Two plus Two plus Two Equals Six: Tenure in Office of Senators and Representatives, 1953-1983

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Research Note

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Two Plus Two Plus Two Equals Six: Tenure in Office of Senators And Representatives, 1953-1983

We consider the relationship between reelection rates and the expected tenure in office of members in the U.S. House and Senate. For senators and representatives to have the same mean years of service, we show that the mean reelection probability of representatives would need to be equal to three times the reelection probability of senators minus two. We also provide a simple approximation formula to estimate the mean individual reelection probability of legislators from data on the mean term of service in the legislature, and vice versa, taking into account the proportion of members of each chamber who run for reelection.

It is well known that U.S. senators in the past several decades have been more electorally vulnerable than members of the House of Representatives (see, e.g., Jewell and Patterson, 1977; Keefe and Ogul, 1977; Cover and Mayhew, 1981; Jacobson, 1980; Nice, 1984; and data from Ornstein, Mann, Malbin, and Bibby, 1984, reproduced in Table 1 below). On the other hand, if we look at tenure in office in terms of expected years of service, we see that over this period House and Senate members have had careers of virtually equal length.

This note presents a simple model of the mathematical relation between expected years of service and probability of reelection—one which to our knowledge has not previously appeared in the literature (cf. Bullock, 1972; Kostroski, 1973; Polsby, 1986).

A Simple Model

The rule of elective office is a simple one: one miss and you're out.[1] For a member of the House to serve as long as a senator, he must

win three times as many elections.[2] If the probability of electoral success for a representative is E, then for an already elected senator to have the same expected additional years of service as an already elected representative, he would need to have a reelection probability of only E^3.

    Some numbers will illustrate this effect. Let E = .9. After three elections, a representative will still be around with probability E^3 = .9 × .9 × .9 = .729. If senatorial election probabilities are in excess of .729, senators once elected will serve longer in office (measured in years) than will representatives once elected.

    For the period 1956-1974, Jewell and Patterson (1977) find that House members won reelection 92% of the time and that Senate members won reelection only 79% of the time. But $(.92)^3$ = .78, so that, for this period, our analysis implies that mean years of service for senators should be marginally higher than for House members.[3] The analysis given above needs to be modified somewhat, however, to take into account the fact that the calculations above apply only to legislators already in office.

    Consider an official who has just won election to his first term in office. Let E be the probability that he will win any subsequent race he enters. Then the probability that a first-term member will win reelection exactly n times is $E^n(1-E)$. The expected number of reelection races he will win is

$$\sum_{n=0}^{\infty} n \, E^n(1-E) = E/(1-E).$$

(See Feller, 1957.) The mean number of terms a member serves is

$$1 + \frac{E}{1-E} = \frac{1}{(1-E)} \quad .$$

If the length of a term is q, then the mean length of service is $q/(1-E)$.

    Let E_S be the reelection probability of senators, let E_H be the reelection probability of representatives, let T_S be the mean term of legislative service for senators in years, and let T_H be the mean term of legislative service for House members in years. Consider the values of E_H and E_S that make expected length of House and Senate terms equal in years. The mean length of service in years for House and Senate members will be equal if

$$\frac{6}{(1-E_S)} = \frac{2}{(1-E_H)} \quad . \tag{1}$$

That is, we obtain the quite nonintuitive result that equality occurs only if

$$E_S = 3E_H - 2. \tag{1'}$$

For example, values of $E_H = 0.9$ and $E_S = 0.7$ give equal expected term lengths in the two chambers. This is not a cube root law, though the result is not far off for values of E_H near to 1. (Recall that for $E_H = .9$, the cube root approximation gave $E_S = .73$ as the value at which expected years of service in the two chambers would be equalized.) Note also that if $E_H < 2/3$, the average tenure of senators in office will necessarily be greater than the tenure of House members. For the time period shown in Table 1 (below) this inequality was never satisfied.

If T equals the mean number of terms of service, then, since

$$T = \frac{1}{1-E} \tag{2}$$

we have

$$E = 1 - (1/T). \tag{3}$$

Thus, if House members serve on average six terms (in steady-state equilibrium) then the probability of reelection must be (under the simplifying assumption of all incumbents seeking reelection) 5/6.

This indirect method of measuring the probability of victory has some advantages. A legislator's decision whether to run for reelection is a strategic one: the less certain an incumbent is of winning, the less likely he is to seek reelection. But examinations of reelection rates see only incumbents who choose to run and thus probably overestimate the true probability of victory for incumbents. If, on the other hand, all incumbents who realize that they would lose the coming election choose not to run, the equation $E = 1 - (1/T)$ would correctly predict the probability of reelection. Finally, if unpopular House members are more likely than unpopular senators to seek reelection, then a comparison of mean lengths of service between the two houses will provide a better picture of the true reelection probabilities than would a comparison of election results for incumbents who run for reelection.

