

Has Leviathan Been Bound?
A Theory of Imperfectly Constrained Government
with Evidence from the States

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Has Leviathan Been Bound? A Theory of Imperfectly Constrained Government with Evidence from the States

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Abstract:

This paper develops a formal theory that combines power-maximizing “Leviathan” political parties with well-defined imperfections in the political process. The model implies that *both* parties tend to make government larger as their likelihood of electoral victory increases. Empirical tests on state-level data confirm this prediction. Racing the Leviathan hypothesis against alternative theories of party motivation indicates that both the Leviathan and the “contrasting ideologies” views have some degree of validity.

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1. Introduction

The “Leviathan” motive of politicians to maximize their power is a central assumption of the public choice approach to political economy.¹ This approach has been strongly attacked for underestimating the importance of competitive checks on politicians; Wittman (1995; 1989) in particular broadly argues that electoral competition is an effective solution to whatever principal-agent problem might exist between politicians and voters. Yet recent research in political economy (Grossman and Helpman [1996]; Dixit and Londregan [forthcoming; 1996; 1995]) casts renewed doubt on the efficiency of political markets. Formal models incorporating imperfections in the electoral process show that politicians have the latitude to deviate somewhat from citizen interests. While politicians face constraints, they retain some measure of monopoly power, a conclusion consistent with the public choice literature.

The main difference between recent political economy and the public choice tradition arises from their assumptions about politicians’ objective functions. The public choice approach tends to view all political parties as power-maximizers, whereas others see parties as either vote-maximizers (Grossman and Helpman [1996]; Dixit and Londregan [1996, 1995]) or promoters of conflicting ideologies (Alesina and Rosenthal [1995]; Dixit and Londregan [forthcoming]). The present paper briefly develops a theoretical model that pits Leviathan - in the form of two power-maximizing parties - against the electoral constraints of modern political economy. The main implication of the model - an implication empirically tested against several alternatives later in the paper - is that *both* imperfectly constrained power-maximizing parties will make government larger as their likelihood of electoral victory increases. Intuitively, the results are consistent with Peltzman's informal analysis of government growth in the face of voters' fiscal conservatism:

The larger question is how political agents can persistently dissipate voter wealth; that is, why has government grown so much (and why is it fiscally progressive)?... One [possibility] is that the political costs of growing budgets are too weak to compel much restraint... These exercises suggest that incumbents can indulge in nontrivial spending growth before they risk a close call next election day. (1992, pp.358-359)

The next section discusses the theoretical and empirical literature on politicians' objective functions and imperfections in the political sector. The third section presents the model of power-maximizing parties facing electoral constraints. Initially, politicians operate in a certain environment; this assumption is then relaxed to yield implications that are both more plausible and more readily tested. The fourth section tests the Leviathan model and its competitors on state-level political and economic data over the 1950-89 period, and analyzes the empirical results. Since section four finds that political parties differ less about the *level* of spending than one might expect, the fifth section examines whether parties matter for the *composition* of taxation and spending. The sixth section concludes the paper.

2. Related Literature

The model developed here builds on the formal theory of recent political economy, the less formal analysis of government found in the public choice literature, and the broader debate about the extent to which politicians find themselves constrained to efficiently satisfy consumer preferences.

The conclusions of my model, like most recent work in theoretical political economy, depend critically upon the existence of an imperfection in the electoral process: Voters treat political parties as differentiated products. A literature beginning with Lindbeck and Weibull (1987) differentiates parties by assuming that they may easily alter their positions on some issues (such as the budget), but must hold their stance

¹ See e.g. Brennan and Buchanan (1980); McGuire and Olson (1996).

on other issues (such as abortion) fixed. Recent advances made upon this foundation include Dixit and Londregan (forthcoming; 1996; 1995) and Grossman and Helpman (1996). This assumption is not ad hoc, as Dixit and Londregan note: even in the face of repeated electoral defeats, "parties find it very difficult to make genuine shifts in their ideological positions." (forthcoming, p.4) Moreover, voters care about party ideology: "[V]oters are attached to parties for reasons other than their own receipts from tactical economic redistribution. For some, the reason is a strong attachment to a party's issue positions, including such matters as international diplomacy and defense, or the balance between citizens' rights and the needs of law and order; for others there are personal loyalties to the parties themselves." (1995, pp.6-7) Fixed ideological positions plus voter ideology adds up to imperfect political competition.²

While a growing literature builds upon Lindbeck and Weibull's approach, there is much less consensus about parties' objective functions. Wittman (1983) provides a general discussion of the implications of politicians' preferences over policies as well as electoral outcomes. Some, such as Grossman and Helpman (1996) and Dixit and Londregan (1996; 1995), simply model parties as vote-maximizers. Others, such as Baron (1994), assume parties maximize their probability of victory. In Alesina and Rosenthal (1995), one party has a pro-government ideology, while the other has an anti-government ideology; Dixit and Londregan (forthcoming) have parties maximize a weighted average of their vote share and an ideological social welfare function. Electoral competition forces both parties to compromise their ideologies to some extent.

² Bender and Lott (1996) survey economic literature on the principal-agent in politics. They conclude that empirically, the problem of political shirking is not severe. For

Vote-maximizing and conflicting ideologies theories of political motivation differ from the power-maximizing or "Leviathan" parties often posited within the public choice literature. In Brennan and Buchanan (1980), for example, it is assumed that both Democrats and Republicans want to make government revenue and spending as large as possible. They only refrain from increasing it even more because of political and economic constraints, not because they do not want to. An analogous perspective is perhaps most dominant in the literature on the political economy of protectionism (see e.g. Grossman and Helpman [1995]). A common conclusion in this literature is that both political parties incline towards excessive protectionism.

3. The Theory of Electorally-Constrained Power-Maximizing Parties³

The players are two federal parties $\{j,j\}$ and a continuum of citizens whose measure is normalized to 1. Play is simultaneous, and in any Nash equilibrium:

1. All citizens must vote for their most-preferred federal party.
2. Both political parties must offer platforms that maximize their expected utility.

3.1. Citizen Preferences and Constraints

Citizen utility depends upon not only consumption of private goods P_c and public goods G , but also on the political environment:

$$(1) \quad u_c = u(P_c, G) + \Psi_c I_i$$

$\Psi_c = \frac{1}{2}[\Psi_{c,i} - \Psi_{c,j}]$ is c 's relative taste for party i versus party j . Ψ_c is the amount of utility (positive or negative) the individual would be willing to give up in order to be ruled by i rather than j ; Ψ may be interpreted as both the average and the median value of Ψ_c . I_i is an indicator variable which is 1 if party i is in power

discussions of party ideology and party advantage in the political science literature, see e.g. Gaddie (1995), Romero (1993), Geer (1991), and King and Gelman (1991).

