\right)\left[(1-\alpha) f''(.) - \alpha\left(\frac{1}{n}\right)^2 g''(.)\right]\left[g'(.) + \frac{\alpha\tau M}{n} g''(.)\right] \tag{35}$$

The numerator of $\frac{\partial \tau}{\partial n}$ is thus equal to Equation (32) minus Equation (35). When including the denominator from Equation (26), we get the following result:

$$\frac{\partial \tau}{\partial n} = -\frac{-\underbrace{f''((1-\alpha)\tau M)}_{<0} - 2\alpha\underbrace{\left(\frac{1}{n}\right)^2}_{>0}\underbrace{g''\left(\frac{\alpha\tau M}{n}\right)}_{<0}}{\underbrace{\left(\frac{\tau^2 M^4}{n^2}\right)}_{>0}\underbrace{[f''((1-\alpha)\tau M)]}_{<0}\underbrace{\left[g''\left(\frac{\alpha\tau M}{n}\right)\right]}_{<0}} \tag{36}$$

$$\therefore \frac{\partial \tau}{\partial n} < 0$$

2.1 Summary of Implications

The model presented is an n-member common pool problem. The coalition simultaneously choose the tax rate τ, and the fraction α of tax revenue directed to local public goods/transfers. The analysis predicted that taxes fall when n increases. This implies that spending falls when n increases. The comparative statics also predicted that α falls when n increases. These are the main predictions of the model. I test these predictions in Section 3.2.

The theory provides a stronger testable implication than those listed above. It is clear that both transfers and spending should decrease as n increases. However α is defined as transfers as a fraction of government revenue, not just transfers as a fraction of GDP. I refer to α as "transfer intensity". The model predicts that α, transfer intensity, should fall as n increases.

A further implication of the model is nonlinearity in the marginal effects. As both τ and α are fractions bounded by $[0, 1]$ we do not expect a constant effect of a change in n. In particular, a marginal change in n at low levels (e.g. from two to three parties) is expected to have a larger effect than a change at high levels (e.g. from six to seven parties). I test this prediction in Section 3.9.

3 Empirical Analysis

3.1 Data Description

The data (Armingeon *et al.*, 2012b) are from the Institute of Political Science at the University of Bern. This includes measures of political competition as well as primary macroeconomic variables such as government revenue and social security transfers for 23 countries[1] from 1975–2010.[2] We see that nations with more parties have larger government sectors.

