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Fiscal Federalism

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# REPRESENTATION AND REGIONAL REDISTRIBUTION IN FEDERATIONS

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ABSTRACT: This paper examines the role of institutions of territorial representation in shaping long-term patterns of inter-regional redistribution within federations. A simple legislative bargaining model with endogenous taxation suggests that over-represented states should be favored in the distribution of inter-governmental grants regardless of their income level. We demonstrate that a striking relationship between legislative representation and grants holds up in a diverse group of federations from around the world. The relationship appears not to be an artifact of economic development, population size, population density, or the historical conditions under which the federal bargain was struck. Furthermore, we suggest that the attractiveness of poor states as coalition partners implies that intergovernmental transfer systems will often tend toward progressivity under equal apportionment, but the systematic over-representation of wealthy (or poor) states can undermine (or bolster) this logic.

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# 1 Introduction

One of the defining features of federalism is that national policy changes require some form of bargaining among representatives of states or provinces. In fact, the basic structure of many federations can be traced to a bargain, or a set of bargains, between previously autonomous entities. These entities are often quite asymmetric in size and income, and the original federal bargain often endowed some units with much greater legislative representation than others, generally in an upper chamber based on territorial rather than population-based representation.

Decades or even hundreds of years later, these highly asymmetric representation structures survive in federations. A relatively large empirical literature asks a rather natural question: Do these institutions matter? In particular, do over-represented regions receive larger per-capita shares of central government expenditures?

Single-country studies, mostly focusing on the United States, have uncovered a positive correlation between representation and expenditures, but there are good reasons to be concerned about the causal mechanism since within any country, given the nature of the initial constitutional bargain, legislative representation is likely correlated with some other factors– for example a small and sparse population and an agricultural economy– that affect central government expenditures through mechanisms having nothing to do with representation. More recently, a handful of case studies have employed stronger identification strategies and found evidence in favor of an exogenous impact of representation on budgetary outcomes, but given their narrow scope and focus on individual countries, it is difficult to draw general conclusions from these studies about the importance of representation.

Moreover, while it seems intuitive that regions with more votes might walk away from the legislature with more money, the theoretical motivation for existing empirical studies is surprisingly weak. Most studies cite the seminal contribution of Baron and Ferejohn (1989), although this model is ambiguous about the impact of representation on budgetary outcomes.

This paper makes two primary contributions. First, it presents a simple legislative bargaining model in which representatives of regions must form winning legislative coalitions in order to enact redistributive tax-transfer schemes. In this model, provinces proposing changes from the status quo must offer both a uniform national tax rate on income and an inter-regional distribution of lump-sum grants. The analysis shows that an increase in representation for a region leads to a higher payoff regardless of whether it is rich or poor. An increase in representation has two effects: it increases a region's proposal power, and it makes a region a more attractive coalitional partner for other proposers. Both of these effects work unambiguously in the same direction.

Second, we demonstrate that the relationship between legislative representation and grants holds up in a surprisingly large number of federations, and the magnitude of the effect is generally quite large. The key advantage of our cross-country empirical approach is that we are able to examine countries with a wide range of institutional settings, and crucially, a wide range of experiences in reaching the initial constitutional bargain that generated the representation scheme. Unlike existing single-country studies, we are able to show that the relationship holds up whether the over-represented states are large or small, densely or sparsely populated, rich or poor, and whether or not they were powerful at the time of the initial constitutional bargain.

Regional income plays a central role in our theoretical model, and a danger in single-country studies is that the legacy of the initial constitutional bargain leaves a high correlation between income and representation, making it difficult to disentangle the relationship between representation and redistribution. Thus it is particularly useful that our federations include some cases in which rich states are over-represented, some cases in which poor states are over-represented, and some in which there is no relationship between income and representation. We show that the connection between representation and grants is strong in each of these settings.

Additionally, the theoretical model can be extended to allow for some more contingent insights into the conditions under which intergovernmental grants might be progressive, regressive, or income-neutral in the long run. In the model, if all provinces have equal representation, agenda-setters will favor poor provinces since their support can be obtained at lower cost, generating long-term progressivity in the transfer system. However, once again, the role of territorial representation looms large since this effect can easily be unraveled or even reversed if relatively wealthy provinces are sufficiently over-represented. Alternatively, it can be amplified if poor provinces are over-represented. These insights are quite consistent with patterns in the cross-country data.

In the next section, we begin by situating our analysis in the literatures on federalism and distributive politics, and introducing basic facts about the joint distribution of population and income across provinces in nine federations along with the institutions through which provinces are represented. The third section develops the legislative bargaining model and establishes the central argument about malapportionment. The next three sections present the results of empirical investigations, and the final section concludes.

# 2 Federalism, Representation, and Distributive Politics

## 2.1 Territorial Representation in Comparative Perspective

While countries that refer to themselves as federations have some similarities, there is no uniform path leading to modern institutions of territorial representation. In some federations, modern representative institutions can be traced directly to a crucial moment when a group of sovereign political units forms a voluntary union. In these settings, institutions of representation that have survived to the present are likely to favor groups that faced the greatest risks of confederation when the initial deal was struck.

In other federations, the notion of a voluntary union is less applicable. For instance, when the post-Franco Spanish constitution was negotiated, the governments of the autonomous communities had not yet been constituted, and representatives of Catalonia were not in a position to threaten to undermine a relatively centralized constitution, in large part because of the unattractive default payoff of a return to authoritarianism (Colomer 1998). In Germany, while Land governments existed prior to the negotiation of the Basic Law in the aftermath of World War II and the wealthier Laender were unhappy with the centralization of tax power, individual Laender ultimately did not have a veto over the constitution (Renzsch 1991).

A concern for empirical studies of malapportionment is that the states favored in the initial constitutional bargain may have some qualities that also favor them in the game of distributive politics years later. Perhaps the most basic concern is that through a common logic, such states tend to be sparsely populated and located in the economic periphery.

The classical view of federalism is as a pact among previously sovereign entities, each of whom perceives some advantages from pooling their sovereignty and creating a union to achieve some important collective goods like mutual defense, a common currency, or free trade. But an important problem in the formation of such unions is that the risks and expected benefits are not equal across units. In particular, some units might fear exploitation by other units in the future, and as a result, withhold their assent to the creation of the union.

One of the most important issues facing proto-federations in the late 18th century and throughout the 19th century pitted the interests of a burgeoning manufacturing sector, which desired protection from imports in order to build up a domestic market, against those of the primary product exporting periphery, which favored free trade. This was an important battle in the events leading to the modern federal bargain in Argentina, Australia, Brazil, Canada, the German Zollverein, Mexico, and the United States. In the United States, of course,

there was also a closely related battle over slavery. Generally speaking, the agricultural periphery feared exploitation by the urban, industrializing core, which was made up of more populous units (e.g. New York, Ontario, Buenos Aires, Sao Paulo) that were also rapidly gaining population. A rather natural way to assuage the fears of the periphery was to draw provincial boundaries and enact modes of provincial representation that would over-represent the periphery, effectively giving them a veto over changes from the status quo.

In the years after the initial bargain was struck, in many federations the process of industrialization and urbanization only increased this asymmetry as migrants moved from the agricultural periphery to the urban core but institutions of representation remained unchanged. Additionally, the representative structure in some federations has been altered by legacies of authoritarianism. Realizing the potential usefulness of small rural states as coalition partners in the legislature, Peron in 1950s Argentina and the Brazilian military regime of the 1960s utilized a similar strategy of creating new, politically friendly states (Gibson 2004; Diaz-Cayeros 2006; Bruhn, Gallego, and Onorato 2008). Thus in many federations, the over-represented states tend to be sparsely populated today.

*−Figure* 1 *about here−*

For the decade from 1990 to 2000, for each province in each of the nine federations for which we were able to collect data, Figure 1 plots the province's average seats per capita, expressed as a share of the national average, against the log of standardized population density. The dark dots correspond to the lower chamber, and the light dots represent the upper chamber. In many federations there is a tendency to over-represent sparsely populated states, especially in the upper chamber. However, the relationship is neither linear nor universal. In addition to the sparse Western states, the U.S. Senate also over-represents urban Eastern states like Delaware and Rhode Island. The most over-represented states in Germany are the urban, industrialized state of Saarland and the dense city-states of Hamburg and Bremen. In Canada, the most over-represented provinces are the relatively dense Maritimes.

Another potentially important correlate of both representation and grants might be income. One possibility might be that wealthy states are inherently influential, and are able to bargain for greater representation. Alternatively, one might guess that by over-representing areas that constituted the agricultural periphery in the 18th or early 19th centuries, federations would tend to over-represent relatively poor provinces. Figure 2 plots the representation variable against average real provincial GDP per capita (expressed as a share of the national average) at the end of the 20th century. Some federations clearly over-represent the poor, some over-represent the wealthy, and others display no pattern.

