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. Like most models of government, coalitions choose inefficiently high tax rates to fund transfers to their political allies. The model predicts that an increase in coalition size reduces this inefficiency. In particular, an increase in coalition size lowers 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. Excluding country fixed effects is equivalent to assuming they all have no effect. Including fixed effects and relaxing this assumption 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 linking 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 countries' number of political parties and tax policies. Lijphart concluded that fragmentation leads to broad, consensus-based coalitions which cause governments to become "kindler, gentler". Investigating the related question of 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 'Law of $1/n$' (Weingast, Shepsle and Johnsen, 1981) models spending as a function of the number of districts in a country, and finds that over-spending is increasing in the number of districts. 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. Austen-Smith (2000) finds that electoral rules that encourage a greater number parties will head to higher spending and transfers. Therefore these alternative frameworks draw the same conclusion as the conventional wisdom: increasing the number of parties makes agreement more difficult, and thus higher spending (e.g. political pork) results.

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 draw these 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 a form of 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 government requiring an exogenous amount of revenue. Suppose for example that the demand for some goods becomes less elastic, and so consumers are less responsive to taxes. The exogenous revenue assumption rules out the possibility of e.g. governments increasing tax revenue when the excess burden of taxation falls. I do not make this assumption.

I will model the coalition's choice of policy as type of 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 goods that benefits all of society, e.g. national defence, weather forecasts. The second are "local public goods" which are particularistic and targeted to 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 strictly concave function f of the pure public good G_1, and an increasing and strictly concave function g of group i's local public good G_2. For convenience I assume that $Y_i = Y \ \forall i$ and that all n parties split G_2 equally. The results hold for more general specifications. Formally, given a national income M, the politician optimizes the following problem:

$$\max_{G_1, G_2, \tau} (1-\tau)Y + f(G_1) + g\left(\frac{G_2}{n}\right) \tag{1}$$

$$\text{s.t. } G_1 + G_2 \leq \tau M \tag{2}$$

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, 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. This contrasts with other models of government (e.g. Austen-Smith and Banks (1988), Milesi-Ferretti and Spolaore (1994)) which do not focus on secular fragmentation. Assumptions about particular norms could of course facilitate alternative equilibrium outcomes. However, no such outcome could Pareto dominate the solution offered by this formulation.

It is important to note that I framed the maximization problem as the individual choice of each of the n politicians. Aggregating the decision up to the group level is equivalent to multiplying Equation (1) by n and not altering the constraint in (2). This would be a monotonic transformation of the original problem and would not affect the solution. The problem can thus be interpreted either at the level of the individual politician, or the coalition

as a whole. Both interpretations are valid.

The planner's problem is not a simple rescaling of Equation (1). The planner wants to maximize welfare for all $N > n$ groups in society. As all N groups' welfare are affected by tax rates and global public goods, the planner's problem multiplies the first two components (but not the third) of the maximand by N. The third component, the distribution of G_2 only affects the n groups. Consequently the planner's problem is:

$$\max_{G_1, G_2, \tau} N(1-\tau)Y + Nf(G_1) + ng\left(\frac{G_2}{n}\right) \tag{3}$$

$$\text{s.t. } G_1 + G_2 \leq \tau M \tag{4}$$

The solution to this problem leads to the efficient allocation, and our first result.

Proposition 1. *Under the efficient allocation,* $g'\left(\frac{G_2}{n}\right) = Nf'(G_1)$.

Proof. Forming a Lagrangian with multiplier λ and taking the first order necessary condition with respect to τ, we find that $\lambda = \frac{NY}{M}$. The FOCs on G_1 and G_2 show that $f'(G_1) = \frac{\lambda}{N} = \frac{Y}{M}$ and $g'\left(\frac{G_2}{n}\right) = \lambda = \frac{NY}{M}$. Thus $g'\left(\frac{G_2}{n}\right) = Nf'(G_1)$. □

The planner chooses spending so that the marginal utility of G_1 is N times larger than the marginal utility of G_2. In contrast to the optimal allocation, the solution to the government's problem of Equations (1) and (2) sees over-provision of G_2. This result is formalized in Propositions 2 and 3.

Proposition 2. *In equilibrium, the coalition chooses spending such that* $g'\left(\frac{G_2}{n}\right) = nf'(G_1)$.

Proof. Forming a Lagrangian with multiplier λ and taking the first order necessary condition with respect to τ, we find that $\lambda = \frac{Y}{M}$. The FOCs on G_1 and G_2 show that $f'(G_1) = \lambda = \frac{Y}{M}$ and $g'\left(\frac{G_2}{n}\right) = \frac{\lambda}{n} = \frac{nY}{M}$. Thus $g'\left(\frac{G_2}{n}\right) = nf'(G_1)$. □

Proposition 3. *The coalition over-provides* G_2 *in equilibrium.*

Proof. In both Proposition 1 and Proposition 2, $f'(G_1) = \frac{Y}{M}$. Therefore the provision of G_1 is unchanged (and optimal) in both scenarios. However $g'\left(\frac{G_2}{n}\right)$ changes from $Nf'(G_1)$ in Proposition 1 to $nf'(G_1)$ in Proposition 2. As $n < N$, the marginal utility from G_2 is higher under the optimal allocation than when provided by the coalition. This implies that G_2 is lower in the optimal allocation. Therefore the coalition over-provides G_2. □

Proposition 4. *In equilibrium, the coalition sets a tax rate* $\tau > \tau^\star$.

Proof. From Proposition 3 we see G_1 is identical in both scenarios but that the coalition over-provides G_2. Constraint (2) implies the government may not run a deficit, and local non-satiation ensures this becomes a balanced budget rule. With spending above that implied by the planner's solution and a balanced budget rule, the coalition sets tax rates above the optimal level. □

These results are reasonably standard. A government of n-coalition partners over-provides local public goods targeted at its constituents at the cost of excessively high taxation. These results are not the focus of this paper. Rather this paper asks how these results are affected by political fragmentation. I model fragmentation as an increase in n. Does fracturing of the coalition make the over-provision of G_2 worse?

