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Seniority and anti-competitive restrictions on the legislative common pool: tenure's impact on the overall production of legislation and the concentration of political benefits

Russell S. Sobel · Matt E. Ryan

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Abstract It is well established that geographic areas benefit, in terms of the share of government spending they capture, from having a legislator with longer tenure, *holding constant* the tenure of other legislators. However, the implications of this literature for how the total production of legislation changes if *all* members gained seniority is less clear. Increased levels and dispersion of seniority within Congress generate a cartel-like effect, whereby legislators restrict the quantity of legislation enacted and increase the average price of each passed bill. The analysis provides a natural experiment to gauge the impacts of the emergence of the congressional committee system.

Keywords Seniority · Tenure · Industrial organization of Congress · Legislative behavior

1 Introduction

In the literature, it is well established that individual geographic areas benefit, in terms of the share of government spending they capture, from having a legislator with longer tenure, *holding constant* the tenure of other members of Congress (see, for example, Ryan 2009; Levitt and Poterba 1999; Payne 1990, 1991; Moore and Steelman 1994). However, what is not clear from the existing literature is how the total production of legislation would change if *all* members gained seniority. Would a legislature with a longer average tenure have a predictably different level of overall legislative activity?[1]

[1] Indeed, legislative activity has seen a significant amount of historical variation. As Fig. 2 notes, the overall number of bills introduced and enacted rose throughout the 19th century, yet fell throughout the 20th century, while total federal spending per capita (Fig. 4) has grown steadily over the latter period.

R.S. Sobel (✉)
Department of Economics, P.O. Box 6025, West Virginia University, Morgantown, WV 26506, USA
e-mail: russell.sobel@mail.wvu.edu

M.E. Ryan
Department of Economics, 802 Rockwell Hall, Duquesne University, Pittsburgh, PA 15282, USA

In addition, theories about the impact of individual tenure changes do not generate obvious predictions about how the degree of seniority inequality within the legislature impacts total legislative output. In other words, *ceteris paribus*, what happens to total legislative production when there is a greater degree of inequality in tenure across legislators?

Our analysis is thus different from prior work that attempts to see how legislative production changes when one member's tenure grows relative to that of the other members, and instead investigates empirically the impact of changing average tenure, as well as changing inequality in tenure, in the U.S. Congress. We do so for two distinct periods in American legislative history to see if the rise of the seniority system influences our relationships of interest.

Holcombe and Parker (1991) note a fundamental shift in the organization of Congress in the 20th century. Since the congressional agenda exhibits characteristics of a non-exclusive resource in the absence of any institutional framework, common pool overuse will occur. Unrestricted access to the congressional agenda will result in resource dissipation, as unfettered access to any common pool results in overconsumption. Restriction of the congressional agenda came with the emergence of the committee system in the 20th century. By granting property rights over the agenda to specialized committees, unrestricted access no longer occurs. This development had the predicted common-pool-enclosing effects of effective agenda management and increased extractive value from the agenda.

As property rights would have little effect on enclosing a common pool without an effective enforcement mechanism to protect those rights, the seniority system provided the appropriate underpinning for the committee system. Holcombe and Parker note that seniority plays an important role in determining committee appointments and, when combined with the fact that a legislator can never influence another legislator's seniority, effectively enforces the property rights to the legislative agenda allocated to committees.

Our analysis looks to verify empirically the claims put forth by Holcombe and Parker. Specifically, we look to isolate the effects of changing average tenure and changing dispersion of tenure within Congress *given the emergence of the committee system as a means of enclosing the legislative common pool.* Could longer tenure levels and more dispersion in tenure within a system of better-defined property rights over the legislative agenda have different effects than a system of open access to the legislative agenda? It is this possibility that we look to investigate.

The analysis begins by reviewing the literature on how the industrial organization of Congress, through committee and seniority systems, influences the productivity of Congress. Next, we present data on average tenure levels and measures of within-Congress disparity in tenure, along with several measures of legislative production. Then, we subject two subsets of congressional data to econometric investigation to determine whether the impact of more tenure and greater dispersion in tenure creates differing outcomes in terms of legislative output and the value of legislation enacted. The results suggest that in modern Congresses, where the committee system effectively encloses access to the legislative agenda, longer of average tenure (and/or greater inequality in tenure) result in fewer bills enacted but more spending per bill, as compared to the Congresses in session prior to the emergence of the committee/seniority system. This result sheds historical light on the determinants of the productivity of the United States Congress. The findings also suggest that during periods when the same party controls both chambers of Congress *and* the presidency, there is a clear

increase in the supply of legislation, causing output (the number of bills enacted) to rise and price (the average spending per bill) to fall.[2]

2 Channels through which tenure influences legislative production: a literature review extended to testable implications

Economists have devoted considerable effort to studying the composition and activity of legislatures. Stigler (1976) notes that while democratic legislatures would seem to vary immensely across states and nations due to the heterogeneity of constituencies, they are in fact remarkably similar, and this similarity persists over time. McCormick and Tollison (1978) analyze the sizes of legislatures and characterize them as labor unions. Within the legislature, Leibowitz and Tollison (1980) find that majority leaders will establish committees in order to maximize the passage of agenda items. Crain (1977) shows that, due to the structure of political markets, incumbent members of legislatures work to restrict electoral competition and, ultimately, entry into the legislature. Despite the similarities in sizes across US state legislatures, differences in legislative output exist. Crain (1979) shows that, for example, length of session and the size of the majority party control play important roles in determining a legislature's production.[3] Further, despite suggestions that a political business cycle may exist under certain conditions (Nordhaus 1975), there exists little evidence that the production of legislation is affected in such a manner (Shughart and Tollison 1985). Nonetheless, the amount of legislation rises along with national output (Shughart and Tollison 1986).

2.1 Seniority & committee systems: the industrial organization of Congress

In their seminal paper, Weingast and Marshall (1988) suggest that the institutional structures within Congress, such as the committee system, arise to help reduce transaction costs and enforce bargains among legislators (as well as limit coalition formation). In analogous fashion to product markets, legislative markets can be viewed within the context of industrial organization theory.