*−Figure 2 about here−*

In Australia, indeed the upper chamber was initially designed to protect the interests of the relatively poor, natural resource-oriented states, especially Tasmania and Western Australia, and there is still a negative correlation between income and per-capita representation, but this is changing as the income of Western Australia and the Northern Territory have experienced dramatic increases associated with natural resource booms. In Canada as well, there is a significant negative relationship between income and representation owing to the Maritimes. In post-unification Germany, the relationship is ambiguous: it would be negative if not for the substantial over-representation of the wealthy city-states. In Brazil and Switzerland, a handful of small, very poor states in the periphery are rather dramatically over-represented, but the overall relationship is not significant. In contrast, the Argentine and Mexican federations tend to over-represent states with income above the national average. The same has been true of the United States until around 1990, after which the relationship has lost significance.

Figures 1 and 2 also demonstrate cross country differences in the extent of malapportionment, and differences between upper and lower chambers. In the Latin American federations as well as the United States and Switzerland, several provinces have per-capita legislative representation in the upper chamber that exceeds 200 percent of the national average. In some federations, like the United States, Germany, Switzerland, and Australia, asymmetric territorial representation is substantial in the upper chamber, while the lower chamber comes somewhat closer to equal apportionment by population. In Argentina, Brazil, and Mexico, however, the asymmetry is dramatic in both chambers.

In Canada and Spain, the constitutional bargain did not include a strong territorial upper chamber, but the lower chamber is characterized by non-trivial malapportionment. However, the literature on both countries describes a form of "executive federalism," where intergovernmental fiscal flows are reportedly subject to bargaining between the national and provincial executives. And in Canada, perhaps in part to compensate for the lack of a territorial upper chamber, there is a strong norm of including representatives of all provinces in the cabinet.

## 2.2 Empirical Studies of Malapportionment and Public Expenditures

Given these large asymmetries in representation, an obvious hypothesis is that as national governments built political coalitions in order to develop the power to tax during the first half of the 20th century and dramatically increased government spending throughout the second

half (Tanzi and Schuknecht 2000), the states that bargained for above-average legislative representation in an earlier era of tariffs and excise taxes would be able to extract above-average shares of government expenditures in the era of direct central government taxation of income. For instance, the literature on the construction of the New Deal coalition in the United States argues that small, sparsely populated states were crucial targets of vote-buying efforts by political entrepreneurs attempting to introduce progressive reforms (Wright 1974, Anderson and Tollison 1991).

Since Wright's (1974) initial study of the New Deal, a large empirical literature has attempted to ascertain the relationship between over-representation and public expenditures in a wide range of contexts. Atlas et al. (1995) and Hoover and Pecorino (2005) establish a positive relationship between changes in states' net receipts from federal expenditures and changes in representation per capita in the U.S. Senate. However, Larcinese et al. (2007) and Elis et al. (2009) point out that it is very difficult to disentangle the effect of population movements from the effect of representation changes in this type of observational study. Above all, population outflow from the economic periphery and increases in federal funds might both be driven by some type of economic distress that has little to do with representation or legislative bargaining.

A more natural approach is to focus on the relationship between levels of representation and expenditures across states. In studies of the U.S. Senate, this approach is taken by Lee (1998, 2000) and Larcinese et al. (2007). This has also been the approach in studies of Germany (Pitlik et al. 2005) and the European Union (Rodden 2002), and a comparative study of the federations in the Americas (Gibson, Calvo, and Falleti 2004). One of the difficulties of causal identification with this approach, however, is that the size and population density of provinces might be correlated with their expenditure needs, and the correlation between representation and expenditures might be spurious. Specifically, provinces with very small or sparse populations may experience higher per capita costs of service provision (Alesina and Spolaore 2005). A related possibility is that voters in sparse and economically undiversified provinces in the periphery place greater value on federal expenditure projects than do voters in large, economically diverse provinces of the economic core, providing incentives for their representatives to expend a larger share of their efforts on distributive politics relative to other legislative endeavors. However, a European literature building on the insights of Popitz (1932) emphasizes the opposite empirical relationship. Since cities have cost advantages in the provision of many public goods, e.g. museums and zoos, urban jurisdictions should optimally receive larger grants per capita than rural areas, and there is evidence that at least in some European countries they do (Buettner and Holm-Hadulla 2008).

Another set of more recent papers attempts to resolve these identification problems with a number of creative techniques. First, Ansolabehere, Gerber, and Snyder (2002) examine changes in apportionment within U.S. states associated with the Supreme Court's Baker v. Carr decision in 1962, which led to a significant flow of funds away from the previously over-represented counties. Horiuchi and Saito(2003) report an equalization in per capita transfers associated with a shift to more equal apportionment in the wake of the 1994 reapportionment in Japan. Hirano (2006) and Hirano and Ting (2008) use the deaths of legislators in the Japanese diet to demonstrate the impact of exogenous under-representation on the distribution of resources. Making use of the relatively equal representation of U.S. states in the House relative to the Senate, Knight (2008) and Hauk and Wacziarg (2007) contrast earmarks that originate in the Senate versus the House and find a greater tendency to target small states in the Senate. Elis et al (2009) make use of discontinuities in the apportionment formula for the U.S. House to demonstrate that when a state receives an extra representative as the result of reapportionment, it receives additional transfers. Finally, Aksoy and Rodden (2009) show that the bias in favor of small, over-represented EU member states in the distribution of agricultural and structural transfers only shows up for new member states once they have had a chance to fully participate in the negotiation of a multi-year budget.

On the whole, these studies bolster the claim that the cross-province correlations between representation and expenditures from earlier single-country studies were driven at least in part by some aspect of legislative representation. The disadvantage of these studies is that they tend to focus on small segments of the overall inter-provincial transfer system (e.g. earmarks), or relatively rare events like reapportionment or death, which make it difficult to assess the overall importance of asymmetric representation for the distribution of resources in federations. Moreover, each of these studies except for Gibson et al (2004) focus exclusively on a single country.

The goal of this paper is to return attention to the bigger picture by analyzing comparable data covering a relatively long period of time over several federations, allowing us to assess the impact of representation on redistribution in a wide variety of contexts. While our analysis suffers from the same limitation faced by all observational research, our explicitly comparative analysis provides a number of advantages. Above all, Figures 1 and 2 show that our cases demonstrate substantial variation on some of the key confounding variables that cannot be achieved in the context of a single-case study. Some of our federations are characterized by rural over-representation, while others over-represent city-states. Some over-represent the poor, while others over-represent the rich. Our sample of federations demonstrates considerable variation in the extent of malapportionment, as well as whether it exists in one legislative chamber or two. As discussed further below, our sample of federations

also demonstrates considerable variation in the nature of executive-legislative relations.

## 2.3 Theories of Malapportionment and Redistribution

Scholars that examine the effect of malapportionment on redistribution usually look for a positive relationship between per capita representation and expenditures, usually citing the seminal Baron-Ferejohn bargaining model. However, it is not clear how more representation translates into a better payoff. Does an increase in representation cause an increase in proposal power, an increase in voting power, or both? What is the connection between more proposal power, more voting power, and the payoff of the distributive bargain? These questions are important since in the Baron-Ferejohn framework, it is possible to have a negative relationship between more representation and a player's expected payoff. The rationale is that although more representation increases a player's proposal power, it could make a player a less attractive coalitional partner in the instances in which that player is not the agenda setter. Depending on the size of the effects, a player could be worse off by an increase in its representation.

The theoretical foundations for the connection between more representation and a higher share of government expenditures are weak because the literature does not clearly disentangle the effect of more proposal power from the effect of more voting power and wether these effects work in the same direction or not. An important exception is Ansolabehere, Snyder and Ting's (2003) analysis of legislative bargaining in a bicameral legislature. They use a non-cooperative bargaining game based on the closed-rule, infinite-horizon model of Baron and Ferejohn to analyze the conditions under which unequal representation in a bicameral legislature may produce an unequal division of public expenditures. Ansolabehere, Snyder and Ting separate the effect of unequal voting power from the effect of unequal proposal power and show that when there is unequal voting power but equal proposal power, all lower-chamber members have the same expected payoff.

Brian Knight (2008) analyses the relationship between legislative representation, bargaining power and the geographic distribution of federal funds from both a theoretical and empirical perspective. He develops a formal model in which the bargaining advantage operates through two channels: a proposal power channel and a voting cost channel. In his model, the relationship between more representation and more distribution of federal funds for a jurisdiction is not unambiguous: the proposal power is not valuable under certain conditions. We develop a model in which an increase in representation unambiguously produces an increase in the expected bargaining payoff; in our model the proposal power is always valuable.

