Changing Needs, Sticky Budget: Evidence from the Geographic Distribution of US Federal Grants*

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Abstract

Most US federal grants are allocated through arguably obsolete formulas, leading fast growing states to contend that they are not receiving their fair share of the budget. We shed lights on this issue analyzing the allocation of formula and non-formula grants during the period 1978-2002. We find that states with fast growing population are penalized in the allocation of formula programs. The estimated losses are sizeable and heavily concentrated among the three fastest growing states. Nevertheless, the majority of the US states is on the winning side, thus providing a plausible explanation for the *status quo* bias in budgetary formulas.

JEL codes: D72, H61, H77

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"An old formula is a good formula. If you write a new formula, particularly if you do not have what Mr. Nixon called sweeteners, you open up a Pandora's box of political regional rivalries".[1]

1 Introduction

The vast majority of US federal grants to the states, i.e. about 84% of federal aid, is allocated through formulas (GAO 2009). Therefore, not surprisingly, formulas' legislation represents a powerful tool through which states' representatives try to bring the "bacon" home (Levitt and Snyder 1995).[2] Another striking feature of formulas is their long lasting life. The statutory matching formula of Medicaid, which is the largest formula grant program, has basically remained the same since 1965.[3] The Federal Highway program (the second largest formula program) is still administered via the formulas legislated in 1956.[4]

Sometimes the *status quo* can be advantageous for states that already receive a generous share of the federal pie. In such cases, rules reducing the flexibility of the budget can serve pork-barrel objectives by preventing spending reallocations. As a result, formulas can represent a powerful instrument for preserving the *status quo.* The opening statement of a Senate Hearing on Medicaid distribution formula by Senator Bob Packwood (chairman of the Committee of Finance, one hundred fourth Congress) provides an emblematic example of the status quo bias in formulas' legislation: 'I am well aware that when it come to formulas, in Senators' - or Representatives'- home State and turf is often infinitely more important than substance. And matters get decided not on merits but on whether you can figure out a formula that will get you 30 states in the Senate (...) But unfortunately if two or three of those states that you loose are New York and California it gives you many problem in the House when the formula division comes up.' In the

[1] Testimony by Richard P. Nathan (director, Nelson A. Rockefeller Institute of Government) before the Senate Committee on Finance, one hundred fourth Congress, first session, July 27, 1995.

[2] For a comprehensive survey of the literature on the economic and political determinants of intergovernmental transfers see Solé-Ollé and Sorribas-Navarro (2008) and Weingast (2009).

[3] The share of Medicaid spending financed by federal government is determined according to a statutory matching rate (FMAP) computed according to the following formula: $1 - 0.45\left(\frac{\text{state income per capita}}{\text{US income per capita}}\right)^2$. The FMAP are computed 1 year before the fiscal year in which they are effective, using a 3-year average of the most recently available income per capita data from the Department of Commerce (GAO 2007).

[4] The Federal Highway program consists of several programs which are mainly allocated by formula taking into account various measures of 'needs', such as vehicle miles, lane miles and population (U.S. Department of Transportation 2007)

same Senate hearing, the failure of the Medicaid formula to respond to the needs of the states is acknowledged.[5] But as of today - when the reform of Medicaid proposed in the 'Medicaid Improvement and State Empowerment Act' is among the most hotly debated issues in Congress - the issue of the funding formula remains open.[6] The same holds true for the Federal Highway program, for which recent legislation - known as the 'Highway Fairness and Reform Act of 2011' - introduced by Sen. Hutchinson (Texas), proposes that states should be allowed to opt out of the Federal Highway program to circumvent the negative effects of the formula penalizing states with fast growing needs.

The controversy surrounding the reform of Medicaid and the Federal Highway program is neither new nor unique. As pointed out by a recent report issued by the United States Government Accountability Office (GAO 2009), about 84% of federal aid is allocated through formulas, which in various ways prevent reallocations of the federal budget in response to the changing needs of the states. The latter are often associated with rapidly growing population and, according to the same report, "grant funding may be affected less or entirely unaffected by changes in population" because of specific formulas prescriptions such as hold harmless provisions, caps, floors and ceilings.[7] The two most important formula programs (Medicaid and the Federal Highway programs) provide emblematic examples of such restrictions.[8] Moreover, formula based allocations typically rely on outdated population data (GAO 1990), which penalize states where the population changes at a fast pace.

Several representatives of fast growing states have repeatedly voiced their concerns

[5] 'Wide disparities seen in the States Medicaid programs demontrate that the formula is not working as intended. For example, during the fiscal year 1994, the number of people covered by the Nevada Medicaid program represents 81% of the poor population, while Vermont population covered by Medicaid equaled 139% of its poverty population.' (Medicaid Distribution Formula, S. HRG. 104-846, page 3). Another report by GAO (2007) also emphasizes that current Medicaid financing rules often widen differences in funding ability among states.

[6] The full text of legislation introduced in the Senate (S.1013) and House (H.R. 2013) in May 2011 is available from the library of congress (http://thomas.loc.gov).

[7] Hold-harmless provisions guarantee that the funds allocated to a state will be no less than a specified proportion of a previous year's funding. In an analogous way, caps impose a limit on the size of an annual increase as a proportion of a previous year's funding. Floors and ceilings operate in a slightly different way, but have similar implications: if a change in population reduces funding below the floor, a state would be guaranteed the amount specified by the floor, whereas if the allocation exceeds the ceiling, the state cannot receive more than the ceiling amount.

[8] For Medicaid, the statutory rate of state spending reimbursed by federal government (FMAP) operates under floor and ceiling restrictions (with a statutory minimum and maximum of respectively 50% and 83%). The Federal Highway program is subject to statutory state minimum spending constraints. For example, the annual apportionment from the Highway Trust Fund to the Surface Transportation Program is subject to statutory 0.5 percent state minimum for states having less than a specified threshold of qualifying roads, vehicle miles traveled on those roads, and taxes paid into the fund (GAO 2009).

about the negative consequences of budgetary inertia: "sticky" budgets fail to respond to the rapidly changing needs associated with their fast growing population. The dissatisfaction of fast growing states with the existing mechanism of federal budget allocation culminated with legislation - known as the "Fair share act"- introduced in Congress between 1989 and 1993 by the representatives of Florida, Arizona and California.[9] Yet, these concerns seem to have gone unaddressed, as shown by the recent debate surrounding the approval of the stimulus package under the "American Recovery and Reinvestment Act of 2009", which once again is reported to have penalized fast growing states in the allocation of important spending programs.[10]

Does budgetary inertia penalize fast growing states? Although widely debated among legislators and policy practitioners, this issue has been surprisingly overlooked by the scholarly literature on federal budget allocation to the states. This paper aims at filling this gap, by empirically investigating whether fast growing states are disadvantaged in the allocation of formula grants and quantifying the size of such loss. To that end, we use Census data on per capita federal grants allocations to the states during the period 1978-2002, which allows us to isolate formula, non-formula, and the two most important formula programs, i.e. Medicaid and The Federal Highway program.

Before empirically investigating the relationship between population dynamics and spending, it is important to clarify what is the relationship between *spending per capita* and *population*. As shown by Alesina and Wacziarg (1998), when publicly provided goods exhibit a certain degree of non-rivalness, the per capita cost of their provision decreases with population size, thus implying an inverse relationship between optimal per capita provision and population. However, as we formally show in the theoretical framework outlined in section 2, when the financing of quasi-public goods is governed by formulas,

[9] The text of the bill introduced in the House and Senate explicitly states "The Congress finds that– there are significant shifts in the United States population between each decennial census; use of decennial census in allocating Federal funds to States unfairly penalizes States where the population is growing, and because the intent of Federal grant programs is to distribute funds fairly to States based on their relative population, it is more appropriate to use annual population estimates produced by the Bureau of the Census for these purposes. (Fair share act of 1989, 1992 and 1993. source: The library of Congress, http://thomas.loc.gov/).

