# Is it Economics or Politics? Trending Economic Factors and the Structure of Congress in the Growth of Government, 1930 - 2002[+]

**by**

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June 29, 2006. Revised April 28, 2007.

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+ Research assistance was provided by Hyoek Ki Min, Can Hakyamez and Haizhen Mou. Winer's research was supported by the Canada-U.S Fulbright Program at Duke University and the Canada Research Chair Program. The hospitality of the Department of Economics at the University of California at Irvine is also gratefully acknowledged. The following people were of assistance with the data: Pamela Kelly, Karen Kosanovitch, George Sciadis and John Wallis. Help was also provided by Paul Rubin, Jim Kau, Roger Congleton, Horst Feldman, Steve Ferris, Justina Fischer, and Larry Kenny. The authors are grateful to two anonymous referees. An earlier version of the paper was presented at the Pubic Choice Society meetings, New Orleans, March 2006. Errors and omissions are the responsibility of the authors.

**Abstract**

We expand the investigation of the role of Congress in explanations of government growth, building on the work of Kau and Rubin (2002). In addition to reconsidering the importance of the median ideological position of elected representatives they introduced, we allow for the roles of majority party strength and of party control of Congress. We consider the relative importance of the state of Congress and of trending supply and demand-side economic factors in the evolution and composition of federal spending since 1930, and we use the resulting model to simulate the consequences of the radical and historically unprecedented shift to the right of Congress in 1994/95.

Our work paints a more robust and more complicated picture of public sector growth than does the almost exclusively supply-oriented explanation of Kau and Rubin. We find that the evolution of demand as well as of supply matters, that ideology and party strength play substantial roles, but over shorter horizons, and that even the unprecedented shift to the right in 1994/95 had only transitory consequences for public expenditure.

**Key words:** public expenditure, Congress, ideology, party strength, female labor force participation, trending versus stationary variables.
**JEL Classification:** H1, H3, H5, H6.

## 1. Introduction

For most of the last century, empirical work on the size and growth of the public sector emphasized the demand for public services as encapsulated, for example, by Wagner's Law[1]. Research on the role of supply factors in public sector growth was given a major impetus by the seminal work of Brennan and Buchanan (1980) and Kau and Rubin (1981, 2002)[2]. Brennan and Buchanan established the Leviathan model, which focuses exclusively on the size of potential tax bases as the only important constraint on government size, and Kau and Rubin independently showed that a similar framework (which also allows for demand) could be adapted for empirical research. These contributions have had a substantial impact on the course of the political economy of fiscal policy over the last two decades.

Kau and Rubin (2002) suggest that as least 50% of the growth of all government spending in the U.S. over the 1930 to 1993 period can be attributed to entry of women into the labor force where they expand the supply of taxable activity, and they argue that little explanatory power can be assigned to demand factors.[3] Demand is represented by D-Nominate, an index of the median ideological position of legislators in Congress constructed by Poole and Rosenthal (1996), and by income.[4] The use of a measure of the ideological position of legislators, an innovative step in its own right, and the starting point for this paper, is based on the reasonable view that demands for public spending are only effective if they are acted upon by elected representatives.

In this paper we pursue the integration of the structure of Congress into explanations of public expenditure that they began in two ways: we incorporate the role of majority party strength in addition to the median ideological position of legislators using recent measures due to Aldrich, Rohde and Tofias (2004); and we consider the importance for spending of the degree to which the branches of Congress are unified under the same party. We then use the resulting model to reassess the importance of trending economic factors relative to the role of politics for growth of the federal government since 1930.

We also apply the extended empirical framework to consider the level and the defense/nondefense composition of federal government spending and, to a lesser extent, to model the consolidated national public sector that was the only measure of spending considered by Kau and Rubin. And finally, we use the model to conduct simulations designed to uncover the consequences for spending of the shift to the right of Congress in 1994/95, a political sea change which Grofman et al (2001) describe as the most dramatic of the modern era.

We do not propose a different basic approach to modeling the size of government, but rather build on

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[1] For a review of this literature, see for example Mueller (2003), Holcombe (2006) and Tridimas and Winer (2005). Often Wagner's Law - that the income elasticity of the demand for government is greater than one - is complemented by consideration of demand for government spending as a means of coercive redistribution towards decisive voters.

[2] This research followed that of Baumol (1967) on the relationship between productivity in the public sector and the size of government. West (1991) surveys and synthesizes the work of Baumol and Kau and Rubin.

[3] Cavalcanti and Tavares (2006) find substantial effects of female participation on government spending relative to GDP in a panel of developed and less developed countries over the period 1960 - 1999.

[4] See also Poole (2005). For extensive discussion of the role of ideology in determining fiscal and other policy choices, see Hinich and Munger (1994). The identification of the first dimension of DW-Nominate scores with the left/right or liberal/conservative dimension is a reasonable assumption. It is not a result of the estimation method, which produces a scale in one or more dimensions (whatever they are) that best explains roll call votes.

the Kau/Rubin framework by incorporating additional important dimensions of Congressional structure, while paying close attention to the differences in the nature of economic and political factors and to the robustness of our results.

Since the Kau-Rubin (2002) data set for 1930 to 1993 is no longer available - the authors looked for it at our request, but it had been disposed of - we construct an analogous one that includes DW-Nominate, the highly correlated successor to D-Nominate, and do so for the longer time period 1930 to 2002.[5] We also employ as an alternative measure of the left-right ideology of members of Congress, the 'real' ADA index of Groseclose, Levitt and Synder (1996), which is available from 1947 to 1999. These authors have adjusted ADA scores to remove the effects of changes in the mean and variance of legislator positions over time due to idiosyncrasies in the selection of Congressional bills used as a basis for classifying voting behavior.

The paper proceeds as follows. In section two we present a basic economic model of government spending and then extended it to incorporate selected features of congressional structure. Because that structure relates most directly to federal spending, we emphasize the modeling of this level of government rather than of all government, consolidated spending which was investigated by Kau and Rubin. It turns out not to matter much which measure of spending one considers, an intriguing stylized fact that is discussed further in what follows.

In section three we consider selected aspects of the data, emphasizing the fact that economic determinants of government spending have strong trends, while political factors tend to be stationary or without trend. This basic and, in our view, neglected difference in the nature of economic and political processes turns out to be one of the key's to the interpretation of our results. We then present empirical models of federal and (to a lesser extent) consolidated government spending, and consider what part of the growth of government can be attributed to changes in female labor force participation, to income effects and to changes in the ideological positions of members of Congress.

The defense-nondefense composition of federal spending is studied in section four, as it possible that different factors may influence these major components. Simulations designed to uncover the effects of the dramatic shift to the right of Congress in the mid-1990's are presented in section five, and section six concludes the main text. Finally, because the original Kau-Rubin data are no longer available, an attempt to reproduce their results with the new data set is briefly presented in an Appendix.

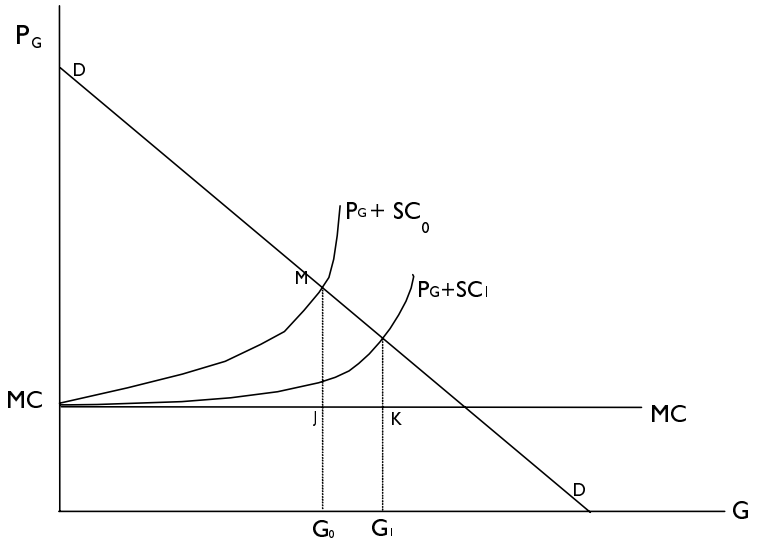
## 2. A Basic Model of Government Growth

### 2.1 *Supply (and demand)*

The basic idea underlying the Kau-Rubin model is illustrated in Figure 1, which is based on West (1991) and Usher (1986). Here the demand for public services G is shown as linear, with mid-point M below which demand is inelastic. The price of public goods $P_G$ is equal to their (assumed) constant marginal resource cost MC, while total social marginal costs including excess burden, compliance and evasion costs of taxation, $P_G$ + SC, is shown as upward sloping:

[5] Extensive discussion of the new recreated and extended data set is provided later. This data set is available on the web at: http://www.carleton.ca/~winers.

*Figure 1: Supply (and Demand) in the Growth of Government*




Kau and Rubin hypothesize that declines in the full social costs of taxation have driven the growth of government in the twentieth century. Supply side developments they consider important include: entry of women into the labor force where they can then be much more easily taxed; declines in the extent of self-employment making it harder to avoid or evade taxes; and increasing computerization which they think shifts the power to enforce compliance to government. In their view, these factors all lead to downward shifts in the full marginal cost of government as shown in the figure.

Under the pressure of political competition, and following a decline in the full cost of taxation, government expands supply to meet demand and consequently as shown, the quantity of public services increases from $G_o$ to $G_1$, while conventionally measured public expenditure grows by the area $G_o$ JK $G_1$.[6] It is the effect on measured public spending that Kau and Rubin try to assess empirically.

It is interesting to contrast this explanation for government growth with Baumol's (1967) supply-side explanation. Baumol suggests that increases in the marginal cost of government relative to that for private goods, due to its relatively intensive use of labor and slower productivity advance, will increase the size of government. In Figure 1 this can be shown by considering an upward shift of the MC curve which, the figure illustrates, leads to a *decrease* in the quantity of public goods in contrast to the Kau-Rubin supply shift. As before however, conventionally measured expenditure still increases if - as West's survey indicates - demand for public services is inelastic.

In both of these cases, outward shifts of demand due to growing incomes will also lead to increases in the size of the public sector. Thus with the passage of time, the model in Figure 1 suggests that there are good reasons for government spending to rise as a result of both demand and supply factors.

[6] Bearing in mind that we are dealing with the price-inelastic part of the demand curve, the total social cost of government will also decline, though Kau and Rubin are content to estimate the consequences for the conventional measure of government size.

2.2 *Integrating ideology, majority party strength and party control of Congress.*

As indicated in the course of our discussion of the model illustrated in Figure 1, Kau and Rubin (2002) represent supply forces in their empirical work by three variables, stated here along with their mnemonics used later in specifying estimating equations: the female labor force participation rate (*female participation*); the rate of self-employment (*self-employment*); and the percent of households with a computer (*computers*).

Demand is represented by two factors that shift the demand curve in Figure 1. The first is of course real income (r*eal income per capita*).[7] The second and innovative variable is the ideological position of members of Congress in the House and Senate as represented by the median of the first dimension of the Poole-Rosenthal (1996) DW_Nominate index (*DW_House, and DW_Senate*).

It is fair to say that the Poole-Rosenthal index of ideological position of members of Congress represents one of the most important advances in the empirical study of Congress over the last two or three decades. As far as we are aware, Kau and Rubin were the first to use it to model public expenditure. The argument for doing so, to recall, is that that public spending must actually be legislated by elected politicians so that, for given income, the decisions emerging from the legislature will depend upon the ideological makeup of those elected to it. They hypothesize that a more conservative or Republican Congress will favor a lower level of spending than will a more Democratic one. In this way they explicitly bring the legislator as a representative of the electorate into the analysis of public policy choices.

In addition to reconsidering the roles of these supply and demand factors using a new and longer time series, we continue the integration of congressional structure into explanations of the growth of government. First, we integrate the organization of parties in the legislature into the analysis. Recent work stresses the importance of majority party strength in Congress includes Krehbiel (1998) and Aldrich, Rohde and Tofias (2004), among others.[8] The latter authors provide a measure of party strength based on the Poole-Rosenthal indexes that is eminently suitable for use in the present context. A party's strength, as they define it, grows with the difference between its members' ideological median and that of the opposition, and it also grows with the degree of intra-party homogeneity. Their measure of party strength is outlined in more detail below.

Aldrich et al (p. 9) argue that *whatever* the median member's ideology, "as a majority party becomes [more powerful, that is] more distinct from its rival and more homogeneous within, it is expected that the members of that party will tend to empower leadership with institutional powers that will allow party outcomes to move away from the floor median and towards the party median". The logic of collective action (Olson, 1965) provides one foundation for this argument: a change in the organization of a majority party brought about in part by its increased ideological homogeneity will tend to make it easier for members to agree on what it (and they) should do. In particular, more homogeneity reduces the principal-agent problem for individual members, allowing majority party members to delegate their legislative power to their leaders who then become more powerful (Aldrich et al, p. 3).

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[7] Kau and Rubin (2002) actually use aggregate real GNP as their income variable (see the Appendix), but since we are going to model per capita expenditure, it makes more sense to use a per capita income variable. Other such differences between our estimating equation and that of Kau and Rubin are introduced below.

