# Do Small States Get More Federal Monies? Myth and Reality About the US Senate Malapportionment

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**EOPP/2009/7**

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## Abstract

We analyze the relationship between senate malapportionment and the allocation of the US federal budget to the states during the period 1978-2002. A substantial literature originating from the influential paper by ?) finds that small and overrepresented states get significantly larger shares of federal funds. We show that these studies suffer from fundamental identification problems and grossly overestimate the impact of malapportionment. Most of the estimated impact is not a scale but a change effect. Rather than evidence of ″small state advantage", we find that states with fast growing population are penalized in the allocation of the federal budget independently of whether they are large or small.

**JEL Codes:** D72, H61, H77.
**Keywords**: federal budget, malapportionment, small state advantage, overrepresentation.

This series is published by the Economic Organisation and Public Policy Programme (EOPP) located within the Suntory and Toyota International Centres for Economics and Related Disciplines (STICERD) at the London School of Economics and Political Science. This new series is an amalgamation of the Development Economics Discussion Papers and the Political Economy and Public Policy Discussion Papers. The programme was established in October 1998 as a successor to the Development Economics Research Programme. The work of the programme is mainly in the fields of development economics, public economics and political economy. It is directed by Maitreesh Ghatak. Oriana Bandiera, Robin Burgess, and Andrea Prat serve as co-directors, and associated faculty consist of Timothy Besley, Jean-Paul Faguet, Henrik Kleven, Valentino Larcinese, Gerard Padro i Miquel, Torsten Persson, Nicholas Stern, and Daniel M. Sturm. Further details about the programme and its work can be viewed on our web site at http://sticerd.lse.ac.uk/research/eopp.

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*The equality of representation in the Senate is another point, which, being evidently the result of compromise between the opposite pretensions of the large and the small States, does not call for much discussion. (Madison 1788)*

# 1 Introduction

The US constitution mandates a different type of representation for the federal States in the two branches of Congress. Members of the House are assigned proportionally to population and regularly reapportioned in response to demographic changes. In the Senate, the principle of equal representation prescribes that each state must be represented by two senators. In the intent of the founding fathers of the US constitution, the double representation principle should balance the interests of the small and big states. The combination of proportional and equal representation, together with the House proposal power on budgetary matters, should grant adequate consideration to the interests of all states, independently of their population size.[1] Ansolabehere et al. (2003) provide a formal model showing how the attribution of proposal power to the lower house may indeed counterbalance the malapportionment in the upper house leading to an equal distribution of per capita government expenditure.

Despite the proclaimed virtues of the double representation system, the current empirical literature provides large support for the existence of a "small state advantage" in the allocation of the US federal budget. In particular, the pioneering and very influential work of Atlas et al. (1995) (henceforth AGHZ), analyzing biennial data between 1972 and 1990, finds a strongly positive and statistically significant relationship between per capita representation in the US House and Senate and per capita federal spending. They introduce in the empirical literature a measure of state over-representation (the number of representatives per capita) which has become very common and has inspired a number of subsequent works. Their procedure amounts to estimating the following equation:

$$\begin{aligned} FEDEXP_{st} &= \gamma * SP_{st} + \delta * HP_{st} + \boldsymbol{\theta}\mathbf{Z}_{st} + \alpha_s + \beta_t + \epsilon_{st}, \\ s &= 1, ...S; \quad t = 1, ..., T; \end{aligned} \tag{1}$$

where $FEDEXP_{st}$ is real per capita federal expenditure (outlays) in state $s$ at time $t$, $SP_{st}$

[1] In relation to the risk of overrepresentation of the small states, Madison writes: "The large States, therefore, who will prevail in the House of Representatives, will have nothing to do but to make reapportionments and augmentations mutually conditions of each other; (...). The House of Representatives cannot only refuse, but they alone can propose, the supplies requisite for the support of government. They, in a word, hold the purse (...)" (Madison 1788).

stands for *senators per capita*, $HP_{st}$ for house members per capita, $Z_{st}$ is a vector of socioeconomic control variables, and $\alpha_s$ and $\beta_t$ represent respectively the state and year fixed effects. Estimating equation (1), AGHZ find a positive impact of per capita representation on spending in both the Senate and the House. The seminal AGHZ contribution has prompted a number of similar studies that have substantially confirmed the correlation between federal spending and per capita Senate representation.[2] The effect of the House has instead not been found again in the literature.

In this paper we argue that the methodology proposed by AGHZ is affected by fundamental flaws that make its results unreliable and misleading. Equation (1) cannot identify the impact of over-representation on spending because it relies exclusively on population variations (both across and within states) which can affect spending for several other plausible reasons besides over-representation. Hence, the effect of malapportionment, in particular in large spending aggregates, remains not identifiable using the number of senators per capita as a measure of over-representation.[3] Moreover, since other factors may be responsible for an inverse relationship between spending and population, the use of this measure alone can lead to a gross overestimation of the effect of over-representation on spending.

According to the estimates of AGHZ, the difference in total real per capita spending due to over-representation between the most overrepresented (Wyoming) and the most under-represented (California) states amounts in 1990 to 1148$ (current dollars) per capita, which is equivalent to approximately one third of the total spending of Wyoming in that year. They estimate that California would gain an additional $25 billion of federal spending if their number of senators were proportional to the state population size. The estimated coefficients of senators per capita from other empirical studies point to similar magnitudes (Wright (1974); Wallis (1998); Larcinese et al. (2006)). Is small Wyoming really so much more powerful than California as current empirical investigations seem to suggest? If this is the case, should the

[2] Lee (1998), using Bickers and Stein (1991) data on domestic outlays from 1983 to 1990, finds evidence of overspending in small states for non-discretionary distributive programmes that are allocated via formulas determined by the Congress. Hoover and Pecorino (2005), considering a different time period (1983-1999) and a broad range of spending aggregates, find that states' representation in the Senate is positively related with total per capita outlays as well as with procurement, grants, wages and pensions. They, however, find a negative impact of House representation. Finally, Knight (2004) does not find a strong effect for Senate overrepresentation on aggregate spending, although he does on earmarked projects: the effect is particularly strong if the earmark comes from the Senate. Hauk and Wacziag (2007), using the authorizations from the 2005 Highway Bill, confirm the existence of an overrepresentation effect on transportation earmarks. At district level, Ansolabehere et al. (2002) analyze the effect of unequal representation prior to 1960 and the equalizing impact on state transfers to counties following the court-ordered redistricting in the 1960s.

[3] Studies that use very specific spending aggregates (Knight (2004), Hauk and Wacziag (2007)) or exploit exogenous variations in representation (Ansolabehere et al. (2002)) are less likely to be affected by the same identification problems.

equal representation principle within the Senate be addressed as a serious flaw of the US constitution?[4]

We provide new evidence that questions the relevance of malapportionment in the US budget allocation process. We show that, while state population has undoubtedly a large negative effect on total per capita spending, only a fraction of this effect, if any at all, is actually due to over-representation. Instead, what the current literature interprets as the effect of malapportionment is in large part due to state specific trends associated with population dynamics. This conclusion is driven by two main findings. First, the coefficient of senators per capita becomes completely insignificant if we appropriately control for state specific trends and state specific population dynamics. Second, fast growing states are penalized in the allocation of the federal pie independently of whether they are large or small. This last result is particularly intriguing and provides support towards the concerns voiced by several representatives of fast growing states complaining about the unfair treatment of their states in the allocation of the federal budget.[5] In fact, according to our estimates, the budgetary loss for fast growing states is sizable. For example, the seven fastest growing states lost on average between 3% and 18% of their budget during the period 1978-2002.

The factors that can be responsible for this important distortion are numerous and can be traced back to the way the budget allocations are actually determined. First, reallocations of funds are limited by the lack of information available for the drafting of the yearly budget.[6] For example, several programs rely on outdated census data to distribute funds across states.[7] Second, for formula programs, the responsiveness of the budget to population changes is often substantially reduced by specific rules, such as for example "hold harmless provisions" (which guarantee fixed shares of past allocations) and upper and lower bound limits to specific formula components. Third, for programs with an entitlement nature, the response of yearly budget allocation to population dynamics is also affected by its demographic components. For any given increase in population, entitlement spending per capita decreases in States where the population growth is concentrated among social groups not qualifying for entitlements and viceversa.

[4] For a critical view on Senate representation in the US constitution see Dahl (2002).