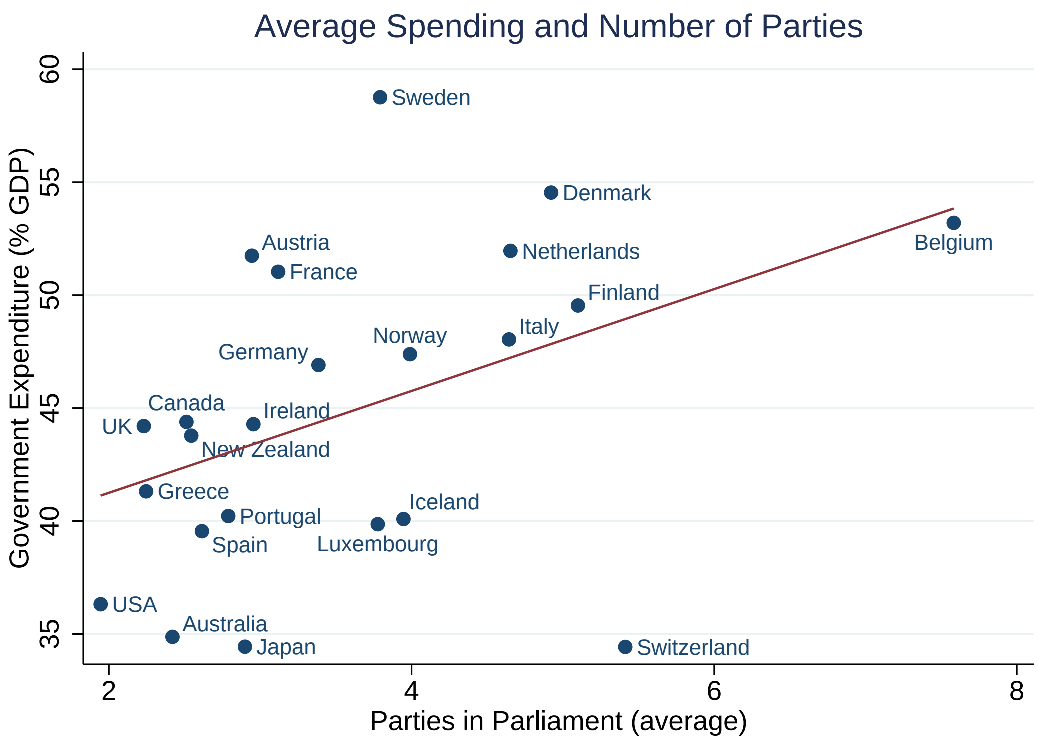

Figure 1: The conventional wisdom on spending

Measuring the number of political parties in a country is a non-trivial exercise. Although there

[1]Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK, and USA.

[2]The data extend back to 1960 but are less reliable pre-1975. For example, in some specifications I include national debt as a control variable. Prior to 1975, more than half (60%) of values for debt are missing, whereas 8% are missing for post-1975. For legislative fragmentation, 11% of the values are missing for the period before 1975, and 0.1% are missing for the period after.

are over 400 parties registered in the United Kingdom, three dominate parliament. Similarly, the United States is considered a two-party system, despite the existence of Libertarians, Greens, etc. To accounts for this, Lijphart (1984) uses the 'effective number of parties', taking weighted averages of parties' importance in elections and parliament. The computation is comparable to the Herfindahl concentration index. In a legislature with m parties, and where s_i denotes the vote share for party i,

$$\text{Effective number of parties in parliament } = \left(\sum_{i=1}^{m} s_i^2\right)^{-1}$$

The median value of this measure of legislative fragmentation is 3.2 and the standard deviation is 1.4. The US has particularly low values: over the period 1975–2010 the mean is 1.95 with a standard deviation of 0.06.

Table 1: Summary statistics for 23 countries, 1975–2010

	Mean	Std. Dev	N	Min	Max
Gov't receipts (% GDP)	42.56	8.40	785	24.35	63.20
Gov't expenditure (% GDP)	45.14	8.18	785	26.07	70.54
Gov't transfers (% GDP)	13.68	3.88	820	4.34	23.89
Eff. parties parliament	3.59	1.43	826	1.69	9.07
Transfers (% Gov't receipts)	31.94	7.33	783	11.89	55.41
Unemployment benefits (% Gov't receipts)	3.06	2.15	636	0.00	11.56
Old age benefits (% Gov't receipts)	16.28	6.01	639	4.82	35.42
Active labor market programs (% Gov't receipts)	1.54	0.89	566	0.00	4.72

Recall that the main predictions of the model were that taxes, spending, and transfers fall as the number of coalition partners rise. For the purposes of the empirical analysis, my measures are total tax receipts as a percent of GDP, total outlays of government as a percent of GDP, and social security transfers as a percent of GDP. Summary statistics are provided in Table 1.

In addition, the theory makes a sharper prediction: that transfers as a fraction of government revenue falls when fragmentation increases. This fraction, labeled α, has several empirical analogs. The data permit testing this prediction with four variants of economic transfers: all social security transfers, unemployment benefits, old age benefits, and expenditure on active labor market programs. Unemployment benefits and active labor market programs are clearly expenditure targeted at specific groups more vulnerable to labor market fluctuations; and old age benefits are not pure public goods.

I primarily measure political competition by the effective number of parties in parliament. Therefore the empirical results in Section 3.2 measure the impact of legislative fragmentation on tax policy. I find that legislative fragmentation is indeed correlated with tax policy. As we will soon see, I find that its impact is of the opposing sign and is statistically different from the conventional approach.

Legislative fragmentation, of course, is distinct from executive/government fragmentation. For example, fragmentation that is restricted exclusively to opposition parties may not correspond to increased executive fragmentation. Some previous work (cf. Kontopoulos and Perotti (1999)) emphasize the importance of this distinction. Therefore in Section 3.3 I will largely repeat the analysis of legislative fragmentation but instead use measures of executive fragmentation.

3.2 Legislative Fragmentation

The empirical analysis is based on a country fixed effect model:

$$y_{it} = a_i + \delta_t + \beta x_{it} + \epsilon_{it}$$

where y_{it} is the outcome (e.g. tax receipts as a fraction of GDP) in country i during year t; the a_i variables are country fixed effects; δ_t represents year fixed effects; x_{it} are country-year covariates (such as legislative fragmentation); and ϵ_{it} is the error term. The standard condition for parameter identification,

$$\mathbb{E}\left[\epsilon_{it} | x_{it}, a_i, \delta_t\right] = 0$$

holds when the change in level of fragmentation is exogenous conditional on fixed effects.