³ Note that the interpretation of all variables is given in Table 1.

and 0 otherwise; $I_j = 1 - I_i$.

Citizens' corresponding indirect utility function z_c is assumed to have functional form:

$$(2) \quad z_c = Z - \beta(G - G_c^*) + \Psi_c I_i$$

There are T distinct types of citizens, each with its own most-desired level of government services, G_i^* , which is uncorrelated with Ψ_c . Each of these types constitutes a fraction χ_i of the population, so:

$$(3) \quad \sum_{i=1}^T \chi_i = 1.$$

3.2. Parties' Preferences and Constraints

The parties compete in an election held each period. G_i is the political platform offered by party i , and G_j is the platform of j . The competing parties are both "power-maximizers" who want government to be as big as possible assuming they are in office.⁴ Formally:

$$(4) \quad u_i = I_i * U(G_i) +$$

$$(5) \quad u_j = I_j * U(G_j) +$$

All properties of standard utility functions hold. It is further assumed that $U(0) = 0$:

Controlling a government with no resources gives the same utility as being out of

⁴ "Power-maximization" has two different interpretations in the literature. McGuire and Olson's (1996) self-interested autocrats maximize their tax revenues minus their expenditures; in consequence, government unconstrained by elections is too small. Brennan and Buchanan (1980), in contrast, equate power-maximization with *maximization* of government spending, making the equilibrium size of government too large. These two approaches are not as different as they might appear: Since direct appropriation of surplus tax revenues is normally impermissible in democracies, politicians face the public-sector equivalent of rate-of-return regulation. The rational response to this cap is to let costs rise to eliminate monopoly profits.

power.

3.3. Political Equilibrium with Certainty About Political Advantage

Since citizens vote to maximize their own utility, a citizen votes for federal party i if:

$$(6) \quad -\beta(G_i - G_i^*) + \Psi_c \geq -\beta(G_j - G_i^*)$$

and for party j otherwise.

Suppose that Ψ can be observed without error by the political parties, and (for simplicity) that a tie goes to i if $\Psi \geq 0$, and to j if $\Psi < 0$. Given majority rule, it will then *not* be an equilibrium for both political parties to offer the median preference. If $\Psi \geq 0$, party i wins with certainty if it plays the median value of G ; due to its advantaged position it can definitely win even if its platform offers a somewhat larger public sector. Party i will want to keep increasing the offered level of government until it drives the percentage of votes it receives down to .5. Similarly, if $\Psi < 0$, j wins with certainty if it exactly satisfies the median preference; due to its advantaged position, it can afford to offer a larger government.⁵

Consider first the case where $\Psi > 0$. Assuming no corner solutions⁶, party i can push its share of the vote down to .5 if it pushes its offered platform up until it satisfies:

$$(7) \quad \sum_{t=1}^I \chi_t \left[(\Psi + .5) - \beta \left[(G_i - G_i^*) - (G_j - G_i^*) \right] \right] = .5$$

⁵ If $\Psi = 0$, then this model reduces to the standard median voter model.

⁶ I.e., some voters of each type vote for each party. This condition would be violated, for example, if $\Psi = 0$ - in which case, 100% of the voters of a given type would vote for the party closest to G_i^* .

Due to disadvantaged status, in equilibrium party j will never win. However, in equilibrium j must still seek to maximize its votes:

$$(8) \quad \max_{G_j} \sum_{t=1}^T \chi_t \left[(\Psi + .5) - \beta \left[(G_j - G_t^*)^2 - (G_i - G_t^*)^2 \right] \right]$$

Define $\tilde{G} \equiv \sum_{t=1}^T \chi_t G_t^*$, the *mean* most-desired level government. Then solving (8)

reveals that j 's vote-maximizing strategy is given by:

$$(9) \quad G_j = \tilde{G}$$

One can find i 's best-response by plugging (9) into (7), yielding:

$$(10) \quad G_i = \tilde{G} + \sqrt{\frac{\Psi}{\beta}}$$

In the case where $\Psi < 0$, it is merely necessary to switch the i and j subscripts and replace Ψ with $|\Psi|$. In general, then, $G = \tilde{G} + \sqrt{|\Psi|/\beta}$ where G is the value of the platform that wins in equilibrium. The advantaged party is always the winning party: if $\Psi > 0$, i wins; if $\Psi < 0$, j wins. The disadvantaged party offers to set the size of government equal to the mean preference, while the advantaged party exceeds it. The advantaged party simply deviates as far from mean preferences as it can get away with without losing office.⁷ Adding the assumption of "product differentiation" to democratic elections with perfect information thus yields an outcome similar to the Bertrand duopoly game with cost advantages. The party with the greater political advantage always wins, but is constrained in its choices by the presence of the alternative, less popular party. Note further that even when both parties are power-maximizers, there will appear to be a "big government" and a "small government"

⁷ Ma and Weiss (1995) and Caplin and Nalebuff (1991) also discuss "mean voter theorems," although in my model policy merely gets closer to mean preference as imperfections decrease.

party. The advantaged party consistently promotes a larger government than the disadvantaged party even though no ideological differences divide them.

3.4. *Political Equilibrium with Uncertainty About Political Advantage*

Adding uncertainty makes the predictions considerably more interesting, especially for empirical testing. Diagrams 1-3 show the basic intuitions of this more complicated version of the model. Diagram 1 illustrates the choice problem of party i holding constant the behavior of party j . Party i 's platform choices lie along the x-axis; its probability of victory choices lie along the y-axis. The curve centered at \tilde{G} is party i 's "budget constraint"; points on the frontier are feasible, while points outside of the frontier are infeasible. It is possible to draw a class of indifference curves on this diagram, indicating the "bundles" of platforms and victory probabilities which give equal utility levels; north-east is the direction of increasing utility. The party's optimum is shown by the tangency of an indifference curve to the budget constraint. Note that because the budget constraint is only negatively sloped to the right of \tilde{G} , the optimal point will definitely be tangent to the right of that point.