Specifically with regard to the committee and seniority system, Holcombe and Parker (1991) claim that these structures exist to establish property rights over subareas of legislation, helping to eliminate the common pool nature of the legislature's overall agenda. They argue:

> Without some institutional constraints, a legislature is a non-exclusive resource because every legislator has free access to all parts of the agenda... As with any non-exclusive resource, unrestricted access reduces the total value of the resource ... [because it] will be used too intensively... [restricting the commons] is the role of the committee system. (Holcombe and Parker 1991: 11)

However, Holcombe and Parker (1991) also argue that the committee system itself cannot achieve this goal unless property rights to committee seats can be protected and enforced at low cost. In that context, they write:

[2] Spending per bill is a proxy for the "price" per bill, as full rent dissipation and zero economic profit in rent seeking should require the full value of the legislation to be reflected in the effort put into securing its passage or defeat, see McCormick and Tollison (1981).

[3] Crain and Tollison (1980) further explore the impact of the size of majorities on legislative output.

> If the legislature is to be subdivided and parcels given to individual members, there must be some system for protecting the rights to the parcels, and the seniority system is the mechanism... The seniority rule makes assignment to a committee a property right, preventing members from losing their committee positions except under unusual circumstances, and not merely partisan transgressions. (Holcombe and Parker 1991: 15)

Therefore, Holcombe and Parker (1991) contend that the seniority system is the integral reason explaining why the committee structure is able to negate the common pool problem over the congressional agenda. The seniority system helps to enforce property rights over subareas of the agenda at low cost. In addition, Holcombe and Parker (1991) point out that because longevity on a committee increases the likelihood of becoming a party leader or committee chairperson, the value of this property right grows with time.[4]

The use of a seniority system for committee appointments in the U.S. Congress is a 20th century phenomenon. In the House of Representatives, for example, prior to the seniority system, the Speaker of the House made committee assignments for both political parties. Therefore, as we move into our empirical testing, an interesting possibility exists for comparing the results for modern Congresses with those from Congresses prior to their current structure.

A point of clarification is in order. An increase in average legislative tenure across an entire Congress does not represent, in and of itself, greater security of property rights. While average levels of accrued legislative tenure have risen sharply since the 1870s, there exists a significant amount of variation in it from year to year. (See Fig. 1 in Sect. 3.) The security of property rights within Congress, however, is not assumed to follow such a volatile path, instead beginning to arise throughout the 20th century. In fact, the emergence of the seniority system during the 20th century as an underpinning of the committee system may have contributed to individuals pursuing additional terms within Congress. Most importantly, what our analysis seeks to consider is how the year-to-year changes in tenure within Congress impact the production of legislation given the existence of the seniority system that creates secure property rights to the legislative agenda. We also seek to show whether the effect of tenure on the production of legislation is different than it was prior to the establishment of this property rights system.

2.2 Incumbency advantage, reduced competition, and the cartelization of legislation

Along with longer tenure comes greater name brand recognition for a legislator, as well as other forms of "incumbency advantage" that tend to reduce both the legislator's within-Congress competition from other legislators' bills, and also the degree of electoral competition faced at home in upcoming reelection bids. This link between electoral and legislative competition and total legislative output has two channels.

First, if the committee/seniority system can be viewed as analogous to a cartel that reduces competition within a legislature among potential new bills, the obvious empirical implication of reduced competition is lower total output, with each bill becoming more valuable. By cartelizing the legislative process, just like a monopoly, fewer units of legislation will be produced and they can be auctioned off at a higher price. If one views the price

[4] While Holcombe and Parker (1991) do not explicitly supply give a definition for the seniority system beyond it representing the process by which more senior members secure committee seats, it can be thought of as an informal set of rules or norms for distributing power within an institution in a nondiscriminatory manner.

of legislation as the value of campaign contributions and other investments in lobbying activities (e.g., rent seeking) by interest groups, for example, the clear analogy is that the way to maximize the total value (or price, P, times quantity, Q) of rent seeking is by reducing output and raising price until demand is of unitary elasticity and total revenue is maximized. If rents are fully dissipated, the amount of rent seeking should equal the value of the resources to be redistributed legislatively. Thus, average spending per bill may be viewed as the price per bill in the absence of explicit data on rent seeking activity.

Second, if longer average tenure translates into legislators being in more secure positions at reelection time, this should improve their ability to provide benefits to well-organized interest groups at the expense of the widespread electorate. The common argument is that legislators generally have an incentive to produce policies with concentrated benefits and dispersed costs (see, for example, Weingast et al. 1981). Their ability to do this, however, does not remain the same over their legislative careers. As legislators become longer tenured, they are more able to provide benefits to interest groups because: (1) they get greater control over the agenda and eventual legislative outcomes; (2) additional years of on-the-job legislative experience lead to a greater effectiveness at getting bills passed;[5] and, (3) with longer tenure comes more job security and less competitive re-election races, lowering the uncertainty (and thus the cost) of future dealings between legislators and interest groups. The clear empirical implication is that as tenure grows, legislators become better able to focus, or concentrate, the benefits of government—that is, fewer bills (i.e., reduced output) with larger spending in each bill (i.e., higher price).

2.3 Summary: the theory of tenure within Congress

The previous sections outline a dual theory about the role of tenure in the U.S. Congress. Both facets of the theory lead to similar effects in light of the emergence of property rights to committee seats in the 20th century, namely that legislative output (quantity) will diminish with each passed bill having a higher value (price). These theories also predict that this lower volume of total output can be sold at higher prices per unit, and that the multiplicative total (P times Q) should be larger. These theories don't necessarily imply that fewer bills will be introduced or offered, but that a smaller number will make it through the process into law. In fact, the property rights system may reduce the probability of any given measure being enacted, and this lower probability may lead to legislators introducing fewer measures.