[5] Several pieces of legislation introduced in Congress between 1989 and 1993 by the representatives of Florida, Arizona and California point out that the budget allocation based on decennial census data penalizes fast growing states. (Fair share act of 1989, 1992 and 1993. source: The library of Congress, http://thomas.loc.gov/)

[6] As posited by a voluminous literature of behavioral "incrementalist" theories of budgeting originated with Wildavsky (1964), the limited temporal, financial and cognitive resources available in each year do not allow a rigorous re-examination of the current budget which is then determined by marginal changes to past budgetary allocations.

[7] For an official report see "Federal Formula Programs: outdated population data used to allocate most funds" (GAO 1990).

Focusing on specific spending aggregates we find evidence consistent with these mechanisms of budgetary inertia. In particular, fast growing states are penalized in the allocation of federal grants, in which formulas play a primary role, as well as in the distribution of direct payments to individuals, which consist mainly of entitlements.[8] We find instead some evidence of a small state advantage in defense spending, although of a rather small size.

Our analysis reveals that a substantial degree of inertia reins in the allocation of the budget implying that the growth (decrease) in population is typically not compensated by a proportional increment (decrease) in federal spending, thus determining a decrease in spending per capita in states with a fast-growing population, and an increase in states where the population decreases or grows slowly. Therefore, the procedures that make public spending not sufficiently responsive to population changes are responsible for a large part of the distortions that are currently interpreted as a consequence of malapportionment.

# 2 Over-representation and federal spending: identification problems

Population size varies considerably across US states and so does per capita Senate representation. Table 1 reports an index of average Senate and House over-representation by state during the period 1978-2002.[9] Under or over-representation is determined by comparison with a fair representation given by the ratio between the total members of the House (or Senate) and the total US population in a given year.[10] States are ordered by average population in the period 1978-2002 (starting with the smallest) and obviously smaller states are overrepresented in the Senate. In the House, however, this phenomenon is negligible and not correlated with the population size of a state. Table 1 also reports average federal spending per capita by state in the period considered, showing that there is no clear pattern linking Senate over-representation and spending. This can be seen graphically in Figure 1, where the states are ordered along the horizontal axis according to their average population in the period considered, while on the vertical axis we report average per capita outlays.

[8] This last finding provides a plausible explanation for the inverse relationship between population and direct payments to individuals, solving one of the most striking puzzles associated with the AGHZ specification, which predicts a large and significant impact of overrepresentation on this hardly targetable spending item.

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

[10] More specifically, define $N_{st}$ as the population of state $s$ in year $t$ and $USpop_t$ as the total US population (in the 48 states considered) in year $t$. Then the overrepresentation index in year $t$ for the Senate is given by $\frac{2}{N_{st}}/\frac{96}{USpop_t} = \frac{USpop_t}{48*N_{st}}$, while for the House is $\frac{hm_{st}}{N_{st}}/\frac{432}{USpop_{st}}$, where $hm_{st}$ is the number of House representatives of state $s$ in year $t$ and 432 is the total number of representatives when Alaska and Hawaii are excluded.

In the following we will focus on the Senate.[11] First of all, we estimate the effect of overrepresentation on spending following the AGHZ methodology and using Census data on total real per capita spending (outlays) for the US States during the period 1978-2002.[12] The results are reported in column 1 of Table 3. Similarly to AGHZ, we find that the impact of senators per capita on federal spending is large and statistically significant.[13] The implied magnitudes are also relatively similar to what has been found by AGHZ and the subsequent literature.

Given the magnitude of these effects, it is legitimate at this point to ask what exactly is being estimated with this procedure. Since the number of Senators is fixed and equal to 2 for all states, the variable $SP$ in equation 1 is simply a constant divided by the population. In other words, $SP$ varies over time for a given state only because population varies. Therefore, interpreting the coefficient of $SP$ as the impact of malapportionment is not an obvious step. In fact, changes in population can affect spending per capita for many reasons, and a negative coefficient of senators per capita only tells us that there is an inverse relationship between federal spending and population. How much of this inverse relationship (if any) is due to malapportionment remains moot.

To get a better understanding of how we should interpret this negative relationship, it becomes then important to clarify how spending per capita and population are related. Changes in the population of the states imply changes in their per capita federal budget allocations via two main channels. First, states may receive different amounts of spending because they differ in their population sizes (*scale effect*). Second, independently of their size, their spending allocation can vary because of pure population dynamics (*change effect*). Differences in spending per capita due to the *scale effect* may arise because states are differently represented in the Senate (as claimed by AGHZ), but also as a consequence of economies of scale in the provision of goods and services financed by the federal spending. In addition to these two different scale effects, an inverse relationship between spending per capita and population can also be observed - independently of the size of the states - whenever yearly changes in per capita spending do not

[11] All our estimates have also been replicated by including House representatives per capita. Consistently with other studies, the coefficient of House representatives per capita is sometimes positive, more often negative, and never statistically significant at any acceptable level. The rather peculiar result of AGHZ concerning the House representation remains puzzling and should probably only be considered a sampling accident. The results on Senate overrepresentation remain unaffected by the introduction of House representatives per capita.

[12] The summary statistics for population, senators and house members percapita and real federal outlays by spending categories are reported in Table 2.

[13] The significance of $SP$, however, disappears if the fixed effects are removed, consistently with Knight (2004) who also finds a very modest impact of overrepresentation in cross-section regressions. The same result can be obtained from yearly cross-section regressions and when using the between estimator. These estimates are not reported but are available from the authors upon request.

exactly reflect yearly changes in population. In this case, fast growing states, independently of their size, could see a decline of per capita spending because budgetary provisions do not adequately respond to population trends. Hence, when we observe an inverse relationship between spending and population it is difficult to understand whether this is due to scale effects, such as over-representation and economies of scale, or to pure population dynamics irrespective of the size of the states.[14]

Having clarified that the coefficient of senators per capita cannot be interpreted (or not entirely, at least) as the effect of malapportionment, in the next section we try to disentangle the different role played by scale and change effects on spending.

# 3 Population dynamics and state-specific trends in federal spending

Many factors contribute to generate inertia in the allocation of the federal budget. First, as pointed out by incrementalist theories (Wildavsky (1964) ; Davis et al. (1966); Dempster and Wildavsky (1979)), the complexity of the budget implies that new provisions are determined mainly by marginal changes to previous ones. Second, formulas play an important role in explaining budgetary inertia. For several programs, hold-harmless provisions guarantee to the states a given share of past spending irrespective of any variation in their circumstances.[15] Similarly, upper and lower limits in specific formula inputs constrain the outcome that would be generated by the basic formula.[16] Finally, the use of outdated population data in formulas penalizes states whose population grows fast.[17]

[14] Another important point in this regard is whether, besides senators percapita, population should also be included in the regressions. The estimated equation would then become $FEDEXP_{st} = \gamma * SP_{st} + \phi * POP_{st} + \boldsymbol{\theta}\mathbf{Z}_{st} + \alpha_s + \beta_t + \epsilon_{st}$, where $POP_{st}$ stands for population in state $s$ year $t$. Including a linear population term we have that $\frac{\partial FEDEXP}{\partial POP} = -\left(\frac{2\gamma}{POP^2} - \phi\right)$, while, without it, the same derivative would be $-\frac{2\gamma}{POP^2}$. Hence, including a linear population term along with senators percapita amounts merely to choosing a slightly different functional form, whereby the hyperbolic effect of population through SP is translated by a linear term. However, and more importantly, the fundamental identification problem remains unaffected by whether or not a linear population term is included. Not surprisingly, therefore, our estimate of the coefficient of senators per capita is not affected by whether a linear population term is included or not.

[15] For example, a 100% hold harmless provision is currently in place for the Title I education program and the WIC (Women, Infant and Children). For a detailed report on formula programs see CNSTAT (2003).

[16] For example, the Title I education program state expenditure per pupil is restricted to a range between 80% and 120% of the national average per pupil expenditure. In the special education program no children may receive more than 40% of the average per pupil expenditure in US public elementary and secondary school. Other important programs subject to limits are the Federal Highway Program and Medicaid.

