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"A Political Economy Model of Congressional Careers:
Supplementary Material "

by

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A Political Economy Model of Congressional Careers: Supplementary Material*

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Abstract

This paper contains additional details about the model in our paper "A Political Economy Model of Congressional Careers" (Diermeier, Keane and Merlo (2004)), as well as the computational methods we use to solve and estimate the model, and the construction of the data set.

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In this paper, we give additional details about the model in our paper "A Political Economy Model of Congressional Careers" (Diermeier, Keane and Merlo (2004)), as well as the computational methods we use to solve and estimate the model, and the construction of the data set.

In our model, we assume that politicians make decisions about running for reelection, running for higher office, and exiting from Congress (either to retirement or another type of work) every two years—the length of a House term. Politicians are forward looking, and realize that current decisions will affect the distribution of future payoffs. Thus, they must solve a dynamic optimization problem to determine the current decision that maximizes expected present value of lifetime utility. We assume that politicians' behavior can be represented *as if* they solve a discrete choice dynamic programming (DP) problem to arrive at optimal current period decisions. This means we must solve that DP problem ourselves in order to form the likelihood function for the model (see, e.g., Eckstein and Wolpin (1989) and Rust (1994)).

In order to solve the DP problem we use a standard backsolving procedure. We assume that the earliest age at which a person can be elected to Congress is 30 and if a politician lives to age 80, then he/she must exit Congress at that point.[1] These assumptions imply that the dynamic optimization problem has (at most) 25 decision periods. Furthermore, it greatly simplifies our analysis to assume that exit from Congress is an absorbing state—that is, the politician cannot return to Congress after leaving, regardless of the age at which he or she exits.[2]

When a politician exits Congress (either voluntarily or via electoral defeat), he/she chooses between two post-congressional career options or retirement. We do not model choice behavior after that point. Exogenous death and retirement transition rates govern the expected present value of each post-congressional option.

The presentation of our model and of the technical issues related to its solution and estimation can usefully be decomposed into several parts. These are: (i) post-congressional payoffs; (ii) the decisions of senators; (iii) the decisions of representatives; (iv) probability functions and the evolution of exogenous state variables; (v) computational issues; and (vi) the likelihood function. We now describe these in turn.

[1] Despite some well-publicized exceptions, entering Congress prior to age 30 or staying after age 80 are rare events.
[2] Returning to Congress after an exit is also a rare event (it occurs in less than 5% of the cases), so we feel this is a reasonable simplification.

1. Post-Congressional Payoffs

At the end of each two-year period, a politician who is in Congress has the option of exiting. A key feature of our model is that, when a politician exits from Congress, he/she can choose between two post-congressional employment options, or else retire. The employment options are (i) work in a private sector occupation, or (ii) work in a public sector occupation (i.e., enter another political job). By other political jobs we are thinking primarily of appointed positions that the politician may be offered, such as cabinet posts, bureaucratic positions, etc.[3]

The wage the politician would receive in each of the two alternatives is determined by the politician's age, education, and variables characterizing his/her congressional experience. We specify log wage functions that are similar in functional form to those postulated in the human capital literature (Mincer (1958)), except for the inclusion of the congressional experience variables. Assume the wage functions take the form:

$$
\begin{aligned}
(1)\qquad \ln W_{ijt} = {} & \beta_{0j} + \beta_{1j} Skill_i + \beta_{2j} BA_i + \beta_{3j} JD_i + \beta_{4j} Age_{it} + \beta_{5j} Age_{it}^2 \\
& + \beta_{6j} TH_{it} + \beta_{7j} TH_{it}^2 + \beta_{8j} TS_{it} + \beta_{9j} TS_{it}^2 + \beta_{10j} COM_{it} + \beta_{11j} VE_{it} + \varepsilon_{ijt}
\end{aligned}
$$

Here, W_{ijt} is the wage offered to individual i in occupation j in period t, for $j = 1,2$, and $t = 1,\ldots,25$. Note that t indexes two-year increments in age from 32 through 80. Since we present the decision process for an individual i, we do not need separate age and calendar time subscripts.