3 Data

3.1 Measures of legislative tenure

The analysis utilizes two categorical measures of legislative tenure: its average level and dispersion. In order to construct those measures, we aggregate the number of years of accrued tenure for every U.S. Representative and U.S. Senator from every state, beginning with the inception of Congress in 1789 through 2004 from the Biographical Directory of the United States Congress. In total, this yields 68,244 individual data points for U.S. Representatives, and 16,542 individual data points for U.S. Senators. From these data, we calculate

[5] According to Denzau and Munger (1986) and Parker (1992), senior legislators tend to have lower supply prices for their vote trades, suggesting that vote trading may rise with tenure. In addition, with increased tenure may come additional ability to control the agenda in the spirit of Romer and Rosenthal (1978).

both the average tenure, annually by chamber and Congress-wide, and compute two different measures of the inequality in tenure within each Congress: (1) the Gini coefficient, and (2) generalized entropy.

The Gini coefficient derives from the Lorenz curve. Within our context, the Lorenz curve would be a graphical representation of the cumulative proportion of accrued tenure across a population of legislators (the House of Representatives, the U.S. Senate, or the entire U.S. Congress) ordered in ascending fashion. The Gini coefficient represents twice the area between the Lorenz curve and the graphical equivalent of an equal distribution of tenure across all members (a 45° line). Mathematically, this generates the following equation for the calculation of the Gini coefficient:

$$G = 1 - 2\int L(p)\,dp$$

where $L(p)$ is the Lorenz curve and the integral is evaluated from 0 to 1. For a full description of the Gini coefficient and Lorenz curves, see Gini (1912) and Lorenz (1905), respectively.

Generalized entropy, GE(a), consists of four classes of measures, where $a = -1, 0, 1,$ and 2. In this analysis, we utilize the class $a = 2$, which is half of the square of the coefficient of variation, or

$$\mathrm{GE}(2) = (1/2)(\mathrm{CV})^2$$

and

$$\mathrm{CV} = \sigma/\mu$$

where σ is the standard deviation of accrued tenure, and μ is the mean accrued tenure.

Figure 1 shows the evolution of the average tenure in both chambers, for each chamber separately, and a simple average of the values for the two chambers.[6] After taking a few years to rise to its eventual level, the average tenure levels in both chambers stayed relatively constant from 1800 to the 1880s, when it began its upward trend that continues today.[7] The upward trends are similar for both chambers, and in much of our subsequent empirical analysis we find the same results whether we use the overall congressional average or enter both chambers' average tenure separately.[8]

Figure 2 shows how the two measures of within-year inequality in legislative tenure have changed through time. These are the averages arrived at by first computing each measure only within each chamber, then taking the simple average of the two numbers. The results for the individual chambers track these overall averages almost perfectly (similar to the above average tenure data), and again, in much of our subsequent empirical analysis we find

[6] We choose to measure the average tenure for Congress as the simple average of the House and Senate values, rather than as the average across all members as this would place much heavier weight on the House because it has a much larger number of members.

[7] For a discussion of the factors leading to this break in the late 1800s, see Ryan (2009). Note also that the average tenure in the Senate exceeds that of the House for the entire sample due largely to the fact that the term length in the Senate is longer than the term length in the House (six years versus two years).

[8] For ease in interpretation, the data are shown as a five-year running average for average accrued tenure from each chamber of Congress. The resulting time-series displays the same trends as a figure presenting annual averages without the choppiness due to biennial elections. All calculations performed in this analysis utilize the original annual data.

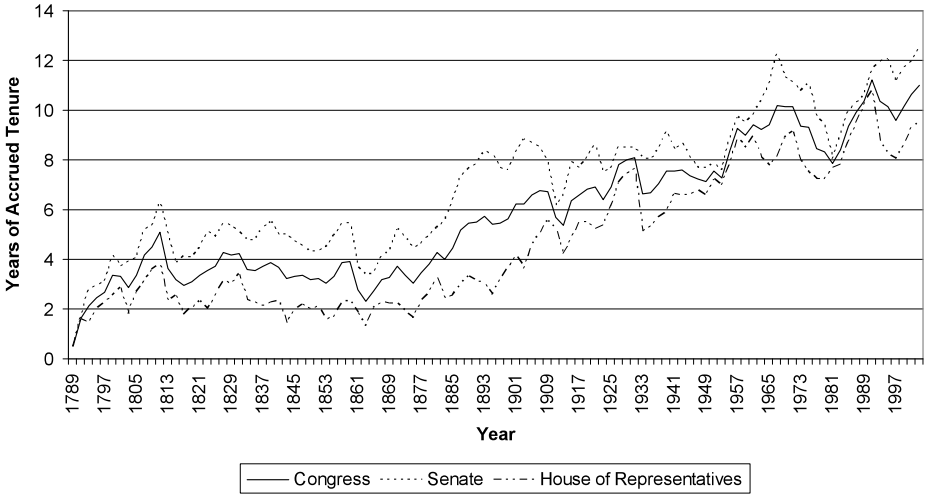

Fig. 1 Average accrued tenure, 1789–2004

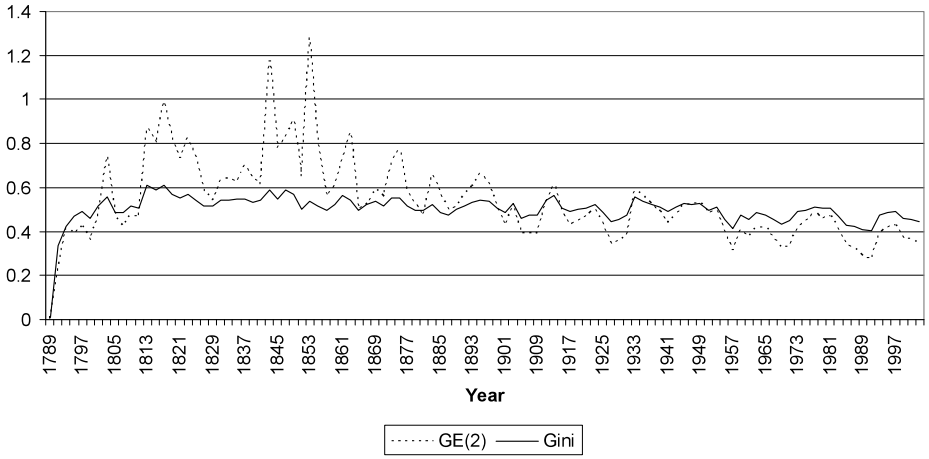

Fig. 2 GE(2) and Gini coefficient for legislative tenure, 1789–2004

the same results whether we use the overall inequality measure or include both chambers' inequality measure separately.