[17] In a recent testimony (26 february, 2008) to Congress concerning State Children's Health Insurance program (SCHIP), the governor of Georgia Sonny Perdue states that "The current funding formula is also flawed because it hurts fast growing states, like Georgia, by lagging behind by as much as four years in factoring in quickly

The budgetary inertia introduced by these mechanisms can have important consequences since the US states are remarkably different in terms of population dynamics. During the period we consider (1978-2002), for example, the population of Nevada increased by three times, that of Florida and Arizona by two. At the same time, in states like West Virginia, North Dakota, Iowa or Pennsylvania the population in 2002 is either slightly below or just slightly above the level of 1978.

To describe the population dynamics of the states independently of their size, we construct a *scale independent* index of population change dividing the population of every year by the population of a given base year (1978). Hence, in 1978 the index ($POPIND$) is equal to 100 for all states, and in all the other years the index will measure the deviation of the state population from the same base year. The pattern for all states during the entire period is summarized in Figure 2, where we report the index for our 48 US states during the period 1978-2002. As we can see, states display very distinct patterns. Moreover, large, medium or small states can be equally found among the fastest growing as well as the slowest growing states. For example, among the three fastest growing states, we have Nevada with an average population of 1.2 million during the period 1978-2002, Arizona with 3.7 million and Florida with 12.7 million. Similarly, among slow-growing states we have New York with an average population of 18 million, as well as Connecticut with 3.2 million and North Dakota with 0.6 million.

Our next step is to analyze the evolution of spending per capita over time and understand how it is related to population dynamics. In Table 4 we show the estimated state trends for federal outlays per capita during the period 1978-2002. In most states the trend is positive and significant at 5% or 1% levels. In four states only (Connecticut, Washington, New Hampshire, and Utah) the estimated trend is not significant. For states where a positive trend is observed, the implied growth rate of federal outlays varies considerably, with estimated coefficient values in the range 0.0065-0.08. This leads us to formulate the hypothesis that a state-trend variable is missing in equation (1). Also, the correlation coefficient between senators per capita and the trend variable is almost always bigger than 0.95, which means that omitting state specific trends from equation (1) can introduce a bias in the estimated coefficient of senators per capita.

A closer inspection of spending per capita in different states reveals that spending trends are also highly related to the different population dynamics. A simple graphical analysis can

changing population numbers. In our 2007 fiscal year, the federal government was using population numbers from 2004, 2003 and as far back as 2002. Georgia has grown by almost a million peoples since 2002. We need data that is reflective of the actual population and need." (source: http:\gov.georgia.gov accessed on April 20 2008).

illustrate the relationship between spending per capita and state population quite effectively. We construct two indices that capture for each state the evolution over time of their respective spending and population shares (of the US total).[18] An increase in an index above 100 means that the state has a higher share of the US total compared to its 1978 share. The evolution of these two indices over time, reported in Figures 3a and 3b, shows a remarkable degree of divergence: an above average increase in population is almost always mirrored by a below average increase in federal spending per capita. For example, California and Texas are two under-represented states with fast growing population and correspondingly decreasing federal spending per capita. Pennsylvania and Ohio are also heavily under-represented, but with a decreasing population: they display an increase in the federal spending index, i.e. an above average growth in spending per capita. Similar patterns can be seen among over-represented states. In Wyoming the population is growing fast until the mid-eighties and its share of spending per capita is decreasing correspondingly. Once, however, the population decelerates its growth compared to national average, its share of spending per capita starts increasing. Utah has an increasing population share and a decreasing spending share, whereas the opposite holds in West Virginia. In Nevada - an over-represented state with the fastest growing population in the US - the spending index is always below its 1978 level and continously decreasing.

From this preliminary analysis we can conclude, first of all, that spending per capita is characterized by state-specific trends correlated with the number of senators per capita and, second, that the pattern of spending per capita is inversely correlated with scale independent population dynamics. Therefore, to obtain a better estimate of the scale effect (which is a proxy of over-representation) we need to remove the pure change effect of population dynamics from the estimated coefficient of senators per capita.

A first strategy consists of introducing state specific trends, $t_s$, in our basic specification[19] and, therefore, estimate the following equation:

$$\begin{aligned} FEDEXP_{st} &= \gamma SP_{st} + \boldsymbol{\theta}\mathbf{Z}_{st} + \alpha_s + t_s + \beta_t + \epsilon_{st}, \\ s &= 1, ...S; \quad t = 1, ..., T; \end{aligned} \tag{2}$$

[18] For spending we construct a size invariant index by dividing the state per capita spending in each year by its value in 1978. We also construct an analogous index for the overall spending in the United States. The ratio between the state spending index and its corresponding US index will then describe the relative change of spending in a state compared to the US average. We then construct an analogous index for the population of each state by dividing our previously computed scale independent index of population by its corresponding US index.

[19] We would like to thank an anounymous referee for suggesting this specification.

When we estimate equation (2), the results of AGHZ change dramatically and the coefficient of senators per capita becomes insignificant (column 2 of Table 3). However, the introduction of state-specific trends is both very demanding and nevertheless insufficient to isolate the effect of population dynamics, since other factors might be responsible for state specific trends in spending.

Hence, to remove the effect of pure population dynamics from the coefficient of senators per capita (which otherwise incorporates both the scale and the change effects), an alternative strategy consists of estimating an equation without state-specific trends but containing instead our scale independent state index of population change ($POPIND$), i.e.

$$\begin{aligned} FEDEXP_{st} &= \gamma SP_{st} + \psi POPIND_{st} + \boldsymbol{\theta} \mathbf{Z}_{st} + \alpha_s + \beta_t + \epsilon_{st}, \\ s &= 1, ...S; \quad t = 1, ..., T; \end{aligned} \tag{3}$$

The results reported in column 3 of Table 3 show that the scale independent measure of population change is key to explain federal budget allocation to the states. The coefficient of $POPIND$ is negative and significant, implying that fast growing states are penalized in the allocation of the federal budget, independently of their size.[20] On the other hand, once we control for the scale independent population change, the coefficient of senators per capita becomes again insignificant (and its magnitude is reduced to about one third of the value estimated in column (1) of table 3).

The result on senators per capita obtained introducing $POPIND$ mirror quite well that obtained using the state specific trends, suggesting that those trends may, to a large extent, be linked to state-specific population dynamics. However, since state specific trends in spending can be driven by other factors,[21] as a further robustness check we run a regression where we introduce both the state specific trends and $POPIND$ (Table 3, column (4)). Once again, senators per capita is not significant, while the effect of $POPIND$ is reinforced.

This analysis leads to some important conclusions. First, states whose population grows faster are penalized in the budget allocation independently of whether they are large (and

[20] As a further robustness check, we also introduced an interaction term between senators percapita and the population index. This term should capture the possibility that small and large states have different bargaining power when they need to renegotiate their budgetary allocations due to their growing population. In turns out that this interaction term, as well as senators percapita, do not have any significant effect on spending, while the population index coefficient remains negative and significant.

[21] The influence that individual states can exert on federal programs may well explain the state-specificity of these trends. Individual states enjoy substantial discretion in promoting outreach or restricting access to welfare programs such as, for example, health care, unemployment benefits or education. For example, on medicaid, states have discretion in increasing access to other groups besides the ones automatically eligible and in excluding some types of immigrants.

hence under-represented in the Senate) or small (and hence over-represented): this suggests that the budget fails to respond to population changes at an adequate pace. Second, senators per capita is not a statistically significant explanatory variable when change and scale effects are separated. Conflating these two effects leads to a serious overestimation of the scale effect and, therefore, of the upper bound of the potential impact of over-representation. Finally, the impact of $POPIND$ on spending is of a realistic magnitude, unlike the implied size of senators per capita in the AGHZ specification. For example, the estimates of Table 3 (column 3) imply that, if in 1990 California had the same $POPIND$ of Wyoming (106.7) then, everything else being equal, California would receive \$174 per capita more than what predicted by using its actual $POPIND$ (134.2). This represents less than 5% of the actual California's per capita spending in 1990. In Table 5 we report the average gains and losses (in 1983 USD) implied by our estimates of the change effect reported in column (3) of Table 3. These have been computed by comparing, for each state, the predicted federal spending per capita implied by the average $POPIND$ in the state during the period 1978-2002, with the federal spending per capita that the state would receive if its $POPIND$ was equal to the US average during the same period. The most penalized state, Nevada, is the fastest growing state. Its average per capita loss per year is around 500 USD, or about 18% of its average budget. With the exception of very few states, however, most gains and losses are contained within 4% of the yearly average state budget. Moreover, gains and losses are not related to the population size of the states.