Furthermore, the theoretical work in the tradition of Baron-Ferejohn, including Ansolabehere, Snyder and Ting (2003) and Knight (2008) assume that the parties bargain over how to divide an exogenous pie. However, if the pie is not exogenous, the same parties that bargain over dividing the pie have to first decide on how much to contribute to the pie that is to be redistributed. If the size of the pie is determined endogenously, another important variable in the bargaining process is a player's income.

In this paper, building from the approach suggested by Perssen and Tabellini (2002), we develop a simple game-theoretic model with both taxation and redistribution in order to shed light on the process through which constituent units in the world's federations constructed coalitions that generated different long-term patterns of inter-regional redistribution. In the model, each player has an initial income. The bargain is both over a level of taxation and redistribution of the pie created from the taxed income. The main purpose of the model is to show that an increase in representation always leads to a higher payoff for a player regardless of the player's initial income. In the model, an increase in representation has two beneficial effects: it increases a player's proposal power and also makes the player a more attractive coalition partner in the instances in which the the player is not the agenda setter. In this model, more proposal power and more voting power work in the same direction with the combined effect of increasing the bargain payoff.

# 3 The Model

## 3.1 An Example

Before explaining the model, we introduce the intuition with a very simple example. Suppose that there are 5 states in the legislature. We label the state by $s = 1, 2, 3, 4, 5$. Their income is $Y_1 = 2, Y_2 = 3, Y_3 = 4, Y_4 = 5, Y_5 = 6$. The total number of votes in the legislature is $V = 15$. The legislative bargaining proceeds as follows: One state is recognized as the agenda setter and makes a policy proposal consisting of a flat tax rate on income and an expenditure share for each state out of the total taxed income. The probability of being recognized as the agenda setter is proportional with a state's voting weight, for a state $s$ the probability of being the agenda setter is $\frac{v_s}{V}$.

The legislature works under simple majority rule and thus a policy proposal needs at least 8 votes to be approved. If the proposal is not approved, the result is the status quo, where each state retains its initial income. Let us compare two cases: 1) in the first scenario, the voting weights are $v_1 = 2, v_2 = 4, v_3 = 5, v_4 = 1, v_5 = 3$ and 2) in the second scenario, the voting weights are $v_1 = 2, v_2 = 3, v_3 = 4, v_4 = 1, v_5 = 5$. In the first case state 5 has

three votes and in the second case state 5 has five votes. State 5 has more representation in the second scenario, and we want to see how such an increase in representation affects state 5 payoff.

Let us consider the first situation, the voting weights are $v_1 = 2, v_2 = 4, v_3 = 5, v_4 = 1, v_5 = 3$. With probability $\frac{1}{5}$ state 5 is the agenda setter and in that instance state 5 makes a coalition with state 3 and obtains an payoff of 16. If state 5 is not the agenda setter (an event that happens with probability $\frac{4}{5}$) state 5 is not a partner in any coalition regardless of the agenda setter and thus state 5 gets a payoff of 0. Thus, in the first situation, the expected payoff of state 5 is 3.2.

Table 1: State's 5 Payoff in Situation 1

| Agenda Setter | Pr(Agenda Setter) | Winning Coalition | State's 5 Payoff |
|---|---|---|---|
| State 1 | $\frac{2}{15}$ | State 2 and State 3 | 0 |
| State 2 | $\frac{4}{15}$ | State 3 | 0 |
| State 3 | $\frac{1}{3}$ | State 2 | 0 |
| State 4 | $\frac{1}{15}$ | State 1 and State 3 | 0 |
| State 5 | $\frac{1}{5}$ | State 3 | 16 |

Now consider the second situation, the voting weights are $v_1 = 2, v_2 = 3, v_3 = 4, v_4 = 1, v_5 = 5$. With probability $\frac{1}{3}$ state 5 is the agenda setter and in that instance state 5 makes a coalition with state 2 and obtains a payoff of 17. In this situation, state 5 can get a positive payoff even in instance in which state 5 is not the agenda setter. If state 2 is the agenda setter (an event that happens with probability $\frac{1}{5}$), state 2 need at least 5 votes to form a winning coalition. The coalition can be formed either with state 5 or with states 1 and 3; both coalitions give the same payoff to state 2: a payoff of 14. Let us assume that a state tosses a coin if two equally attractive coalitions can be formed. Then state 5 obtains a payoff of $\frac{1}{5} \cdot \frac{1}{2} \cdot 6 = 0.6$ when state 5 is not the agenda setter. If any other state but state 2 is the agenda setter, state 5 is not part of any winning coalition. Thus, the expected payoff of state 5 is $\frac{1}{3} \cdot 17 + \frac{1}{10} \cdot 6 = 6.27$.

Table 2: State's 5 Payoff in Situation 2

| Agenda Setter | Pr(Agenda Setter) | Winning Coalition | State's 5 Payoff |
|---|---|---|---|
| State 1 | $\frac{2}{15}$ | State 2 and State 3 | 0 |
| State 2 | $\frac{1}{5}$ | State 1 and State 3 or State 5 | 3 |
| State 3 | $\frac{4}{15}$ | State 1and 2 | 0 |
| State 4 | $\frac{1}{15}$ | State 2 and State 3 | 0 |
| State 5 | $\frac{1}{3}$ | State 2 | 17 |

Compared with the first situation, state 5's expected payoff increases by 3.07. And 2.47 of this increase comes from the increase in agenda setting power and 0.6 comes from being a more attractive coalitional partner when other states set the agenda.

## 3.2 Players, Preferences and the Timing of the Game

Consider a legislature consisting of $J$ distinct states. State $i = 1, ..., j$ has size of (mass) $N$ where $\Sigma_{i \in J} N = J \cdot N$ is the size of the entire population. Individual income is different in all states, $y_1, ..., y_j$ and without loss of generality, we can rank the overall income from the poorest to the richest state, $Y_1 = N \cdot y_1, Y_2 = N \cdot y_2, .., Y_J = N \cdot y_j$ in which $Y_1 < Y_2 < ... < Y_j$.

Each state $i$ has a certain number of votes in the legislature $v_i$. We can interpret this as the number of legislators from the respective state in the legislature. The total number of votes in the legislature is $\Sigma_{i \in J} v_i = V$. We assume that $V$ is odd.

The legislative bargaining proceeds as follows. One state is recognized as the agenda setter. The probability of being recognized as the agenda setter is a function of the number of seats a state has, i.e. for a state $i$ the probability of being the agenda setter is $\frac{v_i}{V}$. The agenda setter makes a policy proposal consisting of a flat tax rate $0 \leq t \leq 1$ and a redistribution share (out the total amount of taxed income) for each state in the legislature $(r_1, r_2, ..., r_j)$. After the agenda setter makes the proposal, each states votes yes or no. The proposal is adopted if it garners at least a simple majority of votes, i.e $\frac{V+1}{2}$. If the agenda setter's proposal does not garner a simple majority of the votes, the status quo policy results: each state $i$ retains its initial income $Y_i$.

Thus, the payoff of a state $i$ from one realization of the game is as follows: if the agenda setter's policy proposal is adopted, it is $U_i = (1 - t) \cdot Y_i + r_i$ and if the agenda setter's policy proposal is not adopted, the payoff is $U_i = Y_i$.

The policy proposal consist both of a flat tax rate $t$ and a redistribution tuple $r_1, r_2, ..., r_j$ in which $r_i$ represents the amounts of grants state $i$ receives in the policy proposal put forth by the agenda setter $a$. Thus, the model includes both taxation and redistribution.

## 3.3 Equilibrium and Comparative Statics

The equilibrium concept we use is subgame perfect equilibrium. We can solve the game by backward induction. For any policy proposal the agenda setter makes, a state $i$ will vote for the agenda setter's proposal if and only if state $i$ gets at least as much as the status-quo outcome. Thus state $i$ decision is to vote yes if $(1 - t) \cdot Y_s + r_s \geq Y_s$ and vote no if $(1 - t) \cdot Y_s + r_s < Y_s$.

Now, given the decision of a state $i$ we can solve for the agenda setter's policy proposal. Let us denote the agenda setter state by $a$, a state in the winning coalition by $w \in W$ and a state in the losing coalition $l \in L$. We show the following results:

*Lemma 1.* For any agenda setter $a$ and any tax proposal $t$, a state $l \in L$ that is not in the winning coalition receives a share of the pie (from the taxed income) of $r_l = 0$.