Examining Fig. 2 suggests that Congresses in the early to mid 1800s tended to have more inequality within the chambers than is present today. The trend in both measures has been slightly downward for the entire 20th century.

3.2 Measures of legislative production and output

We examine several measures of legislative production using data on the number of bills introduced, the number enacted, and the amount of real per capita federal spending embed-

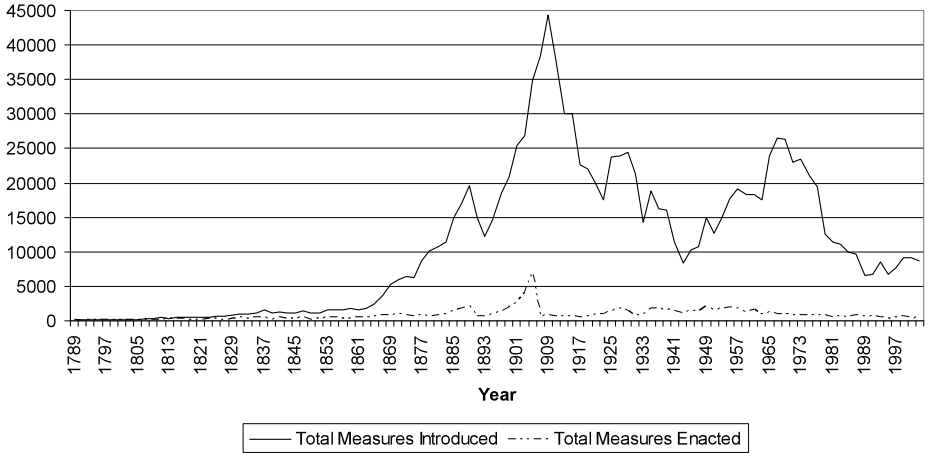

Fig. 3 Total measures introduced & enacted in U.S. congress: 1789–2004

ded in those bills.[9] First, our data on the number of measures introduced and enacted are taken from the Statistical Abstract of the United States. Holcombe (1999) provides data on real per capita federal spending. As our analysis concerns data for each Congress, we utilize two-year averages of federal spending per Congress that coincide with each year's budget. For example, fiscal years 1793 and 1794 correspond to the third Congress, which was in session from March 4, 1793 until March 3, 1795.

Figure 3 shows the entire series for the number of measures introduced and enacted. After a slightly rising trend until the Civil War, two upward spikes become dominant, with a large one in the early 1900s. Interestingly, this large spike is associated with a topic discussed at great length in Holcombe (1999), namely the influence of the first well-organized interest group in America—Civil War veterans receiving pensions. While Holcombe (1999) shows and discusses the impact of this group on federal spending during this period, our data show that it also dramatically impacted legislative production. In terms of explaining this phenomenon with respect to the bills themselves, Luce (1935) states:

> The [number of measures] figures are not to be taken wholly at their face value. When years brought infirmities to the surviving veterans of the Civil War, in great numbers they sought help in the shape of special pension bills. These were the chief factor in swelling the total to the maximum reached in the 61st session, 33,105... Then the need began to be met by general pension legislation, which with statutes putting outside the pale certain classes of hoary claims, caused a sharp drop in the number of bills. The total still included, however, a large number of private pension bills separately introduced and then consolidated. In the 66th Congress the seventeen omnibus pension bills reported to the House contained 3596 private bills that became law. (Luce 1935: 647–648)

[9] The nature of measures passed by Congress creates the possibility of measures in one Congress affecting the amount of spending in future Congresses. That is, the passage of all bills and the allocation of all spending are not necessarily contemporaneous. However, short of analyzing every measure passed in the entire history of the US Congress, this problem cannot be addressed. Recognizing this empirical reality in undertaking an analysis of this nature, we feel that our empirical framework best captures the effects of tenure upon federal spending. For a pointed description of the matching of Congresses to their spending decision, see Sect. 3.2.

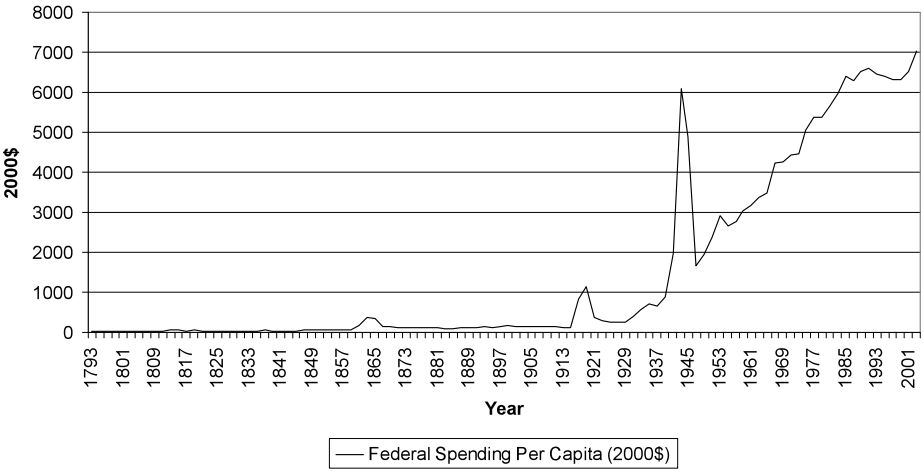

Fig. 4 U.S. federal spending per capita (2000), 1793–2004

This upward spike due to the individual pension bills was a temporary phenomenon, both in time and in that Congress was able to find internal methods to combine the bills, helping to restore the series back to their more normal levels at least by the 1940s.