# 4 Disaggregated spending

Our analysis reveals that population dynamics play a crucial role in explaining the allocation of the federal budget to the States and that, while large states do not get disproportionately less spending than small ones, fast growing states receive significantly less than shrinking ones. Further insights can be obtained by analyzing disaggregated spending categories, since population dynamics is likely to play a different role in the various programs. We turn therefore to a brief analysis of specific spending aggregates by using the two sub-categories analyzed by AGHZ, i.e. direct payments to individuals and defense spending, plus the other sub-categories available from the statistical abstract of the United States, i.e. grants, salaries and procurements spending.

For some spending categories, such as defense, there is no reason to expect that population growth should play any particular role. For formula programs, such as grants – where population is an important input – fast growing states are typically penalized by formulas that impose restrictions on yearly funding changes, as well as by the use of outdated population data. The same can be said of salaries if spending in personnel to provide public goods and services does not grow at the same pace as the overall population growth. Direct payments to individuals could also be affected by different population dynamics as long as population growth may disproportionately concern individuals not qualifying as recipients. For example, since states with an above average population growth tend to have a much slower growth in their share of individuals aged above 65,[22] then fast growing states would be penalized in the allocation of entitlements per capita consisting for a substantial part of retirement spending.[23]

We first estimated the basic specification reported in equation (1) using the various aggregates as dependent variables (Table 6). The coefficient of senators per capita is positive in all the equations but it is statistically significant only in the case of direct payments to individuals, salaries and grants. It is instead insignificant in the case of defense and procurement spending, that are at least as likely to be subject to political pressures. Contrary to AGHZ, we find that the largest coefficient of senators per capita is obtained for direct payments to individuals: this result is particularly puzzling since it is difficult to explain why the number of senators per capita should have such an important effect on spending items that are hardly targetable or politically manipulable. Similarly to Hoover and Pecorino (2005) we find that the coefficient of over-representation in the procurement equation is positive and significant. This result, however, is not robust to clustering the standard errors at the state level.

Hence, we add first state specific trends[24] and then POPIND to the basic specification. The results are reported in Tables 7a and 7b, columns (1)-(5). For grants, direct payments to individuals, salaries and procurement, when we introduce either state-specific trends or POPIND, the coefficient of senators per capita becomes insignificant. Senators per capita displays a positive and significant coefficient on defense spending in one specification (table 7a, column 3). This effect is strongly significant but quite small in size: one standard deviation in senators per capita generates an extra transfer of approximately 72 USD per capita. This

[22] Nevada, for example, has a total population in 2002 which is three times its population in 1978, while its population above 65 is only 1.22 times the 1978 figure.

[23] Moreover, since entitlements include several important types of welfare benefits paid to persons, other disproportionate changes in the share of non-recipients may decrease the amount transferred percapita at the state level. For example, one of the most important welfare benefits is the the Aid to Families with Dependent Children (AFDC) program. The resources devoted to this program declined in real terms from the late 1960s through the 1990s. The Food Stamp and Medicaid programs grew in the early 70s causing the sum of these two and the AFDC to rise, but declining then in real terms after the mid-1970s. There is weak evidence that the decline of these programs is justified by the introduction of other substitutes (Moffitt (1990); Ribar and Wilhelm (1994)) and one explanation is that the decline in participation rates may play an important role (Moffitt (2003)). The analysis of participation rates and population dynamics for more specific spending programs goes beyond the scope of this paper, but it could be an interesting avenue for future research.

[24] Similarly to total federal spending, all the aggregates display significant state specific trends.

result is nevertheless coherent with the fact that defense spending, unlike direct payments to individuals and salaries, is among the most "manipulable" spending categories and, therefore, it is where it should be more likely to find the effects of over-representation. Even in this case, however, the interpretation of the small state advantage remains ambiguous since the coefficient of senators per capita can capture the effect of over-representation together with other scale effects. Concerning POPIND - as we can see in table 7b - the index has a negative and significant impact on direct payments to individuals, grants and salaries. On the other hand, as one would expect, population dynamics do not play any significant role in the defense and procurement regressions.[25]

Concluding this section, the patterns that can be found in more specific aggregates are overall consistent with the results obtained analyzing total federal spending. The impact of senators per capita appears to be stronger in less manipulable spending aggregates such as direct payments to individuals. However, when we introduce state specific trends, or a scale invariant population index, the effect disappears for all spending aggregates. The only exception is defense spending, where in fact there is no reason to expect a particularly important role for population dynamics. The impact of senators per capita on defense spending, even when is statistically significant, is quite small in size.

# 5 Conclusions

Our analysis shows that the emphasis usually given to the impact of Congress malapportionment on the distribution of the federal pie is exaggerated. The prevailing methodology inspired by the work of Atlas et al. (1995) suffers from fundamental identification problems and grossly overestimates the role of over-representation. In particular, using senators per capita as the main explanatory variable in spending regressions does not allow to isolate the role of small state advantage (scale effects like malapportionment or economies of scale) from that of population growth (change effect for a given population size). The reason is that, since there is no state variation in the number of senators, the explanatory variable is simply a monotonic function of population. Moreover any small state advantage found using this variable can be due to a number of factors (related to the population of a state) other than malapportionment. When

[25] If we introduce both the state specific trends and the scale invariant population index, the coefficient of senators per capita remains insignificant in all cases with the exception of the defense equation, where the coefficient of senators percapita is again positive and significant. The coefficient of POPIND is not significant for grants and salaries, whereas it is significant in the regressions of direct payments to individuals and procurement suggesting that other state specific trends not related to population dynamics may be at work. The results are available from the authors upon request.

controlling for the change effect, we find that the coefficient of senators per capita is never significant except, occasionally, for defense spending. Even in this case, the implied magnitudes are extremely modest and the scale effect captured by senators per capita is still only an upper bound of the potential malapportionment effect on defense.

Our analysis reveals that fast growing states are disadvantaged in the allocation of the federal budget independently of their size. This may in part be due to the difficulties of collecting and processing all the information necessary to guarantee to every state a fair share of the budget. However, even when such information is available, budgetary rules and formulas, whose determination is not isolated from the political process, can prevent fair reallocations of the budget. The recent reform of Title I education programs provides an emblematic example. To meet the increased education needs of fast growing states, decennial census data on population have been replaced by biennial census estimates. At the same time, senators of shrinking and slow growing states have managed to obtain the implementation of a 100% "hold harmless provision" that, in the absence of any significant increase in annual appropriations, has *de facto* neutralized the use of updated data, preventing the reallocation of funds toward more needy states. This shows how Congressmen are actively engaged in bargaining over the federal budget allocation to bring bacon home, and how rapid shifts in population can create an important divide between the interests of fast growing as opposed to shrinking or slow growing states. The redistributive effects associated with large population shifts open an important avenue for future research on the allocation of the federal budget to the states. Understanding how budgetary provisions for specific items are negotiated within Congress when large population changes occur, and whether they are affected by institutional and political features, such as committee representation, party politics and electoral considerations, are very fundamental questions that we leave for further investigation.

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Fig. 1: Real spending per capita and state overrepresentation

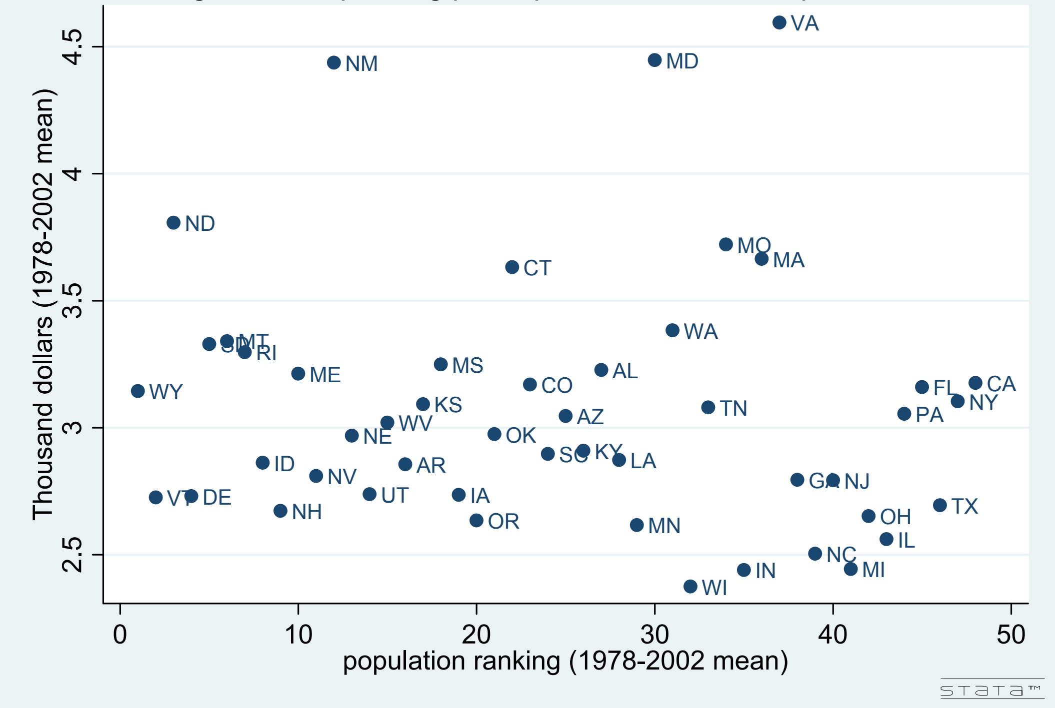

Fig. 2: State Population Index (base year: 1978)