Holding \tilde{G} constant, what factors shift i 's budget constraint? There are two: the strategy of party j , and the value of Ψ . When party j increases the deviation of its platform from voter preferences, party i 's victory prospects improve for every offered platform. Similarly, if the value of Ψ increases, the entire budget frontier shifts upwards. Thus, "political advantage" is analogous to wealth: it shifts the budget constraint out and thereby makes it possible to buy both a larger probability of victory and a larger offered size of government.

Diagram 2 shows the same choice problem from the perspective of party j . Party j 's

budget constraint is rotated because the labels on the axes remain unchanged: the y-axis still gives the probability of party i winning, and the x-axis gives party j 's platform. Movement away from the origin indicates a platform with a larger public sector; south-east is party j 's direction of increasing utility. When j 's political advantage increases (Ψ becomes more negative), or party i offers a platform voters like less, j 's budget constraint shifts out.

Diagram 3 combines the two diagrams in a manner somewhat analogous to an Edgeworth box. The two parties' combined probability of winning must equal 1, and both parties maximize utility subject to the behavior of their competitor. In equilibrium, each party has its indifference curve tangent to its respective "budget constraint." The equilibrium points will lie along a horizontal line, since the joint probability of victory is unity, but in contrast to an Edgeworth box, there is no need for the equilibrium points to also be on the same vertical line.

4. Empirical Tests of the Leviathan Hypothesis and Alternatives

4.1. *Data and Variables*⁸

This section tests the Leviathan and alternative hypotheses using fiscal and political data for the 48 contiguous United States for the period from 1950 to 1989. For empirical purposes, it is necessary to quantify the size of government and the probability of electoral victory of the advantaged party. The size of government is measured in two ways: with states' real per-capita government spending, and with spending as a fraction of personal income. The probability of electoral victory of the advantaged party is proxied by **Distance**, the fraction of legislative seats held by the ruling party; a party with a slim majority is assumed to have had a lower *ex ante*

⁸ Table 1 includes variable definitions; Table 2 shows the summary statistics of the data used as well as details on missing observations.

probability of victory than a party with a large supermajority. Formally, define **Dempercent** for a given legislative body as $\#Dem/(\#Dem+\#Rep)$. Then **Distance** = $|\text{Dempercent} - .5|$, the absolute value of the difference between 50% and the percentage of seats held by the ruling party in a legislative body.⁹

Unless otherwise stated, fiscal data is expressed in per-capita 1982 dollars, all specifications include state and year dummies, and all control for personal income and grants from the federal government.

4.2. *The Leviathan Hypothesis: Preliminary Results*

The Leviathan hypothesis predicts a positive correlation between **Distance** and the size of government. Before testing this null hypothesis against its main competitors, it is necessary to determine if there is even a prima facie case that the Leviathan hypothesis is correct. To answer this question, total government spending and total taxation¹⁰ - both measures in real per-capita terms - were regressed on **Distance** and the standard control variables (state and year dummies, personal income, and federal grants). To check the sensitivity of the results to specification, I use both the lower and the upper houses of the state legislature to measure **Distance**.

The "real per-capita" columns of Table 3 show the point estimates and standard errors of the interesting coefficients. The preliminary evidence matches the Leviathan model's predictions exactly: For both lower and upper measures, the

⁹ Note that $0 \leq \text{Distance} \leq .5$: the difference between the political balance and an even split ranges between 0 and 50%. A few earlier studies of federal spending, including Wallis (1996), Anderson and Tollison (1991), and Wright (1974) use a similar variable. The basic specifications set up below were re-run with **Distance** replaced by **Distance**². This change makes little difference for the results.

impact of **Distance** on total spending and total taxation is positive and statistically significant. If **Distance** in the lower house of the state legislature increases from 0 to .1, total real per-capita spending is predicted to rise by \$7.14, and total taxation by \$11.59. If **Distance** increases by .1 in the upper house, spending goes up by \$6.74 and taxation by \$9.71.

The sign and magnitude of the constant are also noteworthy. **Distance** attains its minimum value of 0 when the legislature is exactly split, 50/50. Since even the smallest government will presumably have a positive level of taxation, one would expect the constants for total taxation and total spending to be positive and statistically significant.¹¹ This expectation is satisfied.

It could be argued that it would be more informative to express fiscal variables as a *percentage of personal income* rather than in absolute levels (and then drop personal income from the list of control variables). Using levels perhaps implausibly implies that the effect of **Distance** is constant over time, even though the absolute size of the economy is constantly increasing. To alleviate this concern, the preliminary regressions were re-run using this alternative specification.

The two rightmost columns of Table 3 (labeled "% of personal income") display the interesting output. Once again, the Leviathan hypothesis works. The impact of **Distance** is invariably positive and statistically significant, whether one looks at taxation or spending, or uses the lower or upper house measure of **Distance**. The coefficients here are particularly easy to interpret. The value of 1.084 on lower

¹⁰ "Total" taxation is defined as the sum of sales, income, and corporate taxation. Note that in general total spending considerably exceeds this measure of total taxation due to federal grants, deficit spending, and additional revenue sources.

¹¹ I owe this observation to an anonymous referee.

Distance in the spending equation means that if **Distance** rises by .1, spending as a percentage of personal income increases by .108. Similarly, under the same conditions one would expect taxation (with a 1.213 coefficient) to go up by .121 percentage points as a fraction of income. It is also noteworthy that the constants continue to be positive in each equation, as expected.

Overall, then, the preliminary evidence for the Leviathan hypothesis is surprisingly positive and robust. It does not matter how one measures the size of government or **Distance**. Both total spending and total taxation always appear to be increasing functions of **Distance** as the model predicts.

4.3. Four Alternatives to the Leviathan Hypotheses

The Leviathan model builds on two crucial assumptions: first, both political parties want the size of government to be as large as possible conditional on electoral victory; second, the electoral constraint works imperfectly. The main implication - which the preliminary results confirm - is that greater political advantage increases the size of the public sector by equal amounts for both political parties. But there are several other classes of models with contrary implications. These either make different assumptions about parties' objective functions, or the degree of electoral slack. This section contrasts the empirical implications of the Leviathan null hypothesis to those of four plausible alternative hypotheses. Table 4 contrasts their key features.