This specification allows for the possibility that individuals have different unobserved endowments of skill for each occupation (as in Keane and Wolpin (1997)). The variable $Skill_i$ indexes the (unobserved) endowment vectors and is simply a dummy variable equal to 1 if the (unobserved) type of politician i is "skilled." The case where the dummy variable $Skill_i = 0$ corresponds to the default or "normal" type. The error term ε_{ijt} represents the purely stochastic component of the wage offer, which is revealed when the politician exits Congress.

Turning to the observables in the wage function, BA_i is a dummy variable equal to 1 if individual i has a bachelor's degree and zero if not, and JD_i is a dummy variable equal to 1 if he/she has a law degree and zero otherwise. TH_{it} and TS_{it} are the number of prior terms served in the House and Senate, respectively. COM_{it} is a dummy variable equal to 1 if, during the prior

[3] We abstract from the fact that a politician might have to run (or be confirmed) for some non-congressional positions.

term in the House, a representative had served on a major House committee.[4] Political scientists typically define the major House committees as Ways and Means, Appropriations, and Rules (see, e.g., Deering and Smith (1990)). The idea here is that service on one of these major committees may augment the human capital one brings to post-congressional employment. For example, being a member of the Ways and Means committee might generate knowledge that would enhance one's value as a lobbyist for companies trying to obtain tax breaks.

Finally, VE_{it} is an indicator function for whether the politician exited Congress voluntarily rather than via losing an election bid. Our rationale for including this variable in the wage function is that the mode of exit (i.e., voluntarily or by losing), may affect the value of the politician in certain types of jobs. Whether the overall effect on wages is positive or negative is *a priori* ambiguous. On the one hand, losing an election may reduce the value of the politician in jobs where popularity is important (such as being a spokesperson for a company). On the other hand, exiting Congress voluntarily may signal the politician's desire to "slow down" and hence reduce the perceived value of the politician to potential employers.

A third option upon exit is retirement. In this case, the politician may (depending on age and length of service) receive congressional pension payments whose value depends on his/her employment history. We describe the congressional pension rules in detail in the paper. Here, we just write the pension rule as:

$$(2) \qquad PE_{it} = f(Age_{it}, TH_{it}, TS_{it})$$

which indicates that the pension payment PE_{it} that individual i will begin to receive if he/she retires at time t depends on his/her age as well as terms in the House and Senate. Then, the payoff in the retirement option is:

$$(3) \qquad PR_{it} = PE_{it} + \alpha_L + \alpha_{VE} VE_{it}.$$

The parameter α_L captures the monetized value of leisure. The parameter α_{VE} captures an additional monetized value of leisure for people who exit Congress voluntarily rather than via losing an election. For instance, $\alpha_{VE} > 0$ captures the notion that those who exit voluntarily desire to "slow down," so that their value of leisure after exiting congress is relatively high. This

[4] Committee membership is less important in the modern Senate (Sinclair (1989)).

parameter enables us to capture a prominent feature of the data: those who exit Congress voluntarily are much more likely to choose retirement as a post-congressional option than further employment, even conditional on age and other observed characteristics.

Equations (1) and (3) give the per-period payoffs for each of the three post-congressional alternatives. We now describe the present value of the utility stream from each option. As noted previously, we do not model behavior beyond the first choice that the politician makes after leaving Congress. Rather, we assume that exogenous death and retirement transition probabilities govern outcomes from that point onward. Specifically, if the politician chooses employment option *j*, for *j* = 1,2, then he/she will remain in that alternative until either retirement or death. Once the politician enters retirement he/she stays in that state until death. Let $\pi_r(t)$, and $\pi_d(t)$ be the retirement probability and death probability, respectively. These are written as functions of *t* to allow them to depend on the age at exit from Congress.[5] Letting δ denote the per-period discount factor, the present discounted value of private sector employment can be written:

$$(4) \qquad PV_1(W_{i1t}) = \frac{W_{i1t} + \alpha_{1C} COM_{it}}{1-\delta(1-\pi_d(t))(1-\pi_r(t))} + \frac{\delta(1-\pi_d(t))\pi_r(t)PV_3(PR_{it})}{1-\delta(1-\pi_d(t))(1-\pi_r(t))}$$

while, for the public sector, we have:

$$(5) \qquad PV_2(W_{i2t}) = \frac{W_{i2t} + \alpha_{2W} + \alpha_{2C} COM_{it}}{1-\delta(1-\pi_d(t))(1-\pi_r(t))} + \frac{\delta(1-\pi_d(t))\pi_r(t)PV_3(PR_{it})}{1-\delta(1-\pi_d(t))(1-\pi_r(t))} .$$

In equation (5), α_{2W} is a parameter that captures the additional utility from holding another political job. Given that politicians get non-pecuniary rewards from being in Congress, it seems reasonable to assume they may also get non-pecuniary rewards from other political jobs. The parameters α_{1C} and α_{2C} capture the monetized value of having served on a major House committee, which could generate additional income from speaking engagements, consulting, book contracts and other similar activities. We allow the value from these activities (which we do not observe) to differ depending on whether the politician's post-congressional occupation is in the private or public sector. Similarly, the present discounted value of the retirement option is:

[5] In our empirical work we also let them vary with age after exit from Congress, but it simplifies the exposition to ignore this.

(6) $$PV_3(PR_{it}) = \frac{PR_{it}}{1-\delta(1-\pi_d(t))}\ .$$

We also assume there is an idiosyncratic (politician specific) taste shock associated with each post-congressional option. Thus, the overall values of the three options may be written $V_j = PV_j + \xi_j$ for j = 1,2,3. We assume the vector $\xi_{it} = (\xi_{i1t}, \xi_{i2t}, \xi_{i3t})$ is *i.i.d* type I extreme value with standard deviation ρ_E. Following Rust (1987), this assumption allows us to form simple expressions for the choice probabilities and the expected maximum value of the exit options, which we now describe.

We assume that politicians do not see the vector of taste shocks ξ_{it} prior to exiting Congress.[6] Nor, as noted earlier, do they see the stochastic component of wage draws $\varepsilon_{it} = (\varepsilon_{i1t}, \varepsilon_{i2t})$. Upon deciding to exit, the ε_{it} and ξ_{it} values are revealed, and the politician chooses the alternative with the highest value. Therefore, in order to form the expected value of the option to exit Congress, the politician must form the expected maximum over the payoff draws for all three alternatives (integrating over the ε_{it} and ξ_{it}).

To achieve a more compact notation, let XP_{it} denote the set of state variables that are relevant for the determination of post-congressional payoffs. We have:

(7) $$XP_{it} = (Skill_i, BA_i, JD_i, Age_{it}, TH_{it}, TS_{it}, COM_{it}, VE_{it})$$

Then, we write the present value of the employment and retirement options as:

(8) $$PV_j(W_{ijt}) = PV_j(XP_{it}, \varepsilon_{ijt}) \qquad j = 1,2$$

and

(9) $$PV_3(PR_{it}) = PV_3(XP_{it})$$

[6] This type of independence assumption is crucial for the type of solution method developed by Rust (1987). However, one might expect politicians who voluntarily exit congress to have a higher value of leisure, on average, and to therefore have relatively high values of ξ_{i3t}, making them more likely to choose retirement as the post-congressional option. This is precisely the sort of dependence that our parameter α_{VE} captures, since it can be interpreted as letting the mean of ξ_{i3t} be conditioned on VE_{it}. In general, as Rust has noted, letting distributions of the stochastic terms be conditioned on lagged observables is the ideal way to relax the strength of the independence assumptions underlying his approach. The parameters α_{1C} , α_{2C} and α_{2W} play a similar role in our model.

to highlight the fact that the present values of wages in post-congressional employment options depend on the state variables XP_{it}, which are known at the time of the decision to exit Congress, and the stochastic terms ε_{it}, which are not.