The answer is not immediately clear. With more groups, it is quite intuitive that demands for group-specific projects grow larger. Conversely, one could argue that a splintered coalition is forced to shift resources to projects of common agreement. This could be more desirable than dividing G_2 among an ever-larger number of claimants.

In this model, the latter effect is what dominates. Fragmentation lowers taxes and reduces the over-provision of targeted transfers. These results are somewhat counter-intuitive and challenge the conventional wisdom that more fragmented political systems have larger public sectors. The results are formalized in Propositions 5 and 6.

To prove these results it is convenient to reformulate the coalition's problem. Recall that the coalition chooses $\tau, G_1,$ and G_2. Assuming the budget constraint holds with equality, the choice of any two of these variables will determine the third. Therefore I define α as the fraction of tax revenue devoted to G_2, i.e. $G_2 = \alpha\tau M$. Consequently the proportion of government revenue allocated to G_1 is the complementary fraction $(1-\alpha)$. By reformulating the coalition's problem this way, we can condense it into a single maximand in two variables (α and τ) and three parameters (Y, M, and n):

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

The government chooses tax rate τ. Fraction $1-\alpha$ of the total revenue τM is spent on G_1. Fraction α is spent on G_2, the politically-targeted spending. I refer to α as "transfer intensity".

Differentiating this expression with respect to τ and α leads to the following first-order

conditions:

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

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

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

$$\frac{\partial F1}{\partial \tau} = \left((1-\alpha)M\right)^2 f''\left((1-\alpha)\tau M\right) + \left(\frac{\alpha M}{n}\right)^2 g''\left(\frac{\alpha \tau M}{n}\right) < 0 \tag{5}$$

$$\begin{aligned}\frac{\partial F1}{\partial \alpha} =& - M\left[f'\left((1-\alpha)\tau M\right) + (1-\alpha)\tau M f''\left((1-\alpha)\tau M\right)\right] \\ &+ \frac{M}{n}\left[g'\left(\frac{\alpha \tau M}{n}\right) + \frac{\alpha \tau M}{n} g''\left(\frac{\alpha \tau M}{n}\right)\right]\end{aligned} \tag{6}$$

$$\begin{aligned}\frac{\partial F2}{\partial \tau} =& \frac{\partial F1}{\partial \alpha} \\ \frac{\partial F2}{\partial \alpha} =& (\tau M)^2 f''\left((1-\alpha)\tau M\right) + \left(\frac{\tau M}{n}\right)^2 g''\left(\frac{\alpha \tau M}{n}\right) < 0 \\ =& (\tau M)^2\left[f''\left((1-\alpha)\tau M\right) + \left(\frac{1}{n^2}\right) g''\left(\frac{\alpha \tau M}{n}\right)\right] < 0\end{aligned} \tag{7}$$

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

$$\frac{\partial F1}{\partial n} = -\left(\frac{\alpha M}{n^2}\right)\left(g'\left(\frac{\alpha \tau M}{n}\right) + \frac{\alpha \tau M}{n} g''\left(\frac{\alpha \tau M}{n}\right)\right) \tag{8}$$

$$\frac{\partial F2}{\partial n} = -\left(\frac{\tau M}{n^2}\right)\left(g'\left(\frac{\alpha \tau M}{n}\right) + \frac{\alpha \tau M}{n} g''\left(\frac{\alpha \tau M}{n}\right)\right) \tag{9}$$

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 $\frac{\partial^2 \Pi}{\partial \tau \partial n}$, i.e. computing the sign of Equation (8). 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 $g'(x) + x g''(x) > 0$, is true for a broad class of concave functions, such as $g(x) = x^\beta$ where $\beta \in (0, 1)$. To proceed, I assume that $g'(x) + x g''(x) > 0$. Under this assumption we may conclude that Equation (8) is negative: an increase in n will lower taxes. Similar conclusions can be drawn about Equation (9).

Comparative statics are 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:

$$\begin{bmatrix} \frac{\partial F1}{\partial \tau} & \frac{\partial F1}{\partial \alpha} \\ \frac{\partial F2}{\partial \tau} & \frac{\partial F2}{\partial \alpha} \end{bmatrix} \begin{bmatrix} \frac{\partial \tau}{\partial n} \\ \frac{\partial \alpha}{\partial n} \end{bmatrix} = - \begin{bmatrix} \frac{\partial F1}{\partial n} \\ \frac{\partial F2}{\partial n} \end{bmatrix} \tag{10}$$

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

$$\begin{bmatrix} \frac{\partial \tau}{\partial n} \\ \frac{\partial \alpha}{\partial n} \end{bmatrix} = - \begin{bmatrix} \frac{\partial F1}{\partial \tau} & \frac{\partial F1}{\partial \alpha} \\ \frac{\partial F2}{\partial \tau} & \frac{\partial F2}{\partial \alpha} \end{bmatrix}^{-1} \begin{bmatrix} \frac{\partial F1}{\partial n} \\ \frac{\partial F2}{\partial n} \end{bmatrix} \tag{11}$$

We can apply Cramer's Rule to Equation (11) to derive our comparative statics results. By signing $\frac{\partial \tau}{\partial n}$ and $\frac{\partial \alpha}{\partial n}$, we see how taxes and transfer intensity respond to an increase in n. The first key comparative static is $\frac{\partial \tau}{\partial n}$, how the tax rate responds to a change in fragmentation. A positive coefficient would indicate that taxes go up when the number of parties increases.

