Transactions Costs and Coalition Stability under Majority Rule

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ABSTRACT:

In this paper we examine the discrepancy between theoretical predictions of unstable majorities and observed stability. Minimum winning coalitions divide program benefits among their members, creating incentives for those left out to entice defection by offering rewards to those who leave and form a different coalition. New coalitions emerge, leading to cyclical majorities, short-term programs, and highly skewed distributions of program benefits. Empirical evidence, however, reveals much more program continuity and equal allocations than the theory suggests. We offer additional evidence of broad, stable sharing in many programs enacted by Congress by describing interstate distributions from the Federal Highway Trust Fund (HTF). The allocation formula for the HTF was initiated in 1916, but despite wide divergence across the states in growth of various economic factors over the rest of the twentieth century there were comparatively limited HTF allocation adjustments. We also examine overall federal expenditure and tax shares among the states from 1975 to 1997 and show that there has been a similar continuity in the interstate distribution of federal funds and taxes. To understand this observed stability and use of relatively egalitarian sharing rules, we emphasize the desire of politicians to minimize the high transactions costs of negotiating and enforcing political coalitions. Politicians have incentive to prevent unraveling of political agreements in order to avoid the costs of searching for new coalition partners, reaching agreement on the nature and distribution of program benefits and costs, and verifying compliance. Moreover, legislators seek to protect constituent benefits accruing from long-term programs that would be lost if coalitions unraveled. Accordingly, we argue that politicians assemble greater than minimum-sized coalitions to build broad political support for their legislative programs, offering benefits to a larger constituency in exchange for additional votes. Considerable negotiation over the distribution of program benefits and costs may be required, so that once agreements are reached, politicians will be loath to consider a major reallocation that could undermine the coalition.

I. Introduction

Under a majority voting rule, representatives of specific political districts must bargain with representatives of other districts to build a coalition for enacting legislation that benefits their narrow constituencies. But the theoretical public choice literature warns of potential for unstable majorities. Minimum winning coalitions divide program benefits just among their members, creating incentives for those left out to entice defection by offering rewards to those who leave and form a different coalition. New coalitions emerge, undermining the old ones, leading to cyclical majorities, short-term programs, and highly skewed distributions of program benefits (Mueller, 1989, pp. 181-97).[1] Despite these dire predictions, empirical evidence reveals much more program continuity and equal allocations than the theory suggests (Tullock, 1981). Stratmann (1996), for example, provides evidence of stable collective choices in Congress regarding pork barrel expenditures at the congressional district level from 1985 through 1990.

In an effort to explain the discrepancy between prediction and observation, researchers have pointed to institutional rules and practices in Congress. For example, the committee system provides a 'structure-induced equilibrium' that limits the possible range of vote trading and thereby, helps to maintain coalitions (Shepsle and Weingast, 1981a; Weingast and Marshall 1988). Further, universalist sharing of program benefits enlarges the winning coalition and extends its political support (Shepsle and Weingast, 1981b, Miller and Oppenheimer, 1982, Collie, 1988).[2]

In this paper, we offer additional evidence of broad, stable sharing in many programs enacted by Congress by describing interstate distributions from the Federal Highway Trust Fund (HTF). The

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[1] For summaries, see Enelow (1997) and Rae and Schickler (1997) on cycling and majority rule.

[2] Collie defines universalistic voting as those votes where at least 90 percent of the voting members vote in the same direction. Our emphasis in this paper, however, is on the share of distributive benefits.

allocation formula for the HTF was initiated in 1916, but despite wide divergence across the states in growth of various economic factors over the rest of the twentieth century, such as vehicle registration and population, that might have led to redirection of highway funds, there were comparatively limited HTF allocation adjustments. Analysis of state receipts from the HTF relative to tax payments into the fund reveals that some states collect much more than they contribute, whereas others pay in more than they receive. Even so, interstate ratios of HTF apportionments to payments have remained stable across the years, varying less than changes in highway use measures would suggest. Going beyond this specific program, we examine overall federal expenditure and tax shares among the states from 1975 to 1997 and show that there has been a similar continuity in the interstate distribution of federal funds and taxes. As with the highway program, there is broad, stable sharing of federal expenditures across the states, with some receiving more than they contribute in taxes to the federal government.

To better understand this observed stability and use of relatively egalitarian sharing rules and to go beyond existing explanations, we emphasize the desire of politicians to minimize the high transactions costs of negotiating and enforcing political coalitions. Politicians have incentive to prevent unraveling of political agreements in order to avoid the costs of searching for new coalition partners, reaching agreement on the nature and distribution of program benefits and costs, and verifying compliance. These activities detract from a legislator's ability to address other voter concerns. Moreover, legislators seek to protect constituent benefits accruing from long-term programs that would be lost if coalitions unraveled.[3] Accordingly, we argue that politicians assemble greater than minimum-sized coalitions to build broad political support for their legislative programs, offering benefits to a larger constituency in exchange for additional votes. Considerable negotiation over the distribution of program benefits and

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costs may be required, so that once agreements are reached, politicians will be loath to consider a major reallocation that could undermine the coalition.

A group of politicians directly interested in specific legislation may not be large enough to achieve enactment within the legislature. Under those circumstances, coalition members must engage in additional logrolling agreements with politicians interested in different legislation to exchange votes and extend political support enough for passage. This means that political coalitions can be far ranging, involving politicians and constituencies interested in seemingly unrelated legislation. Recognizing these linkages suggests the additional hazards for legislators of attempting major *ex post* adjustments in specific program allocations. Changes in the nature and distribution of benefits for one program, due to a breakdown in the initiating political coalition, could undermine the basis for previous logrolling agreements. Accordingly, politicians not only would have to reassemble a coalition for the narrow program, but also engage in new logrolling agreements to sustain a revised program.

The paper is organized as follows: The following section outlines the history of the HTF and demonstrates stability of programmatic shares. Section III examines stability within overall federal expenditures and taxes across the states, the SPEND/TAX ratios. Section IV discusses the explanations provided in the existing literature and then considers the importance of political transactions costs in coalition formation. In the concluding remarks section, we consider the implications program stability has for the performance of government and efficiency assessments.

