New Deal Spending in the Mountain West: Econometric Answers to Old Questions of Renewed Interest

Robert K. Fleck
The John E. Walker Department of Economics
Clemson University
Clemson, SC 29634
phone: (864) 656-3964
e-mail: rfleck@clemson.edu

Preliminary Draft for Discussion Purposes: February 11, 2012

Abstract: Even a casual glance at New Deal spending data reveals substantial differences between regions, with the Mountain West states receiving high per capita allocations (Arrington 1969). In view of this fact, scholars conducting empirical studies of state-level New Deal spending have repeatedly raised concerns about whether some potentially anomalous aspect of the Mountain West drives econometric results. In this paper, I address those concerns directly with a theoretically grounded econometric analysis, and I reach conclusions that differ from some recent interpretations of New Deal spending patterns. More specifically, the econometric relationship between land area and spending is not an artifact of land area proxying for the Mountain West. Moreover, after controlling for land area, the Mountain West states are not high-spending outliers. Indeed, the more relevant question would be why spending in the Mountain West was, ceteris paribus, so *low*. This has broader implications for understanding the New Deal, distributive politics, and econometric estimates of policy effectiveness.

Acknowledgments: For helpful comments, I thank Tony Cookson and Andy Hanssen. I thank John Wallis for providing some of the data used in this paper. For its generous support, I thank the Hoover Institution, where I was a 2010-11 W. Glenn Campbell and Rita Ricardo-Campbell National Fellow and the 2010-11 Arch W. Shaw National Fellow.

I. Introduction

The now large empirical literature on the allocation of New Deal spending across states began with Arrington (1969). Even the title of Arrington's paper – "The New Deal in the West: A Preliminary Statistical Inquiry" – conveys important information. Quite literally, the first words in the literature point to the empirical prominence of western spending levels. Arrington's preliminary inquiry made a seminal contribution to the literature, but more than forty years later, the New Deal spending literature still relies excessively on rather "preliminary" empirical assessments (not theoretically grounded econometric analysis) when describing between-region differences. The purpose of this paper is to provide a better econometric analysis of why the Mountain West states received high per capita allocations.

Before turning to the econometrics, what are the substantive issues at stake? In other words, why should economists and historians care about econometric explanations of regional differences in New Deal spending? Different explanations of heterogeneity in spending provide support for different hypotheses with respect to the nature of the New Deal and, more generally, distributive politics. And that, in turn, matters for the growing literature that relies on the implications of political economy models to develop econometric strategies for estimating the effectiveness of distributive policy. More specifically, in their efforts to sort out directions of causality – most notably from New Deal policy to economic outcomes but also from New Deal policy to political outcomes – economists have employed a variety of political and economic variables as instruments for New Deal policy (e.g., Fleck 1999, 2011b; Fishback, Horrace, and Kantor 2005, 2006; Fishback, Haines, and Kantor 2007). An improved understanding of what factors caused heterogeneity in New Deal spending will help improve these instrumenting strategies.

Given the size of the previous literature on New Deal spending, I will focus my introductory comments on the papers and arguments most relevant for understanding spending in the Mountain West.[1] Even a casual glance at New Deal spending data reveals substantial differences between regions, and scholars have long recognized this fact (Arrington 1969). Moreover, scholars have long considered a variety of hypotheses, including heterogeneity in political factors and in economic hardship, as potential explanations for regional differences.[2] In a seminal paper, Wright (1974) developed and tested a theoretical model of distributive politics.[3] The model predicts that higher per capita allocations will go to states with swing electorates and/or more electoral votes per capita. In an econometric analysis of state-level data on New Deal spending, Wright found support for his model's predictions.[4]

Wright's model can thus account for substantial regional differences as the outcome of distributive politics. The South was (as Arrington noted) a loyally Democratic region, and Wright's political variables predict the low levels of per capita spending received by southern states. The

[1]For reviews of the broader literature on the political economy of New Deal spending, see, e.g., Wallis (1998), Fishback, Kantor, and Wallis (2003), and Fleck (2008).

[2]Arrington (1969) notes that per capita spending varied greatly between regions and appeared to favor states with higher incomes. He points to a variety of potential explanations for the observed spending patterns, including the possibility that electoral concerns produced low per capita spending in the South because "the South was safe in the Democratic fold and did not need as much economic bribing" (Arrington 1969, 312). As a potential explanation of low spending in the low-income South, Reading (1973) argues that spending appeared to be designed to restore incomes to pre-Depression levels rather than to equalize income between regions.

[3]For an indication of how influential Wright's work has been, see, e.g., Wallis (1998), Fishback, Kantor, and Wallis (2003), and Fleck (2008, 2011a).

[4]Wright includes a variety of controls for economic factors (e.g., unemployment, the percent fall in income during the onset of the Depression, and the percent of the state's land owned by the federal government). Many subsequent papers have reexamined the extent to which Wright's political variables and/or other factors can explain the allocation of New Deal spending (e.g., Wallis 1984, 1987, 1998, 2001; Anderson and Tollison 1991; Fleck 2001b).

Mountain West was, by contrast, a swing region with few people per state and, hence, with high per capita representation in the Electoral College and the Senate. Thus, Wright's political variables can predict the high levels of per capita spending in the Mountain West. Wright investigated whether his econometric explanation of spending differences among all 48 states was, in essence, a story about a given region compared to the rest of the country. In particular, when Wright (1974, 34) examined the residuals from his regressions, he found that his estimated equations "achieve a high degree of discrimination *within* as well as among regions."

In a critique of the New Deal spending literature, Wallis (1998) offers an alternative explanation of spending patterns. Based on the econometric performance of a new explanatory variable, 1/population (denoted 1/POP), Wallis concludes that controlling for 1/POP overturns many previous findings, including the large estimated effects of Wright's political variables. Wallis pays particular attention to Nevada, which had the highest per capita spending and very few people. With respect to the Mountain West as a whole, the potential effects of population-driven heterogeneity on per capita spending are large, given the typically small populations of the Mountain West states.

Fleck (2001b) reexamines the data and shows that a few non-political variables, most importantly land area, can account for the vast majority of cross-state variation in per capita spending. Furthermore, including land area in the spending regression causes a dramatic reduction in the ceteris paribus explanatory power of Wright's political variables and Wallis's 1/POP. Given the large amount of land per capita in the Mountain West states, this provides yet another potential explanation of regional spending differences.

The issue has remained unsettled. Wallis (2001) examines regional differences and argues that land area proxies for the Mountain West, and he concludes that the explanatory power that Fleck

(2001b) found in land area is driven by regional differences. Wallis, Fishback, and Kantor's (2006) interpretation, drawing on Wallis (1998, 2001) and Fleck (2001b), is that "The importance of land area in the literature on the political economy of New Deal spending reflects the geographic differences between the east and west." There is no doubt, of course, that the econometric role of land variables must reflect regional differences in geography (in the sense of square miles per state) – that is a mathematical property of spending regressions that include land area variables as explanatory factors. But there remains a question of whether the ability of land area to predict high spending for the high spending region (i.e., for the Mountain West states) arises from the effect of land area on spending or, instead, arises because the land area variable is correlated with, and thus merely serves as a proxy for, something else (e.g., size of the population) that influenced spending.

This paper will resolve the question of whether land area serves a proxy for the Mountain West (it does not) and move on to questions of broader relevance – especially, as mentioned above, for current efforts to sort out the directions of causality between policy decisions and economic conditions. For this purpose, I develop a theoretical model, which Section II of the paper presents. Section III describes the data used in Section IV's econometric analysis. Section V discusses the implications for future research, and Section VI concludes.

II. Theoretical Model

This section develops a theoretical framework for analyzing the allocation of government funds between programs and across jurisdictions (e.g., states). Where the model departs from the typical theoretical approach to distributive politics is in the allocation of funds between program types. In particular, the budget is divided between two programs. One of these distributes funds

according to a specific criterion (i.e., following a formula), while the other must simply stay within its budget constraint.[5]

To keep the exposition straightforward, I will begin with a simple but flexible framework that includes the model's novel features and excludes unnecessary complications. After that, I will explain how the basic framework can be extended to incorporate key ideas from previous theoretical work, notably Wright (1974).

Assumptions

(A1) Allocation of Budget. A fixed total budget S must be allocated between two programs, such that $S = s_c + s_d$, with s_c denoting the amount going to a criterion-based program, and s_d denoting the amount going to a simple distributive (not criterion-based) program ($S>0$; $s_c \geq 0; s_d \geq 0$). The criterion-based program allocates funds across n jurisdictions based on an exogenous factor, so that $s_{ci} = \omega_i s_c$, with s_{ci} indicating funding to jurisdiction i, ω_i exogneous, $\omega_i > 0$ for all i, and $\Sigma_i \omega_i = 1$. For the distributive program, the budget constraint for allocation across the n jurisdictions is $s_d = \Sigma_i s_{di}$, with $s_{di} \geq 0$ for all i. Let s_i denote local spending summed over the two programs (i.e., $s_i = s_{ci} + s_{di}$).