*Proof.* Suppose that the agenda setter $i$ gives a state $l$ that is not in the winning coalition a share of the pie after taxation $r_l = \epsilon > 0$. But since the state $l$ is not in the winning coalition, the agenda setter does not need its vote to get the proposal approved. This implies that the agenda setter's share of the pie would be smaller with $\epsilon$ if the agenda setter gives any positive amount to a state in the losing coalition. Thus the agenda setter has a profitable deviation to $r_l = 0$. □

*Lemma 2* For any agenda setter $a$ and any tax proposal $t$, any state $w \in W$ in the winning coalition (other than the agenda setter) receives a payoff of $U_w = Y_w$.

*Proof.* Suppose that a state in the winning coalition obtains a payoff of $U_w = Y_w + \epsilon$. But then the agenda setter has a profitable deviation to offer the state $w$ exactly $Y_w$ after taxation and redistribution since the state $w$ still votes for the agenda setter's policy proposal and the agenda setter's payoff increases by $\epsilon$. By this reasoning, all states in the winning coalition $W$ receive exactly their initial income after the taxation and redistribution. □

*Lemma 3.* The agenda setter $i$ proposes a flat tax rate of $t = 1$.

*Proof.* Suppose that the agenda setter proposes a tax rate $t < 1$. This implies that states that are not in the winning coalition will have a strictly positive utility after the agenda setter's proposal is adopted. But then the agenda setter has a profitable deviation to $t = 1$ since the agenda setter's payoff increases while the proposal is still adopted. □

Finally, we need to solve for which states are in the winning coalition $W$ and which states are in the losing coalition $L$. The agenda setter needs $\frac{V+1}{2}$ votes to pass its policy proposal. Assuming that the agenda setter always votes for its proposal, the agenda setter needs another $\frac{V+1}{2} - v_a$ votes. The agenda setter's objective is to maximize its payoff under the constraint of forming the cheapest possible winning coalition. Thus, the agenda setter's problem is:

$$minimize\ \Sigma_i Y_i \text{ such that } \Sigma_i v_i \geq \frac{V+1}{2} - v_a \text{ in which } i \in J - a \tag{1}$$

Since there is a finite number of states, there is a finite number of combinations of coalitions the agenda setter can form and thus the above problem has a solution. A simple algorithm to solve the above problem is this: We can rank all possible coalitions in the order of their total income and then find the coalition with the lowest total income but with enough votes to form a majority. In case there are two (or more) coalitions that are solution to the above problem, we assume that the agenda setter randomizes over which coalition to form so that each coalition has an equal probability to be selected. We have the following:

*Proposition 1.* The game has a unique subgame perfect equilibrium.

On the equilibrium path, the agenda setter $a$ proposes a tax rate of $t = 1$ and a redistribution bundle such that for every state $w \in W$, $r_w = Y_w$ and for every $l \in L$, $r_l = 0$ in which the group of states $W$ is the solution to (2) and the group of states $L = J - W - a$.

We can state the comparative statics results of interest. We have the following:

*Proposition 2.* An increase in a state's representation results in an increase in that state's expected payoff.

*Proof.* Suppose we take any state $i$ and increase its representation from $v_i$ to $v_i + \epsilon$ (the extra epsilon in representation can be obtained by having all other states losing the same fraction of votes, but it does not matter what other state or states are losing the $\epsilon$ share of votes). An increase in representation for state $i$ increases the probability of being the agenda setter from $\frac{v_i}{V}$ to $\frac{v_i+\epsilon}{V}$. In the instance in which the state $i$ is the agenda setter, it retains its initial income $Y_i$ and also obtains all the income of the states that are not part of the winning coalition. If the state is not the agenda setter, an increase in representation does not hurt it in the cases in which the state was already in a winning coalition because an increase in its votes might increase the total number of votes of that coalition without changing its total income. Furthermore, more representation might make the state a more attractive coalitional partner since the state's income is the same but the state has now more votes, and as a result state $i$ could be now partner in some winning coalition that was not possible before the increase in representation. Thus, overall an increase in representation unambiguously leads to a higher payoff for a state. □

# 4 Empirical Analysis of Malapportionment

We have collected comparable data on intergovernmental grants, population, land area, legislative representation, and real gross provincial product from 24 Argentine provinces (1980-2001), 8 Australian states and two territories (1970-2001), 27 Brazilian states (1986-2001),

10 Canadian provinces (1968-1997), 10 German Laender prior to unification (1970-1990), and 16 thereafter (1991-2003), 32 Mexican states (1993-2006), 17 Autonomous Communities in Spain (1984-2001), 26 Swiss Cantons (1980-2008), and 50 U.S. states (1977-1997).

Our presumption is that basic patterns of inter-regional transfers can be understood as outcomes of a process of repeated legislative bargaining among representatives of provinces. As intimated above, this might take place primarily in either or both legislative chambers, within a parliamentary executive, or between the chief executives of the center and the provinces.

In practice, each country's legislative institutions structure inter-provincial bargains in different ways. For instance, legislative coalition-building among provincial representatives is most readily on display, and perhaps our model is most intuitive, in countries like the United States, Brazil, Argentina, Mexico, and Switzerland, where the chief executive lacks the threat of a no-confidence procedure with which to force legislative cohesion among co-partisan legislators (Diermeier and Feddersen 1998).

The other cases are parliamentary democracies characterized by stronger and more cohesive parties in the legislature. A concern is that bargains among regional representatives do not characterize legislative coalition-building in settings where party leaders are effectively agenda-setters, and they have strong tools with which to discipline self-seeking provincial representatives. However, in both Australia and Germany, the chief executive cannot threaten to dissolve the upper chamber, and while parties are certainly relevant, raw inter-regional bargaining and coalition-building takes place, especially regarding the basic contours of the transfer system.

In Canada and Spain, with their strong, relatively cohesive parties and powerless upper chambers, our model may seem less compelling. However, it is plausible that inter-regional coalition-building of the kind modeled above is relevant within the Parliament, or even within the political parties themselves, or that informal norms require the construction of cross-region majorities within the executive itself, or through so-called "executive federalism." These details are worthy of more careful theoretical exploration, but they are largely beyond the scope of this paper.

Our model is based on lump-sum payoffs to provinces with a single national tax rate, so it is natural for us to focus our empirical analysis on intergovernmental grants. Our measure of inter-governmental grants aggregates over all transfer programs. Since we are interested in long-term developments including one-off investment projects and periodic negotiations of formulaic programs like co-participation in Latin American federations or equalization in Germany and the Commonwealth federations, we make no distinction between formulaic and discretionary transfers.

The dependent variable, **Grants Share Per Capita** measures the real per capita grants of each province, expressed as a share of the national average. The data have a multilevel structure. The individual observations are clustered by province, by country, and by year. Also, provinces are clustered by country. Thus, we have a multilevel data with both nested and non-nested levels.

The independent variable of theoretical interest is **Seat Share/Capita**, a variable that measures the seats per capita for a given state in a given year relative to the average across all states. Also, if the legislature is bicameral, we take the average of this variable in the lower and the upper chambers.

We also use several control variables that might influence the redistribution of grants. First, as mentioned, the observations are clustered by province, by country, and year. We include fixed effects for years in all models. We also include fixed effect for countries in the analyses in which we only model the provincial level. We will also present some analyses in which we model both the provincial and the country level. Second, the control variables we include are measured both at the provincial level (some are time invariant and some vary by year) and at the country-level (all country-level variables are time invariant).

At the state-level of analysis we include the following variables: **Population Share**, **Income Share**, **Relative State Size**, and **Capital State**. First, we include a variable, **Population Share**, that measures a state's population relative to the average population of all states. The rationale for including this variable is that, as suggested above, government programs might subsidize regions experiencing population outflows for reasons that have nothing to do with representation, and small states might attract larger shares of grants for reasons having little to do with representation.

Second, we include a variable, **Income Share/Capita** that measures the per capita income of a state relative to the national average. The explicit goal of many transfer programs is to allow for equal service provision across provinces in spite of varying tax base or to combat poverty. In many countries, intergovernmental grants are an important component of the social safety net, and we might expect them to flow disproportionately to poor provinces. Moreover, in the formal model above, if apportionment across states is equal, relatively poor states should receive larger shares of transfers because they are more attractive coalition partners (more on this below).

Third, we include a variable, **Relative State Size** that measures the size of a state in square km divided by the size of the country. As suggested above, one could argue that geographically large constituent units, like Alaska or Montana, present diseconomies of scale and therefore require more public resources than small units to obtain the same level of services, or that their representatives face different incentives to expend legislative effort on

distributive politics.