II. The Federal Highway Trust Fund

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[3] See Hall (1987) for a discussion of how members of the House have an almost unlimited range of demands on their

The earliest comprehensive federal involvement in funding highways began with the Federal-Aid Road Act of 1916 (Pub. L. 64-355), and five years later, with the Federal Highway Act of 1921 (Pub. L. 67-212). To assemble political support for federal subsidies for road construction and maintenance throughout the country, funded by federal excise taxes on fuel, political bargains had to be struck. Early formula rules agreed to for distributing highway funds gave equal weight to state area, population, and length of postal routes.[4] The formula advantaged some states, so that other states paid more into the system than they received. Between 1916 through 1998, the year of the last major HTF legislation, there were periodic adjustments in the allocation formula, but parts of the basic framework remained. Indeed, the *same* formula was used for the first 40 years, between 1916 and 1956.[5] A modification for the new interstate highway system to give more weight to population and construction cost was added in 1956.[6] Other adjustments were made 26 years later in 1982 to create a separate Mass Transit Account, to insure that states received no less than 85 percent of their contribution to the HTF, and to include vehicle miles in the formula for distributing maintenance funds.[7] Some additional modifications in

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time and are constantly seeking ways to better allocate their limited time.

[4] The formula as codified in 1921 apportioned funds on the following basis: "One-third in the ratio which the area of each State bears to the total area of all the States; one-third in the ratio which the population of each State bears to the total population of all the States, as shown by the latest available Federal census; one-third in the ratio which the mileage of rural delivery routes and star routes in each State to the total mileage of rural delivery and star routes in all the states at the close of the next preceding fiscal year, as shown by certificate of the Post-master General...."(Pub. L.67-217).

[5] A provision for insuring that no state received less than .5% of annual apportionments was added early in 1921 and maintained through 1982.

[6] Although highway funds had been collected and distributed by the federal government since 1916, the separate Highway Trust Fund was created in 1956 by the Federal-Aid Highway Act of 1956 (Pub. L. 70-627). Federal-aid primary and secondary roads received apportionments according to the past formula. The interstate system included cost of completion variables and a provision that no state receive less than .75% of annual apportionments.

[7] The 85% figure was raised to 90% for 1990 and 90.5% in 1998.

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the allocation formula were made between 1983 and 1998, the year of the last major highway bill.[8] All in all, however, the basic distribution arrangement appears to have been maintained. It has provided a reliable flow of highway funds to constituents within each political jurisdiction long after the initiating coalition members passed from the scene.

To illustrate how this continuity was maintained, we examine two periods when internal pressures within the coalition threatened the basic allocation pattern: the inauguration of the interstate system and creation of a large highway trust fund in 1956 and the near completion of the interstate system in 1982 with a corresponding rise in political demands to redirect funds to mass transit. The legislative histories of these two HTF allocation adjustments reveals how modifications were made in a manner that minimized disruption to *status quo* distributions and thereby helped sustain the underlying political coalition for the highway program.

The new federal interstate highway system and a dramatic increase in annual federal expenditures from $25,000,000 to $175,000,000 under the Federal-Aid Highway Act of 1956 brought an effort in Congress by some legislators to give more weight to population and to add new variables to the distribution formula to address shifting highway 'needs' across the states. This adjustment would have reduced allocations to 31 states and increased it for 17.[9] During Congressional debate representatives of states, such as California, New Jersey, and Indiana that contributed more than they received (see Table 1), argued that the old allocation system had to be dropped to reflect new conditions. Some, like Senator Homer Capehart of Indiana, wanted emphasis on construction costs: "I

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[8] For an outline of the apportionment formulas across time, see U.S. Department of Transportation, <u>Highway Statistics</u>, various years. A history of the HTF and description of the various user taxes can be found in U.S. Department of Transportation (1998), and Department of Transportation (1999, pp. 31-35).

[9] See statement by Senator Robert Kerr of Oklahoma, *Congressional Record-Senate*, May 28, 1956, p. 9079.

can see only one proper basis upon which to arrive at a formula, and that is the number of miles and the number of lanes times the actual cost."[10] Senator Thomas Kuchel of California added: "We need to determine the basis on which the Federal Government can pay the cost of the construction. I argue that it is on the basis of need alone."[11] But supporters of the existing formula countered, emphasizing the ambiguity of need measures and the risks of scrapping long-standing practices. Senator Paul Douglas of Illinois asked: "If the allocations for the initial 2 years are based upon the estimates of cost by the States, will not that furnish an inducement for individual States to make their estimates of cost as high as possible, because the higher the estimate, the greater the share of the initial apportionment they will get?"[12] Senator Albert Gore of Tennessee added, "I say that Congress cannot and must not start the distribution of the vast sums involved in the bill in such a haphazard manner...No perfect formula can be devised. But the [existing] formula has the merit of being the legal formula for the distribution of the taxpayers' money. Moreover, it has the merit of having been tested and tried..."[13] Senator Robert Kerr of Oklahoma (a state that also contributed more than it received) asked: "Why leave a stable foundation of operation for the precarious and insecure situation in which 31 States would find themselves if they abandoned it or permitted it to be taken away from them..." Kerr referred to the proposed change as "revolutionary."[14] Finally, Senator Dennis Chavez of New Mexico emphasized the progress in highway construction that had been made over the 40 years of the existing formula: "...the Senator from Oklahoma is certainly correct when he says it is a tried and proven formula. All the

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[10] *Ibid.*, May 28, 1956, p. 9070.

[11] *Ibid.,* May 28, 1956, p. 9077.

[12] *Ibid.,* May 28, 1956, p. 9077.

[13] *Ibid.,* May 28, 1956, p. 9076.

[14] *Ibid.,* May 28, 1956, pp. 9079, 9201.

Senator from Connecticut has to do is to turn around and look at the red lines on the map [completed federal highways]. They illustrate what the formula has done.'[15] The Senate Committee on Public Works also emphasized the political risks to the highway program of replacing the old formula:

"...each State's share would depend in large measure upon its ability to convince the Bureau of Public Roads of the accuracy of its estimates. Whatever may be said about the efficiency of distribution of Federal funds on the basis of need, the committee considers it contrary to the public interest to initiate a policy of distributing Federal funds on the basis of what each State claims it needs" (U.S. Senate, Committee on Public Works, 1956, p. 3).