The expected value of the decision to exit Congress can then be written:

$$
\begin{aligned}
V_E(XP_{it}) &= E_\varepsilon E_\xi \max\{PV_1(XP_{it},\varepsilon_{i1t}) + \xi_{i1t}, PV_2(XP_{it},\varepsilon_{i2t}) + \xi_{i2t}, PV_3(XP_{it}) + \xi_{i3t}\} \\
&= \int_\varepsilon \rho_E \ln(\exp(PV_1(XP_{it},\varepsilon_{i1t})/\rho_E) \\
&\qquad + \exp(PV_2(XP_{it},\varepsilon_{i2t})/\rho_E) + \exp(PV_3(XP_{it})/\rho_E))f(\varepsilon)d\varepsilon
\end{aligned} \tag{10}
$$

Here, $f(\varepsilon)$ is the joint density of the vector of wage draws $\varepsilon_{it} = (\varepsilon_{i1t}, \varepsilon_{i2t})$, which we assume to be a bivariate normal, $\varepsilon_{it} \sim N(0, AA')$, where

$$
A = \begin{pmatrix} a_{11} & 0 \\ a_{12} & a_{22} \end{pmatrix} \tag{11}
$$

Given this structure, we also obtain simple expressions for the probability that each post-congressional alternative is chosen. Let d_{ikt} be an indicator variable equal to 1 if option k is chosen and 0 otherwise, where k = 1 denotes the private sector, k = 2 denotes the public sector, and k = 3 denotes retirement. Then, the probability that politician i decides to retire is simply:

$$
\begin{aligned}
&P(d_{i3t} = 1 | XP_{it}) = \\
&\int_\varepsilon \frac{\exp(PV_3(XP_{it})/\rho_E)}{\exp(PV_1(XP_{it},\varepsilon_{i1t})/\rho_E) + \exp(PV_2(XP_{it},\varepsilon_{i2t})/\rho_E) + \exp(PV_3(XP_{it})/\rho_E)} f(\varepsilon)d\varepsilon
\end{aligned} \tag{12}
$$

If the politician chooses employment in either the private or public sector, a wage is observed, so we must form a choice probability conditional on the wage in order to obtain the appropriate likelihood function contribution (see equation (34) in Section 6, which describes the construction of the likelihood function).

2. Decisions of Senators

In this section we consider the decisions of a sitting senator. Of course, senators do have options of running for other offices, like president or governor. But the frequency of such decisions is fairly low, and to include them would drastically complicate the model. Thus, we do not model the decisions of senators to run for other offices.[7] Given this simplifying assumption, the behavior of senators is much simpler to describe than that of representatives (who can also choose to run for the Senate), because they have fewer options. This is why we describe the behavior of senators first.

Like representatives, we assume that senators make decisions every two years. It turns out that this is useful, even though a Senate term is six years, because early exit by senators is not uncommon in the data. The set of options a senator faces depends on whether his/her seat is up for election in a given period. Define a state variable *ST* ("Senate term") that is equal to 1, 2 or 3 as the senator has served 2, 4 or the full 6 years of his/her term. If $ST = 1$ or $ST = 2$ then the senator has two options: to continue sitting in the Senate or exit Congress. If $ST = 3$ then the senator has to decide whether to run for reelection or exit Congress.

Denote by XS_{it} the set of state variables relevant to the decisions and/or electoral prospects of senators. We have:

$$(13) \qquad XS_{it} = (XP_{it}, SOS_{it}, SOW_t, Party_i, Achieve_i, Scandal_{it}, ST_{it}, Cohort_i)$$

Obviously this includes XP_{it}, the set of state variables that determine the distribution of post-congressional payoffs should the politician exit the Senate, already defined in (7). The state vector also contains measures of the political climate, which influence the senator's re-election chances, denoted SOS_{it} ("state of the state") and SOW_t ("state of the world"). These indicate, respectively, whether conditions in the senator's home state and aggregate conditions favor election of a Democrat or a Republican.