Fourth, we include an indicator variable, **Capital State** that takes the value 1 if the state is the capital and the value 0 otherwise. The rationale for including this variable is that one might argue that the capital is in need of more public expenditures to fund infrastructure related to the central government's activities, or that the capital has more influence at the bargaining table (for whatever reasons) beyond whatever leverage it gets from its representation in the legislature.

At the country level of analysis we include the following variables: **Presidential System**, **Democracy Age** and **Number of States**. First, we include an indicator variable, **Presidential System** that takes the value 1 if the country is a presidential system and the value 0 otherwise. The rationale for including this variable was described above: in presidential systems the political parties are weaker and the presidents hold an important position at the bargaining table that might influence the type of coalitions formed. In contrast, in a parliamentary system, parties are stronger and thus party leaders might determine how grants are distributed rather than a decentralized bargaining procedure in which each member tries to get as much as possible for the geographic area she represents.

Second, we include a variable, **Democracy Age** that takes the value of the year in which a country has become a democracy. The rationale for including this variable is that one could argue that countries that have had a shorter tradition as a democracy are more likely to be malapportioned. For example, researchers have noted that in Latin American countries, before the transition to democracy, elites have attempted to give more representation to areas from which those elites garnered electoral support (Gibson 2004; Bruhn, Gallego, and Onorato 2008).

Third, we include a country-level variable, **Number of States** that takes the value of the number of subnational units in a given country.

Finally, we also include (in some models) a lagged dependent variable, **Lag Grants Share/Capita**. The political methodology literature is ambiguous about the inclusion of a lagged dependent variable. The rationales for inclusion are both methodological and theoretical. First, the Ordinary Least Squares (OLS) regression estimator assumes that there is no autocorrelation in the residuals. However, in time series data this assumption is almost always violated. If we detect autocorrelation in an OLS regression, the inclusion of a lagged dependent variable often eliminates any residual serial correlation.

Second, a lagged dependent variable might capture important omitted factors. In the context of grants redistribution, one can argue that there are important variables that might be omitted but could be captured by the inclusion of a lagged variables. For example, coalitions are sticky and it might be that once formed, a coalition will continue to exist

regardless of changes in representation.

On the other hand, researchers have argued that including a lagged dependent variable could lead to biased coefficient estimates. For example, Achen (2000) has shown that even if a lagged dependent variable is theoretically appropriate, remaining residual autocorrelation can lead to biased coefficient estimates. We take this criticism and we will report the analysis with and without a lagged dependent variable.

To take into account the multilevel structure in the data, we estimate a multilevel regression model. We present two different set of models: one analysis with country and year indicators and varying intercepts[1] for state groups and another analysis with year indicators and varying intercepts for both country and state groups.

## 4.1 State Level Model

In this section, we present multilevel analysis in which we only model the state-level of the analysis while including fixed effects for country and year. To estimate the multilevel regression model we use the R package lmer. The individual level model is the following:

$$GrantsShare_i \sim N(\alpha_0 + \alpha^{\text{state}}_{s[i]} + X_i\beta + \epsilon_i, \sigma_i^2) \tag{2}$$

where $i$ indexes individual observations, $X$ is a matrix of individual-level covariates, $\beta$ is the vector of coefficients for the individual-level regression, and $\epsilon_i$ is the error associated with observation $i$.

The state-level model is the following:

$$\alpha^{\text{state}}_s \sim N(Y_s\gamma, \sigma^2_{state}) \tag{3}$$

where $s$ indexes the states, $Y_s$ is a matrix of state-level covariates, $\gamma$ is the vector of coefficients for the state-level regression, and $\sigma_{state}$ is the standard deviation of the unexplained state-level errors.

The control variables are: **Lag Grants Share/Capita**, **Population Share**, **Income Share**, **Relative State Size**, and **Capital State**. The results of the multilevel estimation are the following:

*−Table 3 about here−*

Table 3 contains four models. The model in column 2 estimates the grants share per capita controlling for the data structure and including only the variable of theoretical interest: seat

[1]For a discussion about this terminology see Gelman and Hill (2007).

share per capita. The model in column 3 includes the control variables and the model in column 4 includes both controls and the lagged dependent variable. Finally, the model in column 5 is the same as the model in column 4 but all variables are standardized.

The representation variable has the expected sign and is significant at conventional levels. The model in column 2 shows that the effect of the seat share per capita variable holds regardless of any other control variables. In fact there is little difference in the point estimate (and the standard error) for the seat share variable in the model in column 2 and in column 3. The model in column 4 includes the lagged dependent variable, the seat share variable is still significant although the coefficient is half the value of the coefficient in the model in column 2. The model in column 5 is the same as the model in column 4 but the variables are standardized. For the model in column 5, one standard deviation increase in the seats share per capita variable produces a 0.35 standard deviation increase in the dependent variable.

Also, we can note that neither the population share nor the income share variables are significant but the relative size of the state variable and wether a state is a capital state or not have a positive effect on the grants share/capita and also are statistically significant.

## 4.2 Country Level Model

In this section, we present multilevel analysis in which we model both the state-level and the country-level of the analysis while including fixed effects for year. The individual level regression is the following:

$$GrantsShare_i \sim N(\alpha_0 + \alpha_{s[i]}^{\text{state}} + \alpha_{j[i]}^{\text{country}} + X_i\beta + \epsilon_i, \sigma_i^2) \tag{4}$$

where $i$ indexes individual observations, $X$ is a matrix of individual-level covariates, $\beta$ is the vector of coefficients for the individual-level regression, and $\epsilon_i$ is the error associated with observation $i$.

The state-level model is the following:

$$\alpha_s^{\text{state}} \sim N(Y_s\gamma, \sigma_{state}^2) \tag{5}$$

where $s$ indexes the states, $Y_s$ is a matrix of state-level covariates, $\gamma$ is the vector of coefficients for the state-level regression, $\sigma_{state}$ is the standard deviation of the unexplained state-level errors.

The country-level model is:

$$\alpha_j^{\text{country}} \sim N(V_j\kappa, \sigma_{country}^2) \tag{6}$$

where $j$ indexes countries, $V$ is a matrix of country-level covariates, $\kappa$ is the vector of coefficients for the country-level regression, and $\sigma_{country}$ is the standard deviation of the unexplained country-level errors.

The control variables are: **Lag Grants Share**, **Population Share**, **Income Share**, **Relative State Size**, **Capital State**, **Presidential System**, **Democracy Age** and **Number of States**. The results of the estimation are shown in table 2:

*−Table 4 about here−*

Table 4 contains five models. The model in column 2 is exactly the model in table 3 column 4. The model in column 3 estimates the multilevel model with both state and country level variable but without a lagged dependent variable. The model in column 4 includes the lagged dependent variable and the model in column 5 is similar with the model in column 4 except that all variables are standardized. The variable seats share per capita has the expected sign and is significant at conventional levels. The model in column 4 shows that the effect of seats share per capita variable is exactly the same as in the state-multilevel model only. In fact there is little difference in the point estimate (and the standard error) for the seats share per capita variable in the model in column 2 and in column 4. The model in column 5 is the same as the model in column 4 but the variables are standardized. For the model in column 5, one standard deviation increase in the seats share per capita variable produces a 0.35 standard deviation increase in the dependent variable.

We can also notice that if we interact the presidential system dummy with the seat share per capita variable the results do not change. The size of the seat share per capita variable is smaller but the presidential system indicator and the interactions are not statistically significant. This result suggests that it is not the case that malapportionment works in a fundamentally different way in presidential and parliamentary systems. We have also estimated the model with a vote of no confidence indicator (which take the value 1 in all presidential systems plus Switzerland), with similar results. The vote of no confidence variable and the interaction are not statistically significant and the seat share per capita is still statistical significant. The coefficient for the vote of no confidence indicator is -0.05 (and the standard error is 0.1), the coefficient for the interaction is 0.05 (and the standard error is 0.08) and the coefficient for the seat share per capita variable is 0.29 (and the standard error is 0.08).

## 4.3 Cross-Section Analysis

In order to get a better sense of whether the results above are driven primarily by variation across provinces or over time within provinces, in this section we present results of

analysis that focuses exclusively on cross-section variation. We construct a data set with 209 observations by taking provincial averages over the time period in the sample for all variables. We will presents two estimations. First we estimate a simple OLS regression with country fixed effects, and second, we estimate a multilevel regression including country-level variables. The results of the estimations are provided in Table 3.

*−Table 5 about here−*

Table 5 contains three models. The model in column 2 estimates the effect of representation in an OLS model with country fixed effects. We can see that the variable seat share per capita is positive and strongly significant. The model in column 3 estimates a multilevel regression with varying intercepts for country and with two additional country level variable: democracy age and presidential system, while the model in column 4 adds another country-level variable: the number of states in the federation. The coefficient on the representation variable is similar in these estimations to that in column 2.