[10] Fast growing states rank at the bottom in the allocation of transportation funds per capita in the stimulus package (*The Wall Street Journal*, Who gets what from the stimulus package, January 27, 2009, http://online.wsj.com/public/resources/documents/info-STIMULUS0109.html, accessed on April 10, 2009). As highlighted by Mark Foster (chief financial officer for the North Carolina Department of Transportation) in a recent interview, "The infrastructure here clearly hasn't kept up with population growth (...). Typically, what you find is that a lot of Southern states are donors, and those in the Midwest and Northeast are recipients." (source: N.C. falls on short end for stimulus, Charlotte Observer, Thursday, Mar. 12, 2009. http://www.charlotteobserver.com/597/story/591251.html, accessed on April 10, 2009).

then under (over) provision occurs if the actual population is larger (smaller) than the one used by the formula. Therefore, besides inverse relationship between spending per capita and population size due to the partial non-rivalness of publicly provided goods, we will also observe a negative relationship between spending per capita and *population dynamics* due to formulas. As a result only by estimating the separate effects of population size (scale effect) and population dynamics (change effect), we can establish if fast growing states are 'unfairly' penalized in the allocation of the budget. To this end, in our empirical analysis, we use an index of population dynamics, along with state population, which allows us to separate the change effect from the scale effect.

Our empirical investigation provides strong evidence of a negative relationship between population dynamics and per capita federal aid to the states, which is mainly driven by formula programs. Among those programs, the Federal Highway and Formula programs other than the Federal Highway and Medicaid are the most affected. For Medicaid we do not find robust evidence of a population dynamics effect, but the dynamics of income per capita (rather than population alone) has a negative, significant impact on state per capita allocations. Since, during the period we consider, Federal Highway and other formula programs (except Medicaid) represent on average a combined 58% of grants allocated by formula, we conclude that states whose population grows fast tend to be penalized on the majority of formula grants.

We also find that the distortions associated to population dynamics tend to be permanent, unevenly distributed across states and, for the most penalized states, sizeable. The budgetary gains and losses implied by our estimates are such that 16 of the 48 US continental states - whose population grows faster than the US average - lose federal grants to the advantage of the remaining states that grow at a slower pace. The top losing state of the federation (Nevada) suffers on average a loss equivalent to 14 percent of the state average per capita federal aid allocated by formula, and the loss is as high as 21 percent for the Federal Highway program. The distribution of budgetary losses is quite uneven. The top three fastest growing states bear more than half of the burden, whereas gains - which benefit the majority of the states - appear more evenly distributed. The fact that loosing states are a minority can explain the lack of responsiveness from Congress to the requests of fast growing states penalized by formula allocations.

The remainder of the paper is organized as follows. Section 2 analyzes the relationship between per capita spending and population. Section 3 reports descriptive evidence of the relationship between population dynamics and federal spending. Section 4 outlines the empirical model and presents our main results. In section 5 we carry out several robustness checks and Section 6 concludes.

2 Expenditure per capita and population

Publicly provided goods often exhibit a certain degree of rivalness (quasi-public goods), which affects their provision. As shown by Alesina and Wacziarg (1998) (henceforth AW), the optimal provision of non-rival goods implies a *negative* relationship between spending per capita and population size, which stems from the presence of fixed costs and the resulting economies of scale associated with the provision of public goods. To illustrate the relationship between optimal spending per capita and population, we carry out a very simple exercise extending AW to allow for (i) a different degree of rivalness in the publicly provided goods and (ii) a financing rule that may introduce inertia in spending by linking *current spending* to *past population* levels.

As in AW consider a country composed of $N > 1$ identical individuals with constant elasticity of substitution utility functions, $U = \left[C^{\alpha} + \left(\frac{G}{f(N_t)*N_t}\right)^{\alpha}\right]^{1/\alpha}$, where C is private consumption, $\frac{G}{f(N_t)N_t}$ is the amount of publicly provided good consumed by an individual and N_t is the population of period t, with $t = \{0, 1\}$. The function $f(N_t)$, with $\frac{1}{N_t} < f(N_t) < 1$, expresses the degree of rivalry of G. In particular, the assumption $\frac{1}{N_t} < f(N_t) < 1$ captures the quasi-public nature of the good.[11]

The government chooses the level of provision of the quasi-public good by maximizing the following objective function:

$$U_g = \left[C^{\alpha} + \left(\frac{G}{\gamma f(N_t) * N_t}\right)^{\alpha}\right]^{1/\alpha} \tag{1}$$

where:

$$\alpha \leq 1$$

$$\frac{1}{N_t} < f(N_t) < 1$$

$$\gamma = \frac{f(N_0)N_0}{f(N_t)N_t}$$

Notice that, the only difference between the individual utility and the government objective function is given by the parameter γ: this creates a wedge between the preferences of the government and those of the representative individual because the government,

[11] If $f(N_t) = \frac{1}{N_t}$, we are in the pure public good case, whereas if $f(N_t) = 1$, the good is private.

instead of using the current population level (N_t) in its objective function, uses the past value (N_0). The parameter γ is thus a reduced form representation of the various factors that can create 'inertia' in spending. Clearly, if the population does not change ($N_0 = N_1$), then the use of a funding rule based on past population has no effect because $\gamma = 1$.[12] On the other hand, when population grows ($N_1 > N_0$), then $\gamma < 1$, thus implying that the individual consumption of the publicly provided good taken into account in the government maximization (i.e. $\frac{G}{f(N_0)N_0}$) is larger than the actual individual consumption (i.e. $\frac{G}{f(N_t)N_t}$). The opposite holds if the population decreases ($\gamma > 1$).

Assume that each individual is endowed with an exogenous income Y and pays a lump-sum tax R, which is used to finance the provision of the quasi-public good. The individual budget constraint is then given by:

$$C = Y - \frac{G}{N_t}. \tag{2}$$

The maximization of the government objective function (1) with respect to G taking into account the budget constraint (2) leads to the following per capita provision of the quasi-public good:

$$\frac{G^*}{N_t} = Y \left[1 + \left(\frac{1}{\gamma f(N_T)} \right)^{\frac{\alpha}{\alpha-1}} \right]^{-1}. \tag{3}$$

Note that, if population does not grow ($\gamma = 1$), then individual and government preferences coincide. In this case, the maximization of the government objective function leads to the per capita provision $\frac{G^{**}}{N_t} = Y \left[1 + \left(\frac{1}{f(N_T)} \right)^{\frac{\alpha}{\alpha-1}} \right]^{-1}$, which as in AW depends negatively on population whenever $\alpha < 0$, because of the partially non-rival nature of the publicly provided good.[13] On the other hand, if $\gamma < 1$, the financing rule based on past population reduces per capita provision below $\frac{G^{**}}{N_t}$: the larger is the population growth (i.e. the smaller is γ), the larger is the distortion induced by the funding formula.

[12] Moreover, $f(N_t) = \frac{1}{N_t}$ also implies that $\gamma = 1$, i.e. the financing rule using past population does not have any effect on the individual consumption of the pure public good.

[13] In the case of pure public good ($f(N_t) = \frac{1}{N_t}$), since $\gamma = 1$, we obtain the same optimal per capita spending of AW, i.e. $\frac{G^*}{N_t} = Y \left[1 + (N_t)^{\frac{\alpha}{\alpha-1}} \right]^{-1}$. Taking the the derivative with respect to N_t, we obtain $d(\frac{G^*}{N_t})/dN_t = -\frac{\alpha}{\alpha-1} \frac{N_t^{\frac{1}{\alpha-1}}}{(1+N_t^{\frac{\alpha}{\alpha-1}})^2} Y$, which is negative for $\alpha < 0$, positive if $0 < \alpha < 1$, whereas for $\alpha = 0$ the derivative is null. On the other hand, if the good is private ($f(N_t) = 1$) then the optimal provision, $\frac{G^*}{N_t} = Y \left[1 + \left(\frac{1}{\gamma} \right)^{\frac{\alpha}{\alpha-1}} \right]^{-1}$, depends on spending only via the financing rule parameter γ. Hence, when $\gamma = 1$, the optimal per capita provision becomes $\frac{G^*}{N_t} = \frac{1}{2} Y$, which is independent from population.