Proposition 5. *Fragmentation leads to lower taxes.*

Proof. Applying Cramer's Rule to (11):

$$\frac{\partial \tau}{\partial n} = - \frac{\frac{\partial F1}{\partial n}\frac{\partial F2}{\partial \alpha} - \frac{\partial F1}{\partial \alpha}\frac{\partial F2}{\partial n}}{\frac{\partial F1}{\partial \tau}\frac{\partial F2}{\partial \alpha} - \frac{\partial F1}{\partial \alpha}\frac{\partial F2}{\partial \tau}} \tag{12}$$

The numerator of this comparative static is $\left(\frac{\partial F1}{\partial n}\frac{\partial F2}{\partial \alpha}\right) - \left(\frac{\partial F1}{\partial \alpha}\frac{\partial F2}{\partial n}\right)$. Focusing for now on the first two terms:

$$\frac{\partial F1}{\partial n} = - \left(\frac{\alpha M}{n^2}\right) \left[g' \left(\frac{\alpha \tau M}{n}\right) + \frac{\alpha \tau M}{n} g'' \left(\frac{\alpha \tau M}{n}\right) \right] \tag{13}$$

$$\frac{\partial F2}{\partial \alpha} = (\tau M)^2 \left[f'' \left((1-\alpha)\tau M\right) + \left(\frac{1}{n}\right)^2 g'' \left(\frac{\alpha \tau M}{n}\right) \right] \tag{14}$$

Omitting the arguments of functions for clarity, we conclude that their product equals

$$\frac{\partial F1}{\partial n}\frac{\partial F2}{\partial \alpha} = -\left(\frac{\alpha\tau^2 M^3}{n^2}\right)\left[f''(.) + \left(\frac{1}{n}\right)^2 g''(.)\right]\left[g'(.) + \frac{\alpha\tau M}{n}g''(.)\right] \tag{15}$$

Calculating the other terms in the numerator is simplified by substitution from Equation (F2)

$$\frac{\partial F1}{\partial \alpha} = (-\tau M^2)\left[(1-\alpha)f''((1-\alpha)\tau M) - \alpha\left(\frac{1}{n}\right)^2 g''\left(\frac{\alpha\tau M}{n}\right)\right] \tag{16}$$

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

Again omitting arguments for clarity, their product equals

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

The numerator of $\dfrac{\partial \tau}{\partial n}$ is thus equal to Equation (15) minus Equation (18). Calculating this, we conclude that the numerator is:

$$\frac{\partial F1}{\partial n}\frac{\partial F2}{\partial \alpha} - \frac{\partial F1}{\partial \alpha}\frac{\partial F2}{\partial n} = \underbrace{\left(-\frac{\tau^2 M^3}{n^2}\right)}_{<0}\underbrace{[f''(.)]}_{<0}\underbrace{\left[g'(.) + \frac{\alpha\tau M}{n}g''(.)\right]}_{>0} \tag{19}$$

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

$$\frac{\partial F1}{\partial \tau} = (M)^2\left[(1-\alpha)^2 f''((1-\alpha)\tau M) + \left(\frac{\alpha}{n}\right)^2 g''\left(\frac{\alpha\tau M}{n}\right)\right] \tag{20}$$

$$\frac{\partial F2}{\partial \alpha} = (\tau M)^2\left[f''((1-\alpha)\tau M) + \left(\frac{1}{n}\right)^2 g''\left(\frac{\alpha\tau M}{n}\right)\right] \tag{21}$$

We conclude that

$$\frac{\partial F1}{\partial \tau}\frac{\partial F2}{\partial \alpha} = (\tau^2 M^4)\left\{(1-\alpha)^2[f''(.)]^2 + \left(\tfrac{1}{n}\right)^2(\alpha^2 + (1-\alpha)^2)[f''(.)][g''(.)] + \alpha^2\left(\tfrac{1}{n}\right)^4[g''(.)]^2\right\} \tag{22}$$

In terms of the second product in the denominator,

$$\frac{\partial F1}{\partial \alpha} = (-\tau M^2)\left\{(1-\alpha)f''\left((1-\alpha)\tau M\right) - \left(\frac{1}{n}\right)^2 \alpha g''\left(\frac{\alpha\tau M}{n}\right)\right\} \tag{23}$$

Further, because $\frac{\partial F2}{\partial \tau} = \frac{\partial F1}{\partial \alpha}$ it follows that $\frac{\partial F1}{\partial \alpha}\frac{\partial F2}{\partial \tau} = \left(\frac{\partial F1}{\partial \alpha}\right)^2$. Therefore

$$\frac{\partial F1}{\partial \alpha}\frac{\partial F2}{\partial \tau} = (\tau^2 M^4)\left\{(1-\alpha)^2\left[f''(.)\right]^2 - 2\alpha(1-\alpha)\left(\tfrac{1}{n}\right)^2\left[f''(.)\right]\left[g''(.)\right] + \left(\tfrac{1}{n}\right)^4\alpha^2\left[g''(.)\right]^2\right\} \tag{24}$$

The denominator is equal to Equation (22) less Equation (24). This equals:

$$\frac{\partial F2}{\partial \alpha}\frac{\partial F1}{\partial \tau} - \frac{\partial F2}{\partial \tau}\frac{\partial F1}{\partial \alpha} = \underbrace{\left(\frac{\tau^2 M^4}{n^2}\right)}_{>0}\underbrace{\left[f''\left((1-\alpha)\tau M\right)\right]}_{<0}\underbrace{\left[g''\left(\frac{\alpha\tau M}{n}\right)\right]}_{<0} \tag{25}$$

When including the numerator from Equation (19) and the denominator from Equation (25), we get the following result:

$$\frac{\partial \tau}{\partial n} = -\frac{\left(-\frac{\tau^2 M^3}{n^2}\right)\left[f''\left((1-\alpha)\tau M\right)\right]\left[g'\left(\frac{\alpha\tau M}{n}\right) + \frac{\alpha\tau M}{n}g''\left(\frac{\alpha\tau M}{n}\right)\right]}{\left(\frac{\tau^2 M^4}{n^2}\right)\left[f''\left((1-\alpha)\tau M\right)\right]\left[g''\left(\frac{\alpha\tau M}{n}\right)\right]} \tag{26}$$

or, simplified:

$$\frac{\partial \tau}{\partial n} = \frac{\underbrace{\left[g'\left(\frac{\alpha\tau M}{n}\right) + \frac{\alpha\tau M}{n}g''\left(\frac{\alpha\tau M}{n}\right)\right]}_{>0}}{\underbrace{M}_{>0}\underbrace{\left[g''\left(\frac{\alpha\tau M}{n}\right)\right]}_{<0}} \tag{27}$$

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

□

We conclude that fragmentation lowers tax rates.