A. Alternative I: Ideologues

Probably the most popular alternative model of the political process accepts the idea that parties are imperfectly constrained, but gives parties opposite preferences: while one likes to make government big, the other likes to make it small. (Dixit and

Londregan [forthcoming]; Alesina and Rosenthal [1995]) In Dixit and Londregan's model, for example, parties embrace different weighted averages of pure libertarian and pure egalitarian ideologies. One natural way to model this difference would be to assume that one party maximizes the size of the public sector, while the other maximizes the size of the *private* sector. The equilibrium result in the game with uncertainty is predictable: Both parties use political advantage to advance their agenda, but this yields a positive correlation between the probability of victory and the size of government for one party, and a negative correlation for the other. If Alternative I is correct, then a multiple regression of fiscal variables on both **Distance** and **Dempercent** will find zero impact for the former, but a positive effect for the latter. The higher the percentage of Democrats, the larger government becomes; the higher the percentage of Republicans, the smaller it becomes.

B. Alternative II: Voter Preference Shift

Alternative I posits imperfectly constrained, ideological opposed parties that respond to changes in their political advantage. Alternative II posits *perfectly* constrained, ideologically opposed parties responding to shifting voter preferences. When voters want a larger size of government, they give more votes to the large government party; when they want a smaller size of government, they give more votes to the small government party. This generates the same co-movements between victory probabilities and size of government as Alternative I, but without appealing to imperfect constraints upon politicians.

C. Alternative III: Fully Constrained

A third alternative is that political parties are fully constrained, and voter preferences are stable. In consequence, there is no connection between the probability of victory and parties' platforms. The objective function of parties makes no difference, since power-maximizing parties would find themselves forced to do the same thing as ideological parties. Empirically, this predicts that neither **Distance** nor **Dempercent**

will have coefficients significantly different from zero.

D. Alternative IV: No Platform Preferences

A final alternative hypothesis is that parties have no platform preferences; they simply maximize their votes. (Grossman and Helpman [1996]; Dixit and Londregan [1995; 1996]) The implied equilibrium is obvious: with certainty, both parties would offer the platform most-preferred by the mean voter; with uncertainty, both parties would offer the platform that they expect the mean voter to most prefer. Like Alternative III, this predicts no connection between fiscal variables and **Distance** or **Dempercent**.

As Table 5 indicates, some of the alternative hypotheses yield the same predictions. Alternatives I and II both imply the size of government will be an increasing function of **Dempercent**. Additional empirical tests would be necessary to distinguish between them. Similarly, zero observed correlation of the size of government with either **Distance** or **Dempercent** would be consistent with both Alternative III and Alternative IV. The predictions of the Leviathan null hypothesis, however, do not readily follow from any other prominent alternative theories of the political process.

4.4. Leviathan Versus the Alternatives: Baseline Results

The first block of regressions looks at the effect of the political variables on total state spending and total taxation. As before, unless otherwise stated all specifications include state and year dummies, control for personal income and federal grants, and express fiscal data in per-capita 1982 dollars. To check the sensitivity of the results to specification, I continue to use both the lower and the upper houses of the state legislature to measure **Dempercent** and **Distance**. Finally, to allow for the possibility of a discontinuous effect of a change in the controlling party, these

specifications include the variable $\text{Demmajority} = \begin{cases} 1 & \text{if } \text{Dempercent} \geq .5 \\ 0 & \text{otherwise} \end{cases}$.¹² Table

5 ("real per-capita" columns) shows the coefficients and standard errors of the interesting variables. The most notable results:

- The coefficients on *both* **Dempercent** and **Distance** are positive and significant, whether one measures the political variables using the data for lower houses or upper houses. When **Distance** increases by .1, real per-capita spending rises by about \$6.39 (using the lower house data), or \$5.54 (using upper house data). When **Dempercent** increases by .1, spending goes up by \$11.61 using lower house data, \$9.84 using upper house data.
- By definition, if the Democrats' percentage of seats rises by .1, then both **Dempercent** and **Distance** increase by .1; conversely, if a Republican majority's percentage of seats goes from .51 to .61, **Dempercent** falls by .1 but **Distance** rises by .1. Netting these implies that if the Democrat's majority in the lower house rises from .51 to .61, government grows by \$18.00; if the Republican lower house majority rises in the same way, government shrinks by \$5.22. For the upper house, the corresponding changes are +\$15.38 and -\$4.30. However, a simple t-test shows that for both spending equations, it is *not* possible to reject the hypothesis that the coefficients on **Distance** and **Dempercent** are equal. This is equivalent to saying that a larger Democratic majority increases the size of government in a statistically significant way, but a larger Republican majority does not.
- The constants for total taxation and total spending remain strongly positive, although they are somewhat smaller than for the regressions in Table 3.¹³

¹² Note that it is not possible to interact **Demmajority** and (1- **Demmajority**) with **Distance** and **Dempercent** because the resulting vectors would be collinear.

¹³ As an anonymous referee points out, this pattern should be expected if **Dempercent** has a positive coefficient.

- There is a little evidence that changing the majority party has a discrete effect. But while they are not always statistically significant, the coefficients' signs are puzzling: positive for total taxes, negative for total spending. Lower **Demmajority** seems to have a significant negative impact on spending. This means that if the Democrats go from 49.99% of the seats to 50.01% of the seats, spending appears to *decline* by about \$18.57 in real per-capita terms. The robustness of this slightly disconcerting finding is examined later in the paper.

Switching to percentage of personal income measures of fiscal variables (Table 5, two right columns) just strengthens the central results:

- The signs on *both* **Distance** and **Dempercent** continue to be positive and significant for all four equations.
 - Quantitatively, the model predicts that increasing the Democratic majority in the lower house from just over 50% to 100% will increase the typical state budget's size by about 1 percentage point of personal income. Increasing a Republican majority from just over 50% to 100% also increased spending by a smaller magnitude (a statistically insignificant .06 percentage points).
 - As before, it is not possible to reject the hypothesis that the coefficients on **Distance** and **Dempercent** are equal: bigger Democratic majorities make government bigger, but bigger Republican majorities make little difference either way.
 - The anomalous behavior of the coefficient on **Demmajority** does not qualitatively change. The coefficient is positive for the tax equations and negative for the spending equations. But the discrete effect does cease to be statistically significant for all four equations.
-

- The constants in all four equations are still clearly positive.

4.5. Sensitivity Tests

A. Controlling for Governor's Party

The empirical results in Table 5 only look at the effects of the party composition of lower and upper legislative houses. Does ignoring the fiscal impact of the party of the executive branch of state government somehow bias the coefficients? The results for Table 5 were accordingly re-run controlling for the party affiliation of the governor. (**Governor**=1 if the governor of a state in a given year is a Democrat and 0 otherwise).