To sum up, our simple theoretical framework shows that a funding rule based on past (rather than current) population, decreases (increases) per capita provision when population grows (decreases) beyond the amount that would be justified by the partial non-rivalness of the publicly provided good. Notice that, for simplicity we illustrated the working of a formula distorting allocations by linking current provision to past population. The same sort of inefficiency would arise under any other formula that prevents allocations from reflecting actual population levels via other mechanisms (such as state minimum, floors and ceiling restrictions).

The implication of our simple exercise for federal spending (per capita) in the US states is that population size may have a negative effect on per capita spending (as long as publicly provided goods are partially non-rival), but population dynamics should not affect spending unless some funding mechanism (like formulas) implies that current provisions do not correctly reflect current population. We are now ready to analyze the empirical relationship between per capita grants allocations and population across US federal states to disentangle the effect of population size (scale effect) from its dynamics (change effect).

3 Population dynamics and federal grants in the US states

During the period we consider (1978-2002), US states vary substantially in their demographic characteristics.[14] This is true both for *average population* level (see Table 1) as well as population dynamics. To capture the latter, we construct an index of population dynamics by dividing the population of every year by the population of 1978 (the first year of our sample), and then multiplying it by 100. Hence, in 1978 the index (*index_pop*) is equal to 100 for all states, and in subsequent years it measures the deviation of the state population from the base year. In the upper panel of Figure 1, we present the geographic distribution of the average *index_pop* for the 48 US states during the period 1978-2002. It is clear that states display very distinct patterns, and population growth is heavily concentrated in the West and South-West, and in three states to the East (Florida, Georgia and North Carolina).

How does federal aid respond to population dynamics? Some preliminary insight can be gained by constructing for spending in grants an index analogous to *index_pop*, which

[14] Like most of literature on the allocation of US federal spending, we focus on the 48 contiguous states.

is given by the ratio of state grants per-capita in any given year and the grant per-capita of the base year (1978), multiplied by 100. In the lower panel of Figure 1 we represent the average grant spending index by state during the period 1978-2002. The negative correlation between the upper and lower panels of Figure 1 is quite striking: states with the fastest growing population are typically characterized by the slowest growth of real per-capita grants.

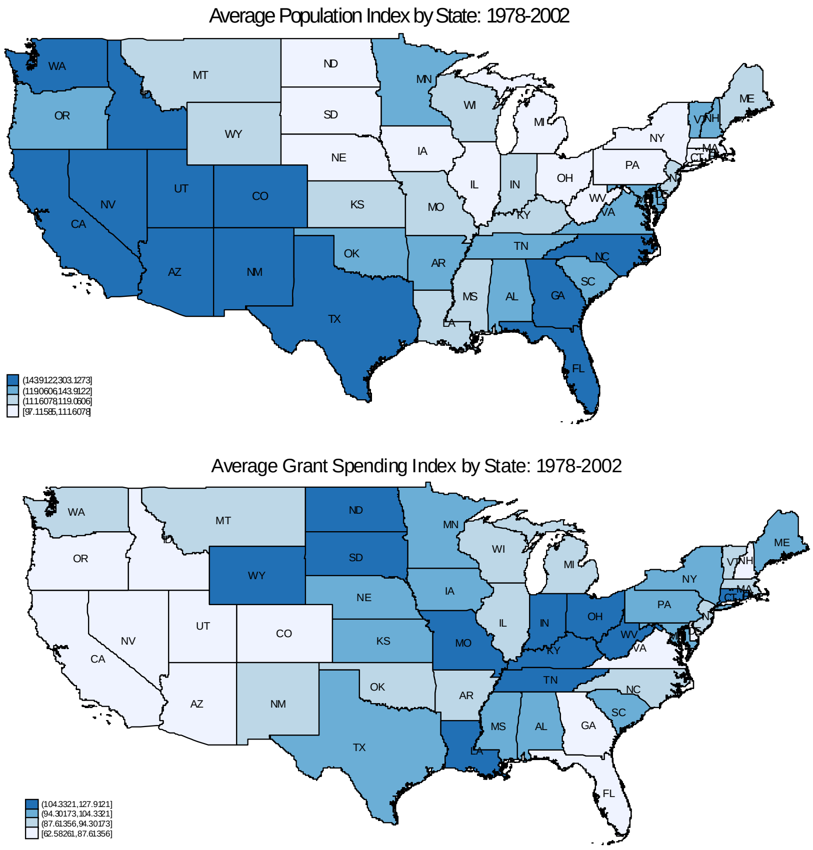

Figure 1. Geographic distribution of population and grants dynamics

This type of evidence - though quite suggestive - is not sufficient to conclude that fast growing states are unfairly penalized in the allocation of federal grants. Remember that for quasi-public goods the optimal per capita provision is inversely related to population size. However, if allocations are affected by inertia, then growing population can lead to sub-optimal per capita allocations. It is therefore important to separate scale effects due do population size, from change effects due to population dynamics. The existence of a negative relationship between spending per capita and population size would simply indicate the existence of non-rivalry in the publicly provided goods. On the other hand, a negative relationship between spending per capita and population dynamics would imply that allocations are distorted because they do not reflect actual population levels.

4 Grants allocations and population dynamics

The purpose of this section is to use regression analysis to investigate whether states with a fast growing population are penalized by the budget allocation process. Our first step is to estimate the following regression:

$$\begin{aligned} GRANT_{st} &= \alpha GRANT_{st-1} + \beta index\_pop_{st} + \gamma Population_{st} + \boldsymbol{\theta}\mathbf{Z}_{st} + \eta_s + \zeta_t + \epsilon_{st}, \\ s &= 1, ...48; \quad t = 1978, ...2002; \end{aligned} \tag{4}$$

where $GRANT_{st}$ is real per-capita grant expenditure (outlays) in state s at time t, $GRANT_{st-1}$ is its lagged value, capturing the incremental nature of the budget,[15] η_s and ζ_t represent respectively the state and year fixed effects, and $\mathbf{Z}_{st}$ is a vector of socioeconomic control variables including real income per capita, unemployment rate, percentage of poor, percentage of non-white population, percentage of elderly and percentage of children.[16]

In this specification, our key explanatory variable is the population dynamics index (*index_pop*). Since we also control for the state population level, the coefficient of *index_pop* allows us to estimate the effect of population dynamics (change effect) independently of the population size of the states (scale effect).

Table 4 (column 1) reports our estimates of equation (4). Notice that, the inclusion of a lagged dependent variable implies that the impact of the independent variables on spending is not transmitted in a single time period, but over a period of subsequent years. As a result, the coefficients of the regressors in equation (1) are short run multipliers, i.e. they capture the impact in a single time period. In Table 6, we also report the long run multipliers (capturing the cumulative effects of the regressors over the years) which are obtained by dividing each short run multiplier by 1 minus the lag of the endogenous variable.[17]

As we can see, population dynamics is key to explain the allocation of federal grants to the states. As expected, the coefficient of *index_pop* is negative and statistically

[15] For a discussion of this point see Lee and Oppenheimer 1999, p. 172.
[16] The summary statistics of all variables are reported in Table 2.
[17] See Koyck (1954), Jorgenson (1966) and Pindyck and Rubinfeld (1981).

significant, both in the short and long run. Our estimated coefficients imply that a 1% increase in the population index (at the mean) is associated with a 0.15% reduction in grants per capita in the short run, and a 0.52% decrease in the long run. Hence, after controlling for the economic and demographic characteristics, which may be important determinants of grants allocations, fast growing states are penalized in the allocation of the federal grants. On the other hand, scale effects do not seem to play a significant role, as shown by insignificant coefficient of the population term.[18]

4.1 Formula grants and population dynamics

In this section first we repeat our analysis distinguishing between formula and non-formula grants. Next, we will focus on the two major formula programs, Medicaid and the Federal Highway Program. The data on formula and non-formula grants, Medicaid and the Federal Highway program are Census data from the Consolidated Federal Fund Report (CFFR), which contains data on federal grants allocation to the states on an obligation base, starting from 1983.