[8] We return to the work of Krehbiel in a later section.

Party strength as Aldrich and his colleagues define it may push spending in the same direction as the does a change in the median legislator's ideological position, or it may counteract it. For example, if one expects that a move to the right in the median position of legislators will lead to a reduction in government spending, and this conservative shift occurs - as it clearly did, for example, in 1994/95 - a concurrent increase in Republican party strength when they are in the majority may reinforce the trend towards reduced spending, *assuming* that the strengthening of a majority party (for a given chamber ideological median) does in fact simply lead to a movement towards the majority party's median.

On the other hand, if a strengthened Republican party in this example tends to favor *more* (and, perhaps, different) spending rather than less for a given chamber median, the two developments may work in opposite directions. This could occur because a more homogeneous party is better able to reach agreement about what money should be spent on, and may be better able to press its demands in this respect in and through Congress.

To construct an index of party strength, Aldrich et al devise chamber-specific 'conditional party government' indexes as they call them, which will be referred to below as *CPG_House and CPG_Senate*. These indexes are based on a factor analysis of four partisan differences in the Congress as measured by the Poole-Rosenthal DW-Nominate data. These four components are drawn from the DW-Nominate indexes of legislator ideal point positions in *two* dimensions. They are: the extent of intra-party heterogeneity; of intra-party homogeneity; of overlap between ideal point positions of the two parties' members; and of the predictability of ideal point locations from knowledge of party affiliation [9].

The *CPG* index of party strength for either chamber increases when the majority party becomes ideologically more homogeneous, as measured by the dispersion of DW-Nominate scores, and it also increases when differences between parties in their median ideological positions grow. In other words, *CPG* rises with within-party homogeneity and with between-party differences in ideological positions. These indexes are graphed in Figures 2a and 2b for the House and Senate respectively, along with corresponding (scaled) median DW_Nominate indexes for the first dimension.

[Figures 2a and 2b here]

Note the obvious downward trend in majority party strength in the House after the war, which bottoms out in the mid to late 1970's, and the consequent reversal for the rest of the period. This corresponds with the decline of Democratic strength over the McCormack and Albert speakerships, and Tip O'Neill's contribution to the turn-around (Aldrich et al, 2004, 8). The historically high level of party strength under Republican speakers Newt Gingrich and Dennis Hashert after 1994 also stands out.

It should also be pointed out that despite the fact that the measures of party strength shown in Figures 2a and 2b are based on various elements of DW_Nominate indexes, the simple correlation between *DW_House* or *DW_Senate* and their conditional party government (*CPG)* counterparts is not high. The simple correlation between *DW_House* and *CPG_House* over our sample period, 1930 to 2002, is 0.59, and that between *DW_Senate* and *CPG_Senate* is - 0.11. The cross chamber correlations are

[9] For details, see Aldrich, Rohde and Tofias (2004); data available upon request. The CPG index used here is the second factor from their principal components analysis, the first being a representation of the first dimension of the original DW-Nominate indexes themselves.

even lower. These variables represent different processes.

A second extension addresses the question of whether or not unified control of the government by one or the other party complements the roles of ideology and party strength. We had previously hypothesized that an ideological swing to the right, for example, may be expected to lead to reduced spending overall (and, perhaps, also to a change in its composition - a matter to be discussed later). So, too, may an increase in party strength by the Republicans when they are in a majority. But, for a given median ideological position, does increased Republican control of the branches of government also lead to a reduction in the size of government. And, for the Democrats, should we expect things to work in the opposite direction, with greater Democratic control implying greater overall government spending?

The obvious answer might appear to be yes. But there are countervailing hypotheses. In particular, Mayhew (1991) in his work on divided government has argued that periods of divided government may actually be periods of great government activity as parties seek to reach compromise on major public projects, such as the national highways. Relatedly, McCubbins (1991) has offered the possibility of stalemate (a bilateral veto game) under divided government in which each party receives support for the projects its constituencies favor, thus leading to a greater increase in the size of government during periods of divided government than at other times. Additionally, one may argue simply that every party wants to spend more on favored constituencies, and that this will be easier the more the three branches of government are unified under its control. *Ceteris paribus* then, do Republicans spend less (or Democrats more) when their control over the various branches of Congress increases? The models we offer will allow us to shed some light on this theoretical puzzle.

To incorporate the degree of partisan control of the branches of Congress, we use the index *Party control* which is the sum of three indicators, each of which is either -1 denoting Democratic control of a chamber or the presidency, or +1 indicating Republican control. (See Figure 2c.) An increase in this index, which varies between +3 and -3, indicates that overall Republican control of both chambers and the presidency is increasing, while a value of (say) -3 indicates complete control of the three branches by the Democrats. [10]

[Figure 2c here]

## 2.3 *A basic estimating equation for real per capita federal government expenditure*

We are now ready to state the basic estimating equation for real gross federal public expenditure per capita that encompasses the Kau-Rubin model as well as the additional dimensions of Congressional structure introduced above:

$$\begin{aligned}\textbf{Real federal spending per capita} &= c_1 \cdot \text{Female participation} + c_2 \cdot \text{Self-employment} + c_3 \cdot \text{Computers} \\ &+ c_4 \cdot \text{Real income per capita} + c_5 \cdot \text{DW1\_House} + c_6 \cdot \text{DW1\_Senate} + c_7 \cdot \text{CPG\_House} \\ &+ c_8 \cdot \text{CPG\_Senate} + c_9 \cdot \text{Party control} + c_{10} \cdot \text{WWII} + c_{11} \cdot \text{WWIIAftermath} + c_{12} \cdot \text{Korea} \\ &+ c_{13} \cdot \text{9/11} + c_{14} \cdot \text{Year} + c_{15} \cdot \text{Constant} + \text{Error.} \end{aligned} \quad \textbf{(1)}$$

[10] We also experimented with a party-neutral index of control of Congress (*Undivided* = 1 if all branches controlled by the same party, = 0 otherwise). Generally this variable does not perform well, and certainly no better than *Party control*. Results for the sign on this variable are not recorded in the following tables but are commented on below.

Expected signs in equation (1) for the variables introduced earlier are: $c_1 > 0$, $c_2 < 0$, $c_3 > 0$, $c_4 > 0$, $c_5 < 0$, $c_6 < 0$, $c_7 = ?$, $c_8 = ?$ and $c_9 = ?$ with the question mark indicating that there are conflicting hypotheses concerning the effects of majority party strength and divided Congress. The signs on the DW_Nominate indexes follow from the fact that *DW1_House* and *DW1_ Senate* vary from -1 (indicating an extreme liberal stance, to +1 (indicating a very conservative perspective on legislative issues), and those for the CPG party strength indexes take into account that a CPG index increases algebraically when party strength does.

In addition to the variables introduced above, equation (1) includes dummy variables related to wars to insure that the estimation is not biased by war-related events, specifically: a shift in the spending equation during the second world war (*WWII*); allowance for the possibility of an upward jump in spending after the war, also referred to as a Peacock-Wiseman (1967) displacement effect (*WWIIAftermath*); a dummy for the Korean War in the early 1950's; and one to allow for the aftermath of the dramatic events of September 2001 (*9/11*)[11]. The coefficients on all of these dummy variables are expected to be positive. A time trend is also allowed for, of unpredictable sign, and in some equations, selected coefficients are allowed to shift after the war in a manner to be indicated later.

Analogous equations to (1) that use only House, or only Senate congressional variables are also estimated, along with similar equations for federal defense and nondefense spending as well as for all government (consolidated) spending. All variables are defined precisely in Table 1, and the data themselves along with detailed sources are presented in a spreadsheet available on the web at www.carleton.ca/~winers.

[Table 1 here]

Equation (1) and it variants are supplemented by four additional equations as in Kau and Rubin's work. These explain *female participation*, *self-employment*, *farm income* and the degree of *urbanization*, making a five equation simultaneous system that is estimated by three stage least squares. These additional equations along with the original Kau/Rubin expenditure equation are given in the Appendix. In addition to estimating this system, we also estimate (1) and its variants by two-stage methods and by least squares. In all cases, the five equation system is used to specify instrumental variables, and Newey-West standard errors are used when appropriate.

Before turning to a brief discussion of some important features of the data and then the estimation, there are two further aspects of equation (1) that deserve highlighting. First, since Congressional structure bears in the first instance on spending by the *federal* government, our work focuses on the explanation of real per capita aggregate federal spending as well as on its defense/nondefense composition. In contrast, the dependent variable used by Kau and Rubin included all government (consolidated) spending. [12]

It turns out not to matter much for the general fit of the estimating equations which measure of government total spending is used. Even a quick look at the time series for various measures of public expenditure graphed in Figure 3a suggests why this fact should not be surprising. The simple correlation between real per capita all government (consolidated) spending and its federal counterpart over the period 1930 to 2002 is evidently very high (it is 0.985), and the movement of the series over

[11] All these dummy variables are suggested by the nature of equation residuals when these events are not considered. Kau and Rubin only used a time trend and a dummy for the second world war.

[12] A referee has emphasized the need to consider the federal level in the present context.

time is similar as can be seen in the figure. We shall return to this matter when discussing estimation results.

[Figure 3a here].

Second, it should be acknowledged that the representation of supply and demand in equation (1) is not unambiguous. Women entering the labor force will likely demand services they used to provide at home, such as early schooling, and income may proxy the size of the income tax base - a supply side factor - as well as lead to demands for public services. Moreover, when women enter the work force, they must necessarily increase aggregate measured income, further confounding supply and demand. These problems of making a precise distinction between supply and demand are present in virtually all studies of government growth: we do not attempt to resolve them here, and we regard the spending equation as a semi-reduced form, where the key issues to be investigated are the relative importance of female labor force participation, of income effects, and of ideology and party strength.[13]

## 3. Data and Estimation Results

### **3.1** *Some key aspects of the data*

To complement the graphs of the political variables discussed earlier, Figure 3b charts important (mean-standardized) economic variables appearing in the estimating equations, and Table 2 provides selected descriptive statistics for both political and economic time series. Two features of these data at least warrant further attention: the measurement of the labor force participation rate of women; and the difference in the time series properties of the political and economic variables.

[Figure 3b and Table 2 here]

The measurement of female labor force participation from 1930, a key factor in the present study, is not straightforward. From 1930 to 1940 inclusive only the two census estimates of female labor force participation exist. In the U.S. Census of Population data for 1930, the female participation rate (ages 15+) is 24.8, and in the Census of 1940 (for ages 14+) it is 25.8. Yearly estimates of this variable are presented in the Current Population Surveys (CPS) only beginning with this publication in 1940. Moreover, in both sources, different age groups are used from time to time to define the relevant populations. We have interpolated (geometrically, from the center out) to produce our estimates of *female participation* between 1930 and 1940 and have adjusted the result for changes in age coverage of the raw data.[14]

Are these data adequate? Just as is the case with the computed figures for the 1929 to 1940 period illustrated in Figure 3b, a measure of the *total* civilian noninstitutional labor force participation rate rises steadily from 40.4 to 42.2 suggesting a steady rise in the labor force participation rate of women

[13] On the former issue concerning women, see Lott and Kenny (1998). On the latter- identifying supply versus demand - see Ferris and West (1996) who try to econometrically identify demand and supply while omitting the study of legislative structure, and Kenny and Winer (2006) who use real GDP as an indicator of the income tax base in a model of taxation.

[14] These adjustments are described in the full data spreadsheet which is available on the web at www.carleton.ca/~winers.

for these years[15]. On the other hand, unemployment rates rise dramatically during these years, perhaps indicating that labor force participation may not adequately capture the financial status of women (or of men). Caution is warranted, and we estimate our equations for the post-war years as well as for the entire period from 1930.

Another important matter, one that leaps out at the observer of the data graphed in Figures 2a to 3b, is that the economic variables exhibit strong trends or, in other words, are integrated of order 1, except for *federal defense* expenditure which is stationary or I(0), facts confirmed by the Dickey-Fuller statistics in Table 2. On the other hand, the political variables shown in Figures 2 are, if not I(0), then nearly so, especially as indicated in the table for *DW_Senate* and *ADA_House*. Because of this difference in the order of integration of these economic and political factors, it is reasonable to expect political developments in ideological positioning and majority party strength to have only transitional or shorter run effects on the evolution of government spending over the decades. We also return to this important issue in empirical political economy below.

### **3.2** *Results using DW_Nominate indexes, 1930 - 2002*

We now turn to the results of estimating equation (1) and selected variations along with the auxiliary equations specified in the Appendix. To conserve space, only the estimates of the federal government spending equation are recorded in Table 3.[16] One equation for all government, consolidated spending is also reported (in column 3b) for comparison with the other equations.

Three methods of estimation are used to insure robustness: three-stage system estimation, two-stage and ordinary least squares. The OLS results in column 5 of Table 3 are especially interesting since the adjusted Dickey-Fuller statistic indicates that the equation as a whole can be considered a cointegrating or longer run relationship in which all variables may be considered endogenous.[17] This is useful because, as noted earlier, women who enter the labor force can raise the potential size of the income tax base only if female labor force participation increases aggregate measured income. Thus the model contains within it a reason why female participation and real incomes are simultaneously determined.