Figure 4 shows real federal spending per capita, in constant 2000 dollars. After remaining virtually constant for 70 years, there is a slight bump upward during the Civil War. Afterward, spending falls back, not quite to its prior level, but nonetheless it remains fairly constant again until the early 1900s, when the clear upward trend in federal spending begins.[10] There are, again, upward spikes for World Wars I and II.

Among all of our variables, there are clearly several major disturbances in the data from the Civil War through the end of World War II. Thus, for our empirical analysis, we choose to analyze data from 1950 to the present. This time period will give us the clearest assessment of how these factors are at work in the modern U.S. Congress. Ironically, our results do hold for the entire sample period, even using simple OLS in levels; however, we do not present those results due to the clear presence of many hard-to-control-for events that occur within the full data period. We do, however, take advantage of the relatively stable period from 1800 to the Civil War for performing comparative analyses and for drawing additional conclusions.

In addition to conducting our analysis on the variables presented above, we also compute two slightly revised versions of the "measures enacted" variable. First, there are wide variations in the number of days in session across Congresses, and clearly additional days in session might result in a larger number of bills introduced and enacted. We therefore also compute the number of measures enacted *per* day in session (i.e., measures enacted divided by days in session). To help get a measure of the dollar values incorporated in these bills, we also calculate real federal spending per capita *per* measure enacted for each Congress (i.e., real per capita federal spending divided by number of measures enacted). These final two variables are shown in first-differenced form in Fig. 5. Again, both measures show the most stability in the post World War II (and prior to Civil War) periods.

[10] Coinciding with the increase in spending per bill over the 20th century is also the emergence of omnibus budget resolutions, which often combine numerous unrelated programs into one large-scale piece of legislation. This is a factor that may affect our analysis, for which we are unable to control.

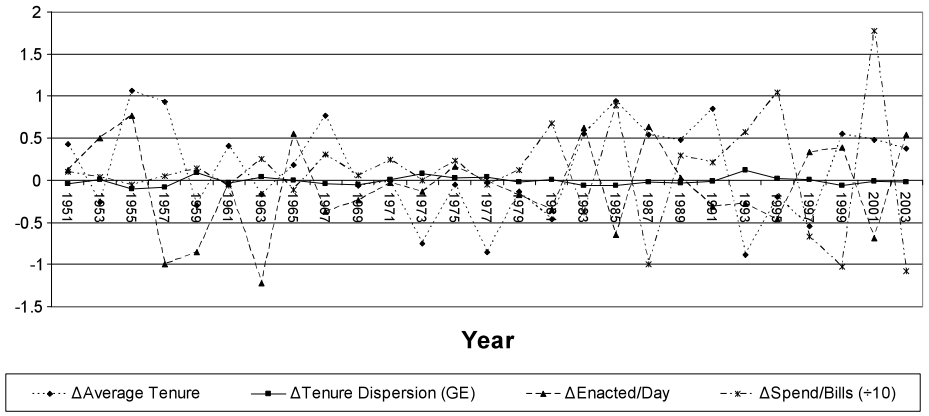

Fig. 5 Changes in tenure & productivity, 1951–2004

4 Empirical analysis

For our main analysis, we restrict our sample to 1950 forward. Our first task is to determine if these time series variables are stationary. If they are, they can be included in a regression in their original, level, form. If they are nonstationary, the regression must be run using the first differences (or changes) in the variables to ensure efficient and unbiased estimates. For each variable, we compute the Augmented Dickey Fuller (ADF) test for stationarity, and the results of these tests are shown in Table 1.

The null hypothesis for this test is that the series has a "unit root" (i.e., it is nonstationary). Therefore, a significant test statistic suggests that the variable is stationary. The first column of numbers shows the ADF tests performed on the original post-1950 series in levels. In every case except one (the Gini coefficient for the House), the test statistics cannot reject the presence of a unit root. Therefore, the series cannot be entered in levels, and we move on to see if a first-differenced (i.e., "change in") series is stationary and thus usable in the econometric analysis. The second column of numbers in Table 1 shows the ADF tests on the first differenced series, and all are significant—indicating that they are now stationary and can be entered into an OLS regression.

The main series in their first differenced forms are shown in Fig. 5.

While econometric analysis isolates the relationship between levels and dispersion of tenure better than a simple grouping of time trends, it is important to note the stationary characteristics of the first-differenced variables, especially the level of tenure over our relevant time span from 1951 to 2004 (see Fig. 5). The series also displays substantial annual variation and does not reveal any significant breakpoints.

The results of our main regressions are shown in Tables 2a, 2b. We run several specifications, looking at measures enacted and introduced, both in numbers and per day in session, and real federal spending per capita and per bill enacted as dependent variables (all in their first difference form).[11]

For independent variables, we include measures of average tenure, our two measures (individually) of inequality in tenure, and three other controls. These other controls factor

[11] Note that our analysis allows us only the ability to compare the outputs of different Congress' output by means of their differences in average tenure level and dispersion of tenure. We describe within-Congress workings so as to explain these across-Congresses differences.

Table 1 Augmented Dickey-Fuller tests for unit root

Test Statistics (Nuli: Series is nonstationary)		
Variable	Level	1st difference
Average accrued tenure, Congress	−1.800	**−4.403****
Average accrued tenure, Senate	−1.552	**−4.670****
Average accrued tenure, House	−2.369	**−4.293****
Generalized entropy (tenure), Congress	−2.814	**−4.640****
Generalized entropy (tenure), Senate	−2.828	**−4.697****
Generalized entropy (tenure), House	−2.865	**−4.718****
Gini coefficient (tenure), Congress	−2.929	**−5.077****
Gini coefficient (tenure), Senate	−2.928	**−4.897****
Gini coefficient (tenure), House	**−2.998***	**−5.040****
Total measures enacted, Congress	−2.126	**−11.816****
Total measures enacted per days in session, Congress	−1.558	**−6.344****
Total measures introduced, Congress	−0.722	**−4.635****
Total measures introduced per days in session, Congress	−1.328	**−4.500****
Federal spending per capita (constant 2000$)	−1.351	**−4.966****
Federal spending per capita per measure enacted	−1.513	**−8.909****

Augmented Dickey Fuller test run on above time series variables from 1950 to 2004

*Denotes significance at the 5% level. Significance represents stationarity. 1% critical value: −3.736

**Denotes significance at the 1% level. Significance represents stationarity. 5% critical value: −2.994

individual, Congress-specific characteristics into the model. We include a zero/one indicator variable for if both houses of Congress and the president are held by the same party, as a political bloc of that nature could affect the rate and nature of legislation. Along the same lines, we also include the percentage of seats held by the majority party in each chamber. In addition, the ideological preferences of each Congress could play a role in determining legislative output. We utilize the D-NOMINATE dataset to construct an ideological score for each Congress and include this measure in our robustness tests. By and large, these latter variables—the degree of majority party control within each chamber and the ideological nature of each Congress—are not significant in determining the price and output of legislation, and subsequently will not be analyzed.[12] As the dependent variable is first differenced, the control variables must be as well.