Since the distinction between formula and non formula grants is not readily available from the CFFR, to identify formula programs we have used the information provided by the Catalogue of Federal Domestic Assistance (CFDA). Formula grants are defined in the CFDA as "allocations of money to States or their subdivisions in accordance with distribution formulas prescribed by law or administrative regulation, for activities of a continuing nature not confined to a specific project". Both formula and non-formula programs in the CFDA are identified by the same codes used in the Consolidated Federal Fund Report (CFFR) . Hence, by matching the information from the CFDA with the spending data from the CFFR, we have classified federal aid into two categories, formula and non-formula grants. Table 3 provides descriptive statistics of formula and non-formula programs by state. The amount of funds allocated by formula is on average always larger than the corresponding non-formula amounts for all states (except Wyoming). During the period 1983-2002, slightly over 67% of federal aid is allocated via formulas.[19] Non-formula grants consist mainly of project grants which provide funding for specific projects (such as fellowships, scholarships, research grants, training grants, planning and construction

[18] This suggest that goods and services financed by grants are charcaterized by a substantial degree of rivalness. This finding is consistent with the results of Larcinese, Rizzo, and Testa (2009), which find evidence of a scale effect in defense spending only.

[19] Lousiana has the highest average share with 76% and only Colorado, Massachusetts, Maryland and Wyoming have less than 60%. Detailed tables can be provided by the authors upon request.

grants) for fixed or known periods.

In columns (2)-(5) of Table 4, we report the estimation of our base line specification using formula and non-formula grants (columns 2-3), Medicaid (column 4) and the Federal Highway program (column 5). In column (6) we report instead the results obtained for total grants during the period 1983-2002 from the CFFR. As we can see, the coefficient of our population index is always negative and significant. However, the size of the *index_pop* coefficient for non-formula grants is almost four times smaller than for formula programs and it is also smaller than the coefficients estimated for the Federal Highway program and Medicaid. For this last one, besides the negative coefficient of population dynamics, we also find a negative coefficient for population size.

5 Robustness checks

In Table 5 we carry out several robustness checks. First, for formula programs such as Medicaid, we know that income per capita plays a precise role in the formula, which determines the share of state Medicaid spending financed by federal government (FMAP).[20] This implies that if the formula introduces inertia in allocations, then states might be penalized or advantaged also via the income per capita channel. Therefore, we include in our specification an index of income dynamics (index_income), which is given by the ratio of state income per capita in any given year and state income per capita in the base year (1978). Concerning the Federal Highway program, we also add the number of driving licences per capita, which is a standard control variable used in the literature (Knight 2002). We also take into account the effect of presidential politics on federal spending by adding as explanatory variables the partizan support for the incumbent president, captured the share of votes received in the last election (presvote), and the extent of 'swing voting' in the past presidential races (sd vote), measured by the standard deviation of democratic vote (as a share of the total of democratic and republican vote) in the last three presidential races. Furthermore, to take into account the influence of state political variables on federal aid, we control for the share of democratic representatives in each state's Senate (% dem state senate) and House (% dem state senate), the party affiliation of the governor (democratic governor), her age (age governor), whether she is facing term limits (termlimit governor) and whether she belongs to the same political

[20] The statutory matching rate (FMAP) is computed according to the following formula: $1 - 0.45(\frac{stateincomepercapita}{USincomepercapita})^2$.

party of the President (President-Governor aligned), of the majority party in the House (House-Governor aligned) and Senate (Senate-Governor aligned)

As we can see from the estimation results reported in table 5 (columns 1-5), once we introduce our additional control variables, the coefficient of *index_pop* loses its significance in the non-formula regression (column 3) and decreases its significance in the Medicaid regression (column 4), whereas the estimated *index_pop* coefficient for the overall formula programs (column 2) and Federal Highway (column 5) remains robust both in terms of size and significance. The modest significance of the *index_pop* coefficient in the Medicaid regression is not surprising if one considers that population dynamics would only have an indirect impact via the income per capita used in the FMAP formula. In fact, income dynamics plays a much more important role: the estimated coefficient of income dynamics is positive and significant, implying that states whose income grows fast are advantaged in the allocation of Medicaid federal funds. Hence, even if according to our estimations Medicaid has a redistributive role (as shown by the negative and significant coefficient of income per capita), the current system of federal financing does not seem to track well changes in income, since it advantages states whose income grows faster and viceversa. It should be noted that, although the coefficient of income dynamics is positive and significant also in the total grants (column 1) and formula programs (column 2) regressions, the effect seems to be driven entirely by Medicaid spending. In fact, the coefficient of income dynamics is not significant when we consider non-formula program (column 3) and the Federal Highway program (column 5). Furthermore, if we exclude Medicaid from the formula programs (column 6), the coefficient of income dynamics loses its significance, whereas the coefficient of population dynamics remains significant. The same holds if we consider an even more restrictive class of formula programs (Other Formula), which exclude Medicaid and the Federal Highway from the overall formula programs (Table 5, column 7). This implies that population dynamics has a negative and statistically significant impact on all formula programs (with the exception of medicaid).

In the last column of table 5, as a further robustness check, we carry out a falsification exercise using federal transfers to individuals from the Food Stamp Program, which is the closest to a pure private good and is not allocated by formula. In this case, we expect not to observe any effect of population, neither in terms of scale nor in terms of change. Our estimates confirm our expectation that population does not affect the allocations of Food Stamps to the states. It should also be noted that the distortion via the redistributive channel (index_income) does not play any role.

5.1 Corrected least squares dummy variable estimation

In all our regressions we included a lagged dependent variable, which is introducing a bias in the estimated coefficients (Nickell 1981). In fact, in dynamic panel regressions, the well known finite sample autoregressive bias of time series models, arising when the time dimension T is finite (Kiviet 1995, Kendall 1954), persists asymptotically in large panels as the cross section sample size dimension $N \to \infty$. This bias is declining in T (see Greene 2003, p. 307) and Monte Carlo simulations tend to show that, for $T > 20$, while the bias in the coefficient of the lagged variable, α, may remain sizeable, the bias in the other coefficients becomes very small (Kiviet 1995, Judson and Owen 1999). Since the time dimension in most of our regressions is slightly smaller than 20 years, we perform a robustness check on the consistency of our estimator. Several options are available to that end (see Wooldridge 2002, pp. 302-5), but according to several Montecarlo simulations (Kiviet 1995, Judson and Owen 1999, Kiviet 2001), the Kiviet's corrected least squares dummy variable (LSDVC) outperforms the other options proposed by the literature. Hence, we re-estimate all our regressions by using the corrected least squares dummy variable method[21] with a parametric bootstrap to estimate the asymptotic variance covariance matrix of the LSDVC.[22]

As we can see from the LSDVC estimations reported in Tables 7 and 8, the results regarding the estimate of the *index_pop* (our main variable of interest) are not affected. Notice also that the population index coefficient is no longer significant in the Medicaid regression, whereas the per capita income index remains significant. The estimated coefficients of the other covariates are also not substantially affected. On the other hand, the estimate of the lagged endogenous variable tends to increase, which is in accordance with previous works (Nickell 1981; Kiviet 1995), which find that the bias of the least squares dummy variable (LSDV) method is negative.