Qualitatively, the main finding of these regressions (coefficients not shown) is that the party of a state's governor appears to make little difference for budgetary policy. **Governor** has no apparent impact on taxation, and at most a marginal one on spending: The point estimate controlling for lower house composition is a statistically insignificant \$8.56; for upper house composition, a barely significant \$10.21. In economic terms, putting a Democratic governor in office has roughly the same estimated effect as increasing a Democratic legislative majority in one house by 5 percentage points.

B. Other Sensitivity Tests

The results in Table 5 all look separately at the impact of the lower and upper houses. The regressions were redone using two alternate specifications. In one specification, parties' seats in both houses of the legislature were added together to calculate the values of **Demmajority**, **Dempercent**, and **Distance**. This specification leaves the results virtually unchanged. A second variant jointly estimates the effects of lower and upper house values of **Demmajority**, **Dempercent**, and **Distance** (for a total of six political explanatory variables). This specification yields larger standard errors and smaller absolute values of coefficients

for the political variables, but rarely changes their signs.¹⁴

One puzzle from Table 5 is that the coefficient on **Demmajority** is sometimes negative, not positive as one would expect. This anomaly is statistically significant only once, so it may not be especially worrisome. But why does this problem arise at all? It does not seem to be due to collinearity: the correlation between **Demmajority** and **Dempercent** is only around .8 for both lower and upper houses. An anonymous referee suggests another possibility: Perhaps spending only changes significantly if one party captures *both* houses of the legislature. To test this possibility, I dropped **Demmajority** and added two interaction variables: **Dempercent*Demboth** and **(1-Dempercent)*Repboth**. **Demboth**=1 if the Democrats control both houses, and 0 otherwise; **Repboth**=1 if the Republicans have both houses and 0 otherwise. The regressions from Table 5 were then re-run, with the results shown in Table 6.

The original puzzle does not clearly go away. The coefficients on **Distance** remain positive and significant; those on **Dempercent** usually do too. The coefficient on **(1-Dempercent)*Repboth** is always negative (as expected) and significant for taxes (but not spending). But the behavior of the **Dempercent*Demboth** coefficient is still problematic: Its sign is always negative for spending. Still, this coefficient is only statistically significant using upper **Distance** and real per-capita fiscal measures. Overall, since the negative coefficient on **Demmajority** is only statistically significant once in Table 5, it might be more informative to simply drop it from the specification. Table 7 shows that if one drops **Demmajority** from Table 5 and re-estimates, all of

¹⁴ Another potential doubt about the baseline specification is that it implicitly assumes that political or economic variables function contemporaneously - if the governing forces or economic factors change, government policy changes in the same year. Replacing the explanatory variables in the baseline specification with their first lags revealed only small changes from the baseline results.

the main findings persist.

4.6. Analysis of Results

A. Magnitudes

As a fraction of income, the predicted magnitude of the impact of partisan composition initially seems small. In the main specifications, moving from an evenly divided chamber to one where a single party holds all of the seats never increases spending as a fraction of income by more than 1 percentage point. But the effect is much more striking if one looks at the predicted magnitude as a *fraction of the state budget*. For a theory of the impact of partisan composition on spending, this is probably a better metric of the economic importance of the results.

Over the sample period, the state budget consumes \$931 real per-capita on average - or about 10% of personal income. Netting the impact of both **Distance** and **Dempercent** implies approximately zero budgetary impact of greater Republican majorities, no matter how lopsided.¹⁵ But the net impact of greater Democratic majorities relative to the state budget is substantial. The Table 7 results predict that increasing the Democrats' majority in the lower house by .1 raises real per-capita spending by \$14.8. For the average state budget of \$931, this means a rise of 1.6%. Alternately, the lower house results for Table 7 predict that this same .1 increase makes spending as a fraction of income go up by .18 percentage points. This translates to a 1.8% rise in the typical budget (which consumes roughly 10% of personal income).

The results for total taxes can be looked at in the same way. Greater Republican majorities have no significant connection to total tax collections. But greater

¹⁵ As noted previously, for the total spending equations one cannot reject the hypothesis that the coefficients on **Distance** and **Dempercent** are equal, implying that the impact of greater Republican majorities is not significantly different from zero.

Democratic majorities noticeably increase taxation. If lower house **Distance** and **Dempercent** go up by .1, Table 6 indicates that real per-capita taxes rise by \$20. The corresponding figure for Table 8 is .20% as a fraction of income. Adjusting for the size of typical state budgets, both specifications predict that taxes go up by about 2% as a result of such a 10 percentage-point change in partisan composition. In sum, the estimated magnitudes are appreciable but not overwhelming. Consistent with Peltzman (1992), my findings suggest that politicians operate in a fairly competitive political environment but nevertheless retain a measurable degree of slack.

B. Interpretation

The Fully Constrained (Alternative III) and No Party Preferences (Alternative IV) hypotheses predict no connection between the size of government and **Distance** or **Dempercent**. The evidence is strongly against either of these alternatives. The contest between the Leviathan null and the Ideologues (Alternative I) and Voter Preference Shift (Alternative II) hypotheses is more difficult. Consistent with the null, **Distance** has the predicted positive impact on the size of the public sector. As electoral margins become larger, so does government. But the sign on **Dempercent** is also positive, as contrasting ideology theories of political parties would predict. Holding their electoral margin constant, Democrats make government bigger than Republicans would. Each hypothesis thus incorrectly predicts that the sign on the variable emphasized by its competitor will be zero.

The facts are more consistent with an intermediate position. To explain the findings, it is probably necessary to combine a model of contrasting ideological tastes with a Leviathan model.¹⁶ The Leviathan hypothesis and Alternatives I and II should be

¹⁶ Alternative I lends itself to this compromise more readily than Alternative II, which posits *perfectly* constrained parties. The positive coefficient on **Distance** suggests that parties

viewed as complements than substitutes. The positive and significant impact of both **Distance** and **Dempercent** on taxes and spending can be interpreted as follows:

For Democrats, ideology and political advantage augment each other. They want to make government larger on ideological grounds, but they also like having more power. For Republicans, in contrast, ideology and advantage pull in opposite directions. Ideologically, they want to make government smaller, but like their Democratic competitors they also want more power. For Democrats, ideology amplifies their non-ideological urge to make government bigger. For Republicans, ideology dampens this same urge. In other words, greater advantage makes it *feasible* for both parties to expand the size of the public sector. However, since the parties' ideological views differ, Democrats expand the size of the public sector as much as politically possible, whereas Republicans are less eager to seize this opportunity when it presents itself.