We describe the construction of *SOS* and *SOD* in detail in Section 7. Here, it suffices to say that, in each period, we classify each state in the U.S. as being relatively good, neutral, or bad for the election of Democrats (*SOS*) based on the state's vote in presidential elections relative to the national vote.[8] Similarly, in each period we classify the situation in the U.S. as a whole (*SOW*), based on the aggregate outcome of all congressional elections to the House of Representatives. (Note that we construct SOS_{it} as a measure of the state of the state *relative* to the aggregate state of the world).

[7] If a senator does become a governor we treat it just like any other post-congressional political job.

[8] Minnesota, for example, would always be a good state for Democrats, whereas a number of southern states have shifted from being good for Democrats to good for Republicans during our sample period.

We assume that the senator knows the state of his/her state as well as the state of the world prior to making the decision on whether to exit, run for reelection or stay in the Senate. The evolution of SOS_{it} and SOW_t over time and how these variables affect election probabilities are described in Section 4. At this point we simply note that SOS_{it} and SOW_t each evolve over time according to a Markov process with transition probabilities $p_{SOS,i,t+1} = P(SOS_{i,t+1} \mid SOS_{it})$ and $p_{SOWt+1} = P(SOW_{t+1} \mid SOW_t)$.

Cleary the variable $Party_i$, which indicates whether the politician is a Democrat or a Republican, is also a relevant state variable, since it is its interaction with SOS_{it} and SOW_t that affects the politician's chances in the next election. A politician's party affiliation may also be an important determinant of the probability of achieving important legislative accomplishments while serving in the Senate. We assume that political party is a fixed characteristic of the politician.[9]

In addition to differ with respect to their (unobserved) political skills (summarized by the variable $Skill_i$, which is contained in XP_{it}), we also allow for the possibility that politicians have different unobserved preferences for holding office, which affect the utility they derive from important legislative accomplishments. The variable $Achieve_i$ indexes the (unobserved) preference-type of a politician and is simply a dummy variable equal to 1 if the politician is an "achiever" (i.e., he/she values personal legislative achievements). As with the variable $Skill_i$, the case where the dummy variable $Achieve_i = 0$ corresponds to the default or "normal" type. Hence, since there are two possible skill-types and two possible preference-types, our analysis admits four different unobserved types of politicians.

Another important state variable that may affect a senator's chances in the next election and is therefore relevant to the decisions of senators is whether the politician is currently involved in a scandal. The variable $Scandal_{it}$ is a dummy variable that takes the value 1 if politician i is involved in a scandal at time t. Finally, $Cohort_i$ is a variable indicating whether a

[9] There are instances of politicians changing parties while in Congress over the sample period, but to include the possibility of changing party would substantially complicate our model, and such instances are sufficiently rare (they occur in less than half of a percent of the cases), that we feel it is a reasonable approximation to ignore them.

politician entered Congress in 1947-1965, 1967-1975 or 1977-1993. We use this variable to capture changes in congressional wages over time.[10]

Consider first the decision of a senator when $ST = 1$. This case corresponds to a situation where the senator's seat is not up for election, so that the senator's choice is simply to stay in office or to exit. If the senator decides to stay in office, then he/she receives the per-period payoff from sitting in the Senate, which includes the possibility of achieving an important legislative accomplishment in the current session of Congress. Denote by $V_S(XS_{it}, s)$ the value of choosing the Senate option given the relevant state variables (XS_{it}, s), where the second element of the state vector indicates that the politician is already a sitting senator. We have:

$$(14) \qquad V_S(XS_{it}, s) = W_S(t) + \alpha_S + Achieve_i\, p_{AS}(XS_{it})\alpha_{AS} + \mu_{1Sit} + \delta(1-\pi_d(t))EV(XS_{i,t+1}, s).$$