In the following discussion, we consider the results by variable taking all methods of estimation and alternative specifications of the basic model into account. Here the statistical significance of the various factors is emphasized. Later on we shall turn to an investigation of the relative quantitative importance of economic factors and congressional structure.

It is evident from Table 3 that *female participation* is indeed significantly associated with increased government spending. This is true even for the OLS estimation in column 5 where the estimated equation can be considered a cointegrating relationship.[18]

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[15] These figures refer to the total civilian noninstitutional labor force from Bureau of Census Table HS-29, divided by total population from Table HS-2. See also U.S. Bureau of the Census, Table HS-30. (www.census.gov/statab/hist. Table 02HS00300.xls).

[16] All estimation was conducted using Eviews 5.1.

[17] Note also that in column 5, an LM test indicates that the OLS residuals are not serially correlated and that, nonetheless, HAC Newey-West t-statistics are used.

[18] The t-statistics for this cointegrating equation are adjusted using the Newey-West method. But whatever the method used, the (unadjusted) point estimates are still appropriate for forecasting purposes, and it is the implications of these for the importance of the different factors that will be of concern in what follows.

[Table 3 here]

*Self-employment* does not have its expected negative and significant coefficient - the coefficient is negative only where it is also insignificant. *Computers* enters negatively and sometimes significantly, indicating, if anything, that contrary to the Kau-Rubin model, increasing computerization shifts power to the taxpayer and not to the tax collector. It seems just as reasonable to find that increases in home computer use increase the ability of taxpayers to avoid and evade, as to expect that on balance computerization shifts power to the tax collector.

Income is significant in some specifications and median chamber ideological positioning is almost always significant with the expected sign. The coefficient of real income is always positive, and is significant in 2 of the 5 columns including the OLS results in column 5, though estimates of the size of the coefficient are not uniform. In addition, leftward movements in the median ideological position of representatives, as indicated by declines in DW-Nominate indexes, for both the House and Senate almost always indicate, as expected, that government size increases, except in 2 of 14 cases where the coefficient is also insignificant. Columns 4 and 5, where pre- and post-war coefficients are distinguished, suggest that the effect of ideological positioning is stronger before the war than after, and that the effect of ideological trends in Congress are stronger in the House than in the Senate.

As for majority party strength: looking across the columns, the size and significance of coefficients on *CPG* (in columns 1 and 3) indicate that stronger parties *in the House*, *whether Democrat or Republican*, lead to more spending, while the opposite is generally true for the Senate, and that the absolute size of the effect tends to be is stronger in the House than in the Senate. This is consistent with the importance of changes in the ability of majority parties in the House to deal with collective action problems in budgeting negotiations, since the group of legislators to be organized is both more heterogeneous and larger than in the Senate.[19] These results are echoed in results for the composition of federal spending to be discussed below, and are new to the literature.

*Party control* generally has positive coefficients and is significant only in the post war period (in columns 4 and 5). When it is significant after the war, the positive coefficient indicates that increasing control by the Republicans is associated with *more* spending, not less, contrary to McCubbins (1991). Later results for the composition of federal spending suggest that this control also involves a compositional shift in federal spending towards defense as well as an increase in overall expenditure. A similar result with respect to total expenditure arises if one uses a partisan - neutral index of when the three branches of government were unified. In that case, the resulting coefficient always shows that undivided government is associated with more spending, though the coefficient is never statistically significant.[20]

Finally, we note that a comparison of columns 3a and 3b confirms that it does not matter much for the general fit of the spending equation whether one uses federal or all government expenditure as the dependent variable. While not reported here, estimation of the remaining columns using all

[19] Constituencies in the House are much smaller than in the Senate and hence more heterogeneous with respect to the nature of voters and of elected representatives.

[20] The largest Newey-West t- statistic is 1.4 in the experiments we conducted. This result refers to the coefficient on the dummy variable *Undivided* (=1 if Congress/Presidency unified under one party, = 0 otherwise) instead of *Party control* in the models of column 5 of Table 3, and column 4 of Table 4.

government spending leads to the same general conclusions as are reported above.[21] There are good reasons for this. Aggregating public expenditure across the 50 states blunts the consequences for estimation of the sometimes wide differences in state electorates and governments, and federal mandates backed by judicial interpretation over the decades along with the growing importance of federal grants in state budgets effectively inserts federal politics into state legislatures. [22]

**3.3** *Using real ADA indexes, 1947 - 1999***.**

The results of using real ADA indexes instead of DW-Nominate, recorded in Table 4, serve as a check on the robustness of the conclusions reached so far, both because they measure ideological position in a different manner, and because these data restrict the estimation to the post-war period 1947 to 1999. For comparison purposes, column 2 of the table reports estimation for the shorter sample period using the DW_Nominate data.

Unlike DW-Nominate scores, which are based in part on the assumption that if a legislators preferences change, they do so smoothly and by the same amount each period, real ADA scores impose no restrictions on how preferences of legislators may change over time. A second advantage of ADA scores is that they are comparable across chambers of Congress while, strictly speaking, DW-Nominate scores are not, and for this reason column 5 of the table reports on the use of averages of the ADA scores for House and Senate. A disadvantage of this data is that ADA scores are not as precise in discriminating among ideological positions of legislators with similar but not identical views.

Chamber medians of the two types of ideology measures are well correlated, as Figures 3a and 3b illustrate. For the House, the simple correlation for 1947 to 1999 is about - 0.79 and for the Senate it is about - 0.87, and these series exhibit the same peaks and valleys. Both indexes also identify the 1994 election as embodying the biggest conservative shift in Congress since the election of 1948, as pointed out by Groseclose et al (1996) and Grofman et all (2001). On this account, we should not expect general results in the two tables to differ. And in fact, a comparison of columns 1 and 2 shows that the ADA indexes perform more or less the same way as do the DW-Nominate indexes in terms of signs and significance of the estimated coefficients. Moreover, the restriction of the sample to the period after the second world war does not appear to alter the general conclusions reached earlier.

[Table 4 here]

In Table 4, *female participation* always has positive and significant coefficients, as before, although the size of the coefficients are much reduced.[23] *Computer* use again has a negative effect on government size, though its coefficient is never significant here. In contrast to Table 3, *self-employment* now has its expected, significantly negative coefficient, indicating that self employed people are, at least in the post-war period, harder to tax.

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[21] These results are found in an earlier version of this paper, dated June 29, 2004, which is available on the web at the first author's website.

[22] Federal grants grew from about 1% of state-local gross spending in 1930 to about 18% in 2002. On the severity of federal mandates, see for example Crémer and Palfrey (2000).

[23] Note that the ADF statistics in columns 4 and 5 of Table 6 do not indicate cointegration, though that in column 4 is close to significant at 10%.

Real income has a negative coefficient, and is always insignificant, in contrast to its positive sign in Table 3. It is hard to imagine why the negative coefficient is sensible, and we suspect that collinearity of variables in the shorter time period covered by the ADA data plays a role here.[24]

Recalling that a bigger ADA score means that the median legislator has moved to the left, it can be seen that in general both a leftward move of the median leads to increased spending. As in Table 3, increased majority party strength in the House (*see results for CGG_House*) leads to increases in government spending, while in the Senate, party strength is not significant and the coefficients are of smaller magnitude, though we do not find negative coefficients as in Table 3. And as in Table 4, the effect of *party control* is to increase spending; that is, as the Congress is increasingly unified under the Republicans, government size increases. Only one coefficient on this index is significant however[25].

Thus on the whole, the results of using the ADA indexes for the reduced ,post-war, sample period support conclusions based on Table 3 except with respect to the effects of real income and self-employment.

### **3.4** *The relative quantitative importance of selected factors*

It is always necessary to study the quantitative importance of a factor as well as its statistical significance. Table 5 presents calculations of the quantitative effects of *female participation*, *real income* and median ideological positions based on equations in which DW_Nominate and real ADA indexes are used in log form, so that their coefficients too are elasticities. We cannot use the party strength indexes in this way however, as adding a constant to transform them to strictly positive time series and then taking logs appears to result in quite a different series and produces sometimes unsatisfactory results. Instead, we shall consider the importance of party strength using simulations in the next section.

The total percentage change in real federal spending per capita for the 1930 to 2002 period is 3427%, and of all government spending is 1358%. Tables 5a and 5b show the proportion of these total changes in spending that can be attributed to the three factors considered. [26]

[Tables 5a and 5b here]

*Female participation* has a large effect that varies considerably with the estimating equation, from about 3% to 29% for federal spending, and from 16% to 30% of all government spending. The most robust results are likely those based on the OLS estimation, shown in the last column of the tables. Here the 3% role for federal spending and 16% percent for all spending is very much less than that found by Kau and Rubin (2002). *Real income* can account for between 0.2% and 8.6% of federal spending and about 3% to 11% of all government spending. And ideology has effects that vary quite a lot too, from 0.4% to 3.8% for the federal level, and from 0.6% to 7.6% for all government.

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[24] Using ADA indexes in log form in column 4 results in a positive but insignificant coefficient on real income.

[25] As before, using the partisan-neutral index *Undivided* results in positive but non-significant coefficients (the largest t-statistic is about 1.3)

[26] For the purpose of making these quantitative estimates, percent changes are defined as (end value - beginning value) / mean value. If the denominator is the beginning value, numbers reported below tend to be larger.

While these results confirm the importance of female labor force participation, it should be noted that in the OLS equation for the federal sector (in column 3 of Table 5a), and for the total government sector (in column 3 of Table 5b), the combination of the effects of income and median ideological position of legislators (10.9% at the federal level and 16.3% for the total government sector) are greater than the effect attributed to female participation in each case. So demand, as expressed through the legislature, matters too.

For purposes of our conclusions it is also important to see that there is another way to look at the attribution to various types of factors. The results in Tables 5a and 5b indicate that trending economic factors, whether on the supply or on the demand side, are in all cases an order of magnitude more important than movements in median ideological position in explaining the evolution of public expenditure. The relevance of this perspective is reinforced by the fact that the effects attributed to ideology in the tables are an order of magnitude greater when coefficients on the indexes of ideology are distinguished by time compared to the situation when just one coefficient is allowed for the whole sample. This is what we should expect in the present context of a factor (such as a DW-Nominate index) that does not have exhibit a uniform or dominant trend over the whole sample period.

## 4. Explaining the Composition of Federal Expenditure

To complete the estimation, we consider the defense-nondefense composition of federal spending. The results of applying the same model to both major components of federal public expenditure are presented in Table 6. These equations are harder to fit than before, especially for defense which is a stationary variable (see Table 2), and we make use only of the longer time series from 1930 that relies on DW-Nominate as the index of ideology. In our discussion of these results, we focus on the implications of the estimates for the composition of federal spending.

[Table 6 here]

*Female participation* generally is associated with increased spending while *self-employment* and *computers* have coefficients that tend to be insignificant.[27] *Real income* has its expected positive and (often) significant effect on defense spending, but it has a negative and (sometimes) significant effect on nondefense spending for unknown reasons.

There are some interesting results here concerning the effects of ideology and party strength. If one considers the OLS results which allow for a shift after the war, in columns 4 and 8, *DW_House* has a negative coefficient for both types of expenditure meaning that, as expected, leftward movements in ideological position generally lead to more spending. The coefficient of this index in the nondefense equation is larger and significant before 1947 while that in the defense equation is insignificant, indicating that a move of the median legislator to the left in the House before 1947 tended to increase the ratio of nondefense to defense spending. After the war, the coefficients on ideology in both equations for the House are insignificant.

Considering the results in remaining columns for *DW_House*, where no structural shift in 1947 is allowed for, we see that leftward movements in ideology generally lead to more spending on both

[27] It is not clear why the KOREA dummy has a significantly negative coefficient in column 5. Some sort of misspecification is suggested.

types of goods with ambiguous effects on composition.

Behavior in the Senate is apparently quite different. Whether one allows for a shift in 1947 or not, in the Senate it appears that a move of the median Nominate score to the left reduces nondefense spending and increases that on defense; this is more pronounced for the period before 1947 than after. Thus ideological developments in House and Senate apparently pushed the composition of spending in conflicting directions though in the end, as indicated by the aggregate equations discussed in the previous section, total federal expenditure tended to rise.

Party strength also appears to operate differently across chambers, as well as with respect to type of spending. If we look at columns 4 versus 8 (using OLS), where a structural shift in 1947 is allowed for, one sees that party strength - regardless of which party was in the majority - in the House after the war, and in the Senate before the war, resulted in an increase in defense relative to nondefense spending.

Turning to the separate effect of *Democratic* party strength in the House (*CPG_House_Dem*) in columns 1 vs. 5 or columns 3 vs. 7, we see that this strength leads to more spending generally, and to a compositional shift towards defense. The same comparisons suggest more or less the same effects for *Republican* strength in the House. Partisan Senate party strength (consider *CPG_Senate_Dem* or *CPG_Senate*) has a different effect however. In the Senate, an increase in the strength of either party leads to less nondefense spending absolutely, and to an increase in the defense/nondefense ratio.