Ornstein et al. (1984) provide mean terms of service for both chambers for the period 1953-1983 and data on the proportion of House and Senate incumbents who run for office who are reelected; the data are reproduced in Table 1. If we break the data into 10-year periods beginning with 1953, we see that the 10-year period in which House members' mean years of service most exceeded those of senators was 1953-1963 (ratio = 1.18); while for the roughly 20-year period

TABLE 1

Mean Term of Service and Reelection Probability
Of Incumbents Seeking Reelection,
Members of House and Senate, 1953-1983

| Congress, Year | House | | Senate | | Ratio of Mean Years of Service, House to Senate |
	Mean Years of Service	Reelection Probability	Mean Years of Service	Reelection Probability	
83d, 1953 (1952)	9.8	91.0	8.5	64.5	1.15
84th, 1955 (1954)	10.4	93.1	8.4	75.0	1.25
85th, 1958 (1956)	11.0	94.6	9.6	86.2	1.15
86th, 1959 (1958)	11.2	89.9	9.4	64.3	1.19
87th, 1961 (1960)	11.6	92.6	9.7	96.6	1.20
88th, 1963 (1962)	11.4	91.5	9.9	82.9	1.15
89th, 1965 (1964)	11.0	86.6	11.1	84.8	.99
90th, 1967 (1966)	11.2	88.1	11.6	87.5	.97
91st, 1969 (1968)	11.4	96.8	11.2	71.4	1.02
92d, 1971 (1970)	12.0	94.5	11.5	77.4	1.04
93d, 1973 (1972)	11.4	93.6	11.2	74.1	1.02
94th, 1975 (1974)	10.8	87.7	11.5	85.2	.94
95th, 1977 (1976)	9.2	95.8	10.6	64.0	.87
96th, 1979 (1978)	10.0	93.7	9.6	60.0	1.04
97th, 1981 (1980)	9.8	90.7	8.5	55.2	1.15
98th, 1983 (1982)	9.2	90.1	9.6	93.3	.96
Mean, 1953-1983	10.7	91.9	10.1	76.4	1.07

Source: Ornstein et al., 1984.

1965-1983, the ratio is exactly one (ratio = 1.00). The high point of mean years of service came about a decade later (1965-1975) in the Senate than in the House (cf. Kostroski, 1973). Mean years of Senate service has been declining since 1975, although the pattern is not perfectly monotonic. For the period 1953-1983, $E_H = .92$ and $E_S = .76$; thus $3E_H - 2 = .76 = E_S$.[4]

    We can now use the data on the percentage of members of each house who seek reelection in an improved formula that will be presented in equation (7) below. In general, the lower the proportions of incumbents who seek reelection, the more equation (2) will understate the reelection probabilities of those incumbents who do run for office.[5] The percentage seeking reelection will, in general, vary between the chambers. This percentage is affected, among other things, by desire for retirement and by opportunities for pursuit of higher office. Also,

because the average age of senators is higher than that for House members, more senators than House members will die in office. As we might expect, a higher proportion of House members than senators run for reelection.[6]

It is thus useful to introduce a correction for the proportion, P, of incumbents who run for reelection. We have

$$T = \left(\frac{1}{1 - EP} \right) \tag{4}$$

so that

$$E = \frac{(T-1)}{(TP)} . \tag{5}$$

Let P_S be the probability that a senator will run for reelection and P_H be the probability that a House member will run for reelection. The mean expected length of service for the two houses will be equal if

$$\frac{6}{1 - E_S P_S} = \frac{2}{1 - E_H P_H} , \tag{6}$$

that is, if

$$E_S P_S = 3 E_H P_H - 2 . \tag{7}$$

For the past three decades $P_S \cong .81$ and $P_H \cong .93$ (Ornstein et al., 1984). Using our previous values of $E_H = .92$ and $E_S = .76$, we have $3E_H P_H - 2 = .57$ and $E_S P_S = .62$. Hence, $3E_H P_H - 2 \approx E_S P_S$. Thus, we would expect the mean terms of service in the two houses to be close. For the entire period, the ratio of House mean years of service to Senate mean years of service is in fact very close to one (1.07).

We would expect that, ceteris paribus, the more likely an incumbent is to be reelected the more likely he is to run for reelection. Nonetheless, there need not be an especially high correlation over time between the E and P values in a given chamber. Consider a situation in which legislators choose to run only if their election probability is above a certain level (cf. Fiorina, 1974), so that only incumbents likely to win reelection will run. This process of self-selection means that the proportion of incumbents who are reelected may be unrelated to the proportion of incumbents who decide to run, since regardless of what proportion of incumbents run, the same (high) proportion will be elected. Nonetheless, we would expect that, for each chamber, P and T will be positively correlated, as would E and T.