Altogether, our analysis provides robust evidence that (with the exception of Medicaid) population dynamics has a negative effect on the allocation of formula grants to the states.

[21] The estimate is performed by using the STATA command *xtlsdvc* (Bruno 2005). In particular the dynamic panel bias is computed and then evaluated by using the Arellano-Bond consistent estimator. Finally the bias is used to compute the corrected bias least square dummy variable estimates.

[22] Monte Carlo simulations (Kiviet 2001) show that the analytical variance estimator performs poorly for a large α, whereas the parametric bootstrap procedure performs much better.

5.2 Gainers and losers

In Table 9 we report the average gains and losses (in 1983 USD) implied by our estimates of the *index_pop* coefficient reported in Table 5. These have been computed by comparing, for each state, the predicted federal grants per capita implied by the average *index_pop* in the state during the period 1978-2002, with the federal grant per capita that the state would receive if its *index_pop* were equal to the US average during the same period.

Nevada, Arizona and Florida, whose population grew much faster than the US average over the period 1978-2002, lose on average respectively 13%, 7% and 6% of their average grant per capita. The size of the losses for the three fastest growing states is of the same order of magnitude for formula and other formula, with the exception of Nevada, whose loss raises to 18% if we consider other formula programs. For the remaining States, gains and losses for total grants, formula grants and other formula are in the order of 3% of the states average budget or below. On the other hand, if we consider the Federal Highway programs, losses are considerably higher. The three fastest growing states loose 21% (Nevada), and 15% (Arizona and Florida) or their average federal highway spending. States such as Texas and California, loose 6% of their average spending, whereas New York gains about 7%.

Overall, we estimate that 16 of the 48 US continental states - whose population grows faster than the US average - loose federal grants (across all the different categories we have analyzed) to the advantage of the remaining states that grow at a slower pace.

6 Conclusions

Fast growing states are disadvantaged in the allocation of federal grants, in particular those allocated by formulas. As their population increases, spending does not adjust sufficiently to guarantee them their fair share of the federal pie. We quantify the effect of this inertia and show that it is sizeable. For example, we estimate that Nevada, the fastest growing state, incurs a yearly loss of 13% of its overall grant budget, with losses reaching as much as 21% for some programs. Losses are on average four times as large for formula than for non-formula programs. This suggests that formulas impose a constraint on the budgetary process, which prevents the spending adjustments necessary to address the changing needs of states with pronounced population dynamics.

What drives this budgetary inertia? Our simple theoretical framework shows that 'sluggish spending' cannot be the outcome of pure social surplus maximization. At the same time, our empirical analysis highlights that, although several fast growing states are penalized by existing rules, the majority of the states is on the winning side. In other words, a majority of the US states seems to benefit from rules limiting the flexibility of the budget, and this suggests that distributive politics might provide an alternative explanation for why such rules persist. Hence, a political economy approach, calling into question the institutional arrangements and the political process behind grant allocation, may be a fruitful avenue for future research on the causes of the observed misallocation of resources. In terms of our simple model, the government funding rule (summarized by the parameter γ) could be endogenized as the outcome of simple majority voting, within a framework where individuals have heterogenous preferences and the preferences of the median voter dictate the parameter γ in the government objective function. The exact solution to a model of this sort would depend on a number of institutional details, for example on whether the 'pivotal legislator' represents the median state (as in the Senate) or the median voter with respect to the overall voting population. In any event, there is no reason to expect such solution to coincide with (or even be close to) the social surplus maximizing one.

This raises an intriguing question on the optimality of formula-based as opposed to discretionary spending programs. While formulas might be a useful instrument to reduce arbitrariness and promote a fair distribution of the federal pie, they can also simply perpetuate a *status quo,* which turns out to be advantageous for a majority. Since the revision of such formulas cannot be isolated from the political process, they may become a further instrument through which the battle for pork is fought. It is then surprising that the literature on grant allocation has focussed mostly on the *size* of states, and therefore on the well known issue of small state overrepresentation in Senate, while entirely neglecting the important distributive consequences of *population growth.* More work is needed to shed lights on these important issues that we leave to further research.

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Table 1 - Average population (millions) by state (1977-2002)

state	population	state	population
AL	4.1048	NJ	7.8072
AR	2.4085	NM	1.5394
AZ	3.7470	NV	1.2759
CA	28.8246	NY	18.1167
CO	3.4654	OH	10.9669
CT	3.2539	OK	3.2190
DE	0.6737	OR	2.9199
FL	12.6848	PA	11.9712
GA	6.6006	RI	0.9906
IA	2.8569	SC	3.4986
ID	1.0717	SD	0.7144
IL	11.6909	TN	4.9895
IN	5.6577	TX	17.2680
KS	2.5040	UT	1.7906
KY	3.7689	VA	6.1577
LA	4.3077	VT	0.5552
MA	6.0055	WA	4.8959
MD	4.7333	WI	4.9643
ME	1.1997	WV	1.8515
MI	9.4346	WY	0.4768
MN	4.4213		
MO	5.1793		
MS	2.6298		
MT	0.8330		
NC	6.7536		
ND	0.6512		
NE	1.6162		
NH	1.0729		

Table 2: Summary statistics

Variable	Mean	Obs	Std. Dev.	Min	Max
Grants	1200	516.3568	170.3119	231.4986	1387.176
Formula	960	391.426	145.197	154.2411	948.484
No Formula	960	182.7558	77.24922	82.80322	770.3221
Medicaid	960	171.8909	92.04632	15.59727	532.1509
Federal Highway	960	63.65681	31.23944	19.73433	216.5602
No Medicaid	960	219.5351	70.71172	98.37959	548.4036
Other Formula	960	155.8783	52.40182	71.46728	384.001
Food Stamps	960	42.08595	18.51336	7.392407	113.377
population	1200	5.197397	5.478277	0.425	35.11603
index_pop	1200	116.3617	23.14855	95.2168	326.35
index_inc	1200	112.7952	15.27762	79.17036	170.6582
income per capita	1200	13.95056	2.519041	8.601129	24.06874
unemployment	1200	5.971833	2.105291	2.2	18
% of non-white population	1200	0.170893	0.113529	0.009992	0.509997
% aged above 65	1200	0.122615	0.018405	0.07	0.19
% of poor	1200	13.16979	4.061477	2.9	27.2
% in schooling age (5-17)	1200	0.193934	0.018672	0.154832	0.265838
licences per capita	1200	0.680858	0.051261	0.511227	0.858676
democratic governor	1200	0.520833	0.499774	0	1
age governor	1200	53.33583	7.866572	33	78
termlimit governor	1200	0.269167	0.443712	0	1
President-Governor aligned	1200	0.375	0.484325	0	1
Senate-Governor aligned	1200	0.445	0.497173	0	1
House-Governor aligned	1200	0.528333	0.499405	0	1
presvote	1200	0.549008	0.064145	0.343509	0.779652
sd	1200	0.057903	0.029397	0.001693	0.221836
% dem state house*	1175	0.573308	0.177685	0.128571	0.980952
% dem state senate*	1175	0.578862	0.183134	0.085714	1

(*) Missing observations for Nebraska because the state legislature is unicameral

Table 3: Formula and non Formula grants (1983-2002)