Corollary 1. *Fragmentation leads to lower expenditure.*

Proof. Equation (27) shows that tax rates fall as fragmentation increases. By budget balancing, this implies that expenditure also falls. □

Our second key comparative static is $\frac{\partial \alpha}{\partial n}$, how the proportion of resources for the targeted local public good respond to a change in fragmentation. The sign of the comparative static indicates whether more or less 'pork' occurs with more parties. Proposition 6 shows that the relationship is negative.

Proposition 6. *Fragmentation leads to lower transfer intensity.*

Proof. We can calculate the sign of this derivative by applying Cramer's Rule to Equation (11):

$$\frac{\partial \alpha}{\partial n} = -\frac{\frac{\partial F2}{\partial n}\frac{\partial F1}{\partial \tau} - \frac{\partial F2}{\partial \tau}\frac{\partial F1}{\partial n}}{\frac{\partial F2}{\partial \alpha}\frac{\partial F1}{\partial \tau} - \frac{\partial F2}{\partial \tau}\frac{\partial F1}{\partial \alpha}} \tag{28}$$

Note that the denominator here is equal to the denominator in Proposition 5. The numerator of this comparative static is $\left(\frac{\partial F2}{\partial n}\frac{\partial F1}{\partial \tau}\right) - \left(\frac{\partial F2}{\partial \tau}\frac{\partial F1}{\partial n}\right)$. For the first two terms, we know from Equation (8) that

$$\frac{\partial F2}{\partial n} = -\left(\frac{\tau M}{n^2}\right)\left(g'\left(\frac{\alpha\tau M}{n}\right) + \frac{\alpha\tau M}{n}g''\left(\frac{\alpha\tau M}{n}\right)\right) \tag{29}$$

and from Equation (5) that

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

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

$$-\left(\tfrac{\tau M^3}{n^2}\right)\left[(1-\alpha)^2 f''((1-\alpha)\tau M) + \left(\tfrac{\alpha}{n}\right)^2 g''\left(\tfrac{\alpha\tau M}{n}\right)\right]\left[g'\left(\tfrac{\alpha\tau M}{n}\right) + \tfrac{\alpha\tau M}{n}g''\left(\tfrac{\alpha\tau M}{n}\right)\right] \tag{31}$$

Now the latter two terms in the numerator. Knowing that $\frac{\partial F2}{\partial \tau} = \frac{\partial F1}{\partial \alpha}$, Equation (23) tells us that

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

Finally,

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

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

$$\frac{\partial F2}{\partial \tau}\frac{\partial F1}{\partial n} = \left(\tfrac{\tau M^3}{n^2}\right)(\alpha)\left[(1-\alpha)f''(.) - \alpha\left(\tfrac{1}{n}\right)^2 g''(.)\right]\left[g'(.) + \tfrac{\alpha\tau M}{n}g''(.)\right] \tag{34}$$

Formulating the full numerator as the difference between Equation (31) and Equation (34)

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

$$= \underbrace{\left(-\frac{\tau M^3}{n^2}\right)}_{<0}\left[\underbrace{(1-\alpha)f''(.)}_{<0}\right] \tag{36}$$

Recall that the denominator here is equal to the denominator in Proposition 5, i.e. the denominator is Equation (25). Combining these we find that

$$\frac{\partial \alpha}{\partial n} = -\frac{\left(-\frac{\tau M^3}{n^2}\right)\left[(1-\alpha)f''\left((1-\alpha)\tau M\right)\right]}{\left(\frac{\tau^2 M^4}{n^2}\right)\left[f''\left((1-\alpha)\tau M\right)\right]\left[g''\left(\frac{\alpha\tau M}{n}\right)\right]} \tag{37}$$

which simplifies to

$$\frac{\partial \alpha}{\partial n} = \frac{\underbrace{(1-\alpha)}_{>0}}{\underbrace{M}_{>0}\underbrace{\left[g''\left(\frac{\alpha\tau M}{n}\right)\right]}_{<0}} \tag{38}$$

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

□

Corollary 2. *Fragmentation lowers the level of transfers.*

Proof. By Equation (38), the fraction of revenue going to transfers falls when fragmentation increases. By Corollary 1, the levels of expenditure falls. Combined, these imply that the level of transfers falls. □

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. Politically motivated goods are over-produced, and the government chooses tax rates that are inefficiently high. In this regard, the model matches the existing literature.

The focus of the model is how these results depend on the level of fragmentation, labeled n. The analysis predicts that taxes fall as n increases. This also implies that spending falls when n increases. The comparative statics also predicted that transfers fall when n increases. These are the main predictions of the model, and they do not coincide with the conventional wisdom. 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 3.11.

3 Empirical Analysis

3.1 Data Description

The predictions of Section 2 can be tested empirically. 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.