Finally, it is useful to visualize the striking cross-section relationship between representation and grants within federations. Averaging over the 1990s, Figure 3 plots each province's grants per capita as a share of the national average against the two-chamber average (for all federations except Spain and Canada, which are only for the lower chamber) of its legislative seats per capita (also expressed as a share of the national average). The relationship is substantively large and significant in every country but Spain. As discussed above, with strong parties, proportional representation, and a weak upper chamber, Spain is the country in the sample with the weakest institutions of regional representation.

*−Figure 3 about here−*

# 5 An Extension: When are Intergovernmental Grants Progressive?

This section discusses a possible extension of our model to a broader question about inter-regional redistribution. Progressive redistribution from rich to poor regions is a key goal of many inter-governmental transfer systems, including those of Australia, Canada, Germany, and Spain. Yet this is apparently not universal. In the empirical analysis above, the income variable had a positive sign and never approached statistical significance. While malapportionment plays a large role in almost all federations, the correlation between provincial income and intergovernmental grants varies dramatically from one federation to another, as demonstrated in Figure 4.

*−Figure 4 about here−*

Figure 4 plots each province's intergovernmental grant receipts against its GDP per capita, each expressed as a share of the national average. The size of the bubbles in Figure 4 correspond to the province's relative legislative representation (the key independent variable in the empirical analysis above). Intergovernmental grants are clearly progressive in Canada and Germany. In Australia, they have been consistently progressive during the postwar period, though by the 1990s, the Australian Capital Territory and Northern Territory had emerged as wealthy outliers. In Spain as well, the system is progressive on the whole, but there are two wealthy outliers: Catalonia and the Basque Country. The correlation in Brazil is consistently negative, and borders on statistical significance, especially when the Federal District is dropped from the analysis. There is no significant relationship between grants and income in Switzerland and the United States, while grants in Mexico and Argentina are actually significantly regressive every year.

Figure 4 hints at a possible reason for the cross-country differences that harkens back to Figure 2 above. The federations that systematically over-represent poor states appear to be those with the most consistently progressive transfer systems, while those that systematically over-represent wealthy states have the most regressive transfer systems. Figure 4 demonstrates that in Canada, the poor states are relatively over-represented (relatively large bubbles) and receive transfers that are well above the national average. This is also the case in Germany if one ignores the relatively wealthy, over-represented city-states. In Argentina and Mexico, the positive correlation between income and grants is clearly driven by the over-represented states.

Thus it seems plausible that the regional representation scheme might have some impact on the bargaining power of poor provinces. While the formal model above does not allow for a clean comparative static on this point, it does help generate some insight into the impact of representation on the progressivity of transfers. Recall the simple example based on five states, $s = 1, 2, 3, 4, 5$ with income $Y_1 = 2, Y_2 = 3, Y_3 = 4, Y_4 = 5, Y_5 = 6$. Consider a case where each province has equal population size and an equal number of votes (3). In order to pass, a proposal requires 8 votes. No matter which state is chosen as the agenda-setter, it will set the tax rate at $t = 1$, and form a coalition with the poorest states in order to keep as much of the surplus for itself as possible. States 4 and 5 are only members of coalitions when they are designated as agenda-setters, and the probability of being so designated is $\frac{1}{5}$ for each state. For example, state 5 would collect 20 in taxes and secure the votes of states 1 and 2 by giving them payoffs of 2 and 3 respectively, keeping 15 for itself State 1 would make payoffs to states 2 and 3, keeping 13 for itself. Aggregating over each agenda-setting scenario, the payoffs for states are summarized with the dark circles in Figure 5.

*−Figure 5 about here−*

The payoffs are progressive. In the long run, transfers flow from states with above-average income to states with below-average income. The relationship between income and fiscal flows is not linear, however, since the votes of higher-income states among the poor are more costly than the votes of the poorest states.

Next consider what happens if the votes are redistributed such that the two wealthiest states are each given four votes, while the two poorest states are left with two and the middle income state retains three votes. Building on the logic established above, this has two impacts on the expected payoff. First, the two wealthiest states are more likely to be chosen as agenda-setters. Second, state 4 is now an attractive coalition partner when relatively poor states are chosen as the agenda-setter because its four crucial votes can be purchased with a payout of only 5. In other words, low income is no longer the primary driver of a state's attractiveness as a coalition partner. Low income must now compete with size.

Finally, consider the impact of increasing the representation of the two poorest states in a similar fashion. The impact owing to their attractiveness as coalition partners has not changed, but their payoff is dramatically improved (see Figure 5) not only because they are more likely to be chosen as agenda-setters, but also because when designated as agenda-setters, they can form a majority by relying only on one another, shutting out the high-income states altogether, which leads to a more progressive outcome than in the case of equal apportionment.

It is not possible to make a general theoretical claim about the impact of apportionment on the progressivity of intergovernmental transfers, because the average expected payoff is highly contingent on exactly which states are over-represented and how dramatically, along with the precise distributions of income, population, and voting weights across provinces.

However, it is useful to examine the model's predictions under a range of possible scenarios. In fact, our data set provides a very useful set of real-world distributions of population and income across jurisdictions. For each country, we can examine the model's predictions under the hypothetical situation where given the federation's distribution of income across provinces, the voting weights are exactly proportionate to each province's population, and we can contrast this with the model's prediction under the actual voting weights of each province in the legislature.

More specifically, Figure 6 displays the results of two exercises. First, we examine the hypothetical of equal apportionment by imagining that the seats for each state are exactly proportionate to its population, calculating the payoffs that would be associated with the

minimum winning coalition that would be formed when each state is the agenda setter, and taking the weighted average of these payoffs, weighting by population.

In the second exercise, rather than imagining that the seats are proportionate to population, we calculate one set of average payoffs based on the weights of the seats in the lower chamber, and another based on the weights of the seats in the upper chamber, and take the average of the two payoffs. (figures for Canada and Spain are based on the lower chamber only).

*−Figure* 6 *about here−*

Figure 6 presents smoothed lowess plots of these two "predicted" payoffs against each province's per capita income, and for comparison, we also present a lowess plot of actual grants against income (all expressed as shares of the national average). The "equal apportionment" payoffs are in orange, the payoffs based on actual representation are in green, and the observed grants are in blue.

First, consider the orange lines. The slightly progressive "equal representation" payoff from the simple example in Figure 5 holds for a variety of real-world income distributions. The model predicts a slightly higher payoff for the wealthiest of the states below the median, but then substantially lower, uniform payoffs for the states above the median (Note that the lowess plots for income shares above 1.5 are generally based on very few observations). This is because the poor states are more attractive coalition partners.

Note, however, that this relationship is not universal. In Canada, the hypothetical equal representation payoffs are actually regressive. Given the small number of states, the concentration of population in Ontario and Quebec, and very small size of the poor provinces, it is not possible to exclude rich states from winning coalitions, and wealthy provinces are very frequently chosen as agenda setters. In all of the other federations, there is a statistically significant negative correlation between income and the predicted payoff because of the attractiveness of poor states as coalition partners.

But in some federations, this changes rather dramatically when we look at the model's predictions based on the asymmetric voting weights observed in actual legislatures. The model prediction becomes regressive in Argentina and Mexico, and flat, bordering on regressive for the United States (the steep upward slope on the high end is driven primarily by Wyoming and Alaska) because of the over-representation of wealthy states. In other federations, most notably Australia, Brazil, Canada, and Germany, the predicted payoffs based on the observed voting weights are more progressive than the equal apportionment baseline, due to the joint impact of improved proposal power and increased attractiveness as coalition partners for some of the poor states.

Canada is especially interesting in this regard. Figure 6 suggests that even though malapportionment is not particularly large in the Canadian parliament relative to upper chambers of other federations, it may nevertheless be an important part of the story of the emergence of a progressive transfer system in Canada in the 20th century due to the high correlation between poverty and over-representation.

Finally, the fact that the green and blue lowess plots are right on top of one another in most federations suggests that the when the actual legislative voting weights are considered, the theoretical model is a very good predictor of long-term inter-territorial redistribution. Without knowing anything about the power of left-wing parties, preferences of voters, or norms of inter-regional solidarity, it may be possible to understand why grants are progressive in some federations and regressive in others with knowledge only of the provincial bargaining weights and the inter-provincial income distribution.

# 6 Conclusion

Asymmetric representation of states and provinces is a key feature of some of the world's most populous democracies. This paper has shown that these representation structures have a substantial impact on the distribution of resources within federations.