(A2) Voter Evaluations of Policy. In each jurisdiction, voters value two aspects of policy: a public good component of the criterion-based spending; an income transfer component of local spending, part of which is from each program. Denote the income transfer effect as m_i, measured as local spending by the distributive program plus a fraction φ of the local criterion-based spending: $m_i = s_{di} + \varphi s_{ci}$; $0<\varphi<1$. Assume that voters value each component with a linear, downward-sloping marginal benefit curve, leading to:

$$B_i = \underline{B}_i - \sigma(\underline{s}_c - s_c)^2 - \mu(\underline{m}_i - m_i)^2$$

where σ, μ, $\underline{s}_c$, and $\underline{m}_i$ are exogenous and positive.[6]

---

[5]By modeling the division of funds between programs of these types, my model builds on previous work by Levitt and Snyder (1995), Johnson and Libecap (2003), and Fleck (2008).

[6]Note that σ, μ, $\underline{s}_c$, and $\underline{m}_i$ indicate the intercepts and slopes of the marginal benefit curves: $\underline{s}_c$ indicates the level of s_c for which the marginal benefit equals zero; $\underline{m}_i$ indicates the level of m_i for which the marginal benefit equals zero; σ reflects the slope of the marginal benefit curve for s_c, and μ reflects the slope of the marginal benefit curve for m_i. Also note that $\underline{B}_i$ in an arbitrary number (the value of which has no effect on the model's implications) that merely indicates the level of total surplus that could be obtained in the absence of a budget constraint.

(A3) Electorally Driven Policy. Policy is set by an incumbent in a manner that maximizes his or her expected number of jurisdiction-level election victories. The allocation of the budget (in the relevant range) affects the probability of victory in jurisdiction i as follows:

$$\Delta P(Win_i) = \pi_i \Delta B_i$$

with $\pi_i > 0$ and exogenous.[7]

Basic Implications

To begin, consider interior solutions. In other words, consider the case in which it will be optimal for the politician to set $s_c > 0$ and $s_{ci} > 0$ for all i. Given that the budget constraint is simply the sum over all types of spending, the first order conditions can be expressed as follows:

$$\Sigma_i \pi_i(\partial B_i/\partial s_c) = \Sigma_i \pi_i(\partial B_i/\partial s_{dk}) \text{ for all k}$$

$$\Rightarrow \quad \Sigma_i \pi_i[\sigma(\underline{s}_c - s_c) + \mu\varphi(\underline{m}_i - s_{di} - \varphi s_c)] = \pi_k\mu(\underline{m}_k - s_{dk} - \varphi s_c)$$

This yields several implications:

(I1) An increase in σ and/or $\underline{s}_c$ will cause an increase in s_c and a decrease in s_{dk} (for all k). In other words, an upward shift in the marginal benefit curve for the public good component of criterion-based spending will increase the amount allocated to the criterion-based program, thereby decreasing distributive program spending in each jurisdiction.

(I2) For two otherwise identical jurisdictions j and k, if $\pi_j > \pi_k$, then $s_j > s_k$ and $s_{dj} > s_{dk}$. In other words, jurisdictions in which the electorate is more responsive to policy will, ceteris paribus, receive larger allocations of funds.

(I3) For two otherwise identical jurisdictions j and k, if $\underline{m}_j > \underline{m}_k$, then $s_j > s_k$ and $s_{dj} > s_{dk}$. In other words, jurisdictions with higher marginal benefit curves for local spending will, ceteris paribus, receive larger allocations of funds.

(I4) For two otherwise identical jurisdictions j and k, if $\omega_j > \omega_k$, then $s_j > s_k$ and $s_{dj} < s_{dk}$. In other words, jurisdictions to which the criterion-based program gives greater weight will, ceteris paribus, receive more funding overall but less from the distributive program.

---

[7] In other words, π_i indicates the rate at which an increase in B_i will increase the probability of victory in jurisdiction i. Note that the jurisdiction-level probability of winning could be replaced by a jurisdiction-level vote share, with the politician seeking to maximize his or her overall (i.e., summed over jurisdictions) vote share – this would not affect the model's implications.

To expand upon the insight that Implication I4 provides regarding the effects of ω, it is useful to consider non-interior solutions. Note that for $\omega_j s_c$ sufficiently large (driven by a sufficiently high marginal benefit of criterion-based spending, as implied by large σ and $\underline{s}_c$), the marginal electoral effect of local spending will be zero (i.e., $\partial P(Win_j)/\partial s_{dj} = 0$) even when $s_{dj} = 0$.[8] This, combined with the election-seeking assumption (A3) underlying the allocation of funding, yields the following:

(I5) Ceteris paribus, a sufficiently high ω_j will, when combined with a sufficiently high s_c, lead the politician to set $s_{cj} = 0$. In other words, when there is a sufficiently large criterion-based program, the jurisdictions with (ceteris paribus) the largest weight in the criterion-based formula will have zero allocations from the distributive program.

Now consider another type of non-interior solution: allocating nothing to the criterion-based program. There must, of course, be some reason to base spending on a specific criterion, given that it imposes a constraint on the allocation of the budget. In the model, the localized income transfer effect of criterion-based spending in a given jurisdiction is, at the margin, below that of purely distributive spending (Assumption A2). Thus, if the criterion-based program lacks a sufficient public good effect, it will be unfunded:

(I6) For sufficiently low σ, ceteris paribus, the politician will set $\underline{s}_c = 0$. In other words, when the criterion-based program offers little in the way of a unique advantage over the purely distributive program, the entire budget will go to the distributive program.

Note that the public good aspect of the criterion-based program could arise from the provision of a pure public good, or alternatively because relying on a formula reduces shared costs – for example, by reducing the costs of political battles (e.g., Johnson and Libecap 2003).

[8]This is, of course, a consequence of assuming (in Assumption A2) that the marginal local transfer effects are linear and decreasing. As explained later, however, the logic underlying the mechanism at work here applies more generally.

Additional Implications

Before turning to the empirical application of the model, it is worth discussing how the theoretical analysis here relates to previous work. As noted earlier, the exposition above is intended to be simple but flexible enough to allow extensions. The most important considerations here are the central features of Wright's (1974) theoretical model: incentives to allocate more funds to swing states and incentives to allocate more funds to states with greater per capita weight in the political system.[9]

With respect to swing states, note that the mechanism modeled by Wright plays a role parallel to that of π in my model. More specifically, in Wright's model, a greater responsiveness of state-level vote shares to own-state spending will (among the set of states for which increasing the incumbent president's expected vote share has a diminishing marginal effect on the probability of winning a state-wide winner-take-all election) lead to higher spending in the state, ceteris paribus. This is analogous to a greater value of π_j leading to a higher level of s_j (as described in Implication I2).

In Wright's theoretical analysis, the apportionment of votes in the Electoral College is what gives rise to heterogeneity among states with respect to their per capita weights in the political process. The same logic applies more generally. Notably, states with small populations have (relative to states with large populations) more Senate seats per capita, as well as more electoral votes per capita. (Wright makes this point in his empirical analysis.) It is easy to extend my model

[9]The key factors modeled by Wright have been incorporated into later models, including my own work (Fleck 1999a, 1999c, 2001a, 2008; Fleck and Kilby 2001). I focus on Wright's model in the main text here, because he developed the seminal model. Before submitting this paper for publication, I will add a more detailed explanation of how the theoretical analysis in this paper differs from my previous theoretical work.

so that it incorporates this feature: Simply weight the probability of winning by the per capita electoral weight. This will show that, ceteris paribus, jurisdictions with greater per capita electoral weight will receive more funding – the same as in Wright's model.[10]

III. Data

Turning to empirical issues, it is essential to recognize that the model is designed to be a useful abstraction. In practice, New Deal spending cannot be divided cleanly into one part that was allocated by criterion-based programs and another part that was not. This means that the starting point for applying the model is to identify measures of spending (in particular s_i for each state i) and plausible criteria (i.e., proxies for ω) underlying the allocation of spending across states in the 1930s.[11]

Proxies for s_i

With respect to spending, I will follow much of the previous literature (e.g., Wright 1974; Wallis 1998; Fleck 2001b, 2008) and begin by using state-level per capita New Deal spending aggregated over the years 1933 through 1939. As emphasized by Arrington and many others, the variation across states is striking: The variable, denoted SPEND, ranges from $147 to $1131, with a mean of $293 and a standard deviation of $178. Because these data include spending for myriad programs, they proxy for s_i (i.e., the sum of s_{ci} and s_{di}).[12]

---

[10]It is also worth noting that the criterion-based program could be defined, instead, as the production of a pure public good with no localized spending. In this case, the difference between ω_j and ω_k would indicate a between-jurisdiction difference in the marginal benefits obtained from the public good.