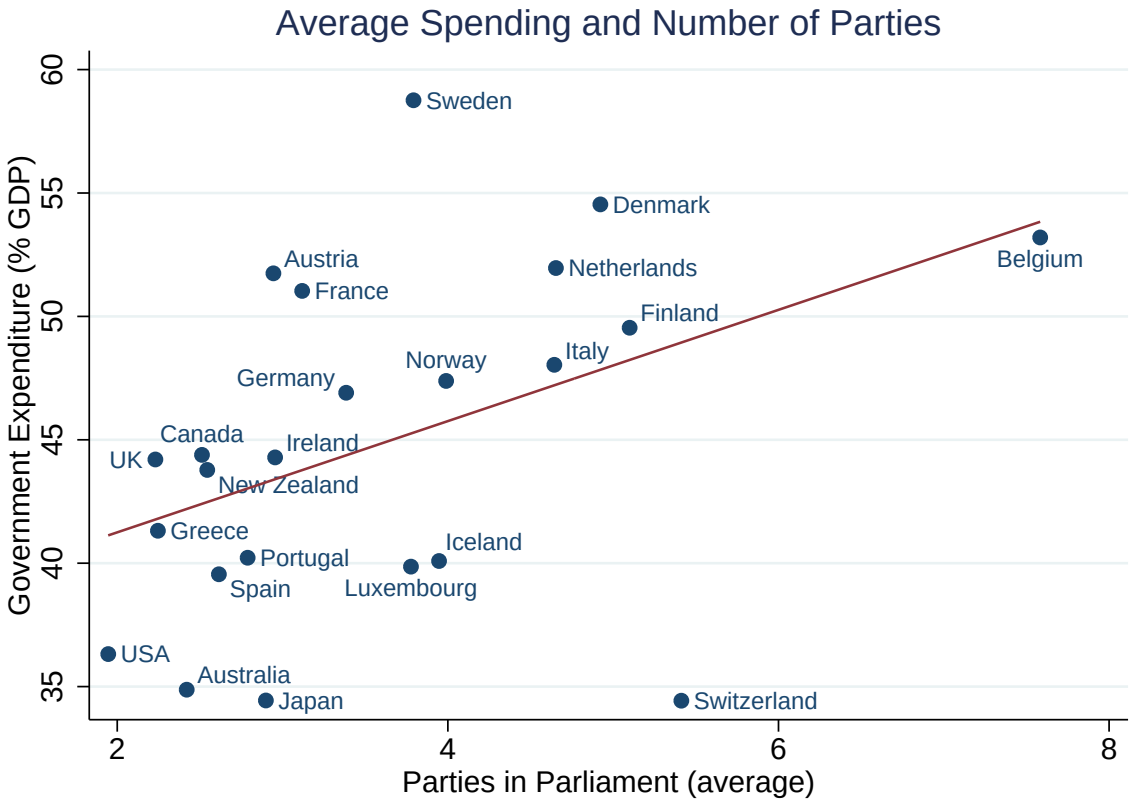

Figure 1: The conventional wisdom on spending

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

[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.

there 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,

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

Over the period 1975–2010 there is a reasonable amount of variation in the measure of legislative fragmentation. For example, Germany has a mean value of 3.38 and a standard deviation of 0.49, while Italy's mean and standard deviation are 4.64 and 1.31 respectively. The median value for all countries is 3.2 with a standard deviation of 1.4. The US has particularly low values: 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 3.4 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. For example, the differences due to ethnolinguistic fractionalization as calculated by Alesina *et al.* (2003), are embedded into country fixed effects.

Identification is not compromised by disgruntled electorates changing party allegiances, e.g. switching from Democrats to Republicans. Identification requires that, conditional on observable characteristics, the level of fragmentation is exogenous. This is a much more reasonable claim. Moreover, cleanly identified evidence of these results have been found by Pettersson-Lidbom (2012). This alleviates concerns that these results are not causal.

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 3.5.

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, and are consistent even under cross-sectional dependence (Driscoll and Kraay, 1998). As suggested by Newey and West (1994), I use the standard lag length of $floor\left[4(T/100)^{2/9}\right]$. This equals 3 for my time horizon. The results are not sensitive to longer lengths. For example, increasing the lag length from 3 to 10 changes the standard error in Column 2 from 0.3187 to 0.3369. This decreases the t-stat from 3.28 to 3.10.

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 fundamental country heterogeneity, shows a negative coefficient. This suggests that moving from a three- to four-party system would lower tax revenue by about one percentage point. This result is also highly significant. Crucially, however, it is of different sign. The different approaches in Columns 1 and 2 reaches opposite conclusions. 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? 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 as a fraction of GDP. The within estimate suggests the same increase in fragmentation would reduce social security transfers by 0.7 percentage points.

Are these results 'real' or, for example, driven by outliers? One method to check for a robust relationship is to take a nonparametric approach to the data. As suggested by Chetty *et al.* (2014), we can visualize the conditional expectation functions using binned scatterplots. This approach is comparable to a scatter plot, but takes the y-axis average of the points within equal-sized x-axis bins. Binned scatterplots also allow for the inclusion of control variables, which can change regression slopes and intercepts and shift the relative position of visualized data points. Thus including control variables (such as fixed effects) will change the location of the points on the graph. The binscatters, with and without fixed effects are shown in Figure 2.