The *ex post* inclusion of 'need' variables into the highway allocation formula not only could have brought political disputes over definition and measurement, as the Senate Committee suggested, but it would have resulted in lower weight being assigned on the previous allocation variables and hence, led to a redistribution of program funds. This reallocation was explicitly addressed in the Senate debate. It seems clear that both factors could have undermined the political coalition that created the federal highway program. The Senate defeated the proposed replacement of the old formula to one based on needs, 55 to 27, with 13 abstaining.[16] In conference committee with the House, the old formula was kept, but modified to raise the weight given to population from 1/3 to ½ with a provision for construction costs to be considered only for allocating funds used in completing the interstate highway system, beginning in 1960. Funds for federal primary and secondary highways continued to be allocated according to the 1916 formula.[17]

Political pressure rose again for adjustment in the allocation formula in 1982 as the interstate highway system neared completion. This milestone was an important goal of the original political

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[15] *Ibid.,* May 28, 1956, p. 9080.

[16] *Ibid.,* May 29, 1956, p. 9203.

[17] *Ibid.,* June 26, 1956, p. 10964.

coalition, and after it was achieved, support for the highway program from representatives of states that contributed more than they received began to erode. Legislators from California, Texas, and Florida (all 'donor' states, Table 1) called for an equity adjustment in the allocation formula. Representative Bill Archer of Texas argued: "I recognize that there is a need for an Interstate System...but certainly over a 20-year period, when the State of Texas has received less than three-quarters of the money that it has paid in, there is a gross inequity..."[18] But Representative James Howard of New Jersey (a net 'donor' state at least through 1973) countered:

"...in developing this bill we did find that there is and has been throughout the history of the highway trust fund a discrepancy between the amount of money that certain States may contribute into the highway trust fund and the amount of money that they may receive...there was a national need for a major interstate highway network across the country...We cannot balance that out one to one. Otherwise we will have 50 separate highway situations in the country, good roads in one State and poor roads in another State." He went on to argue: "We need a national highway system, we need good roads in every State, if we are going to have commerce and safety in our transportation. And so we have to consider having a good national highway system. And if it is going to cost some States, like my own State, to have my people in New Jersey have safe, decent, good, efficient roads when they travel to other States, that is the way I would like it."[19]

Howard warned his colleagues against focusing too narrowly on how they were treated in the highway accounts when they were disproportionately benefited in other national programs. In the big picture, allocation adjustments in one dimension could require changes elsewhere that they might not want to consider:

"If we are going to talk about giving back, getting back everything we give, we could talk to the State of Texas and ask them how much of the billions of dollars in the Federal *Space* program that goes into

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[18] *Congressional Record-House*, December 6, 1982, p. 28914. For statements from legislators from other donor states, see also pages 28884 and 28915.

[19] *Ibid.,* December 6, 1982, pp. 28912, 28913, 28916.

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Texas would they like to share with New Jersey and some of the other States, or how many of our

farm States would like to share money from the *farm* program."[20]

The issue was resolved by increasing the gasoline tax by 5 cents per gallon to fund a Mass

Transit Account (1 cent of the increase) and to guarantee that no state would receive less than 85 % of

its contribution to the HTF. Since both changes were funded out of the new revenue from the tax

increase, Representative Howard could claim that "...this is an amendment that helps several States and

hurts *no* state."[21] No redistributions were required, and the highway coalition was maintained.

Additional logrolling trades, involving diverse issues, were made through amendments to the1982

highway bill that extended U.S. unemployment benefits, required states to allow much heavier trucks on

federal highways, granted tax deductions for conventions on U.S. cruise ships, gave tax benefits for

California utilities, and mandated funds from various other trust funds for reforestation, airport

appropriations, boat safety, and fisheries development.[22] These amendments illustrate the logrolling

trades that were part of enacting major highway legislation.

Other transfers from the HTF were made by legislation passed in 1990 and 1993 to reduce the

federal deficit. Importantly, these transfers involved across-the-board cuts and not in changes in the

interstate allocation formula. In this way, *status quo* positions remained, as all states shared in the

transfer according to the allocation formula. The Omnibus Budget Reallocation Act of 1990 (P.L. 101-

508) temporarily raised the gasoline tax by 5 cents per gallon with half of the resulting revenues directed

to the General Fund of the Treasury. Another fuel tax increase of 4.3 cents per gallon was enacted

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[20] *Ibid.,* December 6, 1982, p. 28916, emphasis added.

[21] *Ibid.,* December 6, 1982, p. 28913, emphasis added.

[22] *Congressional Quarterly*, Almanac, 97th Congress, 2nd Session, 1982, pp. 315-22.

effective October 1, 1993, by the Omnibus Budget Reconciliation Act of 1993 (P.L. 103-66) with the entire amount of the increase directed to the Treasury. As political pressure to reduce the deficit waned, however, members of Congress lobbied for the return of diverted highway tax funds to the HTF. The Taxpayer Relief Act of 1997 (P.L. 105-34) *redirected* the 4.3 cents tax that had been going to the Treasury back to the HTF effective October 1, 1997. This action underscores the importance politicians have assigned to maintaining a comparatively consistent stream of constituent benefits from the HTF.

Table 1 shows the ratio of the amount each state received from the HTF's Highway Account relative to its excise tax contributions to the fund for the periods 1956-73 and 1956-97.[23] **reword] The last row in Table 1, labeled 'Total' shows the ratio for the fund as a whole. Since there are years when the HTF pays out less than it takes in, and other years when the opposite is the case, the state observations for each year are normalized by dividing each state's ratio by the Total ratio for that year....[what to do about this stuff] Thus, the amount paid out over the long-run has exceeded the amount collected. In addition, the HTF typically runs a positive balance, and earns interest on those monies. Surpluses are added to the HTF to counter periods when disbursements exceed tax collections in order to maintain the trust fund.[24] The size of the numerator is determined by the allocation formula. Also included in the numerator are smaller amounts of discretionary funds within the HTF that Congressional committees allocate to the states.[25] The denominator is based on a state's contribution

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[23]These ratios are generally referred to as 'donor/donee ratios,' although they actually reflect the ratio of apportionments to excise tax payments. States that contribute more than they receive back are referred to as 'donor states.'

[24]The last row in Table 1, labeled 'Total,' shows the ratio for the fund as a whole. Since there are years when the HTF pays out less than it takes in, and other years when the opposite is the case, the state observations for each year are normalized by dividing each state's ratio by the Total ratio for that year.