*Party control* is significant only in the OLS estimation, in columns 4 and 8. Here the results suggest that as the Republicans gained more control, nondefense spending before the war declined, and that defense spending after the war grew, the compositional effect we alerted the reader to earlier. One may also note here that when significant (in columns 4 and 8), the *9/11* shock is associated with more defense spending and less spending on other items.[28]

Taking both chambers into account, one can say that the results generally indicate that ideological shifts and increased party strength in the House tended to lead to more defense and nondefense spending, with an emphasis on the latter. In the Senate, the same developments are more likely to have lead to a pro-defense change in composition. A sensible guess as to the reasons for the defense bias in the Senate is the following: first, Senators are more involved with and held accountable for matters of national defense and international affairs than are representatives in the House; and second, and perhaps more importantly, Senators are more able to capitalize on the benefits of defense spending, much of which has a substantial domestic, regionally specific economic impact.

More generally still, the results suggest that a full understanding of the roles of ideology and party strength in determining public expenditure choices will have to allow for compositional effects as well as differences across chambers.

## 5. Forecasting the Effects of the Shift of Congress to the Right in 1994/95

We are now in a position to forecast the effect on federal expenditure of the dramatic shift to the right in Congress that occurred in 1994/95, a change that is larger than in any other period of post-war

[28] With respect to the war dummies, we can also see clearly in Table 6 that there is Peacock-Wiseman type displacement effect, or upward shift in federal spending, after the second world war.

Congressional history as judged by movements in DW-Nominate indexes. To do so, we use the cointegrated OLS equation from Table 3 (column 5), the 2SLS equation from Table 3 (column 4), and the OLS model from Table 4 (column 4) that uses the real ADA indexes and which is which is nearly cointegrated, to forecast what would have happened over the 1995 to 2002 or 1995 to 1999 periods if Congress remained fixed at its 1994 state.

Figure 4a is based on using DW_Nominate indexes and shows what happens when we first forecast with *DW_House* and *DW_Senate* only fixed at their 1994 levels, while Figure 4b shows the full effect on federal spending of freezing Congress at its 1994 state. A comparison of Figures 4a and 4b illustrates the quantitative importance of taking changes in party strength into account when constructing a counterfactual, in addition to changes in median ideological positions. Comparing the forecast in Figure 4b to the predicted value from the estimating equation used reveals how Congressional structure as a whole influenced the post-1994 level of public expenditure.

[Figures 4a - 4d here]

Figures 4a shows that if the swing to the right in 1994/95 (as represented by DW-Nominate indexes) is the *only* change in Congress that is removed from the data, federal spending would have been higher by about 1100$ per capita in 1995. This effect becomes somewhat larger after a few years and then erodes, but remains substantial in the simulation. However, when majority party strength and party control are also fixed at their 1994 levels in Figure 4b - that is, when Congress as a whole is fixed at its 1994 state - the effect of the change in the median ideological position of legislators is blunted by the effects of changes in the other factors. Indeed, initially spending even falls in the counterfactual relative to the predicted value from the estimating equation, and other events take over later on including the *9/11* shock as well as the underlying effects of trending economic factors.

The same sort of result is apparent in Figures 4c and 4d which use different estimation methods and indexes of median chamber ideological position. In these cases, comparison of the predicted values with the counterfactuals indicates that changes in Congressional structure as a whole after 1994 have modest and transitional consequences for federal spending. While not shown, the same is true in comparable experiments using equations for consolidated government spending.

Partly the small overall effects of changes in factors representing Congressional structure here are due to the fact that median ideological position, majority party strength and party control of Congress evolve in somewhat different ways and exert sometimes opposing effects on spending decisions. Partly they are due to the fact that spending and the economic factors exhibit strong trends, while the political variables, being more or less stationary in the historical data, have only a transitory effects on longer run developments.

## 6. Conclusions

Attempts to explain the size of government tend to focus either on 'supply' side factors - including, for example, determinants of taxable income, or of the cost of tax collection such as the degree of self-employment; problems with control of the bureaucracy; and with lagging productivity growth in the public sector - or on the 'demand' side - including changes in the nature of electoral demands due to growth in real incomes and changes in demographic structure; and changes in suffrage rules which may affect both average demand and the ability to coercively redistribute. But we would argue that, at least in the short term, government growth will also depend on institutional factors including the

composition of and operation of legislatures, the extent to which legislation that puts into place some 'non-discretionary' spending that can be expected to grow over time is relied upon (like the enactment of Social Security during the New Deal or Medicare during the Great Society period); [29] as well as on major exogenous shocks that change the society and with it the public sector for various reasons, such as a war. A balanced view will encompass both supply and demand side mechanisms, as well as institutional constraints.

By bringing supply back into empirical research, the empirical work of Kau and Rubin (1981, 2002), coupled with the earlier contributions of Brennan and Buchanan (1980) and of Baumol (1967), has had the effect of shifting research towards a more balanced view, while reminding students of government of the relevance of supply in the face of a literature in which demand-oriented explanations have dominated for most of the twentieth century.

However, while this rebalancing is to be welcomed, we have shown that the estimates of the role of supply made by Kau and Rubin (2002) are almost surely too large. Our guess is that between 3% and 6% of the growth of the federal government can be attributed to this factor, and this is likely an upper bound that will be reduced by using a more comprehensive model than has been estimated here.[30] Estimates of the effect on the total, consolidated public sector we have made are larger; perhaps and about 15% of total government growth could be explained in this way. But there is some doubt that a model that makes use of Congressional structure can fully capture the processes involved at state and local levels[31].

Our work paints a more robust and complicated picture of public sector growth than does earlier work by Kau and Rubin. First, while our point estimates of income elasticities, like those in much of the literature, are not robust to alternative specifications, it is clear that the effects of strongly trending economic factors like real income as well as labor force participation do matter. [32] Second, our work sheds light on conflicting viewpoints about the role of Congress and, in particular, whether it is which party controls the House or Senate that matters most for public spending, whether the issue is simply whether or not government is divided, and whether it is the chamber-wide median ideological position of members of Congress that matters most.

As expected, we confirm that leftward movements of the chamber-wide median ideological positions

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[29] We are indebted to Kenneth Arrow (personal communication, February 15, 2006) for drawing this point to our attention.

[30] We should also note that, as shown in the Appendix, we have failed to replicate the Kau-Rubin results with our new data set, and that estimation of their model over the same time period they investigated with our data produces either incorrect signs or at most a small positive effect of female participation on total government spending.

[31] As a rough check on the reasonableness of this estimate, one can ask if the macroeconomic aggregates are consistent with it? Could the increase in women's earnings since 1930, if taxed at a reasonable rate, in fact fund as much as, say, 10% of government growth since 1930? The answer is - it seems possible. Total real government spending in 1930 was about 100.5 billion (= real per capita spending times population), and in 2002 it was 3411.1 billion, an increase of about 3310.6 billion. Using female labor force participation times total civilian labor force to very roughly estimate total female full time workers in 1930 and multiplying the result by average real income of *full time* female workers (all of which overstates female labor force income in 1930 and thus understates the increase over time), indicates that total real income of full time female workers in 1930 was very roughly 139 billion. In 2002 using actual total female labor force participation of about 67400 thousand[31], the same calculation gives total wages of 2464.3 billion, an increase since 1930 of approximately 2325.4 billion. If women paid for 10% of the increase in total government over the period, they would have paid additional taxes (*of all kinds: sales, excises and income*) of about 331 billion, or about 14 % of the estimated increase in their earnings since 1930.

[32] For discussion of possible reasons for variation in estimated income elasticities, see Tridimas and Winer (2005).

of legislators in the House (especially) and in the Senate tend to lead to increased federal spending. But simple extrapolations of this fact to the consequences of changes in majority party strength and of party control of Congress are likely to be misleading. It appears that given the median position of legislators in Congress, a stronger majority party (as measured by the Aldrich-Rohde-Tofias index), especially in the House after the war, favors and is able to increase federal spending, and this effect is enhanced when the Republicans have greater control over Congress despite their reputation as the party of small government. That the effect of majority party strength in the House is stronger than in the Senate is consistent with the logic of collective action. The group to be organized is larger and more heterogeneous in the House, so that logic should bite more deeply there.

Thus for the Republicans we find what is essentially a curvilinear result: at least for the post - second world war House of Representatives, where Republican control initially leads to a decline in spending, but growth in the size of the Republican majority, and more unified Republican control of the branches of government are associated with increases in spending that match historical levels.

Changes in the nature of the median legislator and in party strength thus appear to have opposing effects on the level of spending from time to time. Partly as a result of this, and partly because the state of the legislature tends to move first one way and then another over the decades while public spending and the relevant economic factors exhibit strong trends, changes in the nature of Congress appear to be an order of magnitude less important in the evolution of federal public expenditure since 1930. We see this difference in the role of trending economic and stationary political factors showing up in our simulations of the consequences of the unprecedented shift to the right in Congress in 1994/95, which (when combined with other developments) even initially had a small effect, and was in any case soon overtaken by other events.

In the concluding chapter of his recent study of Congress Krehbiel (1998, 227/8) asserts:

"Political scientists like to say 'parties matter', and I do not disagree. The important issue...however...is not whether parties matter generally...but rather how majority-party status matters specifically, and whether it ultimately matters in ways that are predictable and *outcome consequential* (emphasis in the original)".

We agree with Krehbiel on this point. Our work has shown that party strength in the House of Representatives does appear to matter a great deal, but in a more complex way that has previously been supposed.[33] However, we have also shown that party (and ideological) effects, while important in the short run, did not impede the long march toward bigger government in the U.S. over the last almost four score years. [34]

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[33] In particular, the robust performance of the Aldrich-Rohde-Tofias measures of party strength supports their view that the operation of Congress is not simply a matter of median ideological position as indicated by DW_Nominate or real ADA scores. In his study Krehbiel focuses on where the supermajoritarian pivot is (i.e., the legislator who can vote to override a presidential veto). It is not immediately clear how pivots should be related to the level of federal spending, or how they ought to be included in the models estimated here, and we have left this and other issues for future research. We venture a guess that incorporating the veto pivot will operate in the same direction as does majority party strength as it is measured here.

[34] It is important to note that we are referring here to the consequences of changes over time in ideology and party strength within a given, stable political system - that of the United States in the 20th century. In a broader setting where ideology plays a role in the choice between and/or development of political systems, it may well have longer run consequences.

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## Table 1: Mnemonics

Unless noted otherwise, estimation uses the natural log of the following variables. Dummy variables are not used in log form unless otherwise stated in the text. *Notation used by Kau and Rubin (2002) is indicated in brackets where appropriate to permit comparisons.* The data set including detailed sources for all variables is found at www.carleton.ca/~winers.

| | |
|---|---|
| ***Agriculture (A)*** | Percent employment in agriculture. |
| ***ADA_House*** | Median score of the real ADA index for legislators, House. Not logged. |
| ***ADA_Senate*** | Median score of the real ADA index for legislators, Senate. Not logged. |
| ***Average_ADA*** | = (ADA_House + ADA_Senate)/2 |
| ***Average_CPG*** | = (CPG_House + CPG_Senate)/2 |
| ***All government spending (AFSR)*** | Real per capita, gross all government (consolidated) spending, 2000 base year. Federal grants to lower level governments are excluded. |
| ***Party control*** | Index of the degree of control of Congress by one party. Varies from -3 to 3. Sum of 3 indexes, one for each chamber and the presidency{-1 if chamber or presidency is controlled by Democrats; +1 if controlled by Republicans}. Not logged. A party neutral analogue discussed in the footnotes is *Undivided* = 1 if all branches controlled by the same party, = 0 otherwise. |
| ***Computers (T)*** | Percent of household with computers. |
| ***CPG_House*** <br> ***CPG_House_Dem*** <br> ***CPG_House_Repub*** | Index of majority party strength in the House (conditional party government). Suffix 'Dem only' or 'Repub only' denotes value of CPG for periods in which Democrats or Republicans control chamber, = 0 otherwise. Not logged. |
| ***CPG_Senate*** <br> ***CPG_Senate_Dem*** <br> ***CPG_Senate_Repub*** | Index of majority party strength in the Senate (conditional party government). Suffix 'Dem only' or 'Repub only' denotes value of CPG for periods in which Democrats or Republicans control chamber, = 0 otherwise. Not logged. |
| ***DW_House (HOU)*** | 1st dimension of DW-Nominate scores for the median member in the House. Not logged. Log form = log (1+ DW1_House) |
| ***DW_Senate (SEN)*** | 1st dimension of DW-Nominate scores for the median member in the Senate. Not logged. Log form = log (1+ DW1_Senate) |
| ***Farm income (FR)*** | Net farm income as percent of GDP. |
| ***Federal defense spending*** | Real per capita gross federal defense expenditure, 2000 base year. |
| ***Federal nondefense spending*** | Real per capita gross federal non-defense expenditure, 2000 base year. |
| ***Female graduates (CF)*** | Number of females 25 years and older who have college degree / number of females 25 years and older. |
| ***Female income (FI)*** | Real mean income of full time female workers. |
| ***Female participation (FP)*** | Female labor force participation rate (number of females in civilian labor force / number of females in civilian noninstitutional population), percent. |
| ***Korea*** | = 1 if year = 1950 - 1953, = 0 otherwise. |
| ***Miles of road (MR)*** | Miles of paved road, thousands. |
| ***9/11*** | = 1 if year = 2001 and beyond; = 0 otherwise. |
| ***Real GDP (GNP)*** | Real GDP, billions of chained dollars, 2000 base year. |
| ***Real income per capita (I)*** | Real per capita GDP. |
| ***Self-employment (SE)*** | Self-employment rate (full time workers), percent. |
| ***Urbanization (U)*** | Urbanization as percent of population in urban areas. |
| ***WWII (DW)*** | Dummy for World War II; = 1 for 1942 - 1946, = 0 otherwise. |
| ***WWIIAftermath*** | = 1 if year = 1947 and beyond, = 0 otherwise. |
| ***Year*** | Time trend. |
| ***"<1947" and "1947+"*** | Suffix that denotes a variable defined for the period before 1947 (<), or from 1947 on (+), = 0 otherwise. |