The results in Tables 2a, 2b suggest that for both the total measures enacted and the number enacted per day in session, that average tenure and either measure of inequality are statistically significant and negative in sign. Both longer average tenure and more dispersion in tenure lead to fewer measures enacted within a Congress having access to the agenda

[12] At the request of a referee, these specifications were estimated using both GDP and GDP per capita (both constant 2000$) under the hypothesis that the nature legislative activity may be affected by the amount of wealth available for redistribution. While reasonable, these variables (in their first-differenced form to coincide with our empirical analysis) held no statistical significance in any of our specifications. In addition, there may be issues of collinearity between GDP/GDP per capita and overall average legislative tenure as both series rise from 1951–2004. However, the correlation between the first differenced values (GDP and average legislative tenure of these variables is exceedingly low (∼0.1).

Table 2a Main results, output measures: 1951–2004

	Dependent variables							
	Δ Total measures enacted		Δ Measures enacted per day in session		ΔTotal measures introduced		ΔMeasures introduced per day in session	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔAverage accrued tenure, Congress	**−200.05****	**−193.56***	**−0.43***	−0.38	1133.99	397.56	3.92	2.99
	(**86.64**)	(**95.84**)	(**0.24**)	(0.26)	(1746.66)	(1423.46)	(5.57)	(5.00)
ΔGeneralized entropy (tenure), Congress	**−3075.23****		**−6.97****		12375.85		37.84	
	(**1147.53**)		(**3.30**)		(22224.35)		(62.00)	
ΔGini coefficient (tenure), Congress		**−5124.62****		**−10.66***		2960.32		41.90
		(**1924.09**)		(**5.44**)		(31819.11)		(93.22)
ΔHouse, Senate and President: same party	**140.82***	**124.63***	**0.37****	**0.34****	-264.00	224.25	0.82	0.99
	(**74.85**)	(**70.50**)	(**0.14**)	(**0.14**)	(718.95)	(776.74)	(2.07)	(2.06)
ΔIdeology, Congress	2617.73	2011.65	9.02	7.91	−16692.19	−19088.00	36.12	37.79
	(2689.40)	(2666.70)	(5.86)	(6.04)	(16885.40)	(15867.86)	(77.54)	(76.66)
ΔMajority % of Senate	500.43	333.94	1 .65	1 .08	−787.21	3355.14	−0.33	5.88
	(1749.95)	(1592.07)	(3.44)	(3.29)	(22832.68)	(19861.36)	(45.88)	(42.03)
ΔMajority % of House	**2558.27***	**2422.95***	**6.02***	**5.85***	3077.89	−5136.91	30.00	28.55
	(**1458.41**)	(**1366.11**)	(**3.44**)	(**3.31**)	(26383.33)	(25014.77)	(66.67)	(64.96)

Table 2a (*continued*)

	Dependent variables							
	Δ Total measures enacted		Δ Measures enacted per day in session		ΔTotal measures introduced		ΔMeasures introduced per day in session	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔKorean War	−251.97	−246.73	**−1.13****	**1.14****	−2426.26	−2023.28	**−12.23*****	**−11.79****
	(152.43)	(144.34)	(**0.42**)	(**0.41**)	(1684.24)	(1912.49)	(**3.96**)	(**4.30**)
ΔVietnam War	173.40	**212.61****	−0.18	−0.09	1736.65	1575.32	−4.37	−4.86
	(120.64)	(**99.19**)	(0.21)	(0.20)	(1993.93)	(1904.88)	(5.06)	(4.90)
N	27	27	27	27	27	27	27	27
R-squared	0.37	0.37	0.40	0.39	0.14	0.13	0.23	0.22

All variables run as 1st differenced values and for years 1950–2004

Robust Standard errors reported in parentheses

*Denotes 1% significance

**Denotes 5% significance

***Denotes 10% significance

Table 2b Main results, value measures: 1951–2004

	Dependent variables							
	ΔFederal spending per capita per bill enacted		ΔFederal spending per capita		ΔTotal pages of legislation		ΔPages per bill enacted	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
ΔAverage accrued tenure, Congress	**8.03****	5.74	97.40	77.18	−196.13	−472.33	**3.57***	2.21
	(**3.44**)	(3.73)	(156.81)	(149.66)	(860.14)	(840.42)	(**1.97**)	(2.05)
ΔGeneralized entropy (tenure), Congress	**143.61*****		−890.12		−3386.73		**65.00****	
	(**41.85**)		(2148.06)		(10210.79)		(**28.18**)	
ΔGini coefficient (tenure), Congress		**189.75****		−2032.74		−12689.32		77.85
		(**74.78**)		(3554.01)		(16439.40)		(50.48)
ΔHouse, Senate and President: same party	−3.09	−2.41	146.89	141.42	**710.01****	**682.05****	−0.17	0.13
	(2.42)	(2.84)	(101.16)	(102.81)	(**311.20**)	(**289.03**)	(0.97)	(1 .08)
ΔIdeology, Congress	−35.09	−20.36	604.25	278.43	−962.78	−3558.86	−8.00	−3.53
	(78.85)	(97.31)	(2652.62)	(2694.24)	(11989.06)	(12133.75)	(39.29)	(44.93)
ΔMajority % of Senate	**−123.01***	−105.50	1186.67	1246.50	−5499.83	−4298.08	−58.74	−49.24
	(**63.61**)	(73.08)	(1815.22)	(1824.12)	(9190.10)	(8407.43)	(35.25)	(37.86)
ΔMajority % of House	−0.44	−1 .42	−1548.67	−1668.83	5331.99	4144.41	8.44	6.81
	(35.96)	(40.45)	(1856.43)	(1857.29)	(8444.49)	(8502.65)	(25.89)	(27.78)