5. Do Parties Differ Along Other Margins?

When Democratic majorities become more lop-sided, total taxation and total spending grows; when Republican majorities become more lop-sided, total taxation and total spending barely change. Conflicting ideology theories seem to over-state how much the parties differ on the total *level* of taxation and spending. Do the parties differ along other margins? In particular, do the parties prefer to use their political slack to change the *composition* of taxes and spending rather than its level? This section searches for less obvious differences between the parties by examining the sensitivity of different types of taxation and spending to **Distance** and **Dempercent**.

5.1. Main Results

have some degree of slack. It is still possible, however, that voter preference shifts *partly* explain the policy changes the accompany changes in partisan composition.

The data set partitions total taxation into sales, income, and corporate taxation, and total spending into spending on education, health and hospitals, highways, public welfare, and "other." Each of these fiscal components was regressed on **Distance**, **Dempercent**, and the standard set of control variables. Table 8 shows the interesting coefficients in real per-capita measures. Table 9 repeats the same exercises measuring fiscal variables as a percentage of personal income. The findings:

- Real per-capita sales taxes have no significant connection to either **Distance** or **Dempercent**. Sales taxes as a percentage of income, in contrast, are an increasing function of both **Distance** and **Dempercent**. The coefficient on upper **Dempercent** is not significant, but all of the others are.
- In the income tax equations, the coefficients on both **Distance** and **Dempercent** are invariably positive and significant.
- Corporate taxes and **Distance** have no clear connection, but consistent with ideological stereotypes, corporate taxes always significantly increase as **Dempercent** increases.
- Education spending appears if anything to be negatively related to **Distance**: the coefficients are usually negative, even though only one is statistically significant. The **Dempercent** coefficient is insignificant in Table 8 (real per-capita), but positive and significant in Table 9 (percentage of personal income).
- Republicans actually seem more inclined than Democrats to increase spending on health and hospitals: **Dempercent**'s coefficient is always negative and usually significant. Health spending's link to **Distance** is less clear: the sign is always positive, but significant only for upper **Distance**.
- **Dempercent** has large negative effects on highway spending, however measured, but **Distance** only has a negative effect in Table 8. Either way, this

means that Democrats drastically cut highway spending when their political dominance becomes greater, while Republicans on net increase highway spending as their electoral position improves. The negative coefficient on **Dempercent** is consistent with standard perceptions of the parties' ideological positions on mass transit versus automobiles.¹⁷ Glazer (1989) provides a possible strategic rationale for a negative coefficient on **Distance**: When parties are confident that they have a secure majority, they are less inclined to try to "bind the hands" of future administrations by spending more on durable goods during the current period.

- **Distance** and **Dempercent** always have significant and positive coefficients in the equations for public welfare and "other" spending.

5.2. Analysis

The Leviathan hypothesis wrongly assumes that parties share identical goals, but the alternatives that attribute different objective functions to the parties overemphasize spending levels rather than spending composition. While most models of platform divergence in political economy emphasize the *level* of spending and taxation, their composition matters at least as much. Tables 8 and 9 show that parties exhibit important differences on *what* they tax and *how* they spend.¹⁸

Democrats are more prone to raise income and corporate taxes than sales taxes. Yet the positive coefficient on **Distance** dampens or even reverses any tendency of income and corporate taxes to fall as Republican majorities increase. In three of the five spending categories - education, public welfare, and "other," Democrats are predictably likely to make spending greater than Republicans would given the same

¹⁷ I owe this observation to an anonymous referee.

¹⁸ See Blais, Blake, and Dion (1993) and Paddock (1992) for two other empirical studies that find small but real differences between the parties.

degree of political slack. But for the remaining components of spending - health and hospital, and highways - the coefficients on **Dempercent** are *negative*. Republicans are actually more inclined to increase spending on these parts of the budget than Democrats are.

Aggregation thus conceals important compositional shifts. Even when total spending is stable, altering the legislature's partisan composition permits large changes in some kinds of spending. Democrats have a particularly strong tendency to reduce highway spending (and, to a lesser extent, health and hospital spending) as their political position becomes more secure. This enables them to increase public welfare and "other" spending by much more than would appear possible if one simply looked at the change in total spending. Republicans increase spending on highways as their political position becomes more secure; they manage to restrain the growth in total spending by slashing public welfare spending.

One possible explanation for these compositional differences is ideological. This is consistent with the positive connection between **Dempercent** and income and corporate taxes, as well as education and public welfare spending. The strong negative relationship between highway spending and **Dempercent** also fits conventional ideological stereotypes. In other cases, "pork barrel" explanations may fit the facts better: health and hospital spending has at most a tenuous connection to Republican ideology.

Some have seen ideology as little more than a way to credibly commit to certain pork barrel policies. (Bender and Lott 1996) On the other hand, recent theorizing suggests that pork barrel explanations may be unable to explain why the parties' spending patterns differ at all. Dixit and Londregan (1995) find that *both* parties will tend to

target money on "swing voters" - politically central, relatively non-ideological, yet non-affluent constituencies. In order to get the contrary "machine politics" result, one needs the special assumption that parties can better deliver pork to their core support groups than to swing voters. (Dixit and Londregan [1996]) Answering these questions must be left to future research; the parties' divergent spending patterns merit more intensive study, especially when the data show that ideological stereotypes oversimplify the facts.

6. Conclusion

As recent literature in political economy emphasizes, imperfections in political and economic competition leave slack for politicians to pursue their own agendas. But what agenda do politicians want to pursue? Do they, as in Dixit and Londregan (forthcoming) or Alesina and Rosenthal (1995), divide up between pro- and anti-government ideology? Or, as the public choice tradition argues and as the theoretical model presented here assumes, do politicians on both sides of the fence want to maximize their power?

Both classes of models seem to explain part of the data. The main empirical problem with the Leviathan model is that it dismisses ideological differences between parties too swiftly. Democrats definitely appear more likely to increase spending when they have a large majority, even controlling for state effects, year effects, personal income, and federal grants. Corporate income tax collections tend to rise with larger Democratic majorities, and fall with larger Republican majorities. Differences in ideology might also explain why Democrats and Republicans shift the composition of government spending as their hold on the legislature becomes more lopsided, although a "pork barrel" explanation for these comovements should not be ruled out.