## Table 2

## Descriptive Statistics, 1930 to 2002 and Other Selected Time Periods*.

| | All govt real per capita spending | Federal real per capita spending | Federal real per capita *defense* spending | Federal real per capita *nondefense* spending | DW_House | DW_Senate | ADA_House | ADA_Senate | CPG_House | CPG_Senate | Real GDP | Real per capita GDP | Female labor force participation rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mean** | 5897 | 3956 | 1441 | 2515 | -0.018 | -0.055 | 36.96 | 36.71 | -0.58 | -0.45 | 3967 | 18149.04 | 42.79 |
| **Mean for Kau / Rubin (2002) period, 1930 - 1993** | 5168 | | | | -0.041 | -0.063 | | | | | 3256 | 16114 | 40.44 |
| **Mean from Kau / Rubin (2002, 398) for 1930-1993** | 3210 | | | | 1.02 | 1.05 | | | | | 1471 | 5394 | 39.29 |
| **Median** | 5870 | 3891 | 1420 | 1879 | -0.028 | -0.083 | 35.32 | 38.54 | -0.426 | -0.258 | 3399 | 17290 | 40.3 |
| **Maximum** | 11901 | 7446 | 5613 | 5985 | 0.309 | 0.113 | 56.97 | 52.24 | 0.691 | 0.66 | 10083 | 34934 | 60 |
| **Minimum** | 816 | 211 | 63 | 148 | -0.185 | -0.184 | 7.69 | 13.46 | -2.595 | -2.665 | 634 | 5056 | 25.2 |
| **% Change, 1930-2002 (or 1947-1999)** | 1358 | 3427 | 2208 | 4498 | -34 | -138 | 158 (1947 - 99) | 54 (1947 - 99) | -377 | -201 | 1175 | 444 | 137 |
| **(Begin - End) / Mean, as in K / R (2002, 400)** | 1.88 | | | | 5.89 | 2.13 | | | | | 2.38 | 1.57 | 0.8 |
| **Standard deviation** | 3349 | 2211 | 987 | 1889 | 0.12 | 0.094 | 10.75 | 11.48 | 0.77 | 0.99 | 2714 | 8529 | 11.3 |
| **ADF (levels)** | -0.29 | | -5.29 | 1.76 | -2.17 | -2.56 | -3.18 | -2.23 | -1.17 | -1.14 | 4.12 | 1.3 | -0.34 |
| **ADF(1st difference** | -6.43 | | -6.34 | -7.71 | -7.65 | -8.37 | -7.47 | -7.35 | -8.38 | -8.39 | -4.68 | -5.49 | -6.62 |
| **Observations** | 73 | | 73 | 73 | 73 | 73 | 53 | 53 | 73 | 73 | 73 | 73 | 73 |
| | | | | | | | | | | | | | |

**Notes:**
* Kau-Rubin (2002) notation in brackets.
ADF = adjusted Dickey-Fuller statistic with constant term only, lags (up to 4) chosen using the Akaike criterion.
MacKinnon (1996) ADF critical value at 1% = -3.53; at 5% = -2.90; at 10% = -2.59.

Figure 2a
Indexes of Ideology and Party Strength:
U.S. House, 1930 - 2002

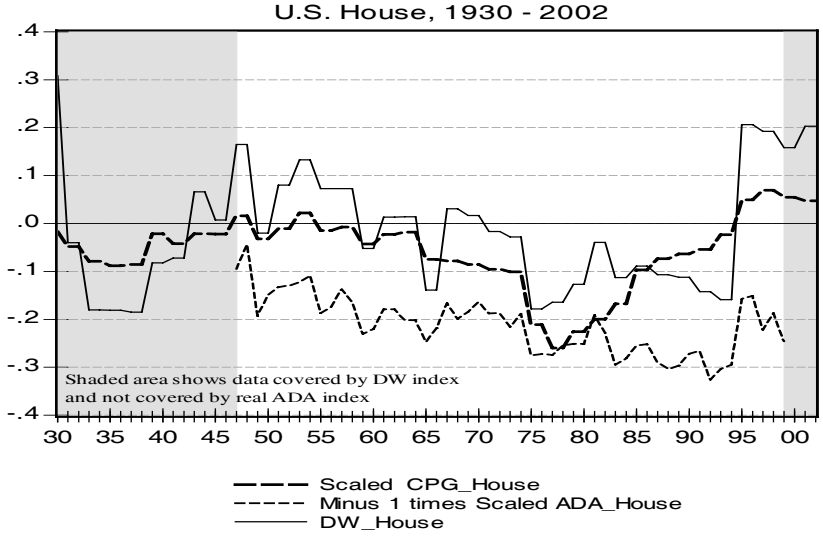



Figure 2b
Indexes of Ideology and Party Strength:
U.S. Senate, 1930 - 2002

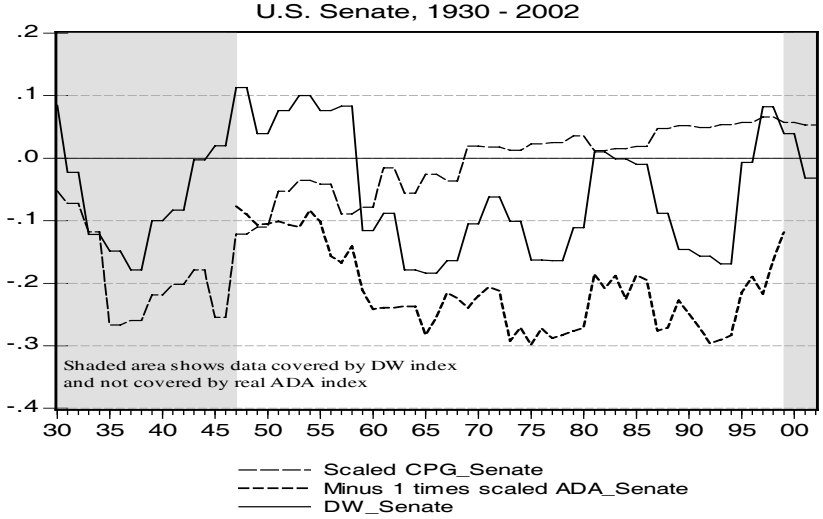



Figure 2c
Indexes of Party Strength and Checks and Balances
1930-2002

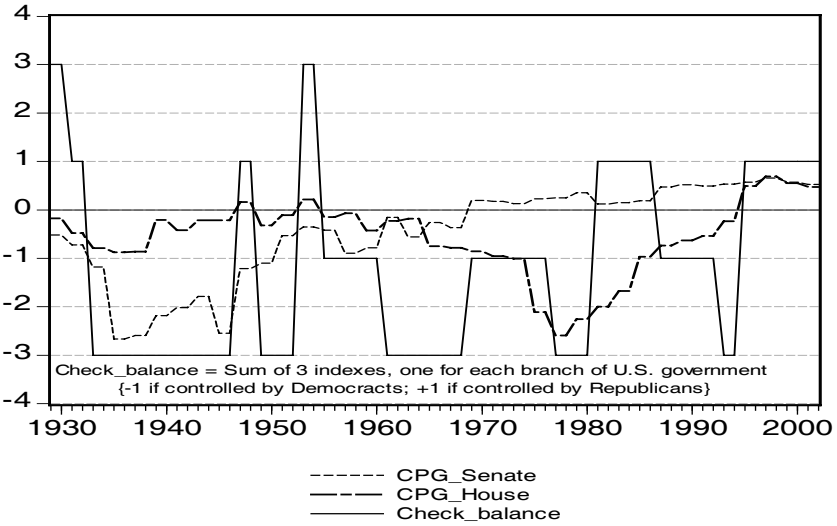


Figure 3a
Real Per Capita Government Spending, 1930 - 2002

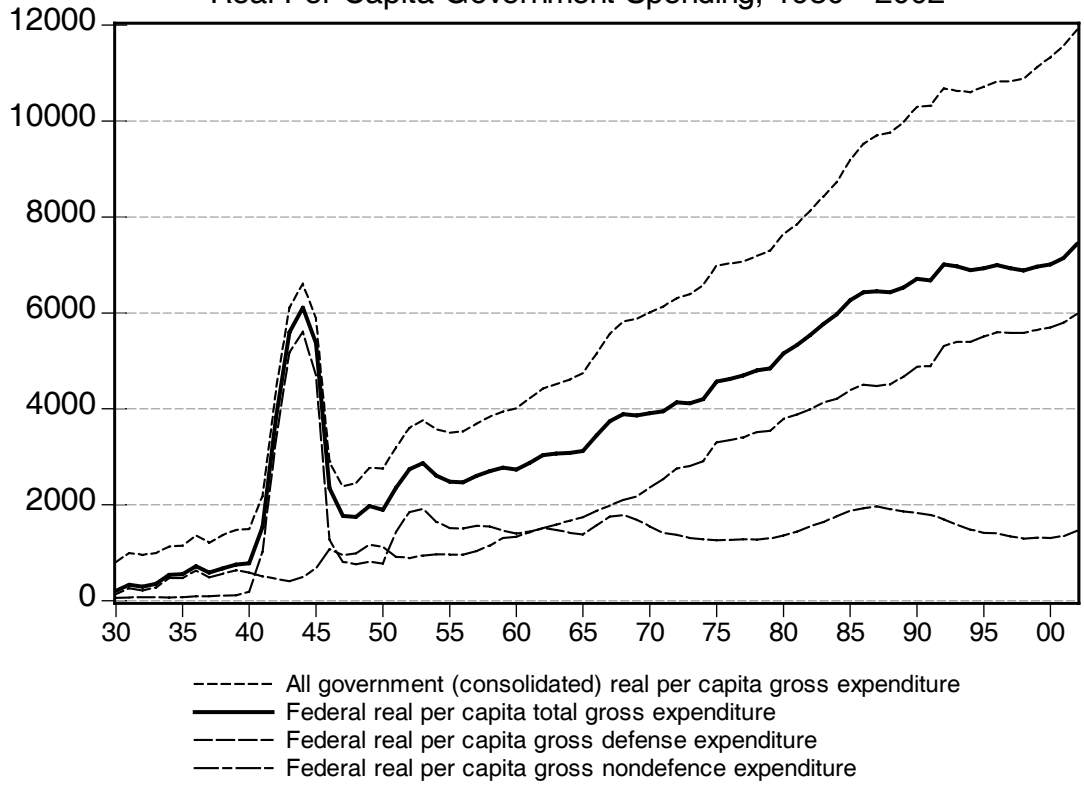



Figure 3b
Selected Mean-Standardized Variables
1930 - 2002

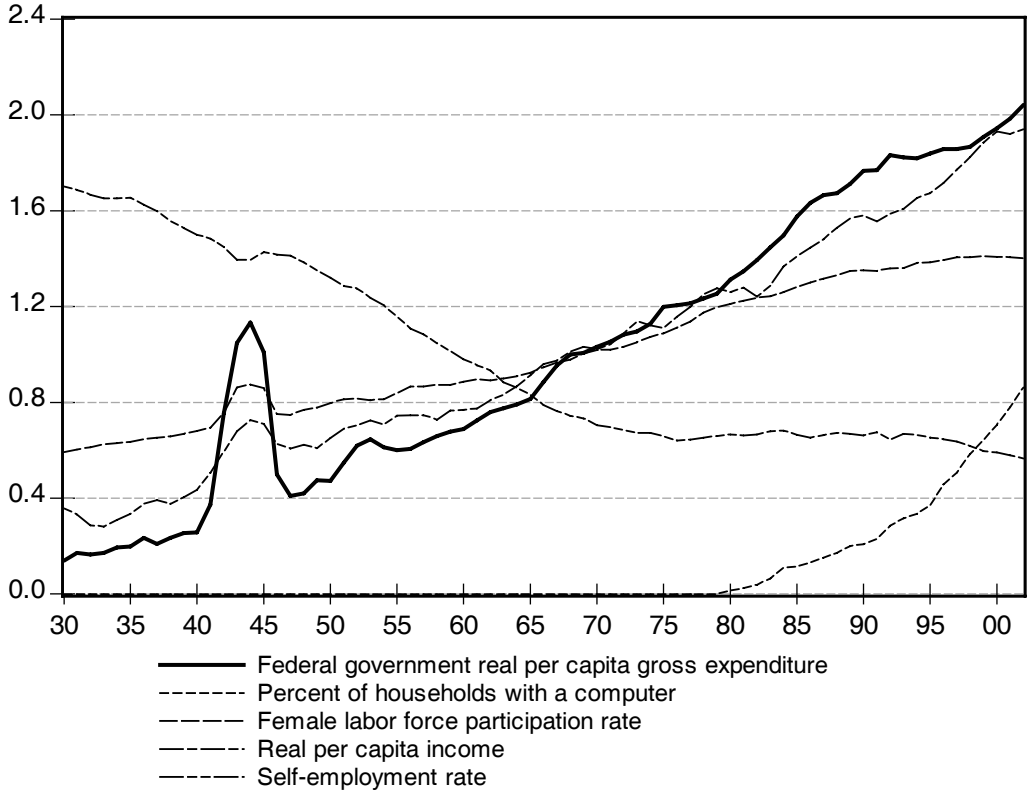


**Table 3**
**Explaining Federal (and *All Government*) Real Per Capita Spending, 1930 - 2002.**
**Various Estimation Methods**