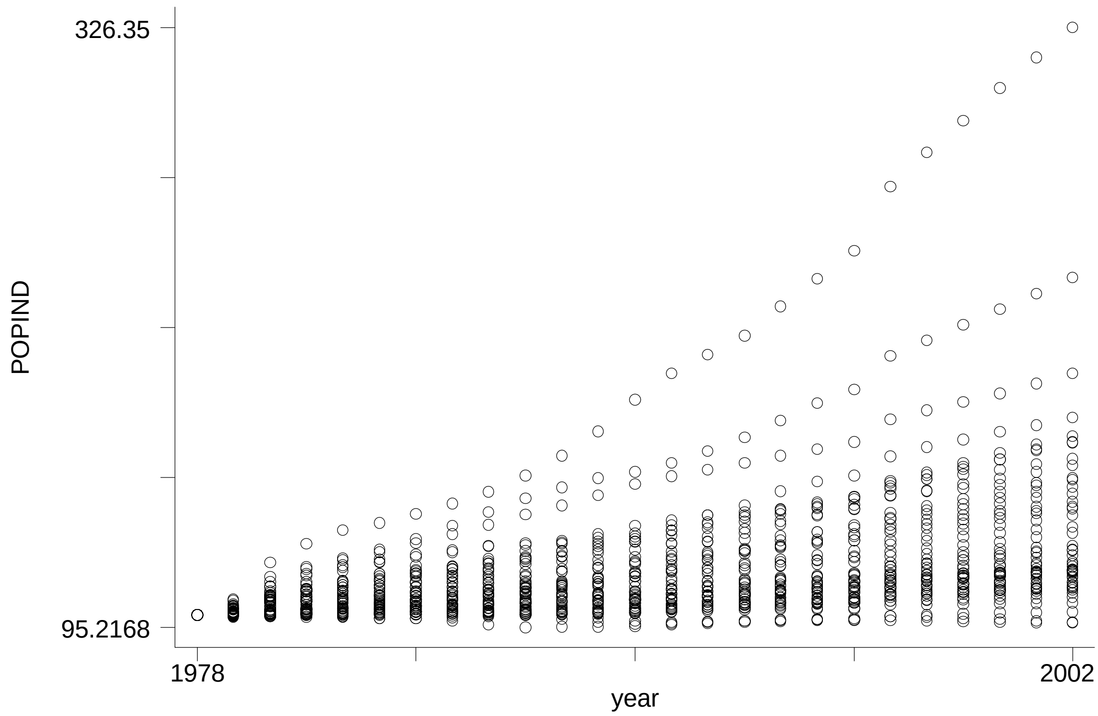

**Fig. 3a: State shares of population and state shares of federal spending (1978=100)**

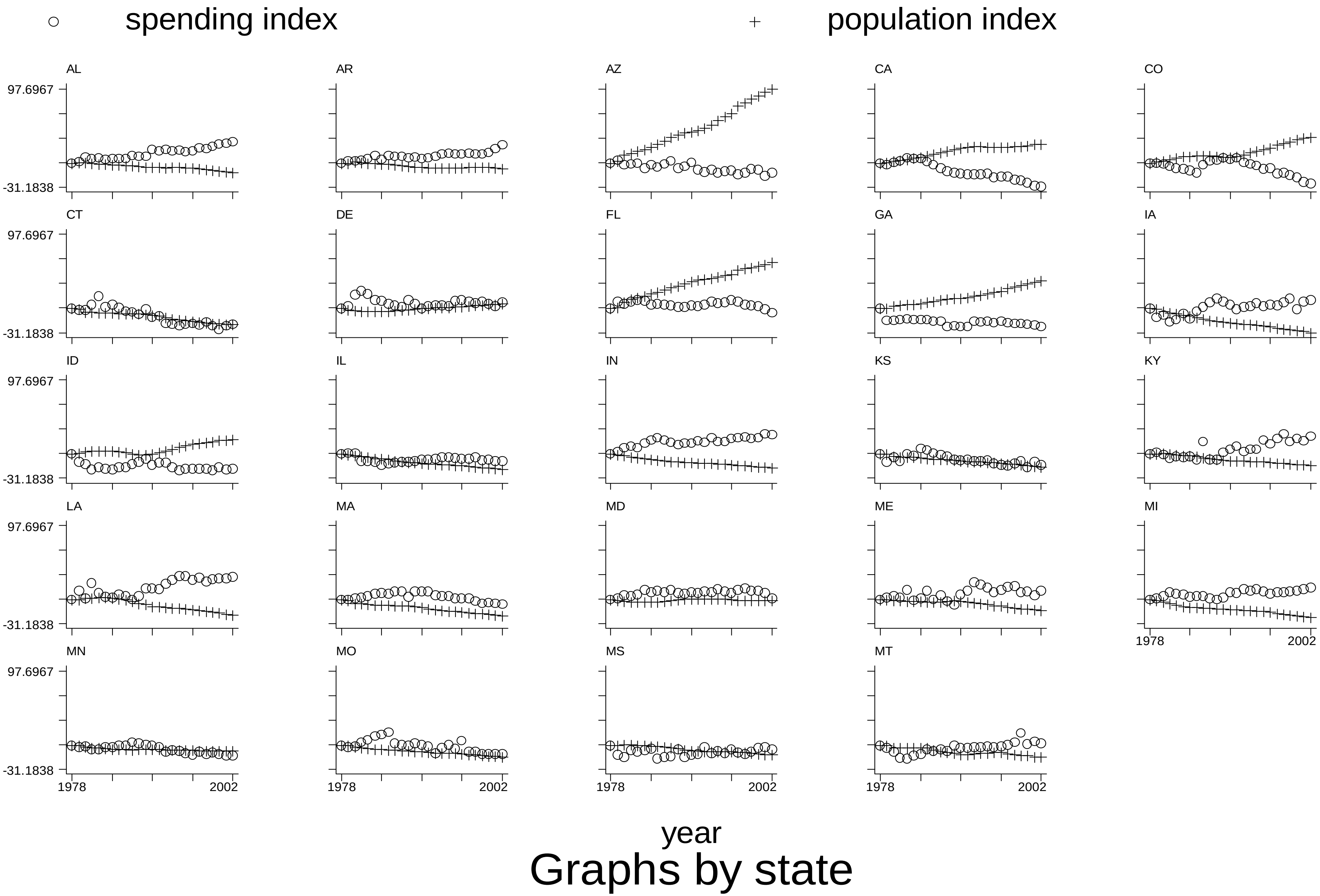

**Fig. 3b: State shares of population and state shares of federal spending (1978=100)**

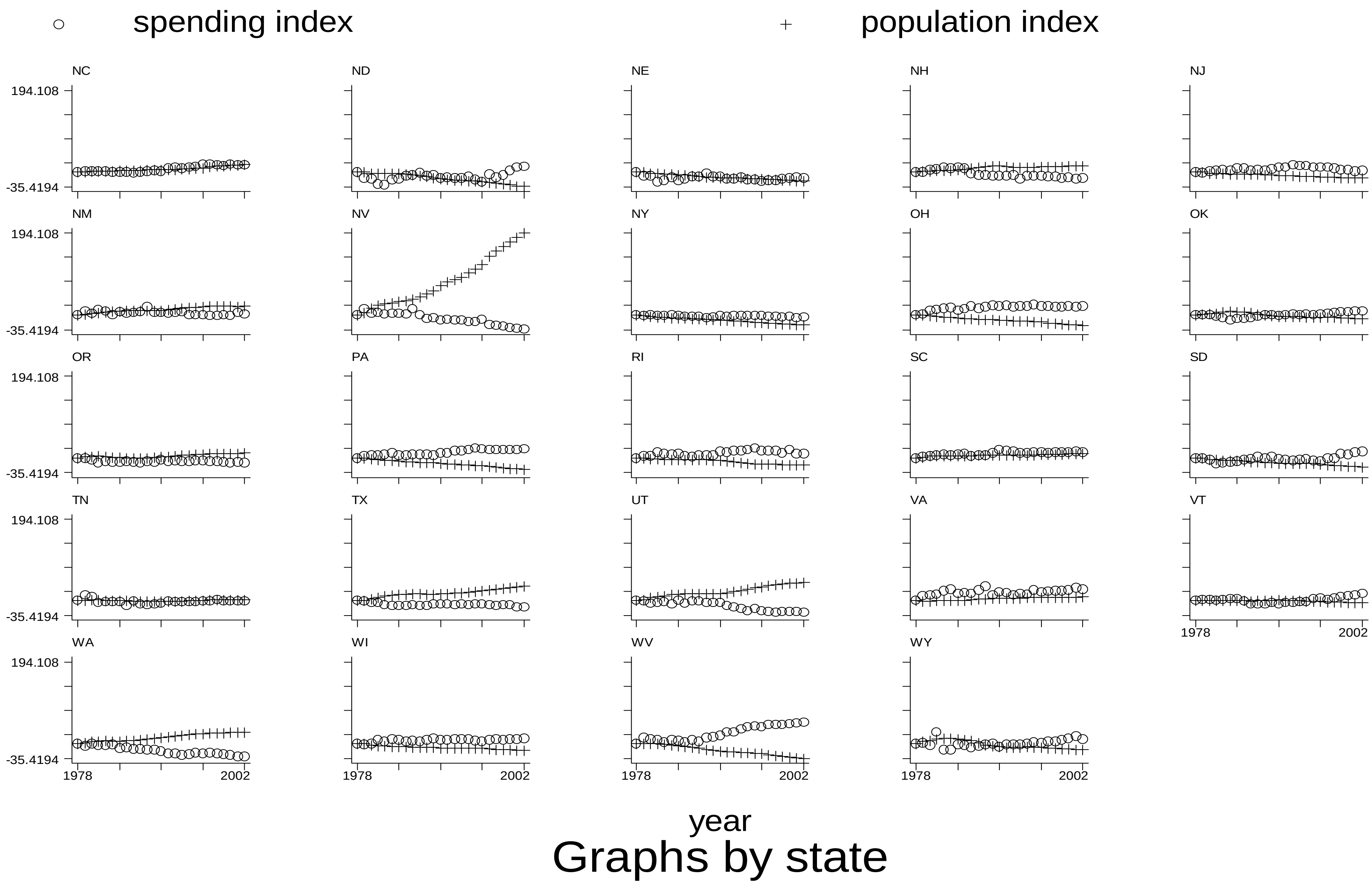

**Table 1: Average population, overrepresentation, and spending in the period 1978-2002**

| state | population (millions) | Senate overrepresentation | House overrepresentation | Federal spending per capita (real 1983 thousands USD) |
|---|---|---|---|---|
| WY | 0.480 | 10.844 | 1.205 | 3144 |
| VT | 0.558 | 9.305 | 1.034 | 2726 |
| ND | 0.651 | 7.995 | 0.888 | 3807 |
| DE | 0.677 | 7.692 | 0.855 | 2731 |
| SD | 0.715 | 7.254 | 0.956 | 3329 |
| MT | 0.836 | 6.210 | 1.097 | 3340 |
| RI | 0.993 | 5.227 | 1.162 | 3297 |
| ID | 1.080 | 4.838 | 1.075 | 2862 |
| NH | 1.082 | 4.820 | 1.071 | 2673 |
| ME | 1.204 | 4.310 | 0.958 | 3212 |
| NV | 1.302 | 4.376 | 0.839 | 2810 |
| NM | 1.553 | 3.364 | 1.041 | 4437 |
| NE | 1.618 | 3.207 | 1.069 | 2969 |
| UT | 1.812 | 2.904 | 0.896 | 2738 |
| WV | 1.851 | 2.815 | 1.113 | 3020 |
| AR | 2.419 | 2.146 | 0.954 | 2856 |
| KS | 2.511 | 2.066 | 1.053 | 3093 |
| MS | 2.639 | 1.966 | 1.092 | 3249 |
| IA | 2.856 | 1.820 | 1.126 | 2736 |
| OR | 2.942 | 1.772 | 0.945 | 2635 |
| OK | 3.235 | 1.605 | 1.070 | 2975 |
| CT | 3.260 | 1.592 | 1.061 | 3632 |
| CO | 3.499 | 1.499 | 0.963 | 3170 |
| SC | 3.523 | 1.477 | 0.985 | 2897 |
| KY | 3.781 | 1.372 | 1.004 | 2910 |
| AZ | 3.805 | 1.418 | 0.802 | 3046 |
| AL | 4.121 | 1.259 | 0.979 | 3227 |
| LA | 4.323 | 1.201 | 1.011 | 2873 |
| MN | 4.439 | 1.170 | 1.040 | 2617 |
| MD | 4.757 | 1.093 | 0.972 | 4447 |
| WA | 4.945 | 1.060 | 0.961 | 3383 |
| WI | 4.977 | 1.043 | 1.043 | 2375 |
| TN | 5.017 | 1.036 | 1.013 | 3080 |
| MO | 5.194 | 0.999 | 1.020 | 3721 |
| IN | 5.671 | 0.915 | 1.036 | 2440 |
| MA | 6.014 | 0.863 | 1.032 | 3664 |
| VA | 6.199 | 0.840 | 0.970 | 4595 |
| GA | 6.663 | 0.789 | 0.909 | 2795 |