[11]See Appendices A for variable definitions and data sources. See Appendix B for descriptive statistics.

[12]In Section IV, I will also examine spending by three specific programs.

Proxies for ω_i

To identify proxies for ω, I will follow Fleck (2008) both in reasoning and in the choice of income and land variables. As a preliminary point, note that the New Deal's famous "relief, recovery, and reform" objectives were widely seen as appropriate by most voters, and this has long been recognized in the historical literature (e.g., Schlesinger 1958) and by scholars conducting empirical analyses of New Deal spending data (e.g., Arrington 1969; Reading 1972; Wright 1974). To the extent that voters valued programs that addressed these objectives – and not just for the own-state effects – this provides a good starting point for identifying proxies for ω.

For variables related to relief and recovery, I will (as in my previous work) use income variables based on data from Arrington. First, to identify states with low incomes, which indicate likely targets for spending designed to combat poverty ("relief"), I use personal income per capita in 1932 ($INCOME_{1932}$). Second, to indicate the extent to which states suffered large declines in income – and thus would be likely targets for spending designed to alleviate the effects of the Depression ("recovery") – I use the decline in personal income per capita from 1929 to 1932 ($INCOME\ FALL_{1929\text{-}1932}$).

For variables related to reform, land-related variables make good sense. Higher spending in states with more land would be in line with efforts to improve the management of land resources. This was an important aspect of "reform" – especially given the prominence of the Dust Bowl and, more generally, a widespread view that the mismanagement of land and resources had led to serious environmental and economic problems. Moreover, land area was an explicit criterion in formula

based spending.[13] For defining land variables, a key point emphasized in literature (including Wright's seminal analysis) is the distinction between federal land and other land. Thus, I will use two variables: federal land area per capita ($LAND_{federal}$) and non-federal land area per capita ($LAND_{non\text{-}federal}$).

Controls for $\underline{m_i}$

The essential starting point here is a question: Why control for factors analogous to $\underline{m_i}$? Doing so is required in order to identify how the land-related variables are related to region-specific spending levels. First, spending in the Mountain West could have differed from spending elsewhere as a result of land-related variables and/or as a result of other factors potentially correlated with land-related variables. Thus, to estimate the extent to which land variables can be interpreted as reasonable proxies for allocation criteria (analogous to ω), it is essential to examine whether economic factors potentially correlated with federal and/or non-federal per capita land area might explain the spending differences of interest. Second, after controlling for land area, if the Mountain West states tend to have larger or smaller than expected spending levels, there will remain the question of what econometrically omitted factors explain the deviations from the expected levels. One potential answer is suggested by the model: States with high values of ω have high levels of criterion-based spending but low levels of distributive-program spending. Alternatively, the answer could be the effects of other allocation criteria.

Thus, to control for across-state differences in economic factors (other than the proxies for ω) that may have (i) influenced spending patterns and (ii) varied substantially between states and

[13]One key example is highway spending. See, e.g., Key (1937), Fleck (2001b), and Johnson and Libecap (2003).

between regions, I will add four variables from Wallis (1998). As measures of the size and wealth of each state's agricultural economy, I include the fraction of the population living on farms, along with farm value per capita. And, to supplement the income variables as proxies for unfavorable economic conditions, I include 1930 unemployment and 1937 unemployment.[14]

Control for π_i

For the reasons explained in Section II, the role of π_i parallels the role of electoral variability in Wright's model. Thus, as a proxy for π_i, I employ a variable developed by Wright. To measure the propensity of a state's electorate to switch with respect to the party it supported in presidential elections, Wright calculated the standard deviation around the trend in the Democratic vote share in presidential elections, 1896-1932.[15] The reasoning (in Wright's analysis and here) underlying the use of the variable, denoted SD, is that the effect of state-level spending on state-level election margins will be higher in states where voters have historically shown greater variability in the party for which they vote.

Controls for Electoral Weight

As discussed in Section II, another potential influence on the allocation of funds across states

[14]Unfortunately, the available measures of economic conditions during the 1930s are far from ideal. In particular, an important consideration with respect to 1937 unemployment is that it will be a function of New Deal policy (e.g., Darby 1976; Fleck 1999b). Thus, one should not interpret the estimated effect of the variable as a measurement of causal effects. By contrast, unemployment in 1930 measures pre-New Deal conditions, but it (like the income variables I use) has the disadvantage of being a noisy proxy for later conditions.

[15]The year 1896 marks the major partisan realignment preceding the New Deal (e.g., Brady 1988). Thus, it serves as a useful point to mark the beginning of the time period over which the inter-temporal variation in voting patterns is measured.

is electoral weight, as modeled by Wright.[16] Wright's empirical application of this idea focused on the role of electoral votes per capita, a variable that can (due to the way electoral votes are apportioned to states) be broken down into two components: members of the Senate per capita; members of the House of Representatives per capita.[17] Because several papers after Wright have examined one or both of these two components, I will include both components.[18]

IV. Econometric Analysis

To illuminate the basic empirical question to address, consider how some key factors differed between regions. Or, to put it in more precise terms, consider how the values of state level variables, when averaged over the Mountain West states (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming), differed from the rest of the country. The Mountain West states had high per capita spending: $596 on average, compared to $233 for other states. They also had smaller populations, so that Wright's V/POP averages .011 among Mountain West states, compared to .005 for the other states. The Mountain West states also had dramatically more square miles per capita: .363, compared to.026 for the other states. Given that more than one potential explanatory factor differs between regions, simple between-region comparisons have limited value for causal inference, and regressions are highly useful.

---

[16]Recall that, for the sake of simplicity and to avoid showing again what is already well known, I do not explicitly include an electoral weight variable in my theoretical analysis.

[17]The fundamental issue is at stake is that each state has two Senate seats. As reported in Fleck (2008), members of Congress per capita (equivalently, electoral votes per capita) has a .987 correlation with senators per capita.

[18]See, e.g., Bennett and Mayberry (1979), Atlas, Gilligan, Hendershott, and Zupan (1995), Lee (1998, 2000, 2004), Lee and Oppenheimer (1999), Hoover and Pecorino (2005), and Fleck (2001b, 2008).

Before specifying regressions for the purpose of analyzing the ways in which New Deal spending differed between the Mountain West and the rest of the country, it is useful to determine how much of the overall variation in the state-level spending data was due to the difference between those regions, and how much was due to heterogeneity within those regions. The biggest component, 59% of the total variation, is between regions; another 29% is within the Mountain West, and the remaining 12% is within the set of states outside the Mountain West.[19] Thus, even though only 8 of the 48 states were in the Mountain West, understanding why spending in the Mountain West was so high is essential for understanding nationwide heterogeneity in the state-level allocations of funds.

Controlling for Land and Income Variables, was Spending High in the Mountain West?

As a starting point for the econometric analysis, consider a parsimonious regression of the main proxy for s_i (SPEND) on the four main proxies for ω_i ($INCOME_{1932}$, $INCOME\ FALL_{1929\text{-}1932}$, $LAND_{federal}$, $LAND_{non\text{-}federal}$). Regression 1 in Table 1 shows the results. Note that this estimated equation is not new – it replicates Regression 1 in Fleck's (2008) Table 3, and it is very similar to Regression 1 in Fleck's (2001b) Table 1.[20] The key findings are that the vast majority of the variance in spending can be explained with income and land variables (R^2=.935), that the directions of the effects are as hypothesized, and that the magnitudes of the coefficients are substantial. The point

[19]More specifically, the following econometric results hold: A regional dummy (which can of course be defined for either the Mountain West or for the rest of the country) yields an R^2 of .5883; with a regional dummy included, accounting for variation within the Mountain West (by using a full set of dummy variables) increases the R^2 by .2944; with a regional dummy included, accounting for variation outside the Mountain West (by using a full set of dummy variables) increases the R^2 by .1172.