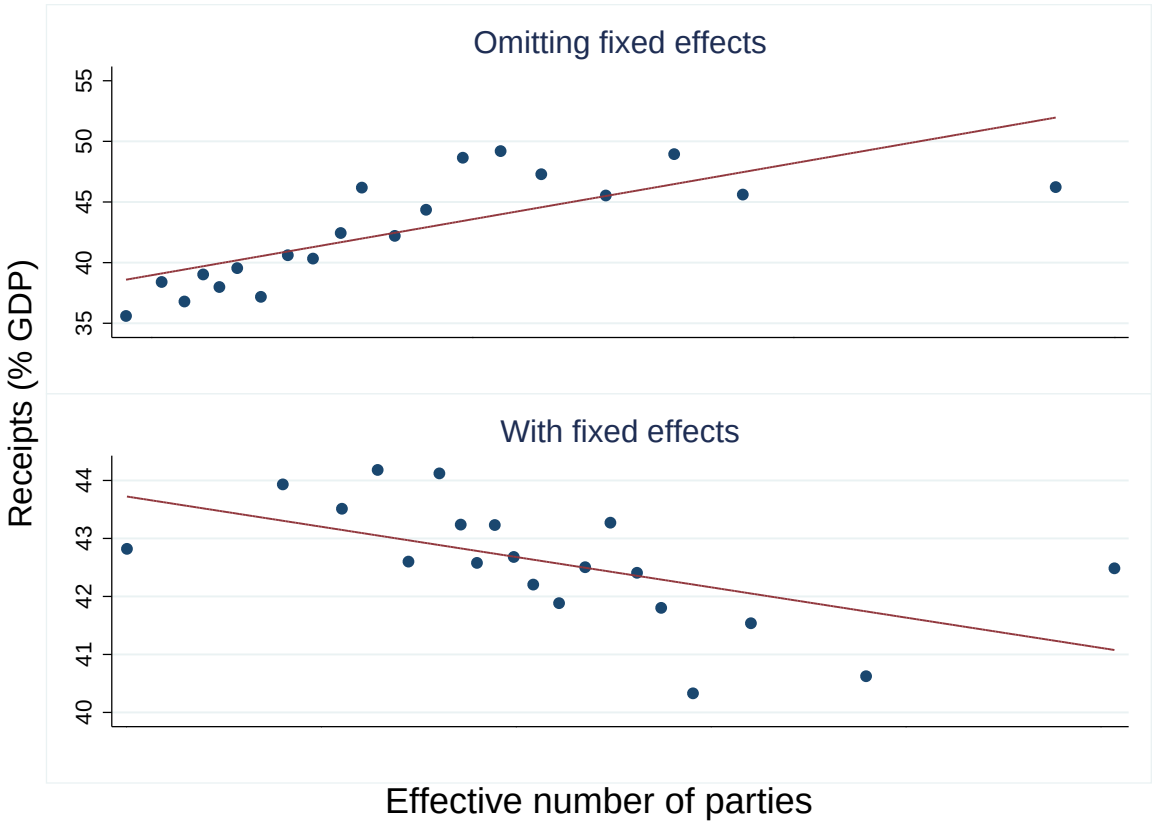

Figure 2: Nonparametric binned scatterplots show reversal of relationship

This nonparametric approach provides visual evidence that receipts fall as the number of parties increases. Almost identical plots can be produced for expenditure and transfers.

To see if the results are confounded by serial correlation, Figure 3 shows scatter bins in first differences i.e. $\Delta Y_{it} = \beta \Delta X_{it} + \Delta \epsilon_{it}$. Results are no longer significant for expenditure, very close to zero for transfers, but remain significant for receipts.

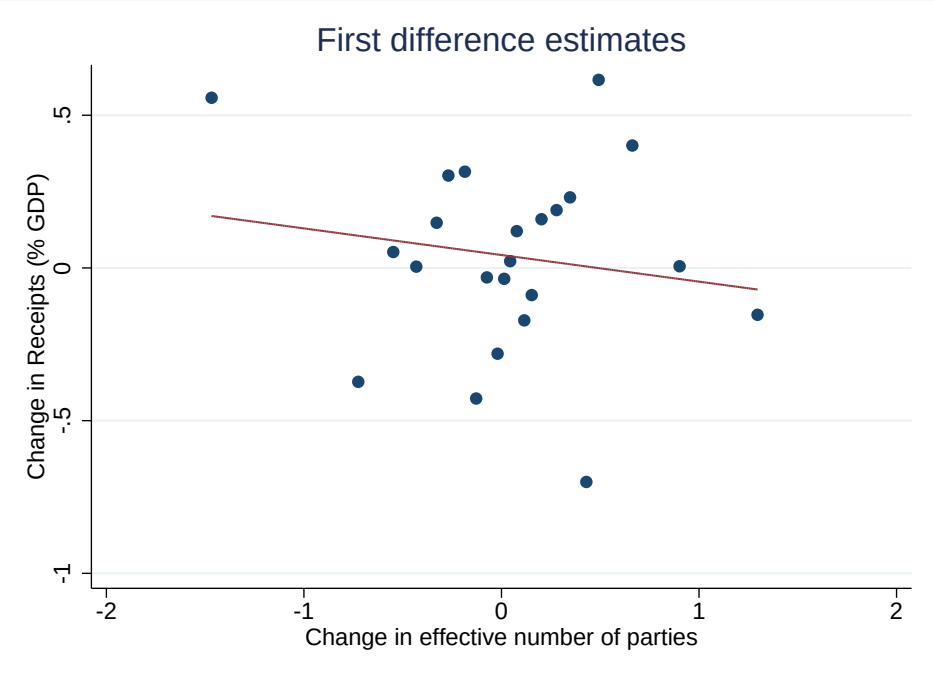

Figure 3: Binned scatterplots show negative relationship in first differences. I exclude bins where there is no change in fragmentation.

The model makes a further, stronger prediction. Not just is it expected 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

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

Again the results support the theory. Targeted transfers fall significantly when legislatures become more fractured. These holds true not just for social security transfers in total, but for each of the components in Table 4. These hypothesis provide a sharp test of the model from Section 2, and the results are unambiguous. For unemployment insurance, the coefficient implies an increase in the number of parties lowers the fraction of tax revenue directed to the unemployed falls for 0.2%. The corresponding numbers for pensions and labor market participation programs are 1% and 0.1% respectively.

Taken as a whole, the results reject the conventional wisdom. More fragmented parliaments are not associated with higher taxes, spending, and transfers. The opposite is true. As parliaments become more fragmented, the size of the public sector falls. This is true whether we look to total receipts, total expenditure, transfers as a whole, or differing components of transfers.

Are these results cleanly identified? Probably not. In any broad international analysis of public finances over a generation, it is unlikely that we can find clean exclusion restrictions. These results would be more convincing with quasi-experimental evidence.