The fixed effects model exploits within country variation, rather than between country variation, to derive results. The estimation is thus based on changes in the number of parties within a country. This approach captures all time-invariant, country-specific heterogeneity, and isolates that effect from any (time-invariant) spurious relationships between countries' number of parties and public finances. Estimation with country fixed effects therefore entirely nests many other approaches, e.g. the ethnolinguistic fractionalization data explored in Alesina *et al.* (2003).

Identification is not compromised by disgruntled electorates changing party allegiances, e.g. switching from Democrats to Republicans. Identification requires that, conditional on observable characteristics, *fragmentation* is exogenous. This is a much more reasonable claim.

Of course any time-varying heterogeneity could also bias the estimator. This is less likely to be a problem with shorter time-horizons and wider cross-sections. For this reason, I repeat the procedure on a wider sample of 35 countries, including those previously behind the Iron Curtain, which is available for the year 1990–2010. These results are in Section 3.4.

Table 2 presents the main empirical contribution of the paper. It shows the results, with and without country fixed effects, of regressing tax policy on legislative fragmentation. Standard errors are robust to heteroskedasticity and serial correlation, are consistent even under cross-sectional dependence (Driscoll and Kraay, 1998), and I use the standard lag length as suggested by Newey and West (1994).

Table 2: Decline in taxes, spending, and transfers

	Receipts		Expenditure		Transfers	
	(1)	(2)	(3)	(4)	(5)	(6)
Eff. parties parliament	2.309***	-1.045***	1.894***	-1.939***	0.615***	-0.697***
	(0.198)	(0.319)	(0.178)	(0.430)	(0.0816)	(0.156)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes
N	783	783	783	783	818	818

Driscoll-Kraay standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Let us first look at the results on tax revenue presented in Columns 1 and 2. Column 1 presents the 'conventional wisdom' estimates, based on between-country regressions. My preferred specification, including country fixed effects, is shown in Column 2.

The first column presents evidence supporting Lijphart (1984)'s conclusion that more parties leads to higher tax receipts. These results are positive and significant at the 1% level. Column 1 suggests that if the UK moved from a three- to a four-party system, the fraction of output collected by the government would increase by about 2.3 percentage points.

Column 2, which has the potential to nest Column 1 but isolates any arbitrary country heterogeneity, shows a negative coefficient. This suggests that moving from a three- to four-party system would lower tax revenue by about a percentage point. This result is also highly significant. Crucially, however, it is a different sign. The approach in Column 2, which is preferable to that employed in Column 1, reaches an opposite conclusion. As predicted by the group maximization problem in Section 2, increased legislative fragmentation is associated with lower tax receipts.

Next we look at government expenditure. The columns have the same interpretation as before. Our coefficients again change sign: Column 3 suggests increasing the number of parties by one will increase government expenditure by about 2 percentage points; Column 4 suggests it would decrease expenditure by a similar amount. Again, the results are of opposing sign, and counter to the conventional wisdom. As predicted by the model, we find lower spending with more fragmentation.

What of transfers? Recall the model in Section 2. Defining α as the share of government revenue going to transfers to certain groups, we found $\frac{\partial \alpha}{\partial n} < 0$, i.e. transfers will fall as the number of parties increase. This implies that transfers must fall when fragmentation rises.

The pattern emerges again. The between country estimator finds a positive effect, the within country estimator a negative effect, and the difference is significant. The between estimate suggests an increase in fragmentation leads to a 0.6 percentage point increase in social security transfers. The within estimate suggests the same increase in fragmentation would reduce social security transfers by 0.7 percentage points.

In truth the model makes a stronger prediction. Not just is it predicted that transfers fall but that transfers as a fraction of government revenue falls. I call this "transfer intensity". The prediction that transfer intensity falls is tested in Table 3. This time, both between and within estimates suggest a negative sign. Again, the prediction is validated by the fixed effects estimates, and the result is significant at the 1% confidence level.