First, we have shown that in a simple legislative bargaining model with endogenous taxation, the advantages of over-represented regions are unambiguous. Not only do they benefit from their greater likelihood of being chosen as agenda-setters, but they are also more attractive coalition partners when other states are chosen as agenda setters.

Second, we have mobilized a unique provincial-level data set from a large group of federations over a period of several decades to examine the impact of representation on patterns of inter-provincial redistribution. Federations are especially useful for this type of analysis because by all accounts, bargaining over the erection of national taxes with asymmetric regional payoffs has been a central concern over the last 50 years in modern federations. Elected regional representatives in democratic federations face strong incentives to direct federal expenditures to their home provinces, and they have few incentives to vote in favor of proposals that would redistribute income away from their constituents.

In existing single-country empirical studies, it is often difficult to differentiate between the possible impact of over-representation in the legislature and other highly correlated characteristics of states such as low population, low population density, low income, or location in the economic periphery. Moreover, little has been known about the extent to which the relationship between representation and budgetary outlays might extend to various institutional contexts. Our multi-country study includes federations with a wide variety of

background conditions, income distributions, and institutions.

We have shown that the relationship between representation and intergovernmental grants is robust in a surprisingly wide variety of settings. However, we found that the relationship does not hold up in Spain: the one country in our sample with the weakest institutions of territorial representation and the most tenuous connection to the concept of "federalism." This raises the possibility that a future study with regional-level data on representation and fiscal flows in a sample of unitary systems with strong party systems and weak institutions of territorial representation would find rather different results. This is an attractive avenue for further research.

Finally, we have introduced a possibility that is worthy of further theoretical and empirical analysis. To the extent that malapportionment systematically favors rich or poor states, it can have an impact on the overall progressivity of intergovernmental transfers.

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Figure 1: Population Density and Legislative Representation

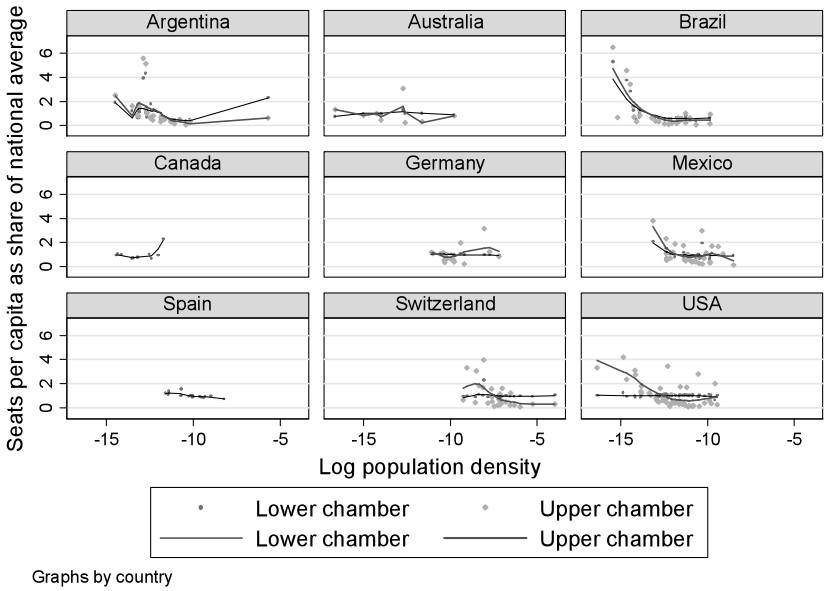


Figure 2: Income and Legislative Representation

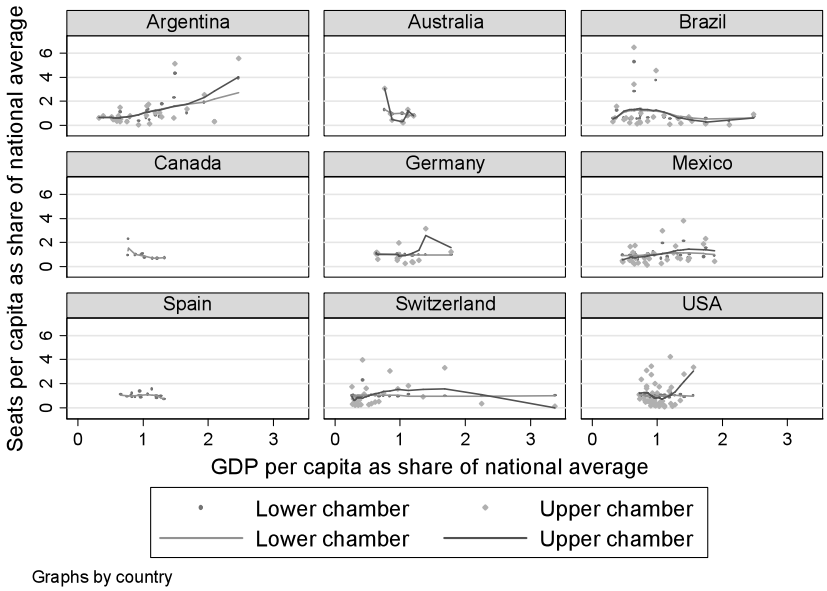


Table 3: Multilevel Estimation for Intrastate Legislative Bargaining

| **Dependent Variable: Grants Share/Capita** | | | | |
|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** |
| Seat Share/Capita | 0.78 | 0.74 | 0.33 | 0.35 |
| | (0.03) | (0.04) | (0.02) | (0.02) |
| Lag Grants Share/Capita | - | - | 0.53 | 0.54 |
| | - | - | (0.01) | (0.01) |
| Population Share | - | -0.06 | -0.005 | -0.002 |
| | - | (0.03) | (0.01) | (0.03) |
| Income Share | - | 0.09 | -0.001 | 0.001 |
| | - | (0.03) | (0.02) | (0.02) |
| Log(Relative State Size) | - | 0.1 | 0.04 | 0.06 |
| | - | (0.03) | (0.01) | (0.03) |
| Capital State | - | 0.63 | 0.31 | 0.35 |
| | - | (0.21) | (0.10) | (0.14) |
| **+ country fixed effects** | | | | |
| **+ years fixed effects** | | | | |
| Constant | 0.23 | 0.55 | 0.25 | -0.03 |
| | (0.12) | (0.16) | (0.20) | (0.30) |
| Log-likelilhood | -227 | -100 | 394 | -950 |
| N | 3667 | 3465 | 3264 | 3264 |

Table 4: Multilevel Estimation for Intrastate Legislative Bargaining

| **Dependent Variable: Grants Share/Capita** | | | | | |
|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
| Seat Share/Capita | 0.33 | 0.74 | 0.33 | 0.35 | 0.29 |
| | (0.02) | (0.04) | (0.02) | (0.02) | (0.08) |
| Lag Grants Share/Capita | 0.53 | - | 0.54 | 0.55 | 0.54 |
| | (0.01) | - | (0.01) | (0.01) | 0.01) |
| Population Share | -0.005 | -0.06 | -0.005 | -0.001 | -0.005 |
| | (0.01) | (0.03) | (0.01) | (0.02) | (0.01) |
| Income Share | -0.001 | 0.09 | -0.0004 | 0.001 | -0.001 |
| | (0.03) | (0.03) | (0.02) | (0.02) | (0.02) |
| Log(Relative State Size) | 0.04 | 0.10 | 0.04 | 0.05 | 0.04 |
| | (0.01) | (0.03) | (0.01) | (0.027) | (0.01) |
| Capital State | 0.31 | 0.61 | 0.30 | 0.33 | 0.30 |
| | (0.10) | (0.21) | (0.10) | (0.14) | (0.10) |
| Presidential System | - | -0.01 | -0.01 | -0.004 | -0.05 |
| | - | (0.12) | (0.05) | (0.09) | (0.10) |
| Number of States | - | 0.003 | 0.001 | 0.02 | 0.001 |
| | - | (0.005) | (0.002) | (0.05) | (0.002) |
| Log(Democracy Age) | - | -0.06 | -0.02 | 0.005 | -0.01 |
| | - | (1.12) | (0.51) | (0.03) | (0.5) |
| Presidential System*Seat Share/Capita | - | - | - | - | 0.05 |
| | - | - | - | - | (0.08) |
| **+ years fixed effects** | | | | | |
| Constant | 0.25 | 0.97 | 0.37 | -0.01 | 0.39 |
| | (0.12) | (8.51) | (3.88) | (0.30) | (3.90) |
| Log-likelilhood | 394 | -96 | 402 | -945 | 401 |
| N | 3264 | 3264 | 3264 | 3264 | 3264 |