State	Formula Grants *mean, real per capita 1983 USD*	No Formula Grants *mean, real per capita 1983 USD*	Formula grants *average share*	No Formula grants *average share*
AL	371.1757	161.0366	0.6863	0.3137
AR	407.3865	128.1648	0.7518	0.2482
AZ	308.6359	154.0325	0.6482	0.3518
CA	358.6081	197.2224	0.6291	0.3709
CO	273.1461	187.9474	0.5883	0.4117
CT	428.0408	201.8631	0.6696	0.3304
DE	370.8155	175.4860	0.6668	0.3332
FL	267.0847	105.7708	0.7014	0.2986
GA	346.1373	129.7318	0.7187	0.2813
IA	341.7656	148.2257	0.6877	0.3123
ID	358.3881	138.3813	0.7151	0.2849
IL	328.0667	160.2796	0.6598	0.3402
IN	322.2666	110.5123	0.7328	0.2672
KS	315.8264	115.8603	0.7183	0.2817
KY	421.0099	147.8741	0.7241	0.2759
LA	503.0139	144.7297	0.7605	0.2395
MA	450.5009	335.6407	0.5637	0.4363
MD	350.3066	238.6976	0.5818	0.4182
ME	494.4766	191.6621	0.7059	0.2941
MI	365.1458	159.9420	0.6793	0.3207
MN	370.8843	167.0188	0.6815	0.3185
MO	361.8533	146.4639	0.6928	0.3072
MS	456.8755	166.8275	0.7183	0.2817
MT	508.8378	258.9873	0.6595	0.3405
NC	346.2684	146.8302	0.6874	0.3126
ND	528.1792	280.3493	0.6545	0.3455
NE	359.0883	131.0386	0.7222	0.2778
NH	335.7621	165.2888	0.6566	0.3434
NJ	364.1422	153.6927	0.6903	0.3097
NM	476.0295	279.5788	0.6155	0.3845
NV	248.1901	139.0239	0.6368	0.3632
NY	612.3120	239.6374	0.7049	0.2951
OH	357.6160	144.2259	0.6964	0.3036
OK	358.2584	152.8267	0.6910	0.3090
OR	371.9590	192.2560	0.6480	0.3520
PA	392.6819	169.7250	0.6833	0.3167
RI	528.9808	264.7364	0.6581	0.3419
SC	379.2935	124.9967	0.7382	0.2618
SD	482.3432	256.8901	0.6512	0.3488
TN	396.4051	155.7217	0.7033	0.2967
TX	320.2990	115.5614	0.7221	0.2779
UT	328.2607	166.2072	0.6580	0.3420
VA	265.6042	131.8172	0.6630	0.3370
VT	510.9214	235.8987	0.6706	0.3294
WA	359.1344	186.4849	0.6473	0.3527
WI	359.9093	158.2559	0.6833	0.3167
WV	513.1048	181.4620	0.7181	0.2819
WY	513.4555	527.4128	0.4900	0.5100
US	*391.4260*	*182.7558*	*0.6756*	*0.3173*

Table 4 - OLS regressions. Dependent variables: federal grants (real per capita, 1983 USD) by spending category

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Grants	Formula	no Formula	Medicaid	Federal Highway	Grants (CFFR)
LAG	0.7044**	0.6892**	0.5756**	0.7385**	0.4137**	0.6754**
	(0.039)	(0.074)	(0.041)	(0.091)	(0.097)	(0.047)
population	0.5399	-1.0834	-0.2853	-1.9233*	0.7024	-1.3354
	(1.068)	(2.064)	(1.416)	(0.904)	(0.786)	(2.677)
index_pop	-0.6848**	-0.5544**	-0.1468*	-0.2381*	-0.1993**	-0.6935**
	(0.141)	(0.161)	(0.071)	(0.091)	(0.069)	(0.168)
income per capita	-4.4584	-5.6962*	1.0263	-2.4508	-2.1523	-5.2550
	(2.517)	(2.464)	(3.236)	(1.474)	(1.156)	(3.623)
unemployment	2.0803	1.4631	0.7302	0.8467	0.2377	2.1110
	(1.145)	(1.455)	(0.821)	(1.162)	(0.884)	(1.767)
% of non-white population	24.5173	-17.7691	5.9776	-19.6463	15.9446	-13.8432
	(47.452)	(81.538)	(27.359)	(51.072)	(13.760)	(91.254)
% aged above 65	321.8583	614.3256	540.7607*	106.8523	272.8363	1,074.7033*
	(308.065)	(471.456)	(244.324)	(284.465)	(149.377)	(474.666)
% of poor	1.6384*	0.9685	1.1525*	0.4818	-0.0811	2.0062*
	(0.689)	(0.593)	(0.508)	(0.528)	(0.280)	(0.849)
% in schooling age (5-17)	-667.5873**	-379.3349	-277.4705	-201.3563	-424.1254**	-662.2650
	(191.107)	(258.334)	(224.684)	(185.441)	(139.938)	(339.922)
licences per capita					11.8709	
					(21.886)	
state fixed effects	YES	YES	YES	YES	YES	YES
year fixed effects	YES	YES	YES	YES	YES	YES
Constant	YES	YES	YES	YES	YES	YES
Observations	1,200	912	912	912	912	912
R-squared	0.9607	0.9715	0.9256	0.9605	0.8766	0.9704

Robust standard errors clustered at state level in parentheses. ** p<0.01, * p<0.05

Table 5 - OLS regressions. Dependent variables: federal grants (real per capita, 1983 USD) by spending category

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Grants	Formula	Non Formula	Medicaid	Federa Highway	No medicaid	Other Formula	Food Stamps
population	1.9833	-0.9085	-0.2708	-2.0783	0.1158	2.3393	2.1046	-0.5684
	(1.160)	(2.473)	(1.644)	(1.296)	(0.857)	(1.893)	(1.375)	(0.353)
index_pop	-0.6787**	-0.5270**	-0.1481	-0.2021*	-0.1989**	-0.4595**	-0.2507**	0.0050
	(0.145)	(0.166)	(0.092)	(0.095)	(0.058)	(0.105)	(0.064)	(0.008)
index_inc	2.8710*	2.5543*	0.0911	2.6814**	-0.2975	-0.4926	-0.2277	-0.0593
	(1.191)	(1.229)	(1.205)	(0.852)	(0.615)	(0.861)	(0.598)	(0.167)
democratic governor	-2.9630	1.8077	-1.0051	3.2499	-0.9772	-2.2121	-1.2160	1.1191**
	(2.823)	(2.352)	(1.860)	(1.977)	(1.065)	(1.199)	(0.944)	(0.289)
age governor	-0.0868	0.0479	-0.0346	0.0210	-0.0135	0.0035	0.0224	0.0053
	(0.133)	(0.100)	(0.135)	(0.072)	(0.064)	(0.073)	(0.045)	(0.023)
termlimit governor	-0.8669	1.0296	1.8757	0.9628	0.6205	0.5857	-0.0775	0.0150
	(2.110)	(1.440)	(1.360)	(0.974)	(0.942)	(1.268)	(0.719)	(0.334)
President-Governor aligned	5.2587	0.0996	1.1251	1.8255	-2.2751	-1.8115	0.2059	0.6548*
	(3.396)	(2.740)	(1.794)	(2.143)	(1.332)	(1.939)	(1.299)	(0.262)
Senate-Governor aligned	-0.5346	0.5207	-0.3219	1.4953	-1.1251	-0.9373	0.1049	0.3380
	(1.929)	(1.694)	(1.806)	(1.498)	(1.189)	(1.240)	(0.758)	(0.281)
House-Governor aligned	2.6719	-2.6291	1.2977	-1.2559	-0.9695	-1.4773	-0.6702	0.4321
	(3.456)	(2.796)	(2.122)	(1.911)	(1.656)	(1.995)	(0.983)	(0.346)
presvote	23.7474	37.7994	54.5631	1.1528	29.8083*	54.6146**	26.1113*	6.6771**
	(22.879)	(20.474)	(28.430)	(13.031)	(13.561)	(16.617)	(10.191)	(2.128)
sd	-20.9820	-1.1923	-122.3290	37.8663	-57.2370	-48.8974	7.8857	-19.6593
	(65.002)	(73.548)	(117.312)	(51.778)	(50.858)	(74.373)	(41.013)	(9.800)
% dem state house	25.9018	-6.3923	17.2327	-17.8928	2.0092	9.2948	4.5508	3.0937
	(21.486)	(19.162)	(17.245)	(13.089)	(9.232)	(11.703)	(8.009)	(2.773)
% dem state senate	14.1248	0.6151	-8.2288	1.7101	-16.3014	6.9616	20.7025*	-1.6055
	(16.407)	(19.365)	(11.494)	(12.279)	(10.984)	(13.340)	(8.885)	(1.869)
income per capita	-24.4856**	-23.2075*	0.7324	-20.9761**	0.5091	-0.6093	-0.5925	-0.2298
	(8.668)	(9.928)	(8.555)	(6.714)	(4.711)	(6.660)	(4.823)	(1.197)
licences per capita					17.0294			
					(25.023)			
Observations	1,175	893	893	893	893	893	893	893
R-squared	0.9615	0.9717	0.9265	0.9614	0.8810	0.9561	0.9629	0.9790

Robust standard errors clustered at state level in parentheses. ** p<0.01, * p<0.05. All regressions include lagged dependent variable, constant, state and year fixed effects, unemployment rate, % over 65 year olds, % in schooling age (5-17), % of non-white population, % poor.