Table 3: Effects on social transfers as % of government revenue

	Transfers Intensity	
	(1)	(2)
Eff. parties parliament	-0.278	-0.892***
	(0.216)	(0.275)
Year FE	Yes	Yes
Country FE	No	Yes
N	781	781

Driscoll-Kraay standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In addition to measuring α with all social security transfers, I confirm that the prediction holds also for sub-components of transfers. In particular, the data permit testing this prediction with unemployment benefits, old age benefits, and expenditure on active labor market programs. The results are in Table 4.

Table 4: Effects on Various Social Transfers

	Unemployment		Old Age Benefits		ALMPs	
	(1)	(2)	(3)	(4)	(5)	(6)
Eff. parties parliament	0.484***	-0.223**	0.210	-1.035***	0.208***	-0.138***
	(0.0576)	(0.0841)	(0.208)	(0.229)	(0.0287)	(0.0340)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes
N	636	636	639	639	566	566

Driscoll-Kraay standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Again the results support the theory. Targeted transfers, such as those on the unemployed, fall significantly when legislatures become more fractured.

The results reject the conventional wisdom. More fragmented parliaments are not associated with higher taxes, spending, and transfers. The opposite is true. Pettersson-Lidbom (2012) provided evidence for this in the context of a natural experimental in Scandinavia. It is reasonable to question the external validity of those results. This paper shows that the results are true more generally. The results hold for a broad selection of OECD countries over the past forty years.

This should lead us to reevaluate our model of policy formation. The data support the model of Section 2 which, unlike other models in the literature, places few restrictions on the optimizing behavior of coalition partners.

To examine whether these results are robust, the next sections repeat the empirical investigation with some modifications. Firstly I confirm the main results hold for executive fragmentation as well as legislative fragmentation. Secondly I test the results with a different, wider panel of OECD countries, including the new post-Soviet democracies. Thirdly I use alternative empirical measures of taxation and political fragmentation. Fourthly I show the results do not depend on the ideological composition of government. Finally I test if the results are robust to the phase of the electoral cycle.

3.3 Executive Fragmentation

The preceding section analyzed the effects of legislative fragmentation on tax policy. It is debateable whether the legislative branch is the appropriate object of study here. Arguably it is the executive branch which warrants closest inspection. Indeed the actors of the model in Section 2 are assumed to be in a government coalition. This section thus repeats the empirical tests above for executive fragmentation. In short, I demonstrate that the results hold for executive fragmentation as well as legislative fragmentation.

The data include details on the type of government in country i at time t. These are coded on a 1-7 scale by the political scientists leading the project. The summary statistics are included in Table 5. As we can see, there is considerable variation in the extent of executive fragmentation. For instance, minority governments have been in power for more a fifth of country-years in the OECD since 1975. Not surprisingly, this measure is positively correlated legislative fragmentation.

Table 6 is the executive fragmentation analogue of Table 2. Instead of regressing policy outcomes

Table 5: Type of Government

	Freq.	Percent	Cum. Percent
Single party government	201	25.74	25.74
Minimal winning coalition	254	32.52	58.26
Surplus coalition	160	20.49	78.75
Single party minority	96	12.29	91.04
Multi party minority	65	8.32	99.36
Caretaker government	5	0.64	100.00
Total	781	100.00	

Fragmentation of government, on a 1-7 scale

on legislative fragmentation, Table 6 shows the results for executive fragmentation.

Table 6: Decline in taxes, spending, and transfers: executive (long)

	Receipts		Expenditure		Transfers	
	(1)	(2)	(3)	(4)	(5)	(6)
Executive Fragmentation	2.523***	-0.438***	1.844***	-0.396	0.633***	-0.0462
	(0.352)	(0.150)	(0.395)	(0.265)	(0.211)	(0.0714)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes
N	723	723	723	723	753	753

Driscoll-Kraay standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The same pattern emerges. All within-country estimates demonstrate negative coefficients, albeit without significant for expenditure and transfers. However the results are of the opposing sign, and statistically different from, the effects predicted by the conventional wisdom.

3.4 More countries, shorter panel

A problem with analysis of the large-T panel data in Sections 3.2 and 3.3 is that the possibility of non-parallel trends increases in T, and this threatens identification. Consequently I repeat the analysis on a larger panel that includes post-Soviet countries. Obviously this requires shortening the time horizon. The data (Armingeon *et al.*, 2012a) again come from the Institute of Political Science at the University of Bern. They include measures of political competition as well as primary macroeconomic variables such as government revenue for 35 countries[3] since 1990. Table 7 summarizes the data, and Table 8 presents the main regression results.