Table 5: Estimation for Cross-Sectional Intrastate Legislative Bargaining

| **Dependent Variable: Grants Share/Capita** | | | |
|---|---|---|---|
| | **(1)** | **(2)** | **(3)** |
| Seat Share/Capita | 0.60 | 0.60 | 0.61 |
| | (0.05) | (0.05) | (0.05) |
| Population Share | 0.02 | 0.03 | 0.03 |
| | (0.03) | (0.03) | (0.03) |
| Income Share | -0.004 | -0.003 | -0.009 |
| | (0.05) | (0.05) | (0.05) |
| Log(Relative State Size) | 0.05 | 0.04 | 0.04 |
| | (0.02) | (0.02) | (0.02) |
| Capital State | 0.35 | 0.33 | 0.34 |
| | (0.20) | (0.19) | (0.19) |
| Presidential System | - | -0.11 | -0.58 |
| | - | (0.18) | (0.22) |
| Number of States | - | - | 0.02 |
| | - | - | (0.01) |
| Log(Democracy Age) | - | 0.77 | 4.02 |
| | - | (2.40) | (2.08) |
| Constant | 0.25 | -5.40 | -30.22 |
| | (0.14) | (18.16) | (15.78) |
| N | 209 | 209 | 209 |

Figure 3: Legislative Representation and Grants, 1990s

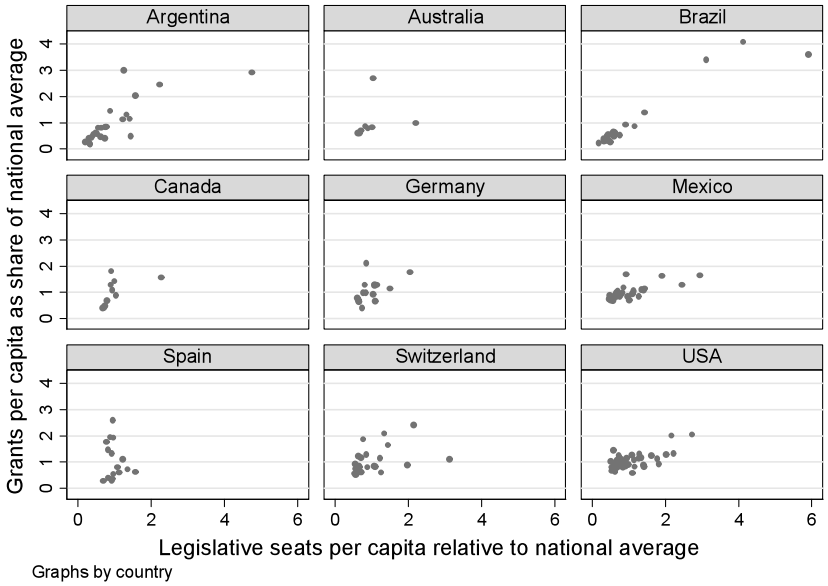


Figure 4: Income and Grants, 1990s

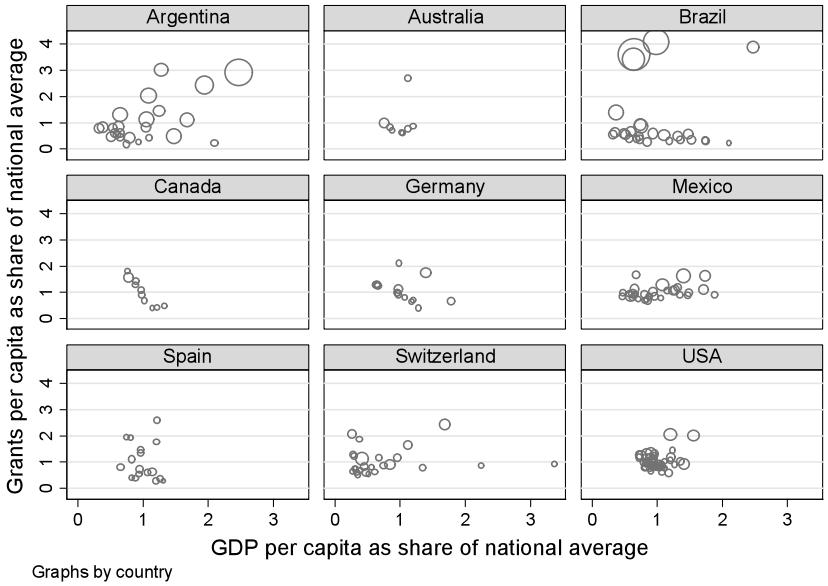


Figure 5: Income and Average Payoffs in 3 Simple Examples

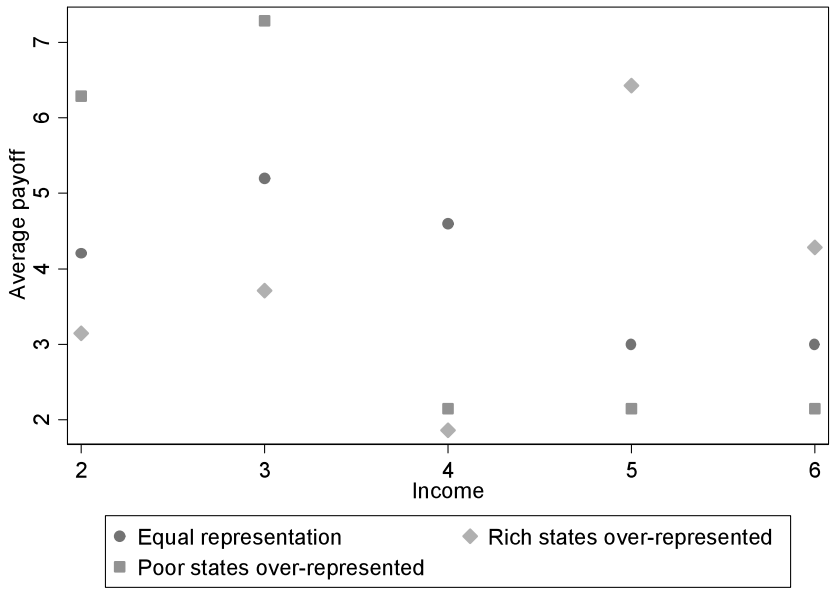
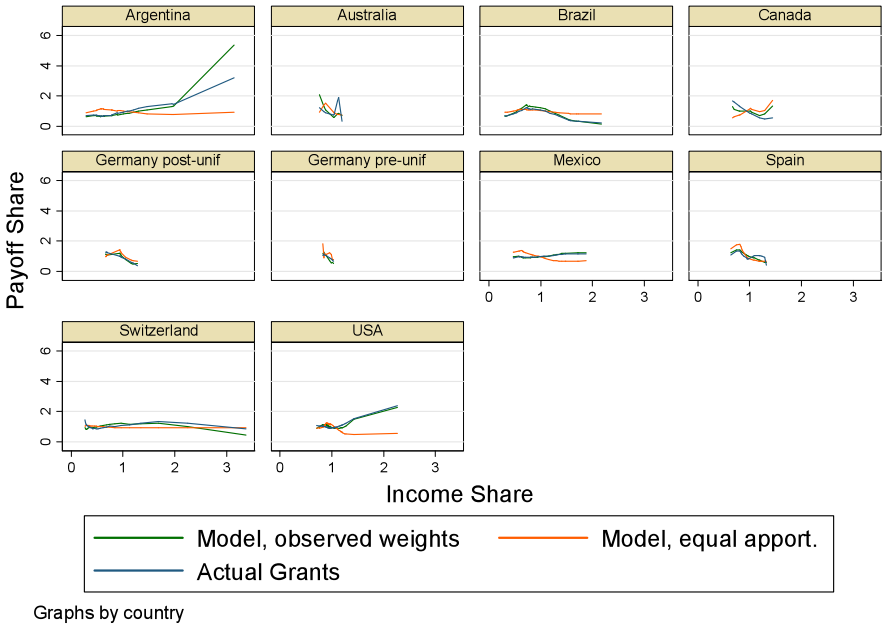


Figure 6: Income, Expected Payoffs, and Observed Grants



**2007**

**2007/1. Durán Cabré, J.Mª.; Esteller Moré, A.**: "An empirical analysis of wealth taxation: Equity vs. tax compliance"
**2007/2. Jofre-Monseny, J.; Solé-Ollé, A.**: "Tax differentials and agglomeration economies in intraregional firm location"
**2007/3. Duch, N.; Montolio, D.; Mediavilla, M.**: "Evaluating the impact of public subsidies on a firm's performance: A quasi experimental approach"
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**2008**

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**2009**

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**2010**

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