The first four terms in (14) capture the immediate payoff from staying in the Senate at time t. $W_S(t)$ is the wage the senator will receive, and the term α_S captures the monetized value of the per-period non-pecuniary rewards from being in the Senate. While all senators receive these rewards, those of the type who value personal legislative achievements (i.e., $Achieve_i = 1$) may also receive additional utility in any given period while sitting in the Senate if he/she achieves an important legislative accomplishment in that period. We denote the probability of a policy achievement by a senator by $p_{AS}(XS_{it})$, and α_{AS} is the monetized value of the utility the achievement generates.[11] The term μ_{1Sit} is a stochastic component to i's utility from being in the Senate at time t. This may capture random fluctuations in the non-pecuniary rewards over time.

The last term in (14) captures the future component of the value from staying in the Senate. This is equal to the discount factor, δ, times the probability of survival to the next decision period, $(1-\pi_d(t))$, times the expected value of the state the politician will arrive at in period t+1 given survival, $EV(XS_{i,t+1}, s)$. Given (7) and (13), we see that:

[10] Wage paths were very similar for members within each entering cohort defined here, regardless of entry year. Thus, we constructed cohort specific wage paths using time-specific averages across the cohort members. If we let each entering class be its own cohort (i.e., have its own wage path), it drastically expands the state space, and increases computational time. This cost did not appear justified given the limited variation of wages within cohorts.

[11] The assumption that only "achievers" derive utility from accomplishments guarantees that α_S and α_{AS} are separately identified. Otherwise, identification would hinge subtly on variation of p_{AS}, the probability of achievement, with XS_{it}..

(15) $$XS_{i,t+1} = XS_{it} + (0 \;\; 0 \;\; 0 \;\; 2 \;\; 0 \;\; \frac{1}{3} \;\; 0 \;\; 0 \;\; ? \;\; ? \;\; 0 \;\; 0 \;\; ? \;\; 1 \;\; 0)$$

which means that if the politician stays in the Senate, and lives until t+1, then age increases by 2, number of terms in the Senate increases by 1/3, the changes in *SOS* and *SOW* and the occurrence of a scandal are uncertain (indicated by ?), and *ST* increases by 1. Uncertainty about the changes in *SOS* and *SOW* is one reason that the politician must take the expectation in (14).[12] The other reason is that the politician does not know what the realization of the *i.i.d.* taste shock μ_{1Sit} will be in period t+1. (Note that μ_{1Sit} is in fact a state variable relevant to the time t decision, but since it is serially independent we follow convention and do enter it explicitly in our value function expressions).

We next develop the expression for $EV(XS_{i,t+1}, s)$, the expected value of the next period state, should the senator remain in the Senate. First, suppose that $SOS_{i,t+1}$ and SOW_{t+1} are known, so that the only uncertainty is with regard to $\mu_{1Si,t+1}$. At time t+1 the politician will again choose whether to stay in the Senate or exit, so $EV(XS_{i,t+1}, s)$ is the expected maximum of $V_S(XS_{i,t+1}, s)$ and $V_E(XP_{i,t+1})$. If we put the model in a form in which V_S and V_E both have additive independent type I extreme value error terms, then we can again use Rust's (1987) close-form formula for the expected maximum. Although V_E does not have an error term, we can achieve an equivalent representation by assuming that $\mu_{1Si,t+1}$ is equal to the difference of two independent type I extreme value error terms, each with standard deviation ρ_{1S}. Then we have:

(16) $$\begin{aligned} EV(XS_{i,t+1}, s) &= E \max\{V_S(XS_{i,t+1}, s), V_E(XP_{i,t+1})\} \\ &= \rho_{1S} \ln(\exp(\overline{V}_S(XS_{i,t+1}, s)/\rho_{1S}) + \exp(V_E(XP_{i,t+1})/\rho_{1S})) \end{aligned}$$

where $\overline{V}_S(XS_{it}, s) \equiv V_S(XS_{it}, s) - \mu_{1Sit}$. Then, to form expected value functions that are not conditional on $SOS_{i,t+1}$ and SOW_{t+1}, we simply take a weighted average of expressions like (16), each calculated at a different realization for $SOS_{i,t+1}$ and SOW_{t+1}, and weighted by the probability of that realization conditional on SOS_{it} and SOW_t, respectively.