[20]Compared to the estimated equation here and in Fleck (2008), Fleck's (2001b) results differ very slightly as a consequence of relying on different data sources for the construction of spending and political variables.

estimates predict that an additional square mile of federal land would increase spending by $585, an additional square mile of non-federal land would increase spending by $1793, having a one dollar higher level of pre-Depression income would reduce spending by 19 cents, and an additional one dollar pre-New Deal decline in income would increase spending by 44 cents.[21]

Are these results, and in particular the large estimated effects of land area, solely a reflection of the Mountain West's high values for SPEND, $LAND_{federal}$, and $LAND_{non\text{-}federal}$? The simplest test is to re-estimate the same equation with the Mountain West states excluded from the sample. What does the exclusion of the Mountain West from the sample do? As shown in Regression 2, this increases the estimated coefficients on $LAND_{federal}$ (from 585 to 1808) and $LAND_{non\text{-}federal}$ (from 1793 to 2353). Thus, land does not merely proxy for the Mountain West – more precisely, the large estimated effects of land area shown in Regression 1 are not just an artifact of land area acting as a

[21]For interpreting the coefficients, recall the units in which the variables are defined. More specifically, note that because spending and land area are both measured in per capita terms, the coefficients on the land variables can be interpreted in a non-per-capita manner: the marginal effect of an additional square mile of land in a state on the number of dollars allocated to the state. Recognizing the correspondence between the units of the land and spending variables is critical for understanding why the specifications in Fleck (2001b, 2008) and here predict so much of the variation in per capita spending. My results contrast, for example, with what Wallis (2001, 308-310) finds when he investigates the effects of replacing Fleck's (2001b) per capita land variables with the inverses of those variables. For some purposes, population density (population/land) could make sense as a variable to explain per capita spending in a linear regression (e.g., if the purpose were to analyze spending by a program that targeted communicable diseases for which the per capita incidence was higher among dense populations). But that functional form, which allocates dollars to states according to a linear function of *population squared over land area*, cannot account for a linear relationship between dollars and land area. The data confirm what the historical record of formula-based spending (on roads, for example) suggests: Far more of the variation in per capita spending can be explained by per capita land area than by population density. And, of particular relevance to this paper, the explanatory power of per capita land area greatly exceeds that of population density not just for the full set of 48 states, but within Mountain West and outside the Mountain West. In bivariate regressions of SPEND on LAND or 1/LAND, the R^2 values are .854 for LAND and .118 for 1/LAND for the 48 states, .876 for LAND and .632 for 1/LAND for the Mountain West states, and .758 for LAND and .151 for 1/LAND for states outside the Mountain West.

proxy for some omitted spending-causing variable that had markedly atypical values for the Mountain West.

To gain further insight into these results, consider the effects of using the full sample of 48 states, but including eight dummy variables – one for each of the Mountain West states. By mathematical necessity, this will yield an estimated equation identical to that in Regression 2. The insight provided is from the estimated coefficients on the dummy variables – these indicate the difference between actual spending for each Mountain West state and what Regression 2 predicts spending would be for each of those states. For each of the eight states, actual spending was less than the amount predicted based on the relationship between spending and the explanatory variables outside the Mountain West. Thus, the question has become not why spending was so high in the Mountain West, but why spending was – after controlling for income and, most importantly, land variables – so low in the Mountain West.[22]

---

[22]To verify that the land variables (rather than the income variables) drive this finding, I re-estimated all three equations in Table 1, but excluded the income variables. The key results are the same: The land variables have large estimated effects and predict the vast majority of variation in spending among the 48 states (R^2=.919); excluding the Mountain West from the sample increases the estimated coefficients on the land variables, from 556 (t=8.41) to 2298 (t=3.06) for $LAND_{federal}$, and from 1906 (t=10.89) to 2219 (t=7.93) for $LAND_{non\text{-}federal}$; when the state dummies are added, they all have negative estimated coefficients. Moreover, as expected, if Mountain West state dummies are included in the absence of the land variables (i.e., just controlling for the income variables), all eight dummies have positive estimated coefficients.

My analysis focuses on the Mountain West because that region has been (for good reason) the subject of attention in the previous literature, and because focusing on a fixed division of states into two distinct groups reduces the concern that a specific division of the full sample is being used in order to support or refute specific hypotheses. That said, it is worth considering whether the land coefficients are driven by some other region (or more generally a set of states) with unusually high spending and unusually large amounts of land per capita. To investigate this possibility, a reasonable alternative to the region-based classification is to select a set of states on the basis of the explanatory variable of principal importance (i.e., the closest proxy for ω). An easy dividing point would be to group the Mountain West with any other states in the Mountain West's range of LAND. Among the Mountain West states, Colorado had the fewest square miles per capita (.100); the other Mountain West states were the top seven in terms of LAND. The three states outside the Mountain West with values of LAND above Colorado's are South Dakota (.110), North Dakota (.102), and Oregon (.101). These were also the only states outside the Mountain West with values of LAND above the mean (.082). Compared to the results from the full sample, when the effects of the

Why was Mountain West Spending Lower than Land Variables Predict?

Of course, something must explain the (ceteris paribus) low spending in the Mountain West. My model suggests a possibility: High spending on land-oriented programs, which sent large amounts per capita (i.e., high $\omega_i s_c$) to the Mountain West, reduced spending on other types of programs (s_{di}) in the Mountain West. But that is not the only potential explanation. One obvious possibility is that the negative coefficients on the dummies could instead reflect the omission of economic variables ($\underline{m}_i$) and/or political variables (π_i, electoral weight) that differed between the Mountain West and the rest of the country. It could also be that the land-oriented programs allocated less than what the estimated linear effects of the land variables predict for the Mountain West. Note that any one or combination of these factors could explain the observation of lower-than-predicted spending.

Adding Controls for Political and Economic Factors

Table 2 estimates equations similar to those in Table 1, but with additional controls for political and economic factors. As Regression 1 shows, the estimated effects of the land variables remain large: \$809 (t=5.68) per square mile of federal land, and \$1167 (t=5.32) per square mile of non-federal land. Moreover, as Regression 2 shows, even when the Mountain West states are excluded, both land area variables predict higher spending in states with more land per capita: \$1637

---

income and land variables are estimated based on the 37 states with below-average values of LAND, the estimated coefficients for both land variables are large, and far larger for federal land: \$7750 (t=4.64) for $LAND_{federal}$ and \$1832 (t=4.45) for $LAND_{non\text{-}federal}$. Moreover, spending remains under-predicted for all the Mountain West states, as well as for Oregon and South Dakota; North Dakota is over-predicted (by \$38, which is less than the amount by which the other ten states are under-predicted).

(t=2.34) per square mile of federal land, and $1096 (t=2.14) per square mile of non-federal land.[23] Turning to the state dummies (Regression 3), most of Mountain West states (6 of 8) are still under-predicted by the land and income variables. As the point estimates for the dummy variables show, while the magnitudes of under-prediction are still substantial for some states, notably $1010 (t=1.43) for Nevada and $218 (t=1.52) for Wyoming, the addition of the controls causes the extent of under-prediction to decline for all six states that remain under-predicted (and, as mentioned above, it causes a switch from under-prediction to over-prediction for the other two states).

These results are encouraging (with a caveat) for researchers who seek to use land variables as instruments. The encouraging factors are that (i) the land area variables have substantial predicted effects and (ii) the Mountain West states' allocations of New Deal spending are not so uniformly under-predicted once additional controls are added. Even more encouraging is that, compared to the economic and political variables I have included here, a richer variety of controls can be included at the county level, because the number of observations (several thousand) does not so severely limit the number of explanatory variables that can reasonably be included. The caveat is, of course, that a sufficient set of control variables will be essential. Given that the appropriate set of controls for such future work will depend on the nature of the question to be addressed, combined with the fact that Regression 3 in Table 2 already estimates 20 coefficients from 48 observations, I will leave the issue of additional controls to future research.

Allocations by Individual Land-Oriented Programs

With respect to whether the Mountain West received less than predicted from individual

[23] An F-test generates a p-value of .0037 with respect to the null hypothesis that the coefficients on both land variables are zero.

land-oriented programs, the real world is far more complicated than the model. The New Deal had many programs, and most had some aspects with plausibly nontrivial relationships to land area – that is, for most programs, more physical space in a state could lead, ceteris paribus, to more projects or more expenditure per project. Thus, there is no way to classify programs cleanly into categories along the lines of those that allocated s_c and those that allocated s_d. That said, it is straightforward to analyze a few programs that had particularly strong relationships to land, and there are two reasons to do so. The first is to see if they drove the (ceteris paribus) low spending in the Mountain West, perhaps because a linear allocation of funds in proportion to specific criteria would have sent so much funding to the Mountain West that it would have been sub-optimal (from the perspective of the dominant political coalition) to follow a linear formula. The second is to verify that at least some criteria-driven programs exhibit a strong relationship to land area – and we should find this to be so, if my interpretation of the way land variables affected overall spending is reasonable. In the analysis that follows, I will focus on spending by three agencies: the Bureau of Public Roads, the Bureau of Reclamation, and the Civilian Conservation Corps (CCC). Examining these three programs makes sense in view of what they did – carrying out land-related projects – and in view of actual spending patterns.[24]