[25] For a discussion of how these discretionary funds are used to influence votes on highway bills, see Evans (1994).

from taxes on highway motor fuel, truck tires, sales of trucks and trailers, and heavy vehicle use. The table reveals the broad sharing in the benefits of the highway program that occurred over the years, including even remote states, like Alaska and Hawaii, that might not obviously be part of an interstate highway system. The table also shows that some states, such as Alaska, with a ratio of 6.69 for the entire period 1956-97, Hawaii, Montana, West Virginia, Rhode Island, and Vermont, experienced exceptionally high returns from the HTF, whereas other states, such as California, Oklahoma, North Carolina, Texas, and Michigan contributed more than they received.

The basic distribution of highway funds was determined when the initial highway coalition was assembled. As the legislative histories presented above indicate, once the coalition was established to create a national highway system politicians were reluctant to fundamentally change the interstate distribution of funds. As a result, the ratios of apportionments to taxes presented in Table 1 should be stable across time. An immediate problem that has to be resolved is the selection of the statistical technique. Although the term stability implies stability over time, there are two dimensions to this problem. First, there is the issue of whether the means and variances of the ratios have changed over time. If the underlying distributions have changed, that would indicate that the allocation scheme has changed. Failure to find a significant change, however, does not imply stability of individual state shares, as winners can replace losers while the underlying distribution remains unaltered. Thus, the second issue revolves around the stability of states' shares over time.

Table 2 provides descriptive statistics for the HTF for each year in the sample, from 1974-97.[26] The mean apportionment/tax ratio for each year is substantially above unity, reflecting the fact that many

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[26] Annual state level ratio data are apparently available only from 1974 on. We searched data bases for the Federal Highway Administration and contacted the National Transportation Library, but no additional annual data were forthcoming.

states enjoy an advantage in the allocation of funds. It is also readily apparent that the distribution of the ratios is highly skewed to the right in each year of the sample for the same reason. Tests for the equality of the means of the ratios in each year yields an F-statistics of 0.189, degrees of freedom (23, 1176). The critical value at the 5 percent level is 1.76, thus we cannot reject equality for the ratio means. A Brown and Forsythe test for the equality of the variances between the series yields a statistic of 0.231, and this measure fails to reject equality of the variances. Other tests were performed, such as excluding Alaska and Hawaii from the sample and testing for a break in the sample with the introduction of the Mass Transit Account in 1982 described above. Taken collectively, however, these tests consistently indicate that the underlying HTF distributions reflected in the apportionment/tax ratios have remained stable over time.[27]

A problem with only examining the stability of the underlying distributions is that they only examining the stability of the underlying distributions is that they may remain stable over time even if state shares are fluctuating widely from year to year. A simple, but yet direct test, of stability is to examine whether the past is a good predictor of the future. If past shares predict future shares, that is prima facie evidence of stability. Let the dependent variable be the state's average apportionment/tax ratio over the period 1974-97, and the explanatory variable equal the state's average ratio over the period 1956-73, as shown in Table 1. The regression results are:

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[27] Stratmann (1996) has proposed a unique test for cycling. Essentially, if there is substantial variance in allocations/outcomes on a periodic basis relative to the variance of the allocations, summed up over the entire period, that could be indicative of cyclical majorities. The underlying notion is that cycling generates stark differences between winners and losers in the short-run, but over the long-run the returns average out. A variant of his test as applied to the apportionment/tax ratios is to first compute the coefficients of variations for each year, sum these up, and then divide by 24. This provides an average measure of the amount of variation occurring annually. This measure can then be compared to the coefficient of variation derived by first computing the average ratio for each state over the 24 year period. Then, obtain the mean and standard deviation of these average ratios. Using the apportionment/tax ratios of the HTF, the coefficient of variation for the former measure is .713 and the latter, .655. While these results can not reject cycling, there is little difference between the two measures.

Apportionment/Tax Ratio$_i$ (1974-97)	=	0.34	+	0.70* Apportionment/Tax Ratio$_i$ (1956-73)
		(4.76)		(18.11)

(t-statistics in parentheses). Number of observations = 50. R-squared = .87.

The high R-squared term and high t-statistic for the coefficient on the explanatory variable indicate that the past is a good predictor, and stability is implied. The coefficient on the apportionment/tax ratio (1956-73) is less than unity, suggesting that some changes in the allocation scheme have occurred. The legislative histories of congressional debate over the distribution formula show that there was political pressure for gradual modification to direct funds to more populous states with growing highway demands. As a consequence, some states, such as Alaska, experienced a decline in their ratios. Additional testing revealed, however, that for the majority of states there was no statistically significant trend in their ratios.

Moreover, consistent with the above results, the apportionments received by each of the states have not been very sensitive to changes in key economic variables, such as motor vehicle registrations, that reflect highway use or 'need.' To see this, we regressed the log of annual apportionments by state from 1974 to 1997 against the log of motor vehicle registration, controlling for individual state effects.[28]

LogApportionment$_{ij}$	=	0.02 LogMotorVehicleRegis$_{ij}$
		(1.57)

(t-statistics in parentheses). Number of observations = 1200. R-squared = .90.

Although total apportionments expanded almost 40 percent in real terms over the 24-year period, a state's apportionments from the HTF were not elastic with respect to motor vehicle registration.[29] The estimated elasticity for apportionments with respect to motor vehicle registrations is close to zero and is not statistically significant. Of course it would be difficult for large states to experience substantial shifts

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[28] In addition to state fixed effects, state individual rho's were estimated and used to correct for auto correlation. The apportionment figures were deflated using the CPI.

[29] Inclusion of a trend variable does not affect the results.

as they are constrained by the aggregate size of the fund, but that too speaks to the stability of allocations from federal programs. Once the highway program was agreed to, it is evident that only minor manipulation of HTF distributions took place.

III. Stability in Overall Federal Expenditures and Taxes Across the States.

We have just examined the federal highway program, which has provided broad, stable shares of highway funds across the states since it was inaugurated in 1916. The funds have been disbursed through formulas that have not been drastically changed, even though the states have had divergent growth patterns in population and vehicle miles. Examination of aggregate federal expenditures and taxes across the states also reveals similar stability.