[12] Note that whether there is a scandal is not relevant, because next period we will have $ST = 2$ and the senator will not be up for re-election.

Given this structure, we also obtain simple expressions for the probability that each alternative is chosen. Let d_{it}^{k} be an indicator variable equal to 1 if option *k* is chosen and 0 otherwise, where *k* = *S,E*. Then, e.g., the probability that the senator decides to remain in the Senate is simply:

$$(17) \qquad P(d_{it}^{S}=1|XS_{it},s)=\frac{\exp(\overline{V}_S(XS_{it},s)/\rho_{1S})}{\exp(\overline{V}_S(XS_{it},s)/\rho_{1S})+\exp(V_E(XP_{it})/\rho_{1S})}$$

There is no important difference in the decisions of senators when *ST* = 2, except that, at that point, the future component of the value of the stay in Senate option is an expected maximum over the run for reelection and exit options, rather than the stay in Senate and exit options. Also, we let the standard deviation of the taste shocks differ at each value of *ST*, so ρ_{2S} replaces ρ_{1S} in all relevant expressions.

Now we describe the senator's decision when *ST* = 3. At that point the senator's seat is up for election, and he/she has the options of running for reelection or leaving Congress. If he/she decides to run, the probability of winning is $p_s(XS_{it})$.[13] We allow the probability of winning to potentially depend on all the senator's state variables (including the unobserved skill-type), as discussed in Section 4. Note that we do not model the outcome of primaries and general elections separately. If a senator loses a bid for reelection we do not distinguish if this was due to losing a primary or a general election.

If the senator wins the reelection bid, then he/she will sit in the Senate for two years, and then make a decision regarding whether to continue. A rather subtle point with regard to timing in the model is thus that the senator, at the time he/she decides whether to run for reelection, does not yet know the draw μ_{1Sit+1} for utility from continuing to sit in the Senate that will be revealed when *ST* = 1. Thus, the expected payoff to winning is given by the expected value of (14):

$$(18) \qquad EV_S(XS_{it},s)=W_S(t)+\alpha_S+Achieve_i\, p_{AS}(XS_{it})\alpha_{AS}+\delta(1-\pi_d(t))EV(XS_{i,t+1},s)$$

Then we have:

[13] We assume the Senator decides whether to run before the random variable $Scandal_{it}$ is realized. Thus, the decision to run is based on a probability of wining that is the weighted average of the probabilities with and without a scandal. We fix the probability of a scandal at 0.0049 in the Senate, which is equal to the frequency in the data.

(19) $$V_{RS}(XS_{it},s)=p_S(XS_{it})EV_S(XS_{it},s)+(1-p_S(XS_{it}))V_E(XP^*_{it})+(\alpha_{RS}+\mu_{RSit})$$

This says that the value of running for the Senate is equal to the probability of winning times the expected value of sitting in the Senate for the next period, plus the probability of losing times the value of exit (recall that a senator who loses a reelection bid then makes a post-congressional career decision), plus the term (α_{RS} + μ_{RSit}). Here, α_{RS} is the mean utility a senator gets from running for the Senate (which may be positive or negative, and whose sign is not obvious *a priori*), and μ_{RSit} is the idiosyncratic component of the utility of running for reelection, which is specific to senator *i* at time *t*. Finally, XP^*_{it} denotes the XP_{it} sub-vector of XS_{it} with VE_{it} set to 0, since the senator exits via losing rather than voluntarily.