However, there is an asymmetry in the data that models emphasizing divergent party ideology fail to capture: A peculiar kind of big government bias exists. Spending grows as Democratic majorities grow, but it does not fall even when Republicans enjoy a supermajority position. If anti-government ideology influences Republicans' policies, it mainly does so by restraining the expansion of the public sector, rather than prompting cuts. Ideological models of party behavior under imperfect political competition need to be supplemented by a power-maximizing model to deal with these findings. Future research on the economics of imperfect political competition should explore the complementary roles of ideology and power-maximization in greater depth.

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Table 1: Summary of the Model

Exogenous Variables	Interpretation
W_c	wealth of citizen c
G_c^*	citizen c 's most preferred quantity of public good
G^*	most preferred quantity of public good assuming homogenous preferences
β	sensitivity parameter for public goods
Ψ_c	intensity of citizen c 's preference for party i
Ψ	average (and median) value of Ψ_c
T	number of types of citizens, each with own most-preferred level of government services
χ_t	fraction of the population belonging to type t
\tilde{G}	<i>mean</i> most-desired level of government services

Endogenous Variables	Interpretation
u_c	utility function of citizen c
P_c	quantity of private good consumed by citizen c
G	quantity of public good ("size of government")
z_c	indirect utility function of citizen c in state k
Z	maximum utility level of citizens
I_i	indicator variable=1 if party i wins,=0 otherwise
G_i, G_j	size of government offered in platforms of parties i, j
u_i, u_j	utility function of parties i, j
$U(G_i)$	utility of federal party i conditional on ruling
δ_i	type-weighted squared deviation from most preferred level of public goods offered by party i
#Dem,#Rep	raw numbers of Democratic and Republican legislators in a given legislative body
Distance	$\equiv \text{Dempercent} - .5 $
Demmajority Dempercent	dummy variable: = 1 if $\# \text{Dem}/(\# \text{Dem} + \# \text{Rep}) \geq .5$, and otherwise =0 $\equiv \frac{\# \text{Dem}}{\# \text{Dem} + \# \text{Rep}}$

Table 2: Summary Statistics**1920 Observations:** 48 continental United States, 1950-1989.*1920 Observations*

Variable	Mean	SD	Min	Max	MWSD
sales tax	286.815	133.097	68.948	816.559	124.524
income tax	107.742	119.991	0	623.357	88.571
corporate tax	34.341	31.248	0	192.21	22.397
total tax	428.898	213.515	68.948	1157.233	227.164
spending	894.453	416.805	196.324	2562.59	447.443
edu	330.802	180.938	29.64	860.21	198.031
hhsp	64.41641	34.825	10.84	210.23	34.64
hwy	161.422	73.519	25.68	658.89	56.638
pw	136.985	91.589	13.49	579.38	78.851
personal income	8887.044	2669.925	2873.966	19002	2747.875

1719 Observations: 48 continental United States, 1950-1989, except: 1951, 1962, and 1964 (all states); NB (all years); and MN, 1950-1972.*1719 Observations*

Variable	Mean	SD	Min	Max	MWSD
sales tax	297.304	133.620	68.948	816.559	125.458
income tax	113.806	123.365	0	623.357	88.797
corporate tax	36.118	31.966	0	192.21	22.62
total tax	447.227	213.814	68.948	1157.233	227.691
spending	930.912	417.256	209.565	2562.59	451.473
edu	346.906	180.976	29.64	860.21	200.223
hhsp	66.931	35.257	10.84	210.23	35.346
hwy	162.270	73.807	25.68	658.89	56.554
pw	143.831	93.382	13.49	579.38	80.205
personal income	9083.006	2672.865	2916.512	19002	2778.613
grant	309.393	181.132	24.423	992.674	195.893
lower Demmajority	0.641	0.480	0	1	0.288
lower Dempercent	0.607	0.229	.01	1	0.123
lower Distance	0.205	0.149	0	0.5	0.095
upper Demmajority	0.608	0.488	0	1	0.279
upper Dempercent	0.606	0.244	0	1	0.129
upper Distance	0.219	0.151	0	0.5	0.100

Table 3:

Regression of Taxation and Spending on Legislatures' Partisan Composition (Omitting Demmajority), Controlling for Federal Grants, and State and Year Effects

Dependent Variable	Taxes (real per-capita)	Spending (real per-capita)	Taxes (% personal income)	Spending (% personal income)
constant	197.166 42.407	773.843 60.950	5.669 0.139	9.475 0.218
lower Distance	115.853 18.177	71.484 26.125	1.213 0.169	1.084 0.265
R ²	0.924	0.959	0.852	0.919
constant	208.976 42.485	780.942 60.876	5.700 0.139	9.502 0.218
upper Distance	97.115 17.703	67.437 25.366	0.984 0.165	0.989 0.257
R ²	0.924	0.959	0.851	0.919

Standard errors below coefficients N=1719 Missing Observations: 201 Years:1950-89

Table 4: Predictions of Null and Alternative Hypotheses

Hypothesis	Coefficient on Distance	Coefficient on Dempercent
Null: "Leviathan"	+	0
Alternative I: "Ideologues"	0	+
Alternative II: "Voter Preference Shift"		
Alternative III: "Fully Constrained"	0	0
Alternative IV: "No Platform Preferences"		

Table 5:

Regression of Taxation and Spending on Legislatures' Partisan Composition (Omitting Demmajority), Controlling for Federal Grants, and State and Year Effects

Dependent Variable	Taxes (real per-capita)	Spending (real per-capita)	Taxes (% personal income)	Spending (% personal income)
constant	167.370 42.087	745.733 60.995	5.250 0.150	9.126 0.237
lower Demmaj.	5.057 5.788	-18.566 8.389	0.049 0.054	-0.067 0.085
lower Dempercent	92.947 18.233	116.081 26.424	0.914 0.168	0.893 0.267
lower Distance	108.062 17.973	63.887 26.048	1.122 0.167	1.007 0.265
R ²	0.926	0.959	0.857	0.920
constant	186.486 42.142	750.924 60.986	5.255 0.150	9.099 0.238
upper Demmaj.	15.285 6.303	-6.703 9.121	0.060 0.059	-0.106 0.093
upper Dempercent	64.355 17.814	98.416 25.780	0.832 0.165	0.983 0.261
upper Distance	83.148 17.542	55.440 25.386	0.834 0.163	0.870 0.258
R ²	0.926	0.959	0.856	0.920

Standard errors below coefficients N=1719 Missing Observations: 201 Years:1950-89

Table 6:
Regression of Taxation and Spending on Legislatures' Partisan Composition and Interaction Dummies, Controlling for Federal Grants, and State and Year Effects