Consider Table 3 which shows the ratio of the amount of federal spending on all programs in each state divided by the amount of federal taxes collected in the state for the years 1975 and 1997. At first glance, there appears to be considerable variation in the SPEND/TAX ratios, and some state's have experienced substantial shifts in their rankings over time. Nevertheless, the simple correlation coefficient between the ratios for 1975 and 1997 is .74. The correlation coefficient using state rankings is .79. These results imply considerable continuity in overall federal tax and expenditure patterns over time.[30]

Other evidence besides the SPEND/TAX ratios reveals legislative stability. The analysis of congressional roll call voting by Poole and Rosenthal (1997) reveals that despite the wide array of issues faced by legislators over the past two hundred years, voting records are remarkably stable and predicable along one or two dimensions. Long-term variables, such as party and urban/rural

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[30] Although there is evidence of redistribution, from higher to lower incomes states (Peltzman, 1985), the allocation of federal funds is far more broad based than the simple game theory models suggest.

constituencies, appear to limit a politician's ability to switch coalitions.[31]   Similarly, Peacock and

Wiseman (1961) and Robert Higgs (1987) have noted that once government programs were enacted in

response to crises, they endured long after the crises have passed.

IV. Universal Sharing, Transactions Costs, and Program Stability

There is convincing evidence of universalist sharing and stability in the ratios of receipts to tax

payments across the states for the highway program and more broadly in aggregate federal allocations

and taxes. These conditions are inconsistent with predictions of cycling majorities in legislative coalitions

and corresponding fluctuation in the distribution of program benefits and costs . Awareness of the

potential for intransitivity of social choice under majority rule dates, at least, to the work of Marquis de

Condorcet in the late 18th century. He showed that an equilibrium may be nonexistent if a committee

uses majority rules to choose among a set of alternatives.[32] The search for conditions that would yield a

stable outcome has been one of the most intensely explored areas in public choice.

There are a number of factors that could encourage compliance with political agreements and

thereby limit coalition defection and vote cycling. One is the value of a legislator's reputation for

adherence. Presumably, if a legislator violated coalition agreements, he or she would not be viewed as

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[31] Koford (1990) analyzes multiple roll-call votes and argues that the consistency found by Poole and Rosenthal and others can be explained by a desire to minimize transactions costs in logrolling. He does not detail the nature of the transactions costs involved, but suggests that political parties have a huge stake in satisfying constituencies via successful coalitions.

[32] To illustrate the nature of the problem, consider the commonly-employed example of a legislature composed of an odd number of members, n. The task before the legislature is to divide a dollar among its members according to majority rule. For simplicity, let n=3, assume the status quo is 1/3 of the dollar to each member, and allow this allocation to be changed by majority vote. Suppose that legislator 1 and 2 decided to form a coalition and divide the dollar between themselves, .6 to legislator 1 and .4 to legislator 2. This outcome is clearly more attractive to legislators 1 and 2, but it immediately sets the stage for legislator 3 to approach legislator 2, who might now offer a .45/.55 split. While the Von Neumann-Morgenstern solution for this game (Luce and Raiffa ,1957, pp. 199-209) is a very non-egalitarian allocation of .5 to each of two legislators and zero to the other, it is not determinable which two will be winners. Moreover, the losing member, who gets nothing, will have an incentive to make a counter offer. Thus, the potential for a breakdown in the coalition, the formation of a new one, and its subsequent collapse seems high. These conditions lead to predictions of cycling in redistribution games.

trustworthy in negotiations and hence, not included in political bargains. Exclusion could be costly to the

politician's constituents because they would not share in program benefits if the legislation were written

around them. A politician considering defection, then, would have to weigh the costs to his constituents

of a damaged reputation with the benefits of joining a new coalition. If the new coalition can be formed

at low cost and the redistribution is significant, then it is conceivable that the constituent gains from

defection could outweigh the losses of membership in fewer future coalitions. Hence, the role of a

politician's reputation in maintaining coalition stability is not obvious. A test of the empirical importance

of reputation as a constraint on behavior is provided by examination of the votes of lame-duck

politicians relative to those facing re-election. It would seem that maintaining a reputation would be less

important for lame ducks and that they might behave opportunistically, voting for one-time gains for their

constituents through defection or for programs that satisfied their individual ideological tastes. Research,

however, on the behavior of last-period legislators does not reveal significant shifts in their voting

patterns (shirking).[33] Accordingly, while reputation may play a role in maintaining coalitions, its

theoretical and empirical contribution is unclear.

Legislative rules that protect committee proposals from alternation also could inhibit cycling.

These rules grant committee chairs and members agenda-controlling powers that favor their preferences

over those of the entire legislature (Shepsle and Weingast, 1981a; Gilligan and Krehbiel, 1987;

Weingast and Marshall, 1988). Since committee members tend to be more homogenous than the

legislature as a whole, signaled-peaked preferences, coupled with the gate-keeping actions of

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[33] Coleman (1983) in his article on trustworthiness suggested that there would be less stability in a lame duck
legislature. Lott (1987, 1990) examined whether or not last-period politicians indulged their ideological preferences
and voted for programs that were not in their constituents' interests when no longer constrained by re-election.
Other than some reduction in attendance rates, he found no significant change in voting patterns for politicians
about to retire.

committee chairs, could provide stability within the committee. There remains, however, the problem of enforcing agreements once legislation reaches the broader legislature. To secure passage in the entire chamber, committee members must engage in logrolling trades with other politicians. But as we have noted, logrolling coalitions are, themselves, subject to competitive unraveling. What then enforces those agreements?

Political reputations and committee structures, then, appear to be only part of the solution to the potential problem of cycling. We emphasize legislative design for universalist sharing of program benefits. Broad programmatic sharing expands the size of the constituent group that has a stake in the legislation and reduces the incentive of politicians to defect from the coalition. If the transactions costs of reassembling coalitions were very low, then universalist sharing would not be important, at least for maintaining agreements. If cycling occurred, coalitions could be restructured quickly, dropping some politicians and their constituents while adding others.[34] Under these circumstances, cycling would be associated with narrowly-shared, but repeatedly shifting benefit allocations. By contrast, if the transactions costs of searching for new coalition partners, negotiating the distribution of program benefits and costs, and monitoring compliance are high and if constituents demand long-term stable benefits, then universalist sharing becomes important for stability. Further, once broad distributions are agreed to, politicians will be reluctant to adjust them in an important way because of the threat of undermining the coalition agreement.