| NC | 6.803 | 0.767 | 0.971 | 2504 |
| NJ | 7.826 | 0.663 | 1.015 | 2793 |
| MI | 9.447 | 0.549 | 1.059 | 2444 |
| OH | 10.978 | 0.473 | 1.078 | 2652 |
| IL | 11.711 | 0.443 | 1.060 | 2561 |
| PA | 11.978 | 0.433 | 1.084 | 3054 |
| FL | 12.854 | 0.412 | 0.893 | 3160 |
| TX | 17.447 | 0.300 | 0.917 | 2695 |
| NY | 18.125 | 0.286 | 1.071 | 3104 |
| CA | 29.102 | 0.180 | 0.944 | 3176 |

**Table 2: Summary Statistics**

| Variable | | Mean | Std. Dev. | Min | Max | Observations | |
|---|---|---|---|---|---|---|---|
| Population | overall | 5.20 | 5.48 | 0.43 | 35.12 | N = | 1200 |
| | between | | 5.47 | 0.48 | 29.10 | n = | 48 |
| | within | | 0.81 | -1.60 | 11.21 | T = | 25 |
| Senate overrepresentation | overall | 0.97 | 0.99 | 0.06 | 4.71 | N = | 1200 |
| | between | | 1.00 | 0.07 | 4.18 | n = | 48 |
| | within | | 0.13 | 0.16 | 2.25 | T = | 25 |
| House overrepresentation | overall | 1.76 | 0.24 | 0.92 | 2.90 | N = | 1200 |
| | between | | 0.14 | 1.42 | 2.09 | n = | 48 |
| | within | | 0.20 | 0.96 | 3.03 | T = | 25 |
| Federal Spending | overall | 3.08 | 0.61 | 1.79 | 5.68 | N = | 1200 |
| | between | | 0.50 | 2.37 | 4.60 | n = | 48 |
| | within | | 0.35 | 1.53 | 4.91 | T = | 25 |
| Direct Payments to individuals | overall | 1.58 | 0.33 | 0.80 | 3.53 | N = | 1200 |
| | between | | 0.18 | 1.12 | 2.07 | n = | 48 |
| | within | | 0.28 | 0.73 | 3.45 | T = | 25 |
| Grants | overall | 0.52 | 0.17 | 0.23 | 1.39 | N = | 1200 |
| | between | | 0.12 | 0.34 | 0.95 | n = | 48 |
| | within | | 0.12 | 0.26 | 1.04 | T = | 25 |
| Salaries | overall | 0.41 | 0.19 | 0.08 | 1.38 | N = | 1008 |
| | between | | 0.19 | 0.17 | 1.22 | n = | 48 |
| | within | | 0.05 | 0.06 | 0.57 | T = | 21 |
| Procurements | overall | 0.48 | 0.36 | 0.09 | 2.34 | N = | 1008 |
| | between | | 0.33 | 0.15 | 1.58 | n = | 48 |
| | within | | 0.16 | -0.16 | 1.58 | T = | 21 |
| Defense | overall | 0.54 | 0.36 | 0.06 | 2.51 | N = | 1200 |
| | between | | 0.34 | 0.11 | 1.99 | n = | 48 |
| | within | | 0.15 | -0.19 | 1.33 | T = | 25 |