Discussion

House members are more likely to win any given election than are senators, but they must win three times (as often) to stay in (the same) place. In fact, for the past two decades the mean years of service in the two houses has been identical; while House members have certainly been more likely to win any given election, their reelection probability, on average, has been such that equation (1) is satisfied. Also, even when we take into account the fact that senators are less likely to run for reelection than are House members, equation (6) has approximately been satisfied. Thus the two chambers have moved in lock-step. This simple point is too easily lost sight of if we focus on reelection probabilities and not on what reelection buys. Certainly, if a senator can expect to serve as long as a congressman and needs to run only in one third as many elections, it does not seem unreasonable to prefer to occupy the higher and far more prestigious office, even though the probability of defeat in any given election is higher for senators than congressmen.

Because senators and House members have had identical career chances in recent years, explanations for the supposed greater vulnerability of senators must be rethought. For example, if a senator's six-year term causes him to lose touch with the people more than the representative does who runs for reelection every two years, as Crotty and Jacobson (1980, p. 194) argue, then why is it that senators are just as likely to be in office seven years from when they were elected as are representatives?[7] Given the differences between the houses—for example, that states are generally more heterogeneous and larger than House districts and that challengers for the Senate are of higher quality than challengers for the House—it is remarkable that the lengths of service of the two houses are now so nearly identical.[8]

In "Federalist Paper Number 63," written in defense of bicameralism and a distinctive role for each chamber, Madison agrees that the Senate, with its six-year term, satisfies the need for a legislative body with "sufficient permanency to provide for such objects as require a continued attention and a train of measures." He goes on to say that a second chamber may be sometimes necessary "as a defense to the people against their own temporary errors and delusions." In contrast, in "Federalist Paper Number 52," Madison argued that the House should have "an immediate dependence on and an intimate sympathy with the people" and that "frequent elections are unquestionably the only policy by which this dependence and sympathy can be effectually assured." While the terms of office in the two chambers still differ in their length (thus permitting senators to take a "longer run" perspective than House

members, who are always faced with an imminent reelection campaign), it is an open question to what extent the difference in time perspective between the chambers has now been reduced by the greater job security of House members.

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NOTES

    1. The sequential sisyphean nature of congressional careerism has been most clearly recognized by Mayhew (1974) and by Erikson (1976). As Erikson points out, even though reelection is highly probable in any single attempt, to stay in office one must keep winning elections and this process (after the first reelection bid) resembles a Bernoulli (independent trials) process. Thus, the probability of eventual defeat goes to one (see also Grofman and Migalski, 1987). Mayhew stresses the fact that a significant proportion of those who leave office do so because of electoral defeat in either a primary or a general election. Thus, the legislator is constantly reminded of the possibility of his own defeat.
    2. It is possible, in principle, to lose (or leave) and then come back and be reelected, but that is relatively rare—although it was more common in the nineteenth century than in the twentieth (Silbey, 15 May 1986; cf. Kernell, 1977). Moreover, in the twentieth-century Congress, even if you get back in, you have lost seniority.
    3. The relationship between reelection probability and mean length of service is affected by the proportion of incumbents who choose to run for reelection (see below).
    4. Note that $(E_H)^3 = .78$, relatively close in value to $3E_H - 2 = .76$. We must remember that equations (2) and (4) are steady state estimates. If the legislature includes members elected from a period in which reelection probabilities were lower (higher), Eq. (2) will yield too low (too high) an estimate of reelection probabilities. Another reason why the fit may not be perfect is that Equations (2) and (4) (and also (1) and (6)) assume that the probability of running for reelection is independent of length of service and that members, as long as they are incumbents, can continue to run for reelection. In fact, of course, as legislators age they become less likely to run for reelection. Also, at some point, legislators cannot run for reelection because they are no longer alive—a fact of particular importance in the Senate because of its higher mean age. Consequently, Equations (2) and (4) underestimate the reelection probabilities of those who do run for reelection, and the problem is more severe for the Senate. We can cope with this difficulty by using an approximation formula with a truncated geometric distribution of the form

$$T \approx 1 + \sum_{m-1}^{M-1} (EP)^k - (M-1)(EP)^M,$$

where M is the maximum number of terms that might realistically be served.

5. We must be especially cautious in using Eq. (2) for periods (such as the middle nineteenth century) when congressional careerism was a rarity and most legislators left office not through defeat but by choice (or by party dictate—since the political parties controlled the nominating process during this period and often forced the party faithful to rotate offices, a fate that befell Abraham Lincoln (Silbey, 16 May 1986).

6. Polsby (1968, Table 2, p. 146) provides data on mean length of service in the House for the period 1789-1963. As far as we have been able to determine, a comparable historical time series does not exist for the Senate (Polsby, 15 May 1986).

7. Cf. Crotty and Jacobson, 1980, pp. 193-194; Dodd and Oppenheimer, 1981, p. 5; and Jewell and Patterson, 1977, p. 91.

8. It may also be important to recognize that, historically, the likelihood of reelection success has varied with both region and party.

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