Table 6: Long run coefficients of population dynamics (index_pop)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Variable	specification	Grants	Formula	no Formula	Medicaid	Federal Highway	Grants (CFFR)	No medicaid	Other Formula	Food Stamps
index_pop	OLS regressions, Table 4	-2.3166***	-1.7837***	-0.3459*	-0.9104***	-0.3399***	-2.1365***			
		(0.316)	(0.371)	(0.181)	(0.211)	(0.109)	(0.481)			
index_pop	OLS regressions, Table 5	-2.1752***	-1.5716***	-0.3375	-0.6998**	-0.3233***	-1.932***	-0.8388***	-0.5166***	0.0252
		(0.358)	(0.390)	(0.221)	(0.238)	(0.090)	(0.496)	(0.187)	(0.132)	(0.040)

Robust standard errors clustered at state level in parentheses. ** p<0.01, * p<0.05

Table 7. LSVD estimation. Dep. variables: federal grants (real per capita, 1983 USD) by spending category

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Grants	Formula	no Formula	Medicaid	Federal Highway
LAG	0.7758**	0.7618**	0.6452**	0.8002**	0.4694**
	(0.022)	(0.021)	(0.018)	(0.018)	(0.022)
population	1.7071	-0.4173	0.1599	-1.3669	0.5027
	(1.869)	(1.273)	(0.895)	(0.973)	(0.454)
index_pop	-0.5535**	-0.4059**	-0.1310	-0.1714	-0.1799**
	(0.099)	(0.123)	(0.117)	(0.113)	(0.058)
income per capita	-0.3071	-5.4529**	0.6815	-2.9738	-2.0994**
	(3.009)	(1.679)	(1.413)	(1.595)	(0.651)
unemployment	-0.4376	1.4069	0.7491	0.6469	0.1603
	(0.792)	(1.079)	(0.910)	(0.915)	(0.468)
% of non-white population	-53.5163	-21.1572	5.7945	-20.2490	14.6370
	(52.132)	(54.248)	(46.488)	(46.387)	(24.018)
% aged above 65	242.6352	529.4523*	417.4408	69.4732	249.8931*
	(182.800)	(262.679)	(222.757)	(247.271)	(111.500)
% of poor	0.9090	0.9195	1.1556	0.4415	-0.0643
	(0.630)	(0.831)	(0.737)	(0.723)	(0.386)
% in schooling age (5-17)	355.8738*	-315.8292	-240.1287	-202.5801	-370.0039**
	(173.723)	(243.729)	(210.331)	(224.535)	(108.266)
licences per capita					12.3788
					(14.391)
Observations	1,200	912	912	912	912

Standard errors in parentheses. ** p<0.01, * p<0.05

Table 8. LSVD estimation. Dep. variables: federal grants (real per capita, 1983 USD) by spending category

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Grants	Formula	Non Formula	Medicaid	Federal Highway	No medicaid	Other Formula	Food Stamps
LAG	0.7504**	0.7340**	0.6273**	0.7725**	0.4395**	0.5129**	0.5776**	0.8583**
	(0.030)	(0.022)	(0.021)	(0.018)	(0.025)	(0.026)	(0.024)	(0.017)
population	3.1396	-0.3965	0.0905	-1.4698	-0.0496	2.1484	2.1074	-0.4725
	(2.502)	(2.811)	(2.339)	(2.392)	(1.108)	(1.692)	(1.196)	(0.268)
index_pop	-0.5621**	-0.3813**	-0.1211	-0.1323	-0.1790**	-0.4044**	-0.2031**	0.0073
	(0.151)	(0.116)	(0.088)	(0.096)	(0.044)	(0.072)	(0.046)	(0.010)
index_inc	4.2214**	2.4232**	0.1879	2.7040**	-0.2529	-0.5059	-0.2325	-0.0072
	(1.446)	(0.893)	(0.833)	(0.822)	(0.440)	(0.568)	(0.378)	(0.087)
democratic governor	-1.1980	2.0694	-0.9398	3.0625	-0.8478	-1.9926	-1.1016	1.0489**
	(3.669)	(2.928)	(2.466)	(2.507)	(1.209)	(1.756)	(1.228)	(0.297)
age governor	-0.0618	0.0268	-0.0483	0.0267	-0.0141	-0.0080	0.0210	0.0069
	(0.158)	(0.182)	(0.155)	(0.163)	(0.072)	(0.109)	(0.075)	(0.019)
termlimit governor	0.8780	0.9088	1.8741	0.8149	0.5827	0.5547	-0.0842	-0.0248
	(3.464)	(2.606)	(2.248)	(2.283)	(1.153)	(1.632)	(1.130)	(0.270)
President-Governor aligned	-3.4897	-0.0231	1.0024	1.6068	-2.2283	-1.7377	0.1630	0.5850
	(2.594)	(3.419)	(2.940)	(2.966)	(1.420)	(2.095)	(1.459)	(0.362)
Senate-Governor aligned	-2.7090	0.4539	-0.1317	1.3529	-1.0457	-0.8957	0.0956	0.3024
	(1.572)	(2.673)	(2.207)	(2.295)	(1.045)	(1.581)	(1.111)	(0.265)
House-Governor aligned	-5.3566	-2.6021	1.3296	-1.0254	-1.0446	-1.4307	-0.6112	0.4235
	(3.115)	(3.818)	(3.170)	(3.364)	(1.501)	(2.163)	(1.498)	(0.374)
presvote	28.4227	32.6265*	49.2533**	-0.7565	27.8905**	51.8116**	24.5024**	5.8870**
	(18.605)	(14.350)	(12.681)	(13.183)	(6.077)	(8.908)	(6.098)	(1.516)
sd	-23.8155	11.5083	-102.6120	44.0958	-55.5581	-45.3450	10.5330	-17.5917*
	(80.912)	(77.533)	(71.196)	(68.020)	(33.355)	(47.476)	(32.965)	(8.154)
% dem state house	39.2213	-4.6855	15.1465	-16.8696	2.3179	9.6404	3.8450	2.5860
	(30.078)	(27.992)	(23.500)	(24.804)	(11.156)	(16.619)	(11.737)	(2.917)
% dem state senate	-0.21	-2.9132	-7.6010	1.6974	-16.4987**	4.6786	19.4683**	-1.4189
	(21.072)	(15.209)	(12.315)	(13.243)	(5.873)	(9.006)	(6.355)	(1.532)
income per capita	-29.98**	-22.23**	-0.55	-21.63**	0.17	-0.38	-0.49	-0.51
	(11.083)	(7.809)	(6.951)	(7.178)	(3.674)	(4.904)	(3.228)	(0.735)
unemployment	0.2853	1.1076	0.5740	0.6896	-0.0329	0.4808	0.5970	0.9766**
	(1.196)	(1.247)	(1.082)	(1.102)	(0.544)	(0.759)	(0.537)	(0.128)
% of non-white population	-11.8817	-30.3034	11.1797	-26.9587	7.5174	-11.2981	-15.2931	3.6110
	(46.264)	(61.175)	(53.252)	(52.949)	(26.306)	(37.625)	(26.132)	(6.149)
% aged above 65	740.7345	775.0405	572.5648	256.0522	323.7342	671.7048*	316.8268	-55.1502
	(434.186)	(468.130)	(417.737)	(438.163)	(215.153)	(290.157)	(203.579)	(49.879)
% of poor	1.8655*	1.3286*	1.1810*	0.7667	0.0184	0.7261	0.6282*	0.0682
	(0.863)	(0.610)	(0.532)	(0.540)	(0.272)	(0.376)	(0.259)	(0.061)
% in schooling age (5-17)	558.8021**	-74.2096	-152.7671	44.8270	303.5029*	-96.4372	152.0694*	-19.9344
	(140.345)	(170.455)	(146.110)	(148.277)	(74.550)	(100.352)	(66.573)	(18.431)
licences per capita					17.5717			
					(18.534)			
Observations	1,175	893	893	893	893	893	893	893