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[34] If transaction cost were zero, implying that information cost were zero, there would be no reason to expect cycling. Costless contracting and enforcement imply a stable equilibrium. Hence, cycling is most likely to occur where transaction costs are relatively low, but not equal to zero.

Avoiding cycling is not the motivation for universalism described in some of the key papers on the issue. Weingast (1979) and Shepsle and Weingast (1981b) argue that universal coalitions are preferred by legislators because of uncertainty regarding the make up of the winning coalition. Since no politician can be sure of membership, a more inclusive group is desired. Miller and Oppenheimer (1982) assert that fairness norms lead to more general sharing than would result from formation of a minimum winning coalition. Glazer and McMillan (1992) make more direct linkage between stability and universal sharing. They argue that narrow proposals appealing to a bare majority are especially vulnerable to amendments and hence are subject to costly renegotiation. Proposals that offer some benefits to a larger majority are less likely to be amended and are more stable and productive for constituents. Congleton and Tollison (1999) also note that uniform benefits to all voters increases stability. Broader coalitions raise the transactions costs of redistribution and reduce the incentive to change the status quo. They argue that inclusion of a transaction cost parameter in redistribution games can prevent cycling. In their framework, when the transaction cost parameter is sufficiently low, cycling may continue, resulting in a downward spiral and increased rent dissipation[35]

These papers are instructive, but they do not develop the importance of transactions costs as an incentive for stability to the degree described here, nor do they place the discussion into the context of an actual legislative setting, such as the Highway Trust Fund. Transaction cost analysis entails more than simply introducing a per-unit charge for each coalition formation. As HTF case reveals, transaction costs are complex and far reaching in their influence on politicians and political behavior. Indeed, as North

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[35] This outcome suggests implausible myopia among legislators. In examining the proposal and gate-keeping powers of committees Baron and Ferejohn (1989) argue that under an open amendment rule, the larger the discount factor facing legislators, the more egalitarian is the distribution of benefits. A summary of some of the literature on majority rule, cycling, and broad sharing is provided by Rae and Schickler (1997) and Stratmann (1997). Stratmann (1997, p. 334) adds discussion of transactions costs as contributing to stability.

(1990) has emphasized, transactions costs and efforts to reduce them shape the institutions (rules of the game) we observe in actual practice.

The notion of endless cycling ignores the cost to politicians of repeatedly forming and reforming coalitions. It also neglects the opportunity costs of failed coalitions and the loss of related government programs that bring valuable benefits to constituents. If transactions costs are positive, and they most assuredly are, endless cycling would at some point have to bankrupt legislators and government programs. Politicians would have to spend their time contacting, negotiating, and monitoring agreements, with little or no time to serve constituents. Further, the associated instability inherent in cycling would suggest that legislation involving long-term programs and allocations could never be enacted. With negative-sum redistribution games, welfare would be reduced as resources were continually used both by politicians in negotiation and renegotiation and by constituents in repeatedly adjusting to program instability.

Accordingly, our explanation for programmatic stability focuses on the high political and resource costs of allowing legislative deals to collapse. Coalitions do not fail in isolation. Because agreement among politicians directly concerned with a narrow program may not carry enough votes for passage, logrolling exchanges with politicians interested in other legislation are required. The basis for these trades, however, are placed at risk with any significant adjustment in program distributions. Gordon Tullock's (1981, p. 195) observation that, "congressional boodle is passed around more or less equally," across political jurisdictions within the United States is germane. The comparatively egalitarian outcome reflected in the SPEND/TAX ratios presented in Table 3 is the result of many logrolling exchanges where stable coalition formation requires assembling political support among many politicians and their

constituents.[36] The individual programs that make up the aggregate SPEND/TAX ratios need not, and likely do not, benefit all states in the same portion as the aggregate ratios. Constituencies and demands vary across political jurisdictions. But, individual programs are enacted as part of broader vote trades and logrolling so that no states are entirely left out. In this manner, all politicians have an interest in the maintenance of the various programs because their success affects the endurance of coalitions for other legislation. Accordingly, efforts to change, for example, agricultural programs must not only confront the congressional committee structure that Shepsle and Weingast point to as a stabilizing influence, but also all other politicians who participated in logrolling exchanges in the general legislature that involved agricultural legislation. Because of these far-reaching effects of coalition breakdown and the associated costs of reassembling new agreements across many legislative interests, politicians will resist major changes in programmatic sharing.

Transactions costs and universalist distributions provide a different explanation for the observed crisis/ratchet phenomena in the growth of government programs noted above. Higgs argues that these ratchets reflect shifts in ideology among voters toward greater acceptance of government intervention during a crisis and subsequent interest group dependence on transfers. These factors may play a role, but they do not consider the political bargaining underlying the adoption and possible elimination of government programs. Responding to new legislative demands during a crisis involves political

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[36]Accordingly, universalism and stability apply to both individual pieces of legislation and to larger legislative bargains. It might be argued that if cross-legislative deals support universality and stability there is no need for balance within a particular piece of legislation. But this notion is incorrect. As we argue, a lack of balance in a particular program would encourage coalition defection, undermining the basis for broader logrolling exchanges. Moreover, a small coalition for narrow legislation would rely even more on broad logrolling exchanges for enactment. The costs of devising logrolling exchanges across heterogeneous legislators likely are higher than forming agreements among the more homogeneous legislators interested in the narrow program. This suggests that politicians would form as large a coalition as possible in support of a specific bill before turning to broader logrolling exchanges to insure passage. An example of broad sharing within a narrow program is the distribution of ethanol plants planned under the early ethanol subsidy. 46 of 50 states were to receive at least one ethanol production plant, even though ethanol was primarily made from corn grown in the Midwest. See U.S. National Alcohol Fuels Commission (1981, p. 57).

agreements and logrolling trades among many politicians. Universalist sharing to build broad coalitions

suggests that a crisis will lead to an increase in expenditures, possibly accompanied by new programs, so

that all political jurisdictions benefit. The response to the crisis will not be allowed to upset the status quo

SPEND/TAX rankings by having only a few political jurisdictions receive the bulk of new spending. The

expansion of New Deal government programs in the 1930s appears to be consistent with this view.[37]

Once coalitions are assembled, there will be resistance to program cuts that threaten benefit streams.