[24]See, e.g., Reading (1972) for an econometrically relevant summary of what each program did and where the various programs operated. Rather than just pick New Deal programs arbitrarily, I identified the three programs as follows. First, I looked at the list of the New Deal's ten largest programs (i.e., ranked by budget) and identified the subset (eight in number) for which there was a reasonably plausible land-oriented component: Agricultural Adjustment Administration (AAA), Civilian Conservation Corps (CCC), Civil Works Administration (CWA), Federal Emergency Relief Administration (FERA), Public Works Administration (PWA), Bureau of Reclamation (Reclamation), Bureau of Public Roads (Roads), Work Projects Administration (WPA). (The two I excluded are the Veterans Administration and the Social Security Administration.) I then examined state-level spending individually for those eight programs. For three of these programs, the predictive power of the income and land variables was relatively high. The two clearest cases are Roads and Reclamation, followed by the CCC: The income and land variables yield R^2 values of .990 for Roads, .957 R^2 for Reclamation, and .778 for the CCC. (The FERA was fourth, with an

To allow comparisons between programs, I will keep the sets of explanatory variables invariant between programs. The baseline regression will include the income and land variables, along with the controls for economic factors. To the baseline, I will add state dummies for the Mountain West. I will leave out the political variables because including them would be inappropriate for the purpose of the analysis here: One objective is to identify the degree to which economic factors (in particular, proxies for ω) under-predict or over-predict spending in the Mountain West, and controlling for political factors could mask those errors in prediction.[25]

As expected for a program that relied on an actual formula, the land variables predict Bureau of Public Roads spending very well. As shown by Regression 1 in Table 3, with the land, income, and controls for other economic factors included, the R^2 is .993. An additional square mile of federal land predicts an additional $167 (t=37.14), and an additional square mile of non-federal land predicts an additional $176 (t=13.94). Consistent with the findings reported by Fleck (2001b, 299-300), land area drives the regression's predictive power: With just one explanatory variable, land area per capita, the R^2 is .988. This leaves little scope for state-by-state tweakings of allocations for political purposes.[26] Moreover, Regression 2 shows no evidence of the Mountain West states receiving systematically less than the level of funding predicted by the explanatory variables.[27] Estimating the

---

R^2 of .591.) For previous work that conducts empirical analysis on a program-by-program basis, see Reading (1972), Bateman and Taylor (2003), and Fishback, Kantor, and Wallis (2003).

[25] Another reason is that the nature of the political system, particularly the importance of logrolling, makes the theoretical effects of political variables less clear for program-specific spending than for overall spending.

[26] Anderson and Tollison (2001) reach the opposite conclusion in their analysis of New Deal road spending, but they do not control for land area.

[27] Spending is over-predicted for two of the states (Idaho and Nevada), and for the other six states, an F-test generates a p-value of .981 with respect to the null hypothesis that the coefficients on the state

equation based solely on states outside the Mountain West (i.e., Regression 2) does, however, reduce the estimated effect of (and dramatically increase the standard error for) $LAND_{federal}$ from \$167 (t=37.14) to \$115 (t=1.48), but the coefficient on $LAND_{non\text{-}federal}$ increases from \$176 (t=13.94) to \$250 (t=5.42).[28] Thus, while excluding the Mountain West renders imprecise the estimated ceteris paribus effect of federal land area, it is quite clear that land area mattered outside the Mountain West.[29]

For the Bureau of Reclamation, per capita spending has a high correlation (.977) with per capita federal land. This is in line with the nature of the Bureau, which had from its beginnings, several decades before the New Deal, a clear focus on the arid parts of the western states, water, and public lands (e.g., Bureau of Reclamation 2012). Without the state dummies included (Table 4, Regression 1), the variable that clearly has great predictive power is, as expected, $LAND_{federal}$, with an estimated marginal effect of \$388 (t=20.21) per square mile. With the addition of state dummies for the Mountain West (Regression 2), the estimated coefficient on $LAND_{federal}$ remains very similar in magnitude, at \$393, but the associated standard error increases by more than a factor of eleven, thus reducing the t-statistic to 1.73. Correspondingly, the ability of $LAND_{federal}$ (or, for that matter, the income, land, and other economic variables together) to explain variation in spending outside the

---

dummies are zero.

[28]The land variables have substantial predictive power outside the Mountain West. For Regression 2 with the Mountain West excluded, $R^2 = .840$. With the Mountain West excluded, the land variables (without other controls) yield $R^2 = .802$, while including the controls only (without the land variables) yields $R^2 = .614$.

[29]A plausible explanation of the large standard error for $LAND_{federal}$ is between-state heterogeneity not just in the quantity of federal land, but in the nature of the land (e.g., remoteness, value of natural resources).

Mountain West is very low relative to the explanatory power of $LAND_{federal}$ for the entire sample.[30] Regression 2 provides little (if any) evidence of the Mountain West states receiving systematically less than the level of funding predicted by the explanatory variables.[31] In short, this was a western program, and the variation in spending among the 48 states is well explained by federal land area principally because the Mountain West states with large amounts of federal land received large allocations from the Bureau of Reclamation.

Now consider the CCC. For the country as a whole, the land variables have substantial estimated coefficients and correspondingly substantial predictive power. As Regression 1 in Table 5 shows, the estimated coefficients predict large marginal effects of land area: \$133 (t=4.78) per square mile of federal land, \$347 (t=4.43) per square mile of non-federal land. Furthermore, the regression's explanatory power (R^2 = .813) comes principally from the land variables.[32] Excluding the Mountain West brings substantial changes (Regression 2). The point estimates for the effects of land area are large, but imprecisely estimated: \$442 (t=1.36) for $LAND_{federal}$ and \$222 (t=1.15) for $LAND_{non\text{-}federal}$.[33] Similarly, the ability of the land variables (or of the income, land, and other economic variables together) to explain variation in spending outside the Mountain West is very low

[30]For Regression 2 with the Mountain West excluded, R^2 = .193.

[31]Spending is over-predicted for two of the states (Arizona and Wyoming), and for the other six states, an F-test generates a p-value of .118 with respect to the null hypothesis that the coefficients on the state dummies are zero.

[32]The land variables (without other controls) yield R^2 = .772, while including just the other variables (without the land variables) yields R^2 = .193.

[33]An F-test generates a p-value of .0955 with respect to the null hypothesis that the coefficients on both land variables are zero.

relative to land variables' explanatory power for the entire sample.[34] Moreover, Regression 2 suggests the Mountain West states did not receive systematically less than the level of funding predicted by the explanatory variables.[35] Thus, similar to spending by the Bureau of Reclamation, variation in CCC spending among the 48 states is well explained by land area principally because the Mountain West states with large amounts of land had high CCC spending.

V. On the Plausibility of Instrumenting for State-Level Spending

For New Deal spending aggregated over programs, land area variables are the obvious state-level candidates for ω and, hence, worth consideration as instrumental variables. Indeed, when one considers the R^2 values generated when land area variables are included in spending regressions, the prospects for finding other state-level variables to use as instruments are not good. As this paper shows, the land variables do not systematically over-predict spending in the Mountain West. Thus, land area does not merely proxy for the Mountain West states. This matters for developing identification strategies in studies of New Deal policy, because if land area did merely proxy for the Mountain West, inferring the causal effects of New Deal policy based on the component of high Mountain West spending predicted by land area would be dubious.

There are, however, some important caveats. With two-stage estimation methods, there are always the basic questions functional form and whether the instruments are correlated with

[34] For Regression 2 with the Mountain West excluded, $R^2 = 303$. With the Mountain West excluded, the land variables (without other controls) yield $R^2 = .042$, while including the controls only (without the land variables) yields $R^2 = .189$.

[35] Spending is over-predicted for two of the states (Idaho and New Mexico), and for the other six states, an F-test generates a p-value of .201 with respect to the null hypothesis that the coefficients on the state dummies are zero.

something omitted from the second stage regression. Yet, as the model illustrates, there is an additional concern when seeking to instrument for spending: For states that have very high values of a variable (ω_i) used as an allocation criterion, that variable may, through its effect on criterion-based spending ($\omega_i s_{ci}$), reduce other types of spending (s_{di}). Because the way in which land area variables predict spending levels differs between programs, land variables have potential as instruments but come with the caveats just discussed. That said, when basic economic and political variables are included as controls, the pattern of systematically under-predicted allocations for Mountain West states decreases. Moreover, Mountain West allocations from the most land-oriented programs (Bureau of Public Roads, Bureau of Reclamation, Civilian Conservation Corps) do not appear to have been systematically higher or lower than what a basic regression including land variables would predict. This is encouraging for those seeking instruments for New Deal spending.