Such evidence already exists. Pettersson-Lidbom (2012) provides evidence challenging the conventional wisdom. In the context of two natural experiments in Scandinavia, Pettersson-Lidbom (2012) finds than an increase in legislature size lowers the size of government. Given that the results are driven exclusively by two Nordic countries, it is reasonable to question the external validity of those results. This paper shows that the effects 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.

3.3 Why such a different relationship?

The result that the inclusion of fixed effects reverses the sign of the relationship presents a puzzle. Why is there such a different relationship? I outline a model below which presents one possible mechanism.

Let country i be endowed, through nature and/or historical process, with a parameter θ_i. This parameter captures the extent of political disagreement within a country. Specifically, the preferences of citizens are evenly distributed over the interval $[0, \theta_i]$. In words, the larger a country's θ, the wider the spectrum of political views its citizens hold. France, for example, has prominent socialist as well as far-right parties. In contrast, the political landscape in the United States is constrained between center-right and conservative parties. Thus France's political spectrum is wider than the United States', and therefore $\theta_{FR} > \theta_{US}$. Graphically, consider the following country with a relatively small θ. For illustrative purposes, I divide the political space into $n = 2$ evenly sized segments, each representing a political party. Each party represents the views of their segment of the spectrum.

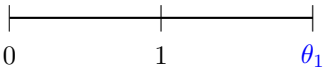

Figure 4: A country of type θ_1, with two parties

Consider alternatively a country of type $\theta_2 > \theta_1$. Here the spectrum of political beliefs is larger. Again, as an illustration, I divide the political space into evenly sized segments. However, there are more political parties in this country. This is because political beliefs are more dispersed. This seems intuitively reasonable, as a larger political spectrum leaves more 'room' for alternative parties. This country has seven parties. A government would require the support of at least $\theta_2/2$ of the electorate; for example, a coalition of parties 1 through 4.

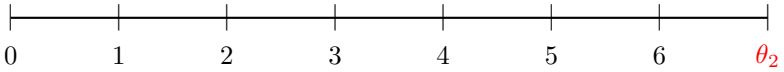

Figure 5: A country of type θ_2, with seven parties

Now consider the case where θ is positively correlated with preferences over the tax rate τ. That is, an increase in the spectrum of political views is more likely to facilitate economically liberal agendas than economically conservative ones. Then countries with higher values of θ will tend to have higher tax rates.

When coupled with the the number of parties increasing in the size of the political spectrum, a positive correlation between θ and τ is sufficient to obtain the conventional

wisdom. Countries endowed with a wider range of views have more parties, and these parties are likely to support larger government sectors. If one were to regress taxes, spending, and/or transfers on the number of parties in a country, we would expect to find a positive relationship. Fragmentation appears to inflate the size of government. That is precisely the conventional wisdom that has prevailed for decades.

This paper asks a slightly more nuanced question: when conditioning on country-specific political factors, what then is the effect of fragmentation? That question can be addressed by including country fixed effects. Controlling for all time-invariant, country-specific factors isolates the impact of fragmentation from the effects of a country's θ parameter. As discussed above, fixed effects capture many likely candidates for the causes of differing values of θ, such as ethnolinguistic fractionalization or the particulars of a country's constitutional history.

We have seen in Table 2 that including country fixed effects suggests a negative relationship between fragmentation and taxes. What is the mechanism driving this result? The intuition is subtle. Consider the same country as described by Figure 5. The value θ_2 remains unchanged and without loss of generality suppose parties 1 through 4 are in a coalition government. Now suppose that the second party exogenously splits in two. This is depicted in Figure 6.

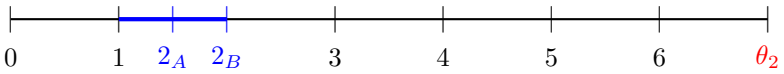

Figure 6: A country of type θ_2, now with more fragmentation

The segment previously occupied by Party 2 is now divided between 2_A and 2_B. It is instructive to note that the split was independent of this country's θ and that the extent of fragmentation has exogenously increased. The coalition now reevaluates its policy choices. Recall from Section 2 that the government chooses tax rates τ, global public good G_1, and targeted public good ("pork") G_2. All parties benefit from lower taxes, and the marginal benefit of lower taxes has remained constant. Conversely, recall that G_2 is divided among coalition partners. With an increase in fragmentation, an extra dollar in G_2 is distributed among more people, leaving less for each individual member. Consequently the parties desire a shifting of resources away from spending on G_2 towards lower taxes. Revenue falls, as does expenditure, as does transfer intensity.

The model above provides one plausible explanation what may be driving the results from Section 3.2 that suggest that an increase in fragmentation leads to a smaller public sector.. To examine whether these results are robust, the next sections repeat the empirical investigation of Section 3.2 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. Fifthly I show the results are robust to the inclusion of macroeconomic controls. Finally I test if the results are robust to the phase of the electoral cycle.

3.4 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.

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

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 with legislative fragmentation.

Table 6 is the executive fragmentation analogue of Table 2. Instead of regressing policy outcomes on legislative fragmentation, Table 6 shows the results for executive fragmentation.

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

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

3.5 More countries, shorter panel

A problem with analysis of the large-T panel data in Sections 3.2 and 3.4 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

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

[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.

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

for the effect 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

3.6 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 7, these tax rate data map neatly to the conventional wisdom.