Any adopted reductions will be spread across politicians and constituents, rather than reliance upon

elimination of a few programs. In this way, there will be universalist sharing in the reductions and a

maintenance of the general distribution of government benefits.[38] The high transactions costs of changing

major policies when there is broad sharing explains Douglass North's (1990) observation that

institutional change involving legislation takes place only incrementally without the wide swings suggested

by cyclical legislative majorities.

V. Concluding Remarks

Despite the near completion of the interstate highway network by the late 1970s and changing

demands that emphasized urban transient systems, allocations from the HTF have been remarkably

stable. A standard of stability is whether the past is a good predictor of the present. In the case of HTF

allocations, aggregate state HTF apportionment/tax ratios for 1956-73 are significant positive predictors

of 1974-97 state ratios, with the estimated coefficient .70. Further, comparing the stability of state

apportionments from 1974-97 to a relevant measure of highway use, motor vehicle registration, reveals

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[37] For analysis of the distribution of federal programs and expenditures during the New Deal, see Wallis (1998).

[38] Similarly, the dramatic reforms undertaken by New Zealand in the 1980s in response to a financial crisis led to broad-based cuts, rather than the elimination of a few programs. There appears to have been a universalist sharing of the expenditure reduction. For discussion regarding the sharing of budget cuts and policy reforms in Scrimgeour and Pasour (1996).

that state apportionments have not been elastic to changes in vehicle registration. Although HTF apportionments expanded by almost 40 percent in real terms between 1974 and 1997, the estimated elasticity for apportionments with respect to motor vehicle registration is close to zero and is not statistically significant. Hence, the apportionment series appears quite stable and is not responsive to shifts in a major highway use variable. Political factors determined the allocation scheme and politicians have been reluctant to importantly change interstate distributions.

We argue that the high transactions costs of coalition formation and maintenance contribute to program stability and that the opportunity costs of allowing logrolling exchanges to collapse induces members of Congress to avoid major programmatic changes associated with cycling majorities. While we do not provide a direct test of this hypothesis, HTF changes have been minor and incremental.[39] The general continuity of all federal distributions over time is revealed in the aggregate SPEND/TAX ratios from 1975-1997. There is no evidence of cycling. If cycling were to occur, it is more likely to take place in very small programs where the overall egalitarian sharing constraint does not matter much. The readjustment in other programs if the coalition surrounding a small program were to collapse could be minimal, and the logrolls that brought it about would be of little consequence to most legislators. In contrast, if the coalition surrounding a major program were to fail, the egalitarian constraint implies that either a new program must be assembled quickly to take its place or that a significant reallocation of all distributions must occur. Given the high transactions costs involved, the latter seems unlikely.

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[39] A direct test would require a measurable change in the transaction costs of negotiating and enforcing logrolling agreements along with observations of changes in sharing rules and/or stability. If, for example, political parties were adept at enforcing deals but subsequently lost that power, then the transactions costs of coalition maintenance should rise. Under these circumstances, elected representatives would respond by increasing the degree to which program benefits are shared. There is empirical support for this prediction. Collie's (1988) results indicate that as party power lessened in the post-war period, universalism increased.

Consideration of transactions costs in coalition negotiation and enforcement makes it more difficult to draw clear efficiency conclusions regarding government programs. Although the allocation rules adopted by Congress to preserve long-term political coalitions serve well the objectives of the elected members, they can generate outcomes that have little semblance to what most economists would consider efficient. But high costs for reaching an agreement, high policing costs, and the interrelated nature of logrolling exchanges constrain program changes, even as underlying demands change. For these reasons, the rules Congress adopts for allocating funds will generate outcomes that reflect heterogenous demands and side payments, rather than the expenditure of funds in a benefit-and-cost-effective manner.[40] The alternative to such programmatic sharing rules could be an inability to reach any stable agreement on long-term constituent programs.

To illustrate the nature of the problem, those who have examined universalistic distributions, such as Weingast, Shepsle, and Johnson (1981) and Inman and Rubinfeld (1997) have commented on the apparent inefficiency of such program allocations. But if minimizing the transactions costs of coalition formation and maintenance in an effort to assure long-term constituent benefits is a motivation for broad sharing rules, then these inefficiency conclusions may be inappropriate.[41] Clearly, transaction costs in politics are positive and we should not expect outcomes in either the market place or the political arena to lie along the same frontier as they would in the absence of these costs. Consideration of transactions costs, however, does not imply that outcomes examined on the basis of their apparent costs and benefits

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[40] Discussions of the consequences of universalism have also pointed to its potential for inefficient outcomes (Shepsle and Weingast, 1981).

[41] As argued in Johnson and Libecap (2001), once transactions costs are introduced, the standard concept of Pareto efficiency loses meaning. For discussion of some of the key issues regarding transactions costs and redistribution in politics, see (Williamson, 1996 pp. 195-213). Williamson (1998, pp. 11-6) attempts to resolve some of the conflicting issues regarding the efficiency of government policies by introducing a remediableness criterion for evaluating programs.

are of no value. Rather, it suggests that institutional change that would remedy the situation may be too costly to achieve.

In the empirical case at hand, a study by U.S. General Accounting Office (1995, pp. 21-4) reported that certain factors, such as rural population and highway mileage factors, used to allocate highway funds across the states were irrelevant or outdated and called for apportionments to be more reflective of a state's contribution to the HTF. As we have argued, while allocating funds to the states based on their contributions would seemingly yield the highest economic return, such criteria would not generate the political consensus necessary to achieve a national highway program.

The allocation rules for the HTF also conflict with those who have argued that user taxes and formula earmarking, as in the case of the federal excise tax on gasoline, are a means of generating *more* efficient outcomes. Teja (1991, 13-26) suggests that earmarked allocations are adopted to avoid perverse outcomes possible under general fund financing.[42] Our analysis suggests that the real motivation is the need to build political coalitions and maintain them. As such, any direct cost-benefit gains, in the traditional sense, may be little more than coincidental.

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[42]See, for example, the papers in Wagner (1991).