Table 7: Summary statistics for 35 countries, 1990–2010

	Mean	Std. Dev	N	Min	Max
Gov't receipts (% GDP)	41.90	7.36	719	24.30	63.13
Gov't expenditure (% GDP)	44.41	7.35	719	24.70	70.54
Soc sec transfers (% GDP)	13.42	3.45	728	5.55	23.66
Eff. parties parliament	3.81	1.46	762	1.74	10.92
Transfers (% Gov't receipts)	31.98	6.19	713	11.89	49.95
Transfers (% Gov't expenditure)	29.97	4.82	713	10.53	39.96

Table 8: Decline in taxes, spending, and transfers

	Receipts		Expenditure		Transfers	
	(1)	(2)	(3)	(4)	(5)	(6)
Eff. parties parliament	1.456***	-0.464***	0.903***	-0.732**	0.331***	-0.204**
	(0.104)	(0.133)	(0.162)	(0.325)	(0.0911)	(0.0963)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes
N	716	716	716	716	725	725

Driscoll-Kraay standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The results here are again fully supportive of the theory, just like the original results found of Section 3.2. It is useful to recall the results from Table 2. The coefficients found for the effect

[3]Australia, Austria, Belgium, Bulgaria, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, UK, and USA.

of fragmentation on receipts, outlays, and transfers were -1.045, -1.939, -0.697 respectively. The analogous coefficients here are -0.464, -0.732, and -0.204. The results in the longer sample are of the same sign and order of magnitude of the results in the original sample. Although slightly closer to zero, the coefficients remain significant at conventional levels. I interpret these results as support for the model and the conclusion of Section 3.2

Further evidence can be seen in Table 9, the effects of legislative fragmentation on transfer intensity α. Although neither coefficient are found to be significant ($p < 0.14$), the sign confirms the negative relationship.

Table 9: Effects on α

	Transfers Intensity	
	(1)	(2)
Eff. parties parliament	-0.348	-0.491
	(0.228)	(0.315)
Year FE	Yes	Yes
Country FE	No	Yes
N	710	710

Driscoll-Kraay standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

3.5 Different measure of taxation

The second robustness check is to use an alternative measure of taxation. Section 3.2 relied on total tax receipts as a fraction of GDP. This could be affected by issues such as windfall receipts from natural resource discoveries. Therefore in the spirit of Mendoza, Razin and Tesar (1994), I test the model with a more micro-founded measure of income tax. As we can see from Figure 2, these tax rate data map neatly to the conventional wisdom.