Table 2b (*continued*)

	Dependent variables							
	ΔFederal spending per capita per bill enacted		ΔFederal spending per capita		ΔTotal pages of legislation		ΔPages per bill enacted	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
ΔKorean War	−2.03	−1.08	**456.15***	**470.85****	−253.52	−78.59	−2.43	−1.81
	(4.61)	(5.21)	(**226.56**)	(**221.06**)	(1023.25)	(979.93)	(3.42)	(3.57)
ΔVietnam War	0.54	−1 .30	**−459.05****	**−447.81****	−267.35	−225.58	0.02	−0.82
	(3.09)	(3.69)	(**168.17**)	(**164.15**)	(521.48)	(453.79)	(1 .66)	(1 .63)
N	27	27	27	27	27	27	27	27
R-squared	0.48	0.39	0.39	0.40	0.13	0.16	0.23	0.16

All variables run as 1st differenced values and for years 1950–2004

Robust Standard errors reported in parentheses

*Denotes 1% significance

**Denotes 5% significance

***Denotes 10% significance

managed by the committee system. The results for measures introduced are insignificant, lending substantial support to the Holcombe and Parker's (1991) explanation of our results. Tenure and inequality in tenure do not impact the number of bills that legislators introduce, but rather simply help to control this commons to restrict which bills actually make it to floor vote and eventual passage.[13] While greater disparity of tenure, in theory, could either make cartel behavior easier or harder to accomplish, our results suggest that it makes cartel behavior easier. Having different firms with varying costs structures generally weakens cartel stability, but here the apparent offsetting factor is the greater concentration of agenda control and power in a few long-tenured and secure legislators.

With reduced output of total legislation, do prices rise? Our measure of real federal spending per capita per bill tends to suggest an affirmative answer. Longer tenure (or more inequality in tenure) results in fewer but larger bills. Therefore, the impact of higher average levels of tenure within a Congress with an agenda managed by the committee system is to create more highly concentrated legislation—each of the fewer bills enacted contains more spending. With more spending per bill but fewer bills, what happens to total spending across all bills? The final two columns show mainly positive but clearly insignificant results. Therefore, this rise in tenure (and inequality in tenure) doesn't necessarily produce a larger budget to allocate, but it does result in what money there is to allocate being loaded into fewer, large bills. Analyzing pages of legislation largely confirms this result. Greater average tenure and increased dispersion of tenure lead to longer bills. These longer bills reflect the increased value of each enacted bill.

Interestingly, situations in which one party controls both houses of Congress and the presidency provides a nice test to complement our main logic. When this condition is present, the "Venn diagram" representing the set of mutually agreeable policies expands. In contrast to how anti-competitive measures reduce the supply of legislation (leading to lower Q and higher P), situations of one-party control should result in increases in the supply of legislation, leading to higher Q and lower P. Indeed, this is what is found in our empirical estimates, as the coefficient on this indicator variable are positive for the number of measures enacted and negative for spending per bill. Thus, one-party control tends to lead to more (arguably marginal) legislation that pulls down the average. This result is not quite as robust as our other results, but we highlight it as an interesting comparison case.

As was mentioned previously, the results found using one average tenure and inequality measure across both chambers are virtually unchanged when they are split and included separately. Because of the high degree of correlation between the measures for the two chambers, significance levels fall slightly, but the actual coefficient estimates remain virtually unchanged and are similar between chambers. Statistical testing confirms the equality of the coefficients across chambers, and this is why we prefer our single measure specifications presented in Tables 2a, 2b as our main results. However, we include these results as Table 3 for readers interested in examining the performance of these alternatively specified regressions.

Our main empirical results, using post-1950 data, support the hypothesis that longer tenured legislatures (and greater inequality of tenure within a legislature) tends to reduce legislative production (measured by the number of bills) but increases the spending per bill. An interesting possibility for testing the robustness of our findings is to explore whether the relationships found using the modern data also appear when examining data from the early U.S. Congresses, prior to the evolution of the seniority system. We estimated the same

[13] While not provided here, regressions exploring the ratio of bills enacted to bills introduced tell much the same story of increased tenure allowing for an enclosing of the legislative commons.