All spending variables are expressed in real (1983) USD per capita

**Table 3: OLS regressions with real federal outlays per capita as dependent variable (1978-2002)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Dep. Variable | federal exp. | federal exp. | federal exp. | federal exp. |
| | | | | |
| senators per capita | 0.6984 | 0.0575 | 0.2311 | 0.0705 |
| | (5.64)*** | (0.28) | (1.38) | (0.27) |
| population index (POPIND) | | | -0.0063 | -0.0094 |
| | | | (3.66)*** | (2.07)** |
| income | -0.0685 | -0.0041 | -0.0757 | 0.0095 |
| | (1.99)* | (0.14) | (2.25)** | (0.36) |
| unemployment | -0.0004 | 0.0043 | -0.0002 | 0.0065 |
| | (0.03) | (0.46) | (0.01) | (0.72) |
| % aged above 65 | 13.5065 | 13.2514 | 10.3704 | 8.2209 |
| | (3.92)*** | (4.08)*** | (3.00)*** | (2.07)** |
| % in schooling age (5-17) | -9.4217 | -3.6479 | -8.6169 | -3.4728 |
| | (3.35)*** | (1.21) | (3.43)*** | (1.24) |
| | | | | |
| Constant | yes | yes | yes | yes |
| State specific trends | no | yes | no | yes |
| Year Dummies | yes | yes | yes | yes |
| State Fixed Effects | yes | yes | yes | yes |
| Observations | 1200 | 1200 | 1200 | 1200 |
| Overall R-squared | 0.9126 | 0.9450 | 0.9196 | 0.9460 |

Robust t statistics in parentheses from standard errors clustered by state

* significant at 10%; ** significant at 5%; *** significant at 1%

**Table 4: Federal outlays (real per capita) and State Trends 1978-2002.**

| stcode | trend | t statistics | correlation senatorsPC year | stcode | trend | t statistics | correlation senatorsPC year |
|---|---|---|---|---|---|---|---|
| | (1a) | (2a) | (3a) | | (1b) | (2b) | (3b) |
| AL | 0.060 | (16.16)*** | -0.98 | NC | 0.046 | (14.38)*** | -0.99 |
| AR | 0.045 | (11.29)*** | -0.96 | ND | 0.076 | (5.55)*** | 0.62 |
| AZ | 0.018 | (4.25)*** | -0.98 | NE | 0.030 | (3.88)*** | -0.87 |
| CA | -0.007 | (1.85)* | -0.97 | NH | 0.007 | (1.67) | -0.97 |
| CO | 0.016 | (2.14)** | -0.98 | NJ | 0.037 | (9.57)*** | -0.98 |
| CT | -0.009 | (1.54) | -0.95 | NM | 0.036 | (5.61)*** | -0.98 |
| DE | 0.024 | (7.84)*** | -0.99 | NV | -0.017 | (2.96)*** | -0.98 |
| FL | 0.029 | (8.86)*** | -0.97 | NY | 0.032 | (7.77)*** | -0.9 |
| GA | 0.025 | (4.22)*** | -0.99 | OH | 0.039 | (13.11)*** | -0.94 |
| IA | 0.053 | (8.30)*** | -0.02 | OK | 0.050 | (9.61)*** | -0.82 |
| ID | 0.027 | (4.14)*** | -0.97 | OR | 0.027 | (6.17)*** | -0.98 |
| IL | 0.030 | (6.26)*** | -0.92 | PA | 0.052 | (15.05)*** | -0.9 |
| IN | 0.039 | (13.05)*** | -0.94 | RI | 0.049 | (12.74)*** | -0.95 |
| KS | 0.019 | (3.51)*** | -0.99 | SC | 0.043 | (14.14)*** | -0.98 |
| KY | 0.061 | (10.50)*** | -0.94 | SD | 0.058 | (7.47)*** | -0.94 |
| LA | 0.057 | (11.62)*** | -0.67 | TN | 0.033 | (5.49)*** | -0.98 |
| MA | 0.029 | (5.07)*** | -0.95 | TX | 0.025 | (5.85)*** | -0.97 |
| MD | 0.055 | (12.22)*** | -0.99 | UT | -0.003 | (0.66) | -0.98 |
| ME | 0.049 | (8.13)*** | -0.97 | VA | 0.064 | (10.37)*** | -0.99 |
| MI | 0.036 | (11.59)*** | -0.9 | VT | 0.042 | (7.70)*** | -0.99 |
| MN | 0.017 | (4.37)*** | -0.99 | WA | -0.002 | (0.48) | -0.99 |
| MO | 0.017 | (2.70)** | -0.98 | WI | 0.033 | (12.12)*** | -0.97 |
| MS | 0.045 | (7.21)*** | -0.94 | WV | 0.079 | (16.00)*** | 0.74 |
| MT | 0.061 | (8.92)*** | -0.92 | WY | 0.051 | (6.56)*** | -0.38 |

Absolute value of t statistics in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%

Notes: In columns 1a and 1b we report the trend coefficient of the trend state regressions.

Column 2a and 2b report the t-statistics of the coefficient. Columns 3a and 3b report the correlation coefficient by state between senatorsPC and the trend variable.