There are several directions in which I plan to build on these findings. First, I have work-in-progress that uses annual New Deal spending (1933 to 1939) to examine how the criteria underlying the allocation of New Deal spending changed over time. The preliminary results suggest that there is sufficient land-related inter-temporal variation to develop useful instruments for changes over time in allocations. In addition, I am using the findings from that work-in-progress (along with the results in this paper) as a foundation for extending my use of county-level data to explain the substantial between-county differences in way the electorate responded to the events of the 1930s (Fleck 2011b).

VI. Conclusion

By presenting a theoretically grounded econometric analysis, this paper advances our understanding of New Deal spending patterns. The findings makes a new contribution to the

political economy literature and, by doing so, improve the foundation for econometric efforts to identify the causal effects of New Deal policy.

References

Anderson, Gary M., and Tollison, Robert D. 1991. "Congressional Influence and Patterns of New Deal Spending." *Journal of Law & Economics* 34 (April): 161-175.

Arrington, Leonard J. 1969. "The New Deal in the West: A Preliminary Statistical Inquiry." *Pacific Historical Review* 38 (August): 311-316.

Atlas, Cary M., Gilligan, Thomas W., Hendershott, Robert J., and Zupan, Mark A. 1995. "Slicing the Federal Government Net Spending Pie: Who Wins, Who Loses, and Why." *American Economic Review* 85 (June): 624-629.

Bateman, Fred, and Jason E. Taylor. 2003. "The New Deal at War: Alphabet Agencies' Expenditure Patterns, 1940-1945." *Explorations in Economic History* 40 (July): 251-277.

Bennett, James T., and Mayberry, Eddie R. 1979. "Federal Tax Burdens and Grant Benefits to States: The Impact of Imperfect Representation." *Public Choice* 34 (September): 255-269.

Brady, David W. 1988. *Critical Elections and Congressional Policy Making*. Stanford: Stanford University Press.

Bureau of Reclamation. 2012. "The Bureau of Reclamation: A Brief History." Available at www.usbr.gov/history/borhist.html (accessed February 11, 2012).

Darby, Michael R. 1976. "Three-and-a-Half Million U.S. Employees Have Been Mislaid; Or, an Explanation of Unemployment, 1934–1941." *Journal of Political Economy* 84 (February): 1–16.

Fishback, Price V., Michael R. Haines, and Shawn Kantor. 2007. "Births, Deaths, and New Deal Relief During the Great Depression." *Review of Economics and Statistics* 89:1-14.

Fishback, Price V., William C. Horrace, and Shawn Kantor. 2005. "Did New Deal Grant Programs Stimulate Local Economies? A Study of Federal Grants and Retail Sales During the Great Depression." *Journal of Economic History* 65:36-71.

Fishback, Price V., William C. Horrace, and Shawn Kantor. 2006. "The Impact of New Deal Expenditures on Mobility During the Great Depression." *Explorations in Economic History* 43:179-222.

Fishback, Price V., Shawn Kantor, and John Joseph Wallis. 2003. "Can the New Deal's Three Rs be Rehabilitated? A Program-by-Program, County-by-County Analysis." *Explorations in Economic History* 40 (July): 278-307.

Fleck, Robert K. 1999a. "Electoral Incentives, Public Policy, and the New Deal Realignment."

Southern Economic Journal 65 (January): 377-404.

Fleck, Robert K. 1999b. "The Marginal Effect of New Deal Relief Work on County-Level Unemployment Statistics." *The Journal of Economic History* 59 (September): 659-687.

Fleck, Robert K. 1999c. "The Value of the Vote: A Model and Test of the Effects of Turnout on Distributive Policy." *Economic Inquiry* 37 (October): 609-623.

Fleck, Robert K. 2001a. "Inter-Party Competition, Intra-Party Competition, and Distributive Policy: A Model and Test Using New Deal Data." *Public Choice* 108 (July): 77-100.

Fleck, Robert K. 2001b. "Population, Land, Economic Conditions, and the Allocation of New Deal Spending." *Explorations in Economic History* 38 (April): 296-304.

Fleck, Robert K. 2008. "Voter Influence and Big Policy Change: The Positive Political Economy of the New Deal." *Journal of Political Economy* 116:1-37.

Fleck, Robert K. 2011a. "The Political Economy of Progress: Lessons from the Causes and Consequences of the New Deal." Chapter 12, pp. 311-335, in *Economic Evolution and Revolution in Historical Time*, edited by Paul W. Rhode, Joshua L. Rosenbloom, and David F. Weiman. Stanford University Press.

Fleck, Robert K. 2011b. "Why Did the Electorate Swing Between Parties During the Great Depression?" Working paper, Clemson University.

Fleck, Robert K., and Christopher Kilby. 2001. "Foreign Aid and Domestic Politics: Voting in Congress and the Allocation of USAID Contracts Across Congressional Districts." *Southern Economic Journal* 67:598-617.

Hoover, Gary A., and Paul Pecorino. 2005. "The Political Determinants of Federal Expenditure at the State Level." *Public Choice* 123 (April): 95-113.

Inter-university Consortium for Political and Social Research (ICPSR). *Historical, Demographic, Economic, and Social Data: The United States, 1790-1970*. Data tape.

Johnson, Ronald N., and Gary D. Libecap. 2003. "Transaction Costs and Coalition Stability Under Majority Rule." *Economic Inquiry* 41 (April): 193-207.

Key, V.O., Jr. 1937. *The Administration of Federal Grants to States*. Crawfordsville, Indiana: R.R. Donnelley & Sons Company.

Lee, Frances E. 1998. "Representation and Public Policy: The Consequences of Senate Apportionment for the Geographic Distribution of Federal Funds." *Journal of Politics* 60

(February): 34-62.

Lee, Frances E. 2000. "Senate Representation and Coalition Building in Distributive Politics." *American Political Science Review* 94 (March): 59-72.

Lee, Frances E. 2004. "Bicameralism and Geographic Politics: Allocating Funds in the House and Senate." *Legislative Studies Quarterly* 29 (May): 185-213.

Lee, Frances E., and Bruce I. Oppenheimer. 1999. *Sizing Up the Senate: The Unequal Consequences of Equal Representation*. Chicago: The University of Chicago Press.

Levitt, Steven D., and James M. Snyder, Jr. 1995. "Political Parties and the Distribution of Federal Outlays." *American Journal of Political Science* 39 (November): 958-980.

Rand McNally. 1992. *The New Cosmopolitan World Atlas*. Chicago: Rand McNally.

Reading, Donald. 1972. "A Statistical Analysis of New Deal Economic Programs in the Forty-Eight States, 1933-39." Ph.D. diss. Utah State University.

Reading, Don C. 1973. "New Deal Activity and the States, 1933 to 1939," *Journal of Economic History* 36 (December): 792-810.

Schlesinger, Arthur M. 1958. *The Coming of the New Deal*. Boston: Houghton Mifflin Company.

United States Department of Commerce, Bureau of the Census. 1933. *Fifteenth Census of the United States: 1930*. Washington: U.S. Government Printing Office.

United States Department of Commerce, Bureau of the Census. 1943. *Sixteenth Census of the United States: 1940*. Washington: U.S. Government Printing Office.

United States Senate Committee on Appropriations. 1939. *Work Relief and Public Works Appropriation Act of 1939* (Hearings), 76th Congress, 1st Session. Washington: U.S. Government Printing Office.

Wallis, John J. 1984. "The Birth of the Old Federalism: Financing the New Deal." *Journal of Economic History* 44 (March): 139-169.

Wallis, John J. 1987. "Employment, Politics, and Economic Recovery in the Great Depression." *Review of Economics and Statistics* 69 (August): 516-520.

Wallis, John J. 1997. "EFFECT.SD2." Data file.

Wallis, John J. 1998. "The Political Economy of New Deal Spending Revisited, Again: With and

without Nevada." *Explorations in Economic History* 35 (April): 140-170.

Wallis, John. 2001. "The Political Economy of New Deal Spending, Yet Again: A Reply to Fleck." *Explorations in Economic History* 38 (April): 305-314.

Wallis, John Joseph, Price V. Fishback, and Shawn Kantor. 2006. "Politics, Relief, and Reform: Roosevelt's Efforts to Control Corruption and Political Manipulation During the New Deal." In *Corruption and Reform: Lessons from America's Economic History*, edited by Edward L. Glaeser and Claudia Goldin, pp. 343-372. Chicago: University of Chicago Press.

Wright, Gavin. 1974. "The Political Economy of New Deal Spending: An Econometric Analysis." *Review of Economics and Statistics* 59 (February): 30-38.

Appendix A: Variable Definitions and Data Sources

Proxies for s_i

SPEND: Expenditure by New Deal programs, 1933-1939, per capita. I calculated the variable as rdgspnd/(wpop*1000), where rdgspnd and wpop are from Wallis (1997). The variable SPEND in my paper equals "Per capita national spending" in Wallis (1998), which approximates Wright's (1974) spending variable (which Wright called "SPND"). Also used in Fleck (2008).