| | 3SLS House (1) | 3SLS Senate (2) | 3SLS Both chambers (separately) Federal (3a) | 3SLS Both chambers (separately) *All Government* (3b) | 2SLS Both chambers (separately), with time shifts (4) | OLS Both chambers (separately), with time shifts (5) |
|---|---|---|---|---|---|---|
| ***Female participation*** | 9.98 (2.81)*** | 3.07 (3.64)*** | 12.26 (3.89)*** | 6.07 (4.52)*** | 8.58 (1.82)* | 2.75 (2.96)*** |
| ***Self-employment*** | 0.19 (0.27) | 1.86 (3.76)*** | -0.06 (0.08) | -0.35 (0.96) | 0.29 (0.39) | 0.07 (0.16) |
| ***Computers*** | -0.23 (2.36)** | -0.22 (3.53)*** | -0.20 (1.92)* | -0.06 (1.35) | -0.25 (1.22) | -0.09 (1.05) |
| ***Real income per capita*** | 0.83 (1.28) | 1.65 (5.34)*** | 0.29 (0.42) | 0.30 (1.00) | 0.67 (0.69) | 1.89 (2.56)** |
| ***DW_House*** | -1.09 (3.11)*** | | -0.41 (1.00) | -0.18 (0.94) | | |
| ***DW_House (<1947)*** | | | | | -1.52 (1.37) | -1.12 (2.01)** |
| ***DW_House (1947+)*** | | | | | 0.32 (0.55) | -0.25 (0.90) |
| ***DW_Senate*** | | -0.72 (2.34)** | -1.00 (1.63) | -0.64 (2.27)** | | |
| ***DW_Senate (<1947)*** | | | | | -1.07 (0.39) | -0.62 (0.39) |
| ***DW_Senate (1947+)*** | | | | | -1.26 (1.52) | -0.36 (1.32) |
| ***CPG_House_Dem*** | 0.35 (2.62)*** | | 0.36 (3.27)*** | 0.17 (3.58)*** | | |
| ***CPG_House_Repub*** | 0.92 (2.31)** | | 0.86 (2.54)** | 0.36 (2.46)*** | | |
| ***CPG_Senate_Dem*** | | -0.11 (2.72)*** | -0.19 (2.71)*** | -0.05 (1.72)* | | |
| ***CPG_Senate_Repub*** | | 0.07 (0.79) | -0.16 (1.04) | 0.0002 (0.003) | | |
| ***CPG_House (<1947)***[3] | | | | | 0.49 (1.42) | 0.23 (0.86) |
| ***CPG_House (1947+)***[3] | | | | | 0.30 (1.62) | 0.11 (1.79)* |
| ***CPG_Senate(<1947)*** | | | | | -0.13 (0.72) | 0.08 (0.63) |
| ***CPG_Senate (1947+)*** | | | | | -0.11 (0.75) | -0.05 (0.49) |
| ***Check_balance*** | -0.02 (1.28) | 0.01 (0.73) | 0.01 (0.50) | 0.01 (1.19) | | |
| ***Party control (<1947)*** | | | | | 0.003 (0.03) | -0.11 (1.75)* |
| ***Party control (1947+)*** | | | | | 0.03 (1.97)* | 0.02 (2.12)** |
| ***WWII*** | 0.002 (0.005) | 0.64 (4.20)*** | -0.12 (0.40) | 0.18 (1.33) | 0.28 (0.51) | 0.63 (2.60)** |
| ***WWIIAftermath*** | 0.32 (1.78)* | 0.54 (4.10)*** | 0.57 (2.78)*** | 0.29 (3.15)*** | 0.43 (0.70) | 0.40 (0.96) |
| ***Korea*** | -0.12 (1.38) | -0.13 (1.80)* | -0.02 (0.20) | -0.01 (0.19) | 0.10 (1.18) | 0.04 (0.66) |
| ***9/11*** | 0.26 (0.91) | 0.003 (0.03) | 0.25 (1.01) | 0.11 (1.02) | 0.42 (1.53) | 0.13 (2.65)** |
| ***Year*** | -0.10 (2.38)** | -0.004 (0.26) | -0.12 (3.34)*** | -0.06 (3.60)*** | -0.07 (1.69)* | -0.04 (3.27)*** |
| ***Constant*** | -33.69 (5.13)*** | -24.05 (6.47)*** | -35.92 (5.63)*** | -14.16 (4.78)*** | -28.44 (2.02)* | -19.38 (3.34)*** |
| **OBSV.** | 73 | 73 | 73 | 73 | 73 | 73 |
| **ADJ $R^2$** | 0.94 | 0.97 | 0.92 | 0.98 | 0.96 | 0.99 |
| **D.W.** | 1.02 | 0.82 | 1.26 | 1.14 | 1.59 | 1.82 |
| **L.M.(P-Value)** | | | | | 0.00 | **0.68** |
| **ADF(residuals)** | | | | | | **-7.75*** ** |

**NOTES**: Absolute value of t-statistics in brackets. (***)(**)(*) = significant at (1%)(5%)(10%); Newey-West HAC standard errors are used where appropriate; D.W. = Durbin-Watson; L.M. = P-value for (obsv* $R^2$) from auxiliary regression to test for serial correlation with lag length 2; ADF = Adjusted Dickey-Fuller statistics using Akaike criterion and maximum lag length 4; MacKinnon (1996) critical value for cointegration with 12 variables, a constant and time: at 1% = -7.61; at 5% = -6.86; at 10% = -6.49.

**Table 4**
**Explaining Federal Expenditure Using Real ADA Indexes, 1947 - 1999.**
**Various Estimation Methods**

| | **3SLS** **(1)** | **3SLS (DW_Nominate)** **(2)** | **2SLS** **(3)** | **OLS** **(4)** | **OLS (AVERAGE_ADA)** **(5)** |
|---|---|---|---|---|---|
| ***Female participation*** | 5.00 (3.44)*** | 5.30 (3.34)*** | 4.68 (4.36)*** | 1.52 (3.72)*** | 1.58 (4.05)*** |
| ***Self-employment*** | -0.59 (1.86)* | -0.42 (0.13) | -0.88 (4.10)*** | -0.42 (2.92)*** | -0.41 (4.13)*** |
| ***Computers*** | 0.02 (0.22) | -0.08 (1.15) | | | |
| ***Real income per capita*** | -0.32 (0.82) | -0.04 (0.10) | -0.55 (1.41) | -0.15 (0.53) | -0.10 (0.38) |
| ***ADA_House*** | 0.001 (0.70) | | 0.003 (2.37)** | 0.003 (2.97)*** | |
| ***ADA_Senate*** | 0.003 (1.67)* | | 0.0008 (0.69) | 0.0005 (0.32) | |
| ***Average_ADA*** | | | | | 0.004 (2.59)** |
| ***DW_House*** | | -0.16 (0.78) | | | |
| ***DW_Senate*** | | -0.53 (2.09)** | | | |
| ***CPG_House*** | 0.10 (1.47) | 0.14 (2.24)** | 0.14 (3.19)*** | 0.04 (2.58)** | |
| ***CPG_Senate*** | 0.05 (0.92) | 0.04 (0.83) | 0.09 (1.07) | 0.09 (1.21) | |
| ***Average_CPG*** | | | | | 0.07 (2.45)** |
| ***Party control*** | 0.008 (1.29) | 0.02 (2.13)** | 0.01 (1.18) | 0.01 (2.00)* | 0.02 (2.17)** |
| ***Korea*** | 0.06 (1.43) | 0.05 (1.22) | 0.12 (1.80)* | 0.12 (2.55)** | 0.14 (3.21)*** |
| ***Year*** | -0.04 (2.83)*** | -0.04 (2.27)** | -0.04 (2.02)* | | |
| ***Constant*** | -4.33 (0.83) | -9.49 (1.71) | -0.39 (0.08) | 4.90 (3.03)*** | 4.15 (2.71)*** |
| **OBSV.** | 53 | 53 | 53 | 53 | 53 |
| **ADJ $R^2$** | 0.96 | 0.96 | 0.97 | 0.98 | 0.98 |
| **D.W.** | 0.99 | 1.05 | 1.33 | 1.25 | 1.35 |
| **L.M.(P-Value)** | | | 0.00 | 0.01 | 0.04 |
| **ADF(residuals)** | | | | **-4.87** | **-2.51** |

**NOTES:**
Absolute value of t-statistics in brackets. (***)(**)(*)=significant at (1%)(5%)(10%)
Newey-West HAC standard errors used where appropriate
D.W. = Durbin-Watson.
L.M. = P-value for (obsv times $R^2$) from auxiliary regression to test for serial correlation with lag length 2;
ADF = adjusted Dickey-Fuller statistic using Akaike criterion and maximum lag length 4.
MacKinnon (1996) critical value for cointegration with 7 variables and constant: at .10% = - 5.00.

**Table 5a: Contributions of Selected Factors to Change in Federal Government Size, 1930-2002**
**Proportionate change in variables defined as: (end value - beginning value) / mean value**

| **Log form of models in Table 3: Proportion of change in real federal spending per capita of 3427% due to:[a]** | **3SLS Log form of Col 3a, Table 3. 1930 - 2002 (1)** | **2SLS Log form of Col 4, Table 3. 1930 - 2002 (2)** | **OLS Log form of Col 5, Table 3. 1930 - 2002 (3)** | **OLS Log form of Col 4, Table 4. 1947 - 1999 (Using ADA) (4)** |
|---|---|---|---|---|
| ***Female participation rate*** | **.293** | **.21** | **.064** | **.032** |
| ***Real income per capita*** | **.012** | **.029** | **.086** | **.002** |
| ***log (1 + DW-Nominate); House plus Senate One coefficient for each chamber for entire sample*** | **.004** | | | |
| ***log (1+DW-Nominate); House plus Senate Separate coefficients for < 1947 and 1947+*** | | **.038** | **.02** | |
| ***log (real ADA); House plus Senate One coefficient for each chamber for entire sample*** | | | | **.002** |
| **ADF (residuals) L.M.(P-Value)** | | | **-7.66*** 0.64** | **-5.21* .002** |

**NOTES:** See Notes to Tables 3 and 4. (***)(**)(*) = significant at (1%)(5%)(10%)
By log form is meant DW-Nominate indexes are also used in the log form: log (1+DW). Changes in these indexes refer to (1+DW).
CPG indexes are not used in log form. All columns use DW_Nominate indexes except column 4 which uses real ADA indexes.
Change in female participation rate / mean, 1930 - 2002 = - 0.80
Change in real income per capita / mean, 1930 - 2002 = + 1.57
Change in (1+ *DW1_House*) / mean, 1930 - 2002 = - .082 (-.321 for 1930 - 1946; +.038 for 1947 and after)
Change in (1+ *DW1_Senate*) / mean, 1930 - 2002 = **-** .124 ( -.699 for 1930 - 1946; **-**.153 for 1947 and after)

**Table 5b: Contributions of Selected Variables to Change in All Government Size, 1930 -2002**
**Proportionate change in variables defined as: (end value - beginning value) / mean value**

| **Log form of models in Table 3 applied to real *all govt* expenditure per capita as the dep. varb: Proportion of change in real all govt spending per capita of 1358% due to:[a]** | **3SLS Log form of Col 3b, Table 3 all govt spending, 1930 - 2002 (1)** | **2SLS Log form of Col 4, Table 3, all govt spending, 1930 - 2002 (2)** | **OLS Log form of Col 5, Table 3, all govt spending, 1930 - 2002 (3)** |
|---|---|---|---|
| ***Female participation*** | **.304** | **.316** | **.159** |
| ***Real income per capita*** | **.032** | **.053** | **.109** |
| ***log (1 + DW-Nominate); House plus Senate One coefficient for each chamber for entire sample*** | **.006** | | |
| ***log (1+DW-Nominate); House plus Senate Separate coefficients for < 1947 and 1947+*** | | **.076** | **.054** |
| **ADF (residuals) L.M.(P-Value)** | | | **-7.88*** 0.64** |