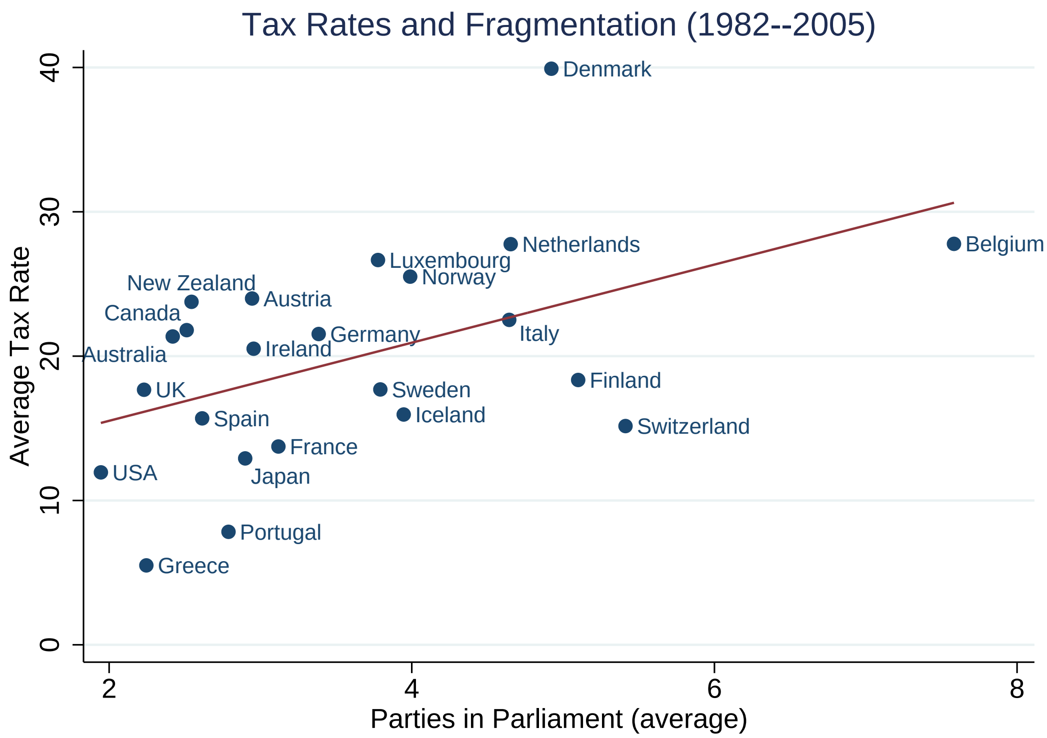

Figure 2: Relationship with alternative measure of taxation

These additional tax rate data come from Peter, Buttrick and Dundan (2010). This dataset emphasizes the actual tax rates paid by individuals at specified income levels (average wage, twice the average wage, etc.) rather than focusing on total receipts of the state. The main variable employed is the tax rate for the mean income level after adjusting for allowances, credits, local taxes, etc. This years included are 1982 through 2005.

Again there is a pattern of coefficients changing sign. The result on $4x$ average income, the coefficient of which is positive, seems to reject a theme of my model. However, the model does not make predictions about the progressivity of the tax schedule. The model is about overall tax rates, and is silent on taxes on higher incomes. Consequently the most useful comparison then is the difference between Column 1 and Column 2, which measures taxes paid at average income levels. The results here are consistent with the model. The results with fixed effects are not statistically

Table 10: Alternative Tax Measure

	Average Income		Avg Income x2		Avg Income x4	
	(1)	(2)	(3)	(4)	(5)	(6)
Eff. parties	0.921***	-0.253	1.097***	-0.210	0.988***	0.461
	(0.199)	(0.349)	(0.168)	(0.391)	(0.254)	(0.357)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes
N	493	493	493	493	493	493

Driscoll-Kraay standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

significant. This is perhaps not surprising as the inclusion of fixed effects reduces the number of degrees of freedom by 35. Although they are not significant, they are negative. Furthermore, they are significantly different from the positive coefficients predicted by excluding fixed effects.

3.6 Different measure of fragmentation

An alternative measure of legislative fragmentation that is closely correlated (but not identical) to the effective number of parties, was proposed by Rae (1968). This is a nonlinear transformation of the effective number of parties. If we define the effective number of parties as e, then the Rae measure equals $\frac{1}{1-e}$. Table 11 shows the regression output. It would be concerning if this transformation substantially changed the interpretation of my results.

3.7 Ideological composition

Table 13 shows the effects of including controls for political ideologies. To ensure robustness, I measure political ideology at both the executive and legislative level. At the executive level, I include the fraction of cabinet posts held by people of differing political persuasions. At the legislative level, I control for the fraction of the parliament seats won by a country's major socialist, conservative, liberal, and religious parties. Summary statistics are provided in Table 12.

Table 11: Alternative Fragmentation Measure

	Receipts		Outlays		Transfers	
	(1)	(2)	(3)	(4)	(5)	(6)
Rae Measure	0.357***	-0.154***	0.265***	-0.250***	0.0881***	-0.0613***
	(0.0174)	(0.0258)	(0.0204)	(0.0431)	(0.0111)	(0.0183)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes
N	783	783	783	783	818	818

Driscoll-Kraay standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Summary statistics for ideological variables

	Mean	Std. Dev	N	Min	Max
Right-wing gov't (%)	38.26	38.58	825	0.00	100.00
Centrist gov't (%)	23.92	30.30	825	0.00	100.00
Left-wing gov't (%)	34.79	37.89	825	0.00	100.00
Socialist par't (%)	28.36	17.19	826	0.00	63.60
Conservative par't (%)	17.20	20.25	826	0.00	74.80
Liberal par't (%)	12.55	17.75	826	0.00	67.10
Religious par't (%)	9.38	13.95	826	0.00	44.30

The odd-numbered columns in Table 13 investigates the effect of ideological divisions on the executive dimension. The even-number columns include controls for the legislative dimension. We can see that for the most part neither the executive nor legislative controls are statistically or economically significant. Moreover, they do not substantially alter the coefficients on the effective number of parties. The results that fragmentation lowers taxes, spending, and transfers remains robust.