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Table 1. Ratios of Apportionments to Tax Payments, HTF

State	Cumulative 1956-73	Cumulative 1956-97
Alabama	1.15	1.11
Alaska	8.86	6.69

Arizona	1.48	1.17
Arkansas	0.89	0.99
California	0.84	0.95
Colorado	1.16	1.31
Connecticut	1.22	1.79
Delaware	1.31	1.5
Florida	0.66	0.89
Georgia	0.82	0.92
Hawaii	3.06	3.78
Idaho	1.59	1.72
Illinois	1.1	1.11
Indiana	0.8	0.87
Iowa	0.93	1.14
Kansas	0.91	1.1
Kentucky	1.16	1.06
Louisiana	1.42	1.23
Maine	1.12	1.15
Maryland	1.14	1.45
Massachusetts	1.06	1.72
Michigan	0.85	0.9
Minnesota	1.18	1.26
Mississippi	1.07	0.99
Missouri	0.96	0.95
Montana	2.69	2.37
Nebraska	0.97	1.14
Nevada	2.08	1.51
New Hampshire	1.4	1.4
New Jersey	0.82	1.02
New Mexico	1.64	1.34
New York	0.98	1.22
North Carolina	0.6	0.86
North Dakota	1.95	1.96
Ohio	1.01	0.92
Oklahoma	0.8	0.86
Oregon	1.43	1.21
Pennsylvania	0.97	1.15
Rhode Island	1.55	2.22
South Carolina	0.77	0.88
South Dakota	1.95	1.97
Tennessee	1.11	0.98
Texas	0.77	0.85
Utah	2.13	1.58
Vermont	2.7	2.13
Virginia	1.21	1.12
Washington	1.32	1.55
West Virginia	2.3	1.99
Wisconsin	0.7	0.9
Wyoming	2.97	1.91
Total	1.04	1.12

Source: *Highway Statistics*, Table FE-221.

Table 2 Descriptive Statistics for the Apportionment/Tax Ratios.

YEAR	1974	1975	1976	1977	1978	1979	1980	1981
Mean	1.436411	1.395102	1.409231	1.292766	1.334845	1.401719	1.377252	1.373846
Median	1.134615	1.122449	1.179487	1.06383	1.154639	1.082031	1.152672	1.164336
Maximum	11.07692	9.622449	9.905983	6.12766	7.226804	8.40625	7.755725	7.286713
Minimum	0.602564	0.602041	0.692308	0.521277	0.57732	0.492188	0.557252	0.58042
Std. Dev.	1.480445	1.27822	1.304611	0.86692	0.983401	1.220099	1.070905	1.01313
Skewness	5.687243	5.494077	5.691692	3.833446	4.529676	4.179741	4.467424	4.282221

YEAR	1982	1983	1984	1985	1986	1987	1988	1989
Mean	1.389	1.309494	1.291607	1.268992	1.259024	1.292069	1.307241	1.324
Median	1.1	1.063291	1.098214	1.069767	1.121951	1.064655	1.073276	0.99
Maximum	6.408333	5.632911	4.464286	4.217054	4.130081	5.017241	6.655172	6.8
Minimum	0.566667	0.664557	0.732143	0.689922	0.691057	0.724138	0.646552	0.62
Std. Dev.	0.966359	0.818731	0.684747	0.704661	0.652665	0.782778	0.973543	1.094094
Skewness	3.376964	3.380457	2.759937	2.653624	2.597141	3.07821	3.829042	3.667861

YEAR	1990	1991	1992	1993	1994	1995	1996	1997
Mean	1.323186	1.273402	1.318584	1.287619	1.228527	1.24463	1.2705	1.226792
Median	0.938053	0.938144	0.99115	1.02381	1	0.981481	1.025	0.981132
Maximum	6.548673	4.164948	6.920354	5.611111	5.310078	5.925926	5.2	4.622642
Minimum	0.530973	0.690722	0.707965	0.65873	0.658915	0.518519	0.7375	0.811321
Std. Dev.	1.094982	0.829936	1.037228	0.911632	0.792678	0.800159	0.72938	0.649109
Skewness	3.345763	2.288077	4.05853	3.431596	3.430582	4.205493	3.395833	3.255851

Table 3. Aggregate SPEND/TAX Ratios for 1975 and 1997.

State	1975		1997	
	Ratio	Rank	Ratio	Rank
Alaska	2.44	1	1.44	8
New Mexico	1.93	2	1.94	1

Mississippi	1.76	3	1.61	3
Hawaii	1.58	4	1.50	6
Washington	1.4	5	0.98	31
North Dakota	1.35	6	1.66	2
Utah	1.35	7	1.02	27
Virginia	1.34	8	1.50	5
Alabama	1.34	9	1.38	12
Arizona	1.31	10	1.09	23
South Dakota	1.29	11	1.35	14
Montana	1.28	12	1.49	7
Idaho	1.25	13	1.16	19
Arkansas	1.24	14	1.32	15
Oklahoma	1.22	15	1.40	9
West Virginia	1.21	16	1.60	4
Kentucky	1.21	17	1.37	13
Wyoming	1.21	18	1.13	22
Maryland	1.2	19	1.31	16
Colorado	1.2	20	0.91	37
South Carolina	1.19	21	1.23	17
Vermont	1.17	22	0.98	32
Louisiana	1.16	23	1.38	11
Georgia	1.16	24	0.99	30
Tennessee	1.13	25	1.16	20
Maine	1.12	26	1.38	10
California	1.11	27	0.93	35
Missouri	1.1	28	1.23	18
Texas	1.03	29	0.99	29
Florida	1	30	1.06	24
New Hampshire	1	31	0.72	47
North Carolina	0.98	32	1.03	26
Kansas	0.98	33	0.96	34
Nevada	0.96	34	0.74	46
Massachuset	0.95	35	0.91	39
Oregon	0.94	36	0.92	36
Rode Island	0.92	37	1.14	21
Connecticut	0.92	38	0.67	50
New York	0.89	39	0.84	41
Pennsylvania	0.87	40	1.01	28
Nebraska	0.84	41	0.97	33
Minneosota	0.83	42	0.76	44
Indiana	0.73	43	0.89	40
Wisconsin	0.73	44	0.80	43
Illinois	0.72	45	0.70	48
Ohio	0.7	46	0.91	38
Iowa	0.69	47	1.03	25
Delaware	0.66	48	0.80	42
New Jersey	0.66	49	0.67	49
Michigan	0.65	50	0.75	45

Notes: SPEND is the amount of Federal spending within the borders of a state, including expenditures on defense. TAX represents the amount of Federal tax revenue collected from or apportion to each state. Source, *Statistical Abstract of the United States 1978*, Table 433, p. 267, and *Statistical Abstract of the United States 1999*, Table 555, p. 356.