Proxies for ω_i

$INCOME_{1932}$: Personal income in 1932, in dollars per capita (Arrington 1969).

$INCOME\ FALL_{1929\text{-}1932}$: Decline in personal income from 1929 to 1932, in dollars per capita. Calculated from data in Arrington (1969).

$LAND_{federal}$: Square miles of federal land in the state, per capita. Calculated from the number of square miles in the state (Rand McNally 1992) and the percent of total acreage in each state owned by the United States (United States Senate Committee on Appropriations 1939). Population data are from the 1930 Census (ICPSR data tape).

$LAND_{non\text{-}federal}$: Square miles of non-federal land in the state, per capita. Calculated from the number of square miles in the state (Rand McNally 1992) and the percent of total acreage in each state owned by the United States (United States Senate Committee on Appropriations 1939). Population data are from the 1930 Census (ICPSR data tape).

LAND: Square miles of land in the state, per capita. Land data are from Rand McNally (1992). Population data are from the 1930 Census (ICPSR data tape).

Proxy for π_i

SD: Standard deviation of the Democratic vote share in presidential elections, 1896-1932. The variable is wse32 from Wallis (1997), equals "Standard deviation of the vote" in Wallis (1998), and equals or approximates the variable Wright (1974) called "SD" in his analysis.

Proxies for $\underline{m}_i$

FARMPOP: Per capita farm population. Variable is "wfmid" from Wallis (1997) and equals "Farm population share" in Wallis (1998).

FARM VALUE: Farm value per capita. Calculated as farmtv30/(wpop*1000), where farmtv30 and wpop are from Wallis (1997). Variable equals "Farm value per capita" in Wallis (1998).

UNEMPLOYMENT 1930: This variable is the sum of two variables (un30a+un30b) from Wallis (1997). The variable equals "Unemployment 1930" in Wallis (1998).

UNEMPLOYMENT 1937: This variable is wun37 in Wallis (1997) and equals "Unemployment 1937" in Wallis (1998).

Controls for Electoral Weight

SENATE/POP: Senate seats per capita, multiplied by 1000. Population data are from the 1930 Census (ICPSR data tape).

HOUSE/POP: House seats per capita, multiplied by 1000. House seats calculated from the electoral votes variable (wv) in Wallis (1997). Population data are from the 1930 Census (ICPSR data tape).

V/POP: Electoral votes, per capita, multiplied by 1000. Variable is wvpop from Wallis (1997) and equals "Per capita electoral votes" in Wallis (1998).

Additional Spending Variables: Program-by-Program

Programs for which Results are Presented in Paper

CCC: Expenditure by Civilian Conservation Corps, 1933-1939, per capita (Arrington 1969).

RECLAMATION: Expenditure by Bureau of Reclamation, 1933-1939, per capita (Reading 1972).

ROADS: Expenditure by Bureau of Public Roads, 1933-1939, per capita (Arrington 1969).

Programs for which Results are Mentioned but Not Presented in Paper

AAA: Expenditure by Agricultural Adjustment Administration, 1933-1939, per capita (Reading 1972).

CWA: Expenditure by Civil Works Administration, 1933-1939, per capita (Arrington 1969).

FERA: Expenditure by Federal Emergency Relief Administration, 1933-1939, per capita (Arrington 1969).

PWA: Expenditure by Public Works Administration, 1933-1939, per capita (Reading 1972).

WPA: Expenditure by Work Projects Administration, 1933-1939, per capita (Arrington 1969).

Appendix B: Descriptive Statistics

Sample: All States

	Obs	Mean	Std. Dev.	Min	Max
SPEND	48	293.4483	178.1432	147.3186	1130.769
INCOME 1932	48	345.2083	143.3917	130	680
INCOME FALL 1929-1932	48	252.8387	80.41672	116.9298	441.9608
LAND FEDERAL	48	.039383	.1477108	4.60e-06	.9977179
LAND NON-FEDERAL	48	.0427323	.0558215	.0015282	.2462914
LAND	48	.0821153	.188214	.0015331	1.206868
FARMPOP	48	.2915615	.1607717	.0235663	.6602544
FARM VALUE	48	.6353009	.5496465	.0598413	2.278847
UNEMPLOYMENT 1930	48	5.745833	2.247169	1.8	12.2
UNEMPLOYMENT 1937	48	4.220833	.8925122	2.4	6.4
SD	48	10.175	4.325801	2.5	18.1
SENATE/POP	48	.0023017	.0035199	.0001589	.021964
HOUSE/POP	48	.0036955	.0011549	.0022958	.010982
V/POP	48	.0059974	.0044867	.0037337	.032967
ROADS	48	24.58333	32.61303	6	217
RECLAMATION	48	14.52458	57.44579	0	379.45
CCC	48	33.625	39.21171	7	213

Sample: Mountain West

	Obs	Mean	Std. Dev.	Min	Max
SPEND	8	595.7729	250.4823	342.3228	1130.769
INCOME 1932	8	343.375	111.4924	205	577
INCOME FALL 1929-1932	8	264.7595	57.50824	148.4482	324.5625
LAND FEDERAL	8	.2221679	.3167265	.0333461	.9977179
LAND NON-FEDERAL	8	.1404985	.0723024	.063919	.2462914
LAND	8	.3626664	.3551294	.1000182	1.206868
FARMPOP	8	.2827411	.0839509	.1606394	.4045693
FARM VALUE	8	.9397611	.3311103	.5583899	1.35658
UNEMPLOYMENT 1930	8	6.05	1.16986	4.6	7.5
UNEMPLOYMENT 1937	8	3.9125	.8408118	3.1	5.3
SD	8	14.7	3.337236	8.1	18.1
SENATE/POP	8	.0067788	.0064376	.0019309	.021964
HOUSE/POP	8	.004511	.0027459	.0022958	.010982
V/POP	8	.0112879	.0090471	.0057915	.032967
ROADS	8	72.375	61.11333	28	217
RECLAMATION	8	77.4625	127.5236	5.29	379.45
CCC	8	101.5	53.88877	41	213

Sample: Outside Mountain West

	Obs	Mean	Std. Dev.	Min	Max
SPEND	40	232.9834	66.96984	147.3186	445.8875
INCOME 1932	40	345.575	150.1563	130	680
INCOME FALL 1929-1932	40	250.4545	84.64516	116.9298	441.9608
LAND FEDERAL	40	.0028261	.0080377	4.60e-06	.0466823
LAND NON-FEDERAL	40	.023179	.0215438	.0015282	.0978753
LAND	40	.0260051	.0260812	.0015331	.1096285
FARMPOP	40	.2933255	.1728163	.0235663	.6602544
FARM VALUE	40	.5744089	.5670868	.0598413	2.278847
UNEMPLOYMENT 1930	40	5.685	2.411888	1.8	12.2
UNEMPLOYMENT 1937	40	4.2825	.8998255	2.4	6.4
SD	40	9.27	3.938515	2.5	18.1
SENATE/POP	40	.0014063	.0015998	.0001589	.00839
HOUSE/POP	40	.0035324	.0003007	.0027808	.0042984
V/POP	40	.0049393	.0016368	.0037337	.012605
ROADS	40	15.025	7.014591	6	36
RECLAMATION	40	1.937	9.111358	0	56.63
CCC	40	20.05	14.06022	7	94

Appendix B (continued): Descriptive Statistics

Correlation Matrix

	SPEND	INCOME	INC FALL	LANDFED	LANDNONFED	LAND	FARMPOP	FARMVAL	UNEMP30	UNEMP37	SD	SENATE/POP	HOUSE/POP
SPEND	1.0000												
INCOME	0.0448	1.0000											
INC FALL	0.1691	0.7658	1.0000										
LANDFED	0.8409	0.2080	0.1502	1.0000									
LANDNONFED	0.8904	-0.1026	0.0240	0.6361	1.0000								
LAND	0.9240	0.1328	0.1250	0.9735	0.7958	1.0000							
FARMPOP	0.0404	-0.9086	-0.7028	-0.1105	0.1605	-0.0391	1.0000						
FARMVAL	0.4713	-0.2747	0.0647	0.1872	0.5216	0.3016	0.3740	1.0000					
UNEMP30	-0.0162	0.7419	0.6302	0.0956	-0.1187	0.0398	-0.8624	-0.3777	1.0000				
UNEMP37	-0.1763	0.2637	0.1423	-0.2143	-0.1847	-0.2230	-0.3229	-0.4329	0.4823	1.0000			
SD	0.5840	-0.0243	0.2949	0.3438	0.5054	0.4197	0.0618	0.6405	0.0169	-0.1878	1.0000		
SENATE/POP	0.8192	0.2256	0.1592	0.8966	0.6867	0.9073	-0.1018	0.2276	0.0285	-0.2787	0.2670	1.0000	
HOUSE/POP	0.6113	0.2776	0.1754	0.8872	0.3859	0.8107	-0.1419	0.0975	0.0965	-0.1991	0.2474	0.7854	1.0000
V/POP	0.8001	0.2487	0.1701	0.9322	0.6378	0.9208	-0.1167	0.2034	0.0473	-0.2698	0.2730	0.9871	0.8742
ROADS	0.9303	0.1035	0.1186	0.9605	0.8101	0.9940	0.0045	0.3569	-0.0076	-0.2602	0.4324	0.9301	0.8050
RECLAM	0.8125	0.2351	0.1756	0.9771	0.5895	0.9417	-0.1407	0.1555	0.1074	-0.2222	0.3313	0.8699	0.8639
CCC	0.8515	0.0435	0.0254	0.8263	0.7561	0.8728	0.0195	0.2548	-0.0380	-0.3303	0.3951	0.8634	0.6153