**NOTES:** See Notes to Table 5a

**Table 6: Real Per Capita Federal Defense & Nondefense Expenditure, 1930 - 2002**
**Various Estimation Methods**

| | Federal Defense Spending | | | | Federal Nondefense Spending | | | |
|---|---|---|---|---|---|---|---|---|
| | 3SLS | 3SLS | 3SLS | OLS | 3SLS | 3SLS | 3SLS | OLS |
| | House | Senate | Both chambers (separately) | Both chambers (separately) | House | Senate | Both chambers (separately) | Both chambers (separately) |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| *Female participation* | 14.44 (2.81)*** | 5.34 (2.78)*** | 20.15 (3.30)*** | 3.73 (1.27) | 16.30 (3.16)*** | 5.27 (5.53)*** | 6.83 (3.48)*** | -1.11 (1.03) |
| *Self-employment* | 0.38 (0.38) | 2.48 (2.10)** | 0.83 (0.52) | 0.09 (0.07) | 0.74 (0.82) | -0.28 (0.49) | -1.00 (1.80)* | -0.18 (0.41) |
| *Computers* | -0.42 (2.61)*** | -0.14 (0.92) | -0.33 (1.67)* | -0.23 (0.85) | -0.28 (1.80)* | -0.04 (0.51) | -0.13 (1.63)* | 0.08 (0.83) |
| *Real income per capita* | 1.99 (2.01)** | 3.90 (5.91)*** | 1.11 (0.86) | 3.79 (1.43) | -0.77 (0.73) | -0.98 (2.91)*** | -1.17 (2.29)** | 0.08 (0.12) |
| *DW_House* | -1.73 (3.33)*** | | -0.32 (0.41) | | -1.23 (2.24)** | | -0.83 (2.59)*** | |
| *DW_House(<1947)* | | | | -1.91 (1.40) | | | | -2.11 (4.90)*** |
| *DW_House(1947+)* | | | | -1.18 (1.14) | | | | -0.07 (0.18) |
| *DW_Senate* | | -1.62 (2.17)** | -1.74 (1.51) | | | -0.12 (0.33) | 0.15 (0.33) | |
| *DW_Senate(<1947)* | | | | 0.41 (0.11) | | | | 4.06 (4.47)*** |
| *DW_Senate(1947+)* | | | | -0.36 (0.40) | | | | -0.08 (0.18) |
| *CPG_House_Dem* | 0.66 (3.22)*** | | 0.59 (2.58)*** | | 0.40 (2.05)** | | 0.21 (2.79)*** | |
| *CPG_House_Repub* | 1.23 (2.22)** | | 0.95 (1.54)* | | 1.26 (2.07)** | | 0.77 (3.58)*** | |
| *CPG_SENATE_Dem* | | -0.06 (0.60) | -0.20 (1.61)* | | | -0.35 (7.06)*** | -0.34 (6.48)*** | |
| *CPG_SENATE_Repub* | | 0.41 (1.92)* | -0.07 (0.23) | | | -0.41 (3.87)*** | -0.63 (5.61)*** | |
| *CPG_House(<1947)* | | | | 0.59 (0.62) | | | | 0.14 (0.78) |
| *CPG_House(1947+)* | | | | 0.38 (1.82)* | | | | -0.17 (1.85)* |
| *CPG_Senate(<1947)* | | | | 0.31 (0.80) | | | | -0.33 (3.00)*** |
| *CPG_Senate(1947+)* | | | | -0.07 (0.26) | | | | -0.05 (0.43) |
| *Party control* | -0.008 (0.35) | 0.03 (0.85) | 0.02 (0.62) | | -0.03 (1.32) | -0.008 (0.51) | -0.01 (0.76) | |
| *Party control (<1947)* | | | | -0.14 (1.10) | | | | -0.08 (1.78)* |
| *Party control (1947+)* | | | | 0.04 (2.20)** | | | | 0.004 (0.40) |
| *WWII* | 0.30 (0.58) | 1.14 (3.59)*** | -0.09 (0.15) | 1.06 (1.30) | -2.04 (3.99)*** | -0.51 (3.26)*** | -0.71 (3.83)*** | -0.18 (1.02) |
| *WWIIAftermath* | 0.96 (3.43)*** | 1.69 (5.72)*** | 1.47 (3.40)*** | 0.53 (0.39) | -0.04 (0.14) | 0.52 (3.56)*** | 0.26 (1.70)* | 0.76 (2.32)** |
| *Korea* | -1.10 (0.73) | -0.26 (1.51) | -0.15 (0.67) | 0.04 (0.22) | -0.22 (1.81)* | 0.04 (0.46) | 0.15 (1.76)* | -0.007 (0.07) |
| *9/11* | 0.54 (1.34) | 0.12 (0.39) | 0.27 (0.57) | 0.33 (2.42)** | 0.54 (1.38) | 0.02 (0.13) | 0.10 (0.65) | -0.20 (1.80)* |
| *Year* | -0.19 (3.08)*** | -0.11 (2.91)*** | -0.24 (3.39)*** | -0.11 (3.76)*** | -0.12 (2.25)** | 0.004 (0.24) | -0.01 (0.67) | 0.04 (3.32)*** |
| *Constant* | -60.02 (6.32)*** | -53.88 (6.58)*** | -72.50 (5.70)*** | -39.89 (2.24)** | -42.28 (4.38)*** | -2.69 (0.68) | -3.78 (0.94) | 8.78 (1.94)* |
| **OBSV.** | 73 | 73 | 73 | 73 | 73 | 73 | 73 | 73 |
| **ADJ $R^2$** | 0.87 | 0.91 | 0.78 | 0.93 | 0.74 | 0.96 | 0.95 | 0.99 |
| **D.W.** | 1.11 | 0.82 | 1.05 | 1.35 | 1.31 | 1.47 | 1.82 | 1.44 |
| **L.M.(P-Value)** | | | | 0.002 | | | | 0.0004 |
| **ADF(residuals)** | | | | -5.99 | | | | -3.95 |

**NOTES:** Absolute value of t-statistics in brackets. (***)(**)(*)=significant at (1%)(5%)(10%); Newey-West HAC standard errors used where appropriate.
D.W. = Durbin-Watson.
L.M. = P-value for (obsv. $R^2$) from auxiliary regression to test for serial correlation with lag length 2.
ADF = Adjusted Dickey-Fuller statistics using Akaike criterion and maximum lag length 4.

**Figure 4a: Forecasts With Median DW_Nominate Indexes Fixed at 1994 Levels**
**OLS estimation based on Table 3, column 5.**

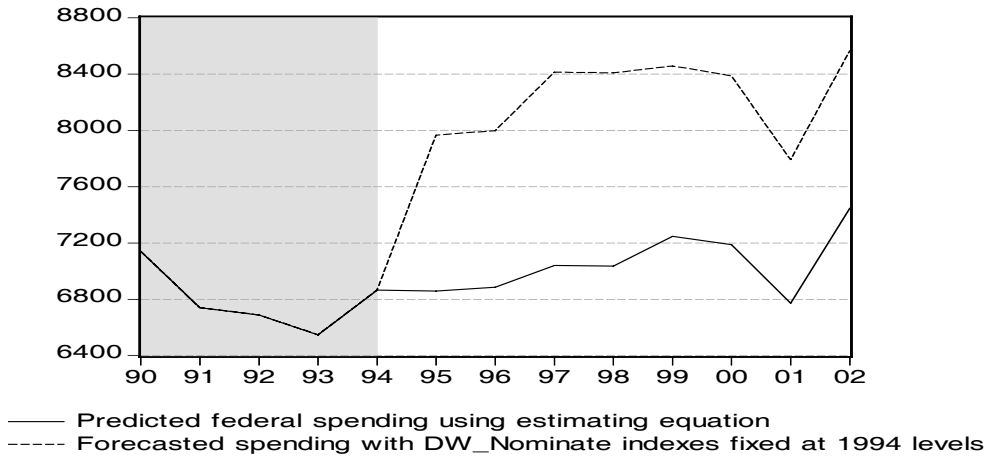



**Figure 4b: Forecast With All Congressional Indexes Fixed at 1994 Levels**
**OLS estimation based on Table 3, column 5.**

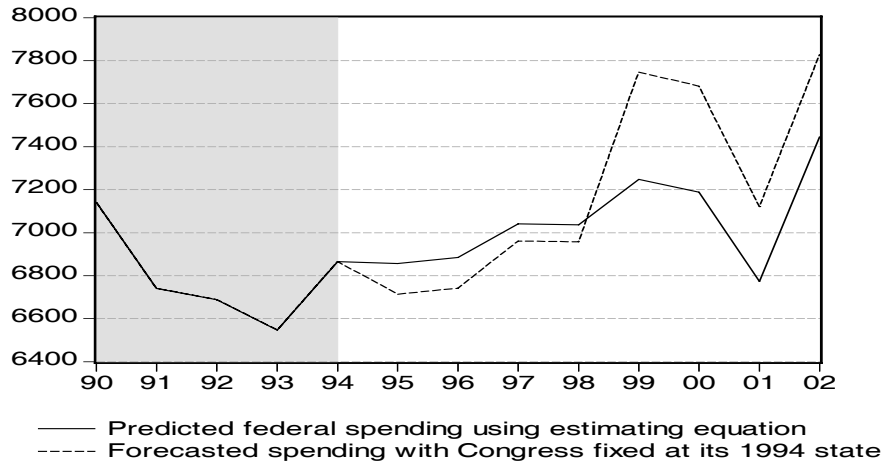



**Figure 4c: Forecast With All Congressional Indexes Fixed at 1994 Levels**
**2SLS based on Table 3, column 4.**

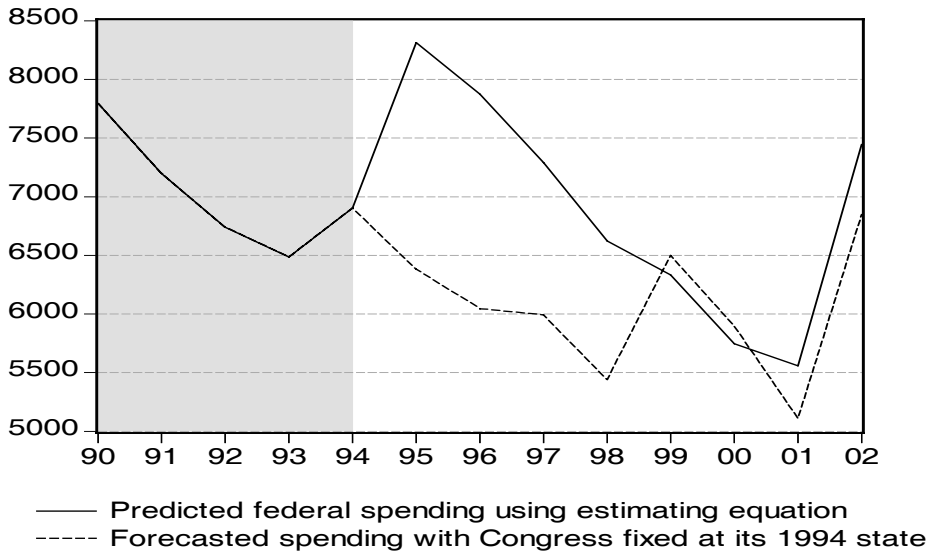
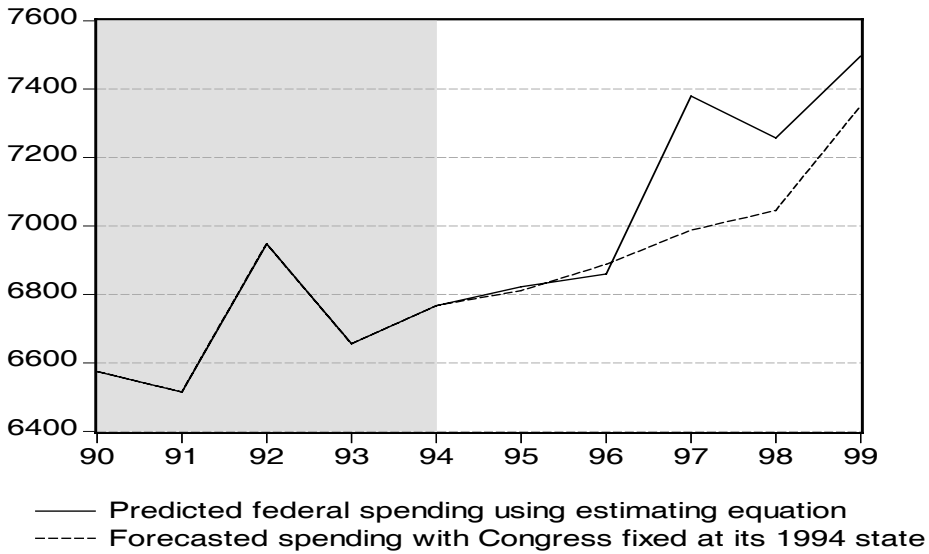



**Figure 4d: Forecast With All Congressional Indexes Fixed at 1994 Levels**
**OLS estimation (using real ADA) based on Table 4, column 4.**



## Appendix: Replicating Kau-Rubin (2002).

As their original data has been disposed of, and we are using a new data set, the opportunity arises to see if the Kau-Rubin (2002) results can be replicated. This is an important exercise, one not often done in social science.