Dependent Variable	Taxes (real per-capita)	Spending (real per-capita)	Taxes (% personal income)	Spending (% personal income)
constant	204.430 42.579	754.746 62.164	5.532 0.164	9.220 0.262
lower Demper.* Demboth	3.653 9.991	-23.620 14.586	0.035 0.093	-0.066 0.148
(1-lower Demper.)* Repboth	-51.997 10.968	-23.762 16.013	-0.413 0.102	-0.141 0.163
lower Demper.	32.988 21.810	79.118 31.841	0.446 0.203	0.669 0.323
lower Distance	146.026 21.754	101.379 31.759	1.417 0.202	1.171 0.322
R ²	0.927	0.959	0.858	0.920
constant	213.173 42.790	745.621 62.036	5.498 0.168	9.123 0.267
upper Demper.* Demboth	-6.075 10.902	-45.072 15.806	-0.065 0.102	-0.224 0.161
(1-upper Demper.)* Repboth	-49.353 11.089	-16.814 16.077	-0.384 0.103	-0.115 0.164
upper Demper.	40.543 21.441	118.479 31.085	0.557 0.200	0.911 0.317
upper Distance	135.811 22.974	107.738 33.307	1.252 0.213	1.156 0.338
R ²	0.927	0.960	0.857	0.920

Standard errors below coefficients N=1719 Missing Observations: 201 Years:1950-89

Table 7:
Regression of Taxation and Spending on Legislatures' Partisan Composition (Omitting Demmajority), Controlling for Federal Grants, and State and Year Effects

Dependent Variable	Taxes (real per-capita)	Spending (real per-capita)	Taxes (% personal income)	Spending (% personal income)
constant	166.490 42.072	748.966 61.051	5.239 0.149	9.142 0.236
lower Dempercent	102.027 14.979	82.742 21.736	1.002 0.138	0.773 0.219
lower Distance	107.776 17.969	64.934 26.074	1.119 0.167	1.011 0.264
R ²	0.926	0.959	0.857	0.920
constant	179.831 42.116	753.843 60.848	5.243 0.150	9.120 0.237
upper Dempercent	92.547 13.518	86.053 19.530	0.943 0.125	0.788 0.197
upper Distance	83.872 17.566	55.123 25.379	0.837 0.163	0.866 0.258
R ²	0.926	0.959	0.856	0.920

Standard errors below coefficients N=1719 Missing Observations: 201 Years:1950-89

Table 8:

Baseline Regression of Taxation and Spending on Legislatures' Partisan Composition, Controlling for Personal Income, Federal Grants, and State and Year Effects

All fiscal variables expressed in per-capita real terms.

Dep. Var.	Sales	Income	Corp	Edu	Hhsp	Hwy	Pw	Other
constant	399.446 32.441	- 136.101 34.372	-95.975 10.642	674.717 30.762	52.644 8.790	-1.809 22.570	-30.281 23.800	50.463 35.199
lower Demmaj.	-8.445 4.462	9.956 4.727	3.546 1.464	-6.246 4.231	2.741 1.209	-7.906 3.104	14.886 3.273	-22.042 4.841
lower Demper.	9.828 14.054	65.337 14.891	17.782 4.610	10.249 13.326	-10.914 3.808	-66.539 9.778	102.997 10.310	80.288 15.249
lower Distance	8.205 13.854	86.765 14.679	13.092 4.545	-22.222 13.137	6.300 3.754	-29.337 9.638	66.708 10.163	42.437 15.032
R ²	0.888	0.852	0.789	0.945	0.882	0.822	0.876	0.880
constant	402.653 32.424	- 121.883 34.623	-94.284 10.690	673.559 30.727	52.880 8.753	-9.952 22.758	-18.512 24.175	52.950 35.211
upper Demmaj.	8.146 4.849	6.646 5.178	0.493 1.599	3.136 4.596	-2.333 1.309	-3.075 3.404	6.119 3.616	-10.550 5.266
upper Demper.	-12.880 13.706	56.149 14.635	21.085 4.519	-1.027 12.989	-5.565 3.700	-55.903 9.620	100.003 10.219	60.909 14.884
upper Distance	21.069 13.497	62.827 14.412	-0.748 4.450	-35.818 12.790	12.485 3.643	-32.579 9.473	48.487 10.063	62.865 14.657
R ²	0.888	0.850	0.787	0.945	0.883	0.819	0.873	0.880

Standard errors below coefficients

N=1719

Missing Observations: 201

Years:1950-89

Table 9:

Baseline Regression of Taxation and Spending on Legislatures' Partisan Composition, Controlling for Personal Income, Federal Grants, and State and Year Effects

All fiscal variables expressed as a percentage of personal income.

Dep. Var.	Sales	Income	Corp	Edu	Hhsp	Hwy	Pw	Other
constant	5.222 0.121	0.045 0.101	-0.017 0.038	4.666 0.119	0.839 0.033	0.562 0.103	0.782 0.090	2.277 0.120
lower Demmaj.	-0.066 0.044	0.090 0.036	0.025 0.014	-0.093 0.043	0.026 0.012	-0.008 0.037	0.116 0.033	-0.109 0.043
lower Demper.	0.303 0.136	0.451 0.114	0.160 0.043	0.425 0.134	-0.189 0.037	-0.752 0.115	0.999 0.102	0.411 0.135
lower Distance	0.341 0.135	0.719 0.113	0.062 0.042	0.051 0.133	0.057 0.037	0.062 0.114	0.527 0.101	0.310 0.134
R ²	0.853	0.872	0.734	0.923	0.770	0.854	0.793	0.829
constant	5.189 0.121	0.099 0.103	-0.034 0.038	4.675 0.120	0.850 0.033	0.505 0.103	0.757 0.091	2.312 0.120
upper Demmaj.	0.040 0.047	0.039 0.040	-0.019 0.015	-0.082 0.047	-0.016 0.013	0.074 0.040	0.028 0.035	-0.110 0.047
upper Demper.	0.225 0.133	0.372 0.113	0.235 0.042	0.380 0.132	-0.136 0.036	-0.668 0.114	1.057 0.100	0.350 0.132
upper Distance	0.463 0.131	0.458 0.112	-0.086 0.041	-0.174 0.130	0.073 0.036	0.013 0.112	0.355 0.099	0.603 0.130
R ²	0.854	0.869	0.734	0.923	0.771	0.852	0.791	0.831

Standard errors below coefficients

N=1719

Missing Observations: 201

Years:1950-89