Table 13: Effects on Ideological Composition

	Receipts		Outlays		Transfers	
	(1)	(2)	(3)	(4)	(5)	(6)
Eff. parties	-1.149***	-1.097***	-2.183***	-1.899***	-0.796***	-0.719***
	(0.304)	(0.337)	(0.397)	(0.445)	(0.175)	(0.185)
Right-wing gov't (%)	-0.0303		-0.0742**		-0.0259	
	(0.0286)		(0.0354)		(0.0154)	
Centrist gov't (%)	-0.0331		-0.0736**		-0.0327**	
	(0.0264)		(0.0312)		(0.0132)	
Left-wing gov't (%)	-0.0262		-0.0631*		-0.0298*	
	(0.0279)		(0.0363)		(0.0151)	
Socialist par't (%)		0.0357*		0.0234		0.00619
		(0.0200)		(0.0340)		(0.0171)
Conservative par't (%)		0.0157		0.0177		0.0101
		(0.0174)		(0.0231)		(0.0132)
Liberal par't (%)		0.0543**		0.0221		0.00811
		(0.0253)		(0.0376)		(0.0177)
Religious par't (%)		-0.116***		-0.0206		-0.0303*
		(0.0381)		(0.0522)		(0.0169)
Year & Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	783	783	783	783	817	818

Driscoll-Kraay standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

3.8 Electoral cycle

The results are also robust to phases of the electoral cycle. Table 14, which is large and thus left to the the appendix, illustrates this. I include controls for year before, year of, and year after election. These results are generally negative but insignificant. They are somewhat significant on receipts: taxes do indeed go down in an election year. In no specification do the electoral cycle variables meaningfully alter the main parameters of interest.

3.9 Heterogeneous treatments

As mentioned in Section 2.1, the model predicts nonlinearity in the marginal effects of n on tax policy. Both the tax rate τ and the fraction of revenue dedicated to transfers α are bounded by $[0, 1]$, so all OLS-like estimates such as those above provide linear approximations of the effect. As the outcome is bounded, these effects cannot hold over the complete range of the X variable. In particular, the model predicts that a change in n at low levels will have a larger effect than a change in n at high levels. We expect that results are stronger for smaller values of n. To test this theory, I split the sample into above- and below-median values of the effective number of parties.

Table 14: Decline in taxes, spending, and transfers: heterogeneous treatments

	Receipts		Expenditure		Transfers	
	(1)	(2)	(3)	(4)	(5)	(6)
Eff. parties	-2.584***	-0.742**	-4.053***	-1.681***	-0.688*	-0.726***
	(0.760)	(0.333)	(1.004)	(0.399)	(0.400)	(0.161)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Above Median	No	Yes	No	Yes	No	Yes
N	396	387	396	387	406	412

Driscoll-Kraay standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

We can see for receipts and outlays that the effect is about three times larger for the below-median values of n than the above-median values. Interestingly, the results appear approximately constant for transfers. I conclude that there is strong evidence of nonlinearity in effects on receipts and outlays, but no such evidence for transfers.

4 Conclusion

This paper asks how political fragmentation affects fiscal policy outcomes. I modeled this as a common pool problem. This common pool problem presents a coalition which simultaneously chooses tax and expenditure policies. Unlike other models which constrain the coalition's actions through norms, the coalition's choice essentially corresponds to a group welfare maximization problem. The coalition can fund two types of good: the pure public good which is shared by all, and the local public good which is targeted to political constituencies. Comparative static analysis indicates that taxes, spending, transfers, and transfer intensity fall as the coalition becomes more fragmented.

The contributions of this paper are twofold. Firstly, it supports the empirical result of Pettersson-Lidbom (2012) with greater external validity than quasi-experimental settings can provide. The selection of data from a panel of developed nations lends the empirical section to a battery of robustness tests. The results are robust to different specifications, measures of executive fragmentation, alternative data sources, ideological controls, and electoral cycle effects. Secondly, the paper provides a general theoretical foundation that motivate these results. The conventional wisdom in the literature is that more fragmented governments lead to larger public sectors. Both the theoretical and empirical sections suggest that the conventional wisdom is incorrect. The model in Section 2 could be extended to incorporate more nuance in the effect of fragmentation on legislative bargaining. This is an avenue for future work.