Table 3 Robustness measures: 1951–2004

	Dependent variables														
	ΔTotal measures enacted			Δmeasures enacted per day in session			ΔFederal spending per capita per bill enacted			ΔFederal spending per capita			ΔPages per bill enacted		
	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)
ΔAverage accrued tenure, Congress	**−258.36****			**0.53***			**9.12****			66.27			**3.64***		
	(**116.78**)			(**0.27**)			(**3.51**)			(170.20)			(**2.05**)		
ΔAverage accrued tenure, Senate		**−90.48****	**−138.23***		−0.20	−0.29		4.49	**8.53****		37.59	−46.49		**1.68***	141
		(**38.28**)	(**65.98**)		(0.12)	(0.17)		(399)	(**1.70**)		(80.44)	(95.61)		(**0.85**)	(100)
ΔAverage accrued tenure, House		−171.63	−104.49		−0.31	−0.20		8.13	2.46		132.10	250.30		2.56	2.93
		(148.24)	(168.26)		(0.31)	(0.37)		(7.74)	(7.13)		(145.59)	(160.19)		(2.30)	(3.28)
ΔGeneralized entropy (tenure), Congress		**−3867.35****			**−8.02***			158.51			32.36			**73.53***	
		(**1791.16**)			(**4.38**)			(145.70)			(2410.45)			(**40.41**)	
ΔGeneralized entropy (tenure), Senate	**−2580.36****		**−2597.51****	−5.10		−5.15	**91.25****		135.37	−1001.59		−1152.51	**33.80***		**33.03***
	(**11088.43**)		(**1089.61**)	(3.02)		(3.11)	(**32.32**)		(7870)	(1423.19)		(1253.37)	(**18.21**)		(**18.34**)
ΔGeneralized entropy (tenure), House	**−1271.52***		−1060.44	**−3.07***		−251	**66.84*****		544	−303.04		1553.51	**32.17****		41.67
	(**684.43**)		(141123)	(**1.67**)		(315)	(**19.26**)		(68.20)	(1242.36)		(1574.21)	(**15.14**)		(33.59)
ΔHouse, Senate and President: same party	**127.03***	117.40	134.36	**0.35****	**0.34***	**0.37****	−2.84	3.49	2.05	13953	**174.17****	**204.02****	−0.15	0.08	0.17
	(**72.34**)	(82.76)	(86.05)	(**0.14**)	(**0.17**)	(**0.17**)	(2.20)	(3.67)	(4.33)	(10673)	(**76.76**)	(**83.09**)	(0.97)	(1.00)	(1.23)
ΔIdeology, Congress	(2271.69)	2353.16	2321.35	8.48	8.67	8.62	−2864	**274.15***	**276.84***	419.56	912.37	856.38	−7.57	−5.15	−5.33
	(3025.73)	(3043.64)	(3134.76)	(6.28)	(6.41)	(6.26)	(71 70)	(**146.08**)	(**135.90**)	(2695.40)	(2637.96)	(2308.44)	(37.71)	(37.10)	(39.79)
ΔMajority % of Senate	666.61	443.49	719.26	1.91	1.58	2.05	**−126.11****	−6.70	−30.01	1275.37	1252.98	1738.49	−58.95	−58.13	−56.58
	(1452. 59)	(1622. 41)	(1602.27)	(3.21)	(3.35)	(3.63)	(**59.44**)	(160.10)	(147.47)	(1897.44)	(1738.63)	(1677.29)	(**36.43**)	(**34.10**)	(3617)
ΔMajority % of House	2275.44	2549.04	2229.96	5.58	6.00	5.46	4.84	76.77	103.74	−1699.62	−1537.92	−2099.67	8.79	8.54	6.74
	(1554. 17)	(1482. 27)	(1614.90)	(3.63)	(3.47)	(3.90)	(36.83)	(70.73)	(78.10)	(1910.24)	(2033.29)	(2135.31)	(26.19)	(26.80)	(27.45)

Table 3 (*continued*)

	Dependent variables														
	ΔTotal measures enacted			Δmeasures enacted per day in session			ΔFederal spending per capita per bill enacted			ΔFederal spending per capita			ΔPages per bill enacted		
	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)
ΔKorean War	−214.42	−189.60	−233.80	**−1.07****	**−1.05****	**−1.12****	−2.73	−2.34	1.40	**476.19***	**383.52***	30570	−2.48	−3.11	−3.35
	(168.04)	(178.55)	(202.15)	(**0.47**)	(**0.49**)	(**0.49**)	(4.65)	(7.98)	(8.56)	(**230.35**)	(**207.62**)	(22073)	(3.36)	(3.53)	(4.00)
ΔVietnam War	**204.84***	199.70	199.39	−0.13	−0.15	−0.15	-0.05	−8.80	−8.77	**−442.27****	**−489.68*****	**−490.23****	−0.02	−0.26	−0.27
	(**113.53**)	(124.96)	(123.27)	(0.21)	(0.23)	(0.25)	(3.06)	(9.39)	(9.50)	(**170.63**)	(**162.89**)	(**162.78**)	(1.72)	(1.62)	(1.66)
N	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
R-squared	0.41	0.38	0.41	0.41	0.40	0.42	0.50	0.30	0.38	0.40	0.41	0.48	0.23	0.24	0.24

All variables run as 1st differenced values and for years 1950–2004

Robust Standard errors reported in parentheses

*Denotes 1% significance

**Denotes 5% significance

***Denotes 10% significance

specifications shown in Tables 2a, 2b and 3 using data from 1801 to 1859. Not only were both the average tenure and inequality measures insignificant in explaining bills enacted and spending per bill, but they interestingly were positive and significant with respect to measures introduced. Thus it appears that in the early U.S. Congress, prior to the emergence of the committee system, longer average tenured legislatures tended to have more bills introduced but not necessarily different productivities in terms of bills passed. In our judgment, the evidence suggests that the emergence of the committee system in the U.S. Congress as outlined by Holcombe and Parker (1991), caused a fundamental change in the impact of longer average tenure and greater disparity in tenure on congressional productivity.

5 Conclusion

While specific states may benefit if they are represented by more senior legislators (holding constant the tenure of others) in terms of their share of federal spending, this paper explores the interesting question of how an increase in overall average tenure (and changes in the inequality of it within a legislature) impacts total legislative output or production in the United States Congress.[14]

Based on theories of the industrial organization of Congress, we argue that under the current seniority system that establishes property rights to the legislative agenda, tenure should result in less legislation (lower output) at a higher price (spending or rent seeking per bill). We then test this hypothesis using data on the U.S. Congress for as much of its history as possible, given the nature of the data. Our empirical analysis focuses on how year-to-year changes in the structure of tenure impact the production of legislation. Our results confirm our hypotheses, highlighting the effects of changing average levels and disparity of tenure on legislative productivity under the committee and seniority systems as described by Holcombe and Parker (1991). They argue that the committee structure of Congress, coupled with the seniority system, helps to alleviate the common pool problem present in a legislative agenda. By enclosing the commons, the legislature can act like a cartel to reduce output and sell legislation at a higher price. Higher average levels of tenure, and more disparity in tenure amongst members of Congress, tend to increase the degree to which this cartelization is affected under the committee system; prior to its emergence, higher levels of average tenure and greater levels of dispersion of tenure had no discernable impact on the output of legislation.

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[14]For the relationship between legislative tenure and federal spending at the state level, see Ryan (2008).

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