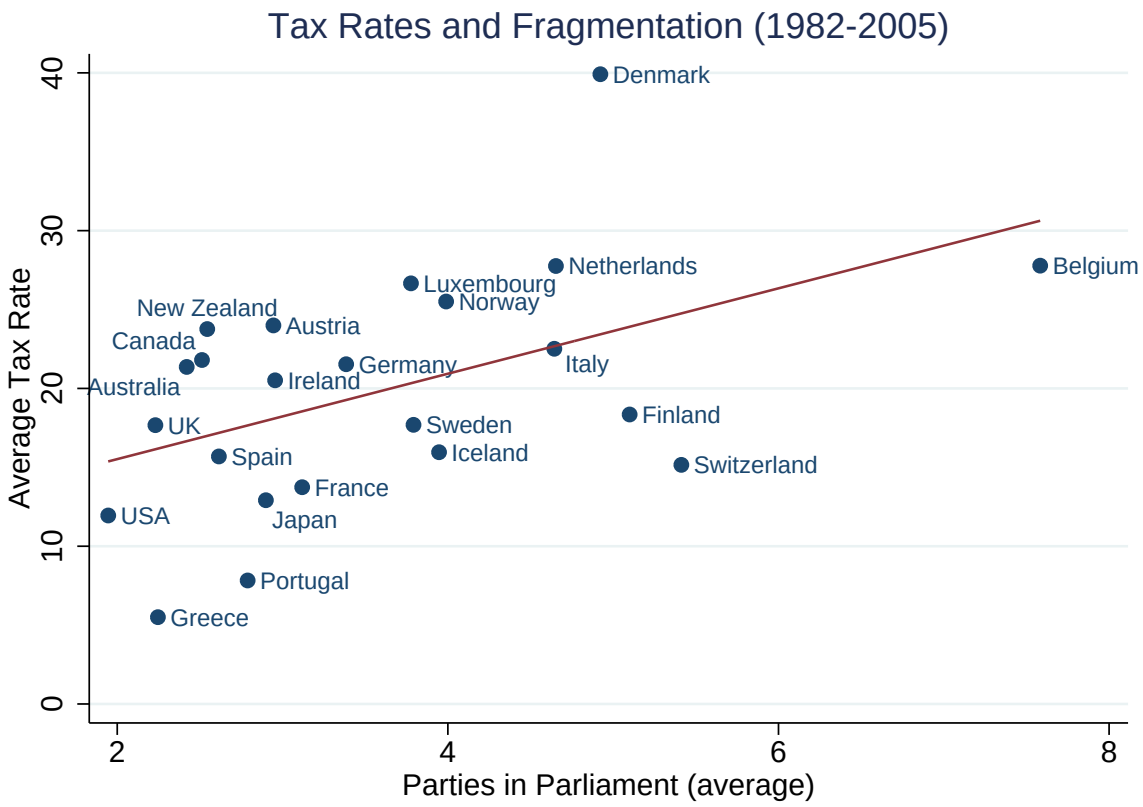

Figure 7: Relationship with alternative measure of taxation

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 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

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

negative. Furthermore, they are significantly different from the positive coefficients predicted by excluding fixed effects.

3.7 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.

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

3.8 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 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.

3.9 Macroeconomic controls

Perhaps the changes in tax policy are responses not to fragmentation, but to macroeconomic shocks. There as a further robustness check, I control for some macroeconomic variables. The variables included are summarized in Table 14.

The inclusion of macro controls are potentially endogenous. Consequently I intentionally chose control variables that are at least partly outside the control of government: openness to international trade, population over 65, and national debt. International trade is well explained by the geographical size of a country and proximity to its neighbors; modern democracies have limited control on the size of its adult population; and national debt is

Table 13: Effects of 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

Table 14: 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
Social security transfers (% GDP)	13.68	3.88	820	4.34	23.89
Eff. parties	3.59	1.43	826	1.69	9.07
International Trade (% GDP)	72.48	44.99	828	16.01	319.55
Population over 65 (millions)	4.87	7.51	818	0.02	40.54
National Debt (% GDP)	61.22	30.77	755	4.64	192.74

a a stock variable that a government may have difficulty substantially affecting. Although these controls are likely less endogenous than variables such as deficit level or inflation rate, they should be interpreted carefully. Regression results with and without macro controls are included in Table 15.

Table 15: Effect of Macro Controls

	Receipts		Expenditure		Transfers	
	(1)	(2)	(3)	(4)	(5)	(6)
Eff. parties	-1.045***	-0.667***	-1.939***	-1.277***	-0.697***	-0.334**
	(0.319)	(0.202)	(0.430)	(0.236)	(0.156)	(0.124)
Year & Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls	No	Yes	No	Yes	No	Yes
N	783	742	783	742	818	742

Macroeconomic factors do catch some of the residual variance and consequently influence our coefficients of interest. In general, the magnitudes drop by about half. The substantive results — and the sign of the relationship — remain the same.

3.10 Electoral cycle

The results are also robust to phases of the electoral cycle. Table 17, which is large and thus left to 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.

3.11 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 16: 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

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 where a coalition of n members 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. The model shows that governments fund targeted public goods above the level a benevolent social planner would choose, and consequently that governments set tax rates that are inefficiently high. These results are standard in the literature.

Next the paper showed how these results respond to a change in n. Comparative static analysis indicates that taxes, spending, transfers, and transfer intensity fall as the coalition becomes more fragmented. Fragmentation reduces the inefficiency. These results are not standard. Over the decades, the theoretical and empirical literatures on the question have generated a consensus ("conventional wisdom") that fragmentation leads to a larger public sector. My results run counter to the conventional wisdom.

I test these results with data from dozens of OECD countries over the past forty years. I replicate the conventional wisdom using a naive estimation procedure. An improved spec-

ification which includes country fixed effects has results that are wholly different from the conventional wisdom. Rather than a positive relationship between fragmentation and the size of government, the relationship is negative. This holds true for receipts, expenditures, transfers, the fraction of government revenue assigned to transfers, and various forms of transfers. This results also hold true for legislative as well as executive fragmentation. The results are not affected by the ideological composition of government or parliament, or the phase of the electoral cycle.

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 an intuitive 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.

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Appendix: Tax Policy and the Electoral Cycle

Table 17: 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

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