The basic Kau-Rubin estimating equation for real all government spending per capita, using the median ideological position of Senators, is as follows. Here notation in brackets is that used by Kau-Rubin (2002), so that the reader can more easily compare results given below with the Kau-Rubin paper if he or she so wishes:

$$\textit{Real all govt spending per capita (AFSR)} = c_1 \cdot \textit{Female participation (FP)} + c_2 \cdot \textit{Self-employment (SE)} + c_3 \cdot \textit{Computers (T)} + c_4 \cdot \textit{Real GDP (GNP)} + c_5 \cdot \textit{Log(1+DW1\_Senate)(SEN)} + c_6 \cdot \textit{WWII (DW)} + c_7 \cdot \textit{Year} + c_8 \cdot \textit{Constant} + \textit{Error} \quad \textbf{(A1)}$$

Remaining equations in the Kau-Rubin system, for the *self-employment rate (SE), female participation rate (FP), farm revenue as a percent of GDP (FR)* and the *urbanization rate (U)*, are stated below.

Expected signs of coefficients in equation (A1) are: $c_1 > 0$, $c_2 < 0$, $c_3 > 0$, $c_4 > 0$, $c_5 < 0$, $c_6 > 0$, $c_7 > ?$. In particular, an increase in the female participation rate is expected to lead to an increase in government size, and a smaller value of the DW1_Nominate index for either chamber, indicating a leftward shift in the position of the median ideological position of Senators, should also result in more spending.

Results for the spending equation of estimating the Kau-Rubin system using three-stage least squares is presented in Table A1, while the remaining equations for selected models are presented below. The first two columns of Table A1 repeat the results for the spending equation from page 399 of Kau and Rubin (2002). Columns 3 and 4 report our replication for the same time period, 1930 - 1993, using the new data set, and the last two columns use the new data for the longer period 1930 - 2002.

The table shows that in our replication over either time period: (i) *female labor force participation* generally is insignificant with the wrong (negative) sign, and is only significant once (see col. 6) and then with the right (positive) sign, in contrast to the Kau-Rubin results where it is always positive and significant; (ii) as in Kau-Rubin, *self-employment* is highly significant with the wrong (positive) sign; (iii) aggregate *real GDP* has the right (positive) sign and is significant in all equations, in contrast to Kau-Rubin where aggregate income enters with a negative and significant coefficient.

Concerning the role of ideology, in Kau-Rubin, DW1_Nominate has a positive and significant effect in the Senate equation, and is not significant in the House equation. The coefficients also differ in size across chambers. Here, in marked contrast, both chambers exhibit expected negative and significant coefficients on DW1_Nominate, and the size of the coefficients is similar across chambers. From the discussion in Kau-Rubin, one can infer that either the positive sign on the coefficient of D-Nominate is mistakenly reported in their table of results, or that they reversed the definition of the variable to produce a positive coefficient. The important difference between the results in Table A1 and in Kau-Rubin (2002) is that the coefficient for the House is also significant here and that the coefficients generally do not differ much in size across chambers.

Obviously there must be differences between the data Kau and Rubin (2002) used and those we have assembled. There are reasonable ways in which one can collect the required data, especially when estimation is required (as with *female participation*, as discussed in the text, and as with *miles of paved road (MPR)* and *females with college degrees (CF)*, both of which appear in the additional equations listed below Table A1. Reported means in Table 2 of the text for female participation rates and self-employment rates are similar to that reported by Kau and Rubin, though of course we cannot know if higher moments of the distributions are also alike.

In addition, it should be noted that between 1993 and 2006 there have been major revisions to the National Income and Product Accounts, affecting to some degree measures of real income and of government expenditure, and indeed we see in Table 2 that reported means for total *real GDP*, *real per capita income (I)*, as well as for *real all government spending per capita (AFSR)* are different in our data from those reported by Kau and Rubin. (Calculated growth of government figures for 1930 - 93, not reported in the table, are however roughly similar[35]). It is not possible to know with certainty what measurement or other factors are responsible for the differences in the two sets of estimation results in Table A1.

All in all, the results of using the new data set shown in Table A1 and in the remaining parts of the system of equations are substantially different than those in the Kau-Rubin (2002) paper. Indeed, it is fair to say that these results indicate that the original model is not robust and, in particular, they clearly do *not* support the original hypothesis about the importance of the supply-side in the growth of government. Indeed, even if one just ignores the negative elasticities in Table A1, and takes the most complementary coefficient on *female participation* of 0.73 along with the percentage change (relative to its mean) in female participation rates over the sample of about 80%, this elasticity can explain about 4.3 percent (.73 * 80) /1358)) of the 1358% increase in real per capita all government spending since 1930.

**Table A1: Replication of the Kau-Rubin (2002) System, 1930 - 1993 and 1930 - 2002.**
**Equation for the log of real all government spending per capita (AFSR in Kau-Rubin), 3SLS Estimation**

| Variable names (and Kau-Rubin 2002 notation) | 1930-1993[c] K-R(2002) House (1) | 1930-1993[c] K-R(2002) Senate (2) | 1930-1993[d] House (3) | 1930-1993[d] Senate (4) | 1930-2002[d] House (5) | 1930-2002[d] Senate (6) |
|---|---|---|---|---|---|---|
| ***Female participation (FP)*** | 7.72<br>(3.25) | 8.39<br>(3.58) | -1.45<br>(1.55) | -0.11<br>(0.10) | -0.29<br>(0.55) | 0.73<br>(1.75)* |
| ***Self-employment (SE)*** | 0.486<br>(1.65) | 1.01<br>(2.85) | 1.59<br>(6.72)*** | 1.57<br>(6.21)*** | 1.37<br>(8.02)*** | 1.40<br>(7.87)*** |
| ***Computers (T)*** | -0.0005<br>(0.008) | -0.049<br>(0.856) | -0.21<br>(5.95)*** | -0.20<br>(5.45)*** | -0.19<br>(6.62)*** | -0.18<br>(6.51)*** |
| ***Real GDP (GNP)[a]*** | -0.93<br>(1.85) | -0.915<br>(1.94) | 1.04<br>(4.65)*** | 0.90<br>(4.76)*** | 1.21<br>(6.94)*** | 1.20<br>(8.79)*** |
| ***Log (1+DW1_House)[b]*** | 0.136<br>(0.579) | | -0.39<br>(2.92)*** | | -0.23<br>(2.35)** | |
| ***Log (1+DW1_Senate)[b]*** | | 1.49<br>(2.77) | | -0.31<br>(2.16)** | | -0.32<br>(3.57)*** |
| ***Year*** | -1.48<br>(3.19) | -2.00<br>(3.65) | 0.05<br>(3.27)*** | 0.04<br>(2.17)** | 0.03<br>(2.56)*** | 0.01<br>(1.38) |
| ***WWII (DW)*** | 0.729<br>(4.05) | 0.745<br>(4.36) | -0.82<br>(6.11)*** | 0.68<br>(4.46)*** | 0.62<br>(7.22)*** | 0.49<br>(6.30)*** |
| **Constant** | N.A. | N.A. | -0.27<br>(0.10) | -3.56<br>(1.05) | -4.40<br>(2.58)*** | -7.69<br>(4.55)*** |
| **OBSV.** | 64 | 64 | 64 | 64 | 73 | 73 |
| **ADJ $R^2$** | | | 0.96 | 0.97 | 0.97 | 0.98 |

**NOTES:** Absolute value of t-statistics in brackets. (***)(**)(*)=significant at (1%)(5%)(10%)
**a**. Kau and Rubin used *real GNP* instead of *real GDP*.
**b**. Kau and Rubin used D-Nominate instead of the more recent and almost identical DW-Nominate.
**c**. Instruments include *Log (1+DW1_House), Log (1+DW1_Senate), WWII, Year,* and in log form: *T, MR, A, CF, FI* and r*eal GDP*.
**d**. Instruments include *DW1_House, DW1_Senate, WWII, Year*, and in log form: *T, MR, A, CF, FI and real GDP*.

[35] For real *all government spending per capita (AFSR in Kau-Rubin)*, our simple percent change over the Kau-Rubin period (1930-93) is 1202%, while they report a total change of 1161%. We also note that using real income per capita instead of real GDP in equation (A1) does not lead to a substantial change in conclusions except that, in the House results, *labor force participation* now has a negative (wrong signed) coefficient that (still) misses significance at 10%.

**The remainder of the 3SLS System: Equations for the *Self-employment rate (SE)*, *Female participation rate (FP)*, *Farm revenue as a percent of GDP (FR)* and the *Urbanization rate (U)*. All variables are in log form except the dummy variables *YEAR* and *WWII* (= *DW* in Kau-Rubin). Mnemonics are found in Table 1 of the text.**

**1. <u>From Kau-Rubin (2002, 399)</u>**
(Constant terms not reported)

**House, 1930 - 1993**

SE = 0.076*AFSR - 2.69*MR + 0.011*TECH - 2.11*U + 4.30*YEAR -0.052*WWII
(0.968) (3.71) (0.668) (2.67) (9.20) (1.42)

FP = 0.050*AFSR - 0.076*A + 0.107*CF + 0.110*FI + 0.007*FR + 0.300*YEAR - 0.074*WWII
(1.82) (3.24) (2.43) (3.87) (.325) (9.30) (9.17)

FR = 0.333*AFSR + 0.646*A - 0.16*T - 0.259*YEAR - 0.042*WWII
(3.10) (6.65) (8.63) (1.91) (1.00)

U = 0.178*AFSR - 0.084*I + 1.29*MR - 0.929*YEAR - 0.051*WWII
(6.51) (3.78) (5.75) (3.99) (5.96)

**Senate , 1930 - 1993**

SE = 0.029*AFSR - 3.08*MR + 0.019*T - 1.61*U + 4.50*YEAR - 0.032*WWII
(0.428) (4.84) (1.29) (2.36) (10.79) (0.983)

FP = 0.049*AFSR - 0.076*A + 0.107*CF + 0.109*FI + 0.004*FR + 0.302*YEAR - 0.073*WWII
(1.78) (3.24) (2.44) (3.88) (0.193) (9.40) (9.15)

FR = 0.336*AFSR + 0.649*A - 0.16*T - 0.263*YEAR - 0.042*WWII
(3.13) (6.68) (8.63) (1.94) (1.02)

U = 0.177*AFSR - 0.084*I + 1.28*MR - 0.925*YEAR - 0.051*WWII
(6.48) (3.76) (5.75) (3.98) (5.96)

**2. <u>Results for additional equations in 3SLS system corresponding to Table A1, columns 3 and 4</u>**

**House, 1930 – 1993**

SE = 5.34 + 0.31*AFSR + 0.11*MPR + 0.12*TECH - 1.23*U - 0.03*YEAR - 0.29*WWII
(2.86) (2.93) (0.83) (6.14) (2.31) (9.81) (2.89)

FP = 10.36 - 0.35*AFSR - 0.27*A + 0.15*CF - 0.49*FI + 0.30*FR + 0.03 *YEAR + 0.40*WWII
(3.85) (3.25) (3.08) (3.14) (2.48) (3.58) (3.79) (4.27)

FR = -7.96 + 1.42*AFSR + 0.06*A + 0.12*TECH - 0.10*YEAR - 0.98*WWII
(4.40) (4.86) (0.14) (1.68) (3.51) (3.53)

U = 0.99 - 0.49*AFSR + 0.53*IREAL + 0.32*MPR - 0.0003*YEAR + 0.27*WWII
(1.81) (4.78) (4.80) (5.84) (0.29) (4.02)

**Senate, 1930 - 1993**

SE = 4.57 + 0.28*AFSR + 0.14*MPR + 0.13*TECH - 1.03*U - 0.03*YEAR - 0.26*WWII
(2.64) (2.64) (1.16) (6.68) (2.11) (10.54) (2.61)

FP = 3.29 - 0.02*AFSR - 0.05*A + 0.21*CF - 0.003*FI + 0.04*FR + 0.008*YEAR + 0.13*WWII
(2.14) (0.38) (0.98) (5.19) (0.02) (0.88) (1.58) (2.45)

FR = -7.90 + 1.41*AFSR + 0.07*A + 0.11*TECH - 0.10*YEAR - 0.96*WWII
(4.34) (4.66) (0.15) (1.49) (3.33) (3.41)

U = 0.93 - 0.47*AFSR + 0.54*IREAL + 0.29*MPR - 0.0005*YEAR + 0.25*WWII
(1.74) (4.60) (4.93) (5.53) (0.49) (3.76)

**For both House and Senate, the following coefficients in the indicated equations take a different sign than in the above equations from Kau/Rubin 2002. SE**: MPR; YEAR. **FP**: FI; WWII. **FR**: TECH. **U**: AFSR; IREAL; WWII.