References

Alesina, A., Devleeschauwer, A., Easterly, W., Kurlat, S. and Wacziarg, R. (2003) Fractionalization, *Journal of Economic Growth*, **8**, 155–194.

Armingeon, K., Careja, R., Weisstanner, D., Engler, S., Potolidis, P. and Gerber, M. (2012a) Comparative Political Data Set III 1990-2010, Bern: Institute of Political Science, University of Bern.

Armingeon, K., Weisstanner, D., Engler, S., Potolidis, P. and Gerber, M. (2012b) Comparative Political Data Set I 1960-2010, Bern: Institute of Political Science, University of Bern.

Austen-Smith, D. (2000) Redistributing income under proportional representation, *Journal of Political Economy*, **108**, 1235–1269.

Driscoll, J. C. and Kraay, A. C. (1998) Consistent covariance matrix estimation with spatially dependent panel data, *Review of Economics and Statistics*, **80**, 549–560.

Hall, P. A. and Soskice, D. W. (2001) *Varieties of Capitalism: The institutional foundations of comparative advantage*, vol. 8, Oxford University Press.

Kontopoulos, Y. and Perotti, R. (1999) Government Fragmentation and Fiscal Policy Outcomes: Evidence from OECD Countries, in *Fiscal Institutions and Fiscal Performance*, National Bureau of Economic Research, NBER Chapters, pp. 81–102.

Lijphart, A. (1984) *Democracies: Patterns of majoritarian and consensus government in twenty-one countries*, New Haven: Yale University Press.

Lijphart, A. (1999) *Patterns of Democracy: Government forms and performance in thirty-six democracies*, New Haven: Yale University Press.

Mendoza, E. G., Razin, A. and Tesar, L. L. (1994) Effective tax rates in macroeconomics: Cross-country estimates of tax rates on factor incomes and consumption, *Journal of Monetary Economics*, **34**, 297–323.

Milesi-Ferretti, G. M., Perotti, R. and Rostagno, M. (2002) Electoral systems and public spending, *The Quarterly Journal of Economics*, **117**, 609–657.

Newey, W. K. and West, K. D. (1994) Automatic lag selection in covariance matrix estimation, *The Review of Economic Studies*, **61**, 631–653.

Persson, T. and Tabellini, G. (2002) *Political Economics: Explaining Economic Policy*, MIT Press.

Peter, K. S., Buttrick, S. and Dundan, D. (2010) Global reform of personal income taxation, 1981-2005: Evidence from 189 countries, *National Tax Journal*, **63**, 447–478.

Pettersson-Lidbom, P. (2012) Does the size of the legislature affect the size of government? Evidence from two natural experiments, *Journal of Public Economics*, **96**, 269–278.

Rae, D. (1968) A note on the fractionalization of some European party systems, *Comparative Political Studies*, **1**, 413–418.

Tsebelis, G. (2002) *Veto Players: How political institutions work*, Princeton University Press.

Weingast, B. R., Shepsle, K. A. and Johnsen, C. (1981) The political economy of benefits and costs: A neoclassical approach to distributive politics, *The Journal of Political Economy*, pp. 642–664.

Appendix: Tax Policy and the Electoral Cycle

Table 15: Effects of Electoral Cycle on Receipts, Outlays, and Transfers

	Receipts				Outlays				Transfers			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Eff. parties	-1.045***	-1.038***	-1.006***	-1.103***	-1.939***	-1.943***	-1.946***	-2.111***	-0.697***	-0.699***	-0.661***	-0.730***
	(0.319)	(0.319)	(0.336)	(0.314)	(0.430)	(0.432)	(0.458)	(0.430)	(0.156)	(0.159)	(0.158)	(0.144)
Election Year		-0.160	-0.0943	0.00554		0.0926	0.199	0.590		0.0662	0.126	0.309*
		(0.160)	(0.245)	(0.343)		(0.239)	(0.331)	(0.456)		(0.107)	(0.134)	(0.182)
Pre-election Year			0.0180	0.103			0.0496	0.376			0.0537	0.183
			(0.237)	(0.298)			(0.266)	(0.330)			(0.0998)	(0.124)
Post-election Year				0.0463				0.543				0.243*
				(0.267)				(0.365)				(0.142)
Year & Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	783	783	760	742	783	783	760	742	818	818	797	775

Driscoll-Kraay standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$