	V/POP	ROADS	RECLAM	CCC
V/POP	1.0000			
ROADS	0.9372	1.0000		
RECLAM	0.9052	0.9268	1.0000	
CCC	0.8358	0.8746	0.7916	1.0000

Table 1

	1	2	3
DEPENDENT VARIABLE	SPEND	SPEND	SPEND
C	147.4094 (6.07)	129.156 (6.73)	129.156 (6.73)
$INCOME_{1932}$	-.1857694 (2.27)	-.039013 (0.64)	-.039013 (0.64)
$INCOME\ FALL_{1929\text{-}1932}$	.4370883 (3.17)	.230174 (2.35)	.230174 (2.35)
$LAND_{federal}$	584.9131 (8.85)	1807.79 (2.54)	1807.79 (2.54)
$LAND_{non\text{-}federal}$	1793.015 (10.29)	2353.50 (7.63)	2353.50 (7.63)
ARIZONA	147.4094 (6.07)	-104.289 (0.94)	-104.289 (0.94)
COLORADO			-23.2196 (0.62)
IDAHO			-85.2289 (1.13)
MONTANA			-67.5828 (1.03)
NEVADA			-1346.48 (1.97)
NEW MEXICO			-246.773 (3.39)
UTAH			-161.472 (2.30)
WYOMING			-470.750 (3.95)
# obs	48 states	40 states (not Mtn West)	48 states
R^2	.9348	.8074	.9774
R^2 adj.	.9287	.7854	.9697

Regressions are ordinary least squares; t-statistics are in parentheses.

Table 2

	1	2	3
DEPENDENT VARIABLE	SPEND	SPEND	SPEND
C	177.7148 (1.91)	133.37 (1.10)	133.37 (1.10)
$INCOME_{1932}$	-.0808914 (0.63)	-.0495839 (0.47)	-.0495839 (0.47)
$INCOME\ FALL_{1929\text{-}1932}$	.2643894 (1.86)	.182653 (1.71)	.182653 (1.71)
$LAND_{federal}$	809.417 (5.68)	1636.573 (2.34)	1636.573 (2.34)
$LAND_{non\text{-}federal}$	1167.111 (5.32)	1096.237 (2.14)	1096.237 (2.14)
FARMPOP	-10.81827 (0.08)	-28.9662 (0.26)	-28.9662 (0.26)
FARM VALUE	12.97873 (0.69)	18.98602 (1.15)	18.98602 (1.15)
UNEMPLOYED 1930	-7.471837 (1.18)	-8.353201 (1.58)	-8.353201 (1.58)
UNEMPLOYED 1937	22.64919 (2.52)	19.03111 (2.54)	19.03111 (2.54)
SD	6.326909 (2.93)	4.579024 (2.38)	4.579024 (2.38)
SENATE/POP	7250.134 (1.55)	7953.052 (2.22)	7953.052 (2.22)
HOUSE/POP	-38901.95 (2.86)	-13896.08 (0.74)	-13896.08 (0.74)
ARIZONA			-20.71548 (0.19)
COLORADO			22.81413 (0.56)
IDAHO			-59.25005 (0.74)
MONTANA			73.98496 (0.94)
NEVADA			-1010.323 (1.43)
NEW MEXICO			-92.77915 (1.13)
UTAH			-124.6021 (1.74)
WYOMING			-218.3904 (1.52)
# obs	48 states	40 states (not Mtn West)	48 states
R^2	.9602	.8740	.9852
R^2 adj.	.9480	.8245	.9752

Regressions are ordinary least squares; t-statistics are in parentheses.

Table 3

	1	2
DEPENDENT VARIABLE	ROADS	ROADS
C	3.611306 (0.56)	7.162839 (0.88)
$INCOME_{1932}$	.0107735 (1.20)	.0063115 (0.58)
$INCOME\ FALL_{1929\text{-}1932}$	.0058004 (0.57)	.0116345 (1.04)
$LAND_{federal}$	166.7259 (37.14)	115.1211 (1.48)
$LAND_{non\text{-}federal}$	176.0566 (13.94)	250.3664 (5.42)
FARMPOP	12.96244 (1.38)	7.648819 (0.67)
FARM VALUE	2.087924 (1.70)	-.0631367 (0.04)
UNEMPLOYED 1930	-.1795381 (0.39)	-.254702 (0.49)
UNEMPLOYED 1937	-.5632357 (0.87)	-.9622357 (1.20)
ARIZONA		-1.596703 (0.13)
COLORADO		-.6465112 (0.16)
IDAHO		2.138465 (0.26)
MONTANA		-5.873876 (0.78)
NEVADA		38.87776 (0.52)
NEW MEXICO		-5.945292 (0.69)
UTAH		-.8016474 (0.10)
WYOMING		-6.834665 (0.49)
# obs	48 states	48 states
R^2	.9930	.9939
R^2 adj.	.9915	.9907

Regressions are ordinary least squares; t-statistics are in parentheses.

Table 4

	1	2
DEPENDENT VARIABLE	RECLAMATION	RECLAMATION
C	18.43137 (0.67)	9.641294 (0.41)
$INCOME_{1932}$	-.0113682 (0.30)	-.0244692 (0.77)
$INCOME\ FALL_{1929\text{-}1932}$	.031096 (0.72)	.020795 (0.63)
$LAND_{federal}$	387.7028 (20.21)	392.7575 (1.73)
$LAND_{non\text{-}federal}$	-33.92488 (0.63)	-31.95923 (0.24)
FARMPOP	-21.49221 (0.54)	-25.40255 (0.77)
FARM VALUE	-3.215931 (0.61)	.23912 (0.05)
UNEMPLOYED 1930	-1.31311 (0.67)	-.9876563 (0.66)
UNEMPLOYED 1937	-1.376404 (0.50)	1.89211 (0.81)
ARIZONA		34.292 (0.95)
COLORADO		-5.497575 (0.46)
IDAHO		-27.13622 (1.14)
MONTANA		-25.23158 (1.14)
NEVADA		-2.829167 (0.01)
NEW MEXICO		-26.14828 (1.04)
UTAH		-22.55445 (0.99)
WYOMING		22.94392 (0.56)
# obs	48 states	48 states
R^2	.9586	.9831
R^2 adj.	.9500	.9744

Regressions are ordinary least squares; t-statistics are in parentheses.

Table 5

	1	2
DEPENDENT VARIABLE	CCC	CCC
C	70.24377 (1.77)	22.45956 (0.66)
$INCOME_{1932}$	-.0029387 (0.05)	.0723356 (1.59)
$INCOME\ FALL_{1929\text{-}1932}$	-.0267213 (0.43)	-.0600769 (1.28)
$LAND_{federal}$	132.9509 (4.78)	441.7611 (1.36)
$LAND_{non\text{-}federal}$	346.7255 (4.43)	221.7447 (1.15)
FARMPOP	-10.80263 (0.19)	56.03575 (1.18)
FARM VALUE	-11.83151 (1.55)	-9.212553 (1.25)
UNEMPLOYED 1930	.3267784 (0.12)	1.974026 (0.92)
UNEMPLOYED 1937	-9.503319 (2.36)	-9.60092 (2.85)
ARIZONA		-10.3936 (0.20)
COLORADO		-5.52219 (0.32)
IDAHO		51.58265 (1.51)
MONTANA		-25.83899 (0.81)
NEVADA		-302.6393 (0.97)
NEW MEXICO		12.19928 (0.34)
UTAH		-.7769489 (0.02)
WYOMING		-44.66721 (0.76)
# obs	48 states	48 states
R^2	.8128	.9256
R^2 adj.	.7744	.8872

Regressions are ordinary least squares; t-statistics are in parentheses.