**Table 5: Average federal spending per capita and population index: 1978-2002**

| State | population index *(average)* | average population *(millions)* | average spending *per capita (real 1983 USD)* | predicted difference: *per capita (real 1983 USD)* [1] | predicted difference: *total (real 1983 USD ml)* | predicted difference: *percentage of average spending* |
|---|---|---|---|---|---|---|
| NV | 195.43 | 1.22 | 2810 | -505 | -616 | -17.98 |
| AZ | 160.35 | 3.68 | 3046 | -284 | -1044 | -9.32 |
| FL | 148.41 | 13.02 | 3160 | -208 | -2713 | -6.60 |
| UT | 137.65 | 1.73 | 2738 | -140 | -243 | -5.13 |
| TX | 133.18 | 17.04 | 2695 | -112 | -1914 | -4.17 |
| GA | 131.28 | 6.51 | 2795 | -100 | -653 | -3.59 |
| CA | 130.50 | 29.93 | 3176 | -95 | -2854 | -3.00 |
| WA | 130.38 | 4.90 | 3383 | -95 | -464 | -2.80 |
| CO | 129.32 | 3.30 | 3170 | -88 | -290 | -2.77 |
| NM | 127.85 | 1.52 | 4437 | -79 | -119 | -1.77 |
| NH | 124.50 | 1.11 | 2673 | -57 | -64 | -2.15 |
| ID | 122.48 | 1.01 | 2862 | -45 | -45 | -1.56 |
| NC | 122.11 | 6.66 | 2504 | -42 | -282 | -1.69 |
| SC | 121.41 | 3.50 | 2897 | -38 | -133 | -1.31 |
| OR | 119.97 | 2.86 | 2635 | -29 | -83 | -1.10 |
| VA | 119.73 | 6.21 | 4595 | -27 | -170 | -0.60 |
| DE | 115.99 | 0.67 | 2731 | -4 | -3 | -0.14 |
| TN | 115.79 | 4.89 | 3080 | -3 | -12 | -0.08 |
| MD | 114.68 | 4.80 | 4447 | 4 | 21 | 0.10 |
| VT | 114.60 | 0.56 | 2726 | 5 | 3 | 0.18 |
| OK | 113.84 | 3.15 | 2975 | 10 | 31 | 0.33 |
| WY | 112.84 | 0.45 | 3144 | 16 | 7 | 0.51 |
| AR | 111.63 | 2.35 | 2856 | 24 | 56 | 0.83 |
| AL | 110.55 | 4.05 | 3227 | 31 | 124 | 0.95 |
| MN | 110.32 | 4.39 | 2617 | 32 | 140 | 1.22 |
| ME | 110.28 | 1.23 | 3212 | 32 | 40 | 1.00 |
| MS | 109.98 | 2.58 | 3249 | 34 | 88 | 1.05 |
| LA | 108.46 | 4.22 | 2873 | 44 | 185 | 1.52 |
| KY | 108.35 | 3.69 | 2910 | 44 | 164 | 1.53 |
| MO | 107.17 | 5.13 | 3721 | 52 | 266 | 1.39 |
| MT | 107.16 | 0.80 | 3340 | 52 | 42 | 1.55 |
| KS | 106.99 | 2.48 | 3093 | 53 | 131 | 1.71 |
| NJ | 106.99 | 7.76 | 2793 | 53 | 411 | 1.90 |
| RI | 106.53 | 1.00 | 3297 | 56 | 56 | 1.70 |
| WI | 106.28 | 4.90 | 2375 | 58 | 282 | 2.42 |
| IN | 105.29 | 5.56 | 2440 | 64 | 354 | 2.61 |
| CT | 104.61 | 3.29 | 3632 | 68 | 224 | 1.87 |
| IL | 104.56 | 11.45 | 2561 | 68 | 782 | 2.67 |
| MA | 104.22 | 6.02 | 3664 | 71 | 424 | 1.92 |
| SD | 103.68 | 0.70 | 3329 | 74 | 51 | 2.22 |
| NE | 103.15 | 1.58 | 2969 | 77 | 122 | 2.60 |
| MI | 102.90 | 9.31 | 2444 | 79 | 734 | 3.23 |
| OH | 102.59 | 10.86 | 2652 | 81 | 877 | 3.05 |
| NY | 102.40 | 18.00 | 3104 | 82 | 1476 | 2.64 |
| PA | 101.51 | 11.90 | 3054 | 88 | 1042 | 2.87 |
| ND | 99.71 | 0.64 | 3807 | 99 | 63 | 2.60 |
| WV | 99.47 | 1.79 | 3020 | 100 | 180 | 3.33 |
| IA | 98.28 | 2.78 | 2736 | 108 | 300 | 3.95 |

(1) The Average predicted difference is obtained by substracting the average state spending per capita predicted using the average US population index from the average state spending per capita predicted using the state average population index during the period 1978-2002.

**Table 6: OLS regressions with aggregates from the Statistical Abstract**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Dep. Variable | Direct payments | Grants | Salaries | Procurement | Defense |
| | | | | | |
| senators per capita | 0.3221 | 0.1721 | 0.1091 | 0.1832 | 0.0226 |
| | (3.56)*** | (3.97)*** | (2.57)** | (1.47) | (0.38) |
| income | -0.0259 | -0.0055 | 0.0032 | -0.0608 | -0.0560 |
| | (2.13)** | (0.76) | (0.58) | (1.46) | (1.74)* |
| unemployment | 0.0114 | 0.0077 | -0.0007 | -0.0163 | -0.0206 |
| | (2.04)** | (2.70)*** | (0.24) | (1.29) | (1.98)* |
| % aged above 65 | 7.7769 | 3.2110 | 0.2453 | 2.2666 | 1.0835 |
| | (2.92)*** | (3.92)*** | (0.22) | (0.56) | (0.35) |
| % in schooling age (5-17) | -3.0887 | -1.0248 | -0.4271 | -4.2245 | -3.7114 |
| | (2.60)** | (1.89)* | (0.58) | (2.23)** | (2.57)** |
| | | | | | |
| Constant | yes | yes | yes | yes | yes |
| State Specific trends | no | no | no | no | no |
| Year Dummies | yes | yes | yes | yes | yes |
| State Fixed Effects | yes | yes | yes | yes | yes |
| Observations | 1200 | 1200 | 1008 | 1008 | 1200 |
| R-squared | 0.9035 | 0.9195 | 0.9602 | 0.8631 | 0.8922 |

Robust t statistics in parentheses from standard errors clustered by state.

* significant at 10%; ** significant at 5%; *** significant at 1%

**Table 7a: OLS regressions with disaggregated spending and state specific trends**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Dep. Variable | Direct payments | Grants | Salaries | Procurement | Defense |
| Senators per capita | -0.1068 | -0.0951 | 0.0687 | 0.0236 | 0.2004 |
| | (1.00) | (1.40) | (1.55) | (0.10) | (2.20)** |
| Other controls[1] | yes | yes | yes | yes | yes |
| Constant | yes | yes | yes | yes | yes |
| State Specific trends | yes | yes | yes | yes | yes |
| Year Dummies | yes | yes | yes | yes | yes |
| State Fixed Effects | yes | yes | yes | yes | yes |
| Observations | 1200 | 1200 | 1008 | 1008 | 1200 |
| R-squared | 0.9565 | 0.9534 | 0.9863 | 0.9309 | 0.9439 |

Robust t statistics in parentheses from standard errors clustered by state.

* significant at 10%; ** significant at 5%; *** significant at 1%

0ther controls: income, unemployment, % aged (above 65), % in schooling age (5-17)

**Table 7b: OLS regressions with disaggregated spending without state specific trends**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Dep. Variable | Direct payments | Grants | Salaries | Procurement | Defense |
| Senators per capita | 0.0298 | 0.0497 | -0.0291 | 0.0421 | 0.0546 |
| | (0.30) | (0.94) | (0.42) | (0.27) | (0.46) |
| Population index | -0.0039 | -0.0017 | -0.0016 | -0.0017 | 0.0004 |
| | (3.34)*** | (3.40)*** | (2.59)** | (1.23) | (0.40) |
| Other controls[1] | yes | yes | yes | yes | yes |
| Constant | yes | yes | yes | yes | yes |
| Year Dummies | yes | yes | yes | yes | yes |
| State Fixed Effects | yes | yes | yes | yes | yes |
| Observations | 1200 | 1200 | 1008 | 1008 | 1200 |
| R-squared | 0.9128 | 0.9255 | 0.9639 | 0.8642 | 0.8923 |

Robust t statistics in parentheses from standard errors clustered by state.

* significant at 10%; ** significant at 5%; *** significant at 1%

0ther controls: income, unemployment, % aged (above 65), % in schooling age (5-17)

**Material for the Referee: regressions including both POPIND and state-specific trends**

| Dep. Variable | (6) Direct payments | (7) Grants | (8) Salaries | (9) Procurement | (10) Defense |
|---|---|---|---|---|---|
| senators per capita | -0.1020 | -0.0941 | 0.0672 | 0.0459 | 0.2054 |
| | (0.89) | (1.23) | (1.65) | (0.14) | (2.20)** |
| population index | -0.0035 | -0.0007 | 0.0006 | -0.0081 | -0.0036 |
| | (1.73)* | (0.65) | (0.61) | (2.22)** | (1.33) |
| income | -0.0139 | -0.0077 | 0.0069 | 0.0249 | 0.0397 |
| | (0.86) | (1.21) | (1.06) | (1.28) | (2.22)** |
| unemployment | 0.0091 | 0.0027 | 0.0030 | -0.0036 | -0.0089 |
| | (2.26)** | (1.43) | (1.79)* | (0.52) | (1.58) |
| % aged above 65 | 5.0530 | 2.3514 | -0.0085 | -1.1773 | -2.0704 |
| | (2.23)** | (1.89)* | (0.01) | (0.25) | (0.68) |
| % in schooling age (5-17) | -2.7728 | -0.6271 | 0.1649 | 2.8521 | 0.4801 |
| | (1.62) | (0.89) | (0.41) | (1.38) | (0.42) |
| Constant | yes | yes | yes | yes | yes |
| State Specific trends | yes | yes | yes | yes | yes |
| Year Dummies | yes | yes | yes | yes | yes |
| State Fixed Effects | yes | yes | yes | yes | yes |
| Observations | 1200 | 1200 | 1008 | 1008 | 1200 |
| R-squared | 0.9569 | 0.9535 | 0.9864 | 0.9322 | 0.9443 |

Robust t statistics in parentheses from standard errors clustered by state.

* significant at 10%; ** significant at 5%; *** significant at 1%