Standard errors in parentheses. ** p<0.01, * p<0.05.

Table 9: predicted spending in grants (real 1983 USD)

state	POPIND average	predicted difference: total grants per capita (real 1983 USD)	share of: state average	predicted difference: formula grants per capita (real 1983 USD)	share of state average	predicted difference: other formula per capita (real 1983 USD)	share of state average	predicted difference: federal highway per capita (real 1983 USD)	share of state average
NV	195.4310	-51.9090	-0.1339	-35.9844	-0.1450	-19.7673	-0.1829	-13.6711	-0.2089
AZ	160.3490	-28.8777	-0.0700	-20.0186	-0.0649	-10.9968	-0.0773	-7.6054	-0.1552
FL	148.4131	-21.0417	-0.0614	-14.5866	-0.0546	-8.0129	-0.0675	-5.5417	-0.1549
UT	137.6520	-13.9771	-0.0316	-9.6892	-0.0295	-5.3226	-0.0361	-3.6811	-0.0578
TX	133.1808	-11.0417	-0.0292	-7.6544	-0.0239	-4.2048	-0.0309	-2.9080	-0.0635
GA	131.2843	-9.7967	-0.0214	-6.7913	-0.0196	-3.7307	-0.0262	-2.5801	-0.0498
CA	130.5002	-9.2819	-0.0193	-6.4344	-0.0179	-3.5346	-0.0201	-2.4445	-0.0655
WA	130.3823	-9.2045	-0.0192	-6.3808	-0.0178	-3.5052	-0.0232	-2.4242	-0.0425
CO	129.3159	-8.5044	-0.0208	-5.8955	-0.0216	-3.2386	-0.0270	-2.2398	-0.0438
NM	127.8483	-7.5410	-0.0110	-5.2276	-0.0110	-2.8717	-0.0136	-1.9860	-0.0263
NH	124.4964	-5.3404	-0.0120	-3.7021	-0.0110	-2.0337	-0.0168	-1.4065	-0.0257
ID	122.4833	-4.0188	-0.0085	-2.7859	-0.0078	-1.5304	-0.0104	-1.0584	-0.0124
NC	122.1098	-3.7736	-0.0088	-2.6160	-0.0076	-1.4370	-0.0112	-0.9938	-0.0211
SC	121.4149	-3.3174	-0.0073	-2.2997	-0.0061	-1.2633	-0.0093	-0.8737	-0.0173
OR	119.9697	-2.3687	-0.0045	-1.6420	-0.0044	-0.9020	-0.0053	-0.6238	-0.0120
VA	119.7341	-2.2140	-0.0063	-1.5348	-0.0058	-0.8431	-0.0068	-0.5831	-0.0119
DE	115.9882	0.2452	0.0005	0.1700	0.0005	0.0934	0.0006	0.0646	0.0008
TN	115.7882	0.3765	0.0008	0.2610	0.0007	0.1434	0.0011	0.0992	0.0019
MD	114.6826	1.1023	0.0023	0.7642	0.0022	0.4198	0.0031	0.2903	0.0046
VT	114.5993	1.1570	0.0017	0.8021	0.0016	0.4406	0.0022	0.3047	0.0031
OK	113.8405	1.6552	0.0036	1.1474	0.0032	0.6303	0.0042	0.4359	0.0080
WY	112.8437	2.3096	0.0024	1.6010	0.0031	0.8795	0.0038	0.6083	0.0037
AR	111.6332	3.1043	0.0062	2.1519	0.0053	1.1821	0.0081	0.8176	0.0129
AL	110.5512	3.8146	0.0079	2.6444	0.0071	1.4526	0.0102	1.0046	0.0158
MN	110.3159	3.9691	0.0081	2.7514	0.0074	1.5115	0.0104	1.0453	0.0220
ME	110.2810	3.9920	0.0063	2.7673	0.0056	1.5202	0.0089	1.0514	0.0188
MS	109.9754	4.1926	0.0073	2.9064	0.0064	1.5966	0.0091	1.1042	0.0191
LA	108.4592	5.1880	0.0090	3.5964	0.0071	1.9756	0.0116	1.3663	0.0266
KY	108.3467	5.2618	0.0100	3.6476	0.0087	2.0038	0.0130	1.3858	0.0265
MO	107.1686	6.0353	0.0134	4.1838	0.0116	2.2983	0.0163	1.5895	0.0290
MT	107.1612	6.0401	0.0084	4.1871	0.0082	2.3001	0.0114	1.5908	0.0116
KS	106.9934	6.1503	0.0155	4.2635	0.0135	2.3421	0.0183	1.6198	0.0274
NJ	106.9901	6.1525	0.0131	4.2650	0.0117	2.3429	0.0155	1.6203	0.0375
RI	106.5258	6.4573	0.0096	4.4763	0.0085	2.4590	0.0137	1.7006	0.0191
WI	106.2753	6.6217	0.0139	4.5903	0.0128	2.5216	0.0176	1.7439	0.0387
IN	105.2879	7.2699	0.0190	5.0397	0.0156	2.7685	0.0233	1.9147	0.0388
CT	104.6128	7.7132	0.0148	5.3469	0.0125	2.9372	0.0188	2.0314	0.0266
IL	104.5587	7.7487	0.0174	5.3715	0.0164	2.9508	0.0188	2.0407	0.0535
MA	104.2180	7.9723	0.0127	5.5266	0.0123	3.0359	0.0187	2.0996	0.0360
SD	103.6807	8.3251	0.0123	5.7711	0.0120	3.1703	0.0161	2.1925	0.0184
NE	103.1485	8.6745	0.0190	6.0133	0.0167	3.3033	0.0221	2.2846	0.0357
MI	102.8954	8.8406	0.0183	6.1285	0.0168	3.3666	0.0213	2.3283	0.0598
OH	102.5938	9.0386	0.0202	6.2658	0.0175	3.4420	0.0240	2.3805	0.0610
NY	102.4030	9.1639	0.0122	6.3526	0.0104	3.4897	0.0157	2.4135	0.0691
PA	101.5089	9.7509	0.0194	6.7595	0.0172	3.7132	0.0236	2.5680	0.0513
ND	99.7148	10.9287	0.0151	7.5760	0.0143	4.1617	0.0199	2.8782	0.0222
WV	99.4733	11.0873	0.0177	7.6859	0.0150	4.2221	0.0242	2.9200	0.0294
IA	98.2817	11.8695	0.0274	8.2282	0.0241	4.5200	0.0334	3.1260	0.0540

(1) The Average predicted difference is obtained by substracting the average state spending percapita predicted using the average US population index from the average state spending percapita predicted using the state average population index