Letting μ_{RSit} be the difference of two independent type I extreme value error terms, each with standard deviation ρ_{RS}, we then have:

(20) $$\begin{aligned} EV(XS_{it},s) &= E\max\{V_{RS}(XS_{it},s),V_E(XP_{it})\} \\ &= \rho_{RS}\ln(\exp(\overline{V}_{RS}(XS_{it},s)/\rho_{RS})+\exp(V_E(XP_{it})/\rho_{RS})) \end{aligned}$$

where $\overline{V}_{RS}(XS_{it},s)\equiv V_{RS}(XS_{it},s)-\mu_{RSit}$. The choice probability expressions are similar to (17).

3. Decisions of Representatives

Decisions of representatives are more complex than those of senators, because representatives may have the option of running for the Senate. Moreover, because Senate terms are six years while House terms are only two years, a representative will not have the option of running for higher office in every election. A further complication is that, if a Senate seat is up for election, a representative's chances of winning the seat depend critically on the seat's incumbency status. If there is an incumbent senator of the representative's own party running for the seat, then there is (presumably) little chance he/she can win it. If there is an incumbent running from the other party then the chances of winning may be better, but they are still likely to be small. If the seat is open, however, the representative's chances of winning may improve substantially.

Denoting by XH_{it} the set of state variables that are relevant to the decisions and/or electoral prospects of representatives, we have:

$$XH_{it} = (XP_{it}, SOD_i, SOS_{it}, SOW_t, Party_i, Achieve_i, Scandal_{it}, \mathrm{Re}dist_{it}, ES_{it}, Cycle_{it}, INC_{it}, Cohort_i) \quad (21)$$

where XP_{it} denotes the vector of state variables relevant to post-congressional payoffs and the variables SOS_{it}, SOW_t, $Party_i$, $Achieve_i$, $Scandal_{it}$ and $Cohort_i$ were already introduced when we described the decision problem faced by senators.

Clearly, the value of a House seat may be enhanced substantially if it is likely that the holder of that seat will have an option to run for Senate with a reasonably large probability of winning in the not too distant future. Thus, a key aspect of the representative's problem is to forecast when Senate seats in his/her state will be up for election, whether an incumbent will be running when a seat does come up, and the incumbent's party affiliation. The problem is complicated by the fact that each state has two senators. Furthermore, it is uncertain when (and if) Senate seats will become open, because senators may die in office, leave the Senate before the end of their terms or decide not to run when their terms run out.[14]

To capture these features of the problem, it is useful to define new state variables that we call *Cycle* and *INC*. The position of a state in its "Senate cycle" refers to the number of periods until each of its two Senate seats comes up for election, baring unusual circumstance like death or early retirement of sitting senators. *Cycle* = 1,2,3 indexes the three possible positions in the Senate cycle for a state, which are (a,b) = (0,1), (0,2), or (1,2) respectively, where a is the number of periods until a Senate seat is first scheduled to come up, and b is the number of periods until the next Senate seat is scheduled to come up. Thus, e.g., when *Cycle* = 1 there is a Senate election scheduled for both t and $t+1$. The variable *Cycle* evolves deterministically (i.e., scheduled elections are unaffected by deaths or retirements of senators).

INC = 1,…,4 indexes the four possible states of incumbency for a state's two Senate seats, with the seats ordered in terms of which is scheduled to come up for election first (just as in the definition of *Cycle*). Letting *D*, *R* denote Democrat and Republican, respectively, the possibilities are (*D, D*), (*D, R*), (*R, D*), (*R, R*). Thus, e.g., if *INC* = 3 we have (*R, D*) which means

[14] Clearly, a senator's decision to not seek reelection may depend on the identity of the representatives who may seek election to the Senate as well as on the decisions of other senators. Similarly, a representative's decision to run for the Senate may depend on whether other representatives from the same state are likely to do the same and on their identity. These considerations suggest that strategic interactions may play an important role and the decisions of all politicians may be viewed as outcomes of a dynamic game among the members of Congress. While certainly valuable such an extension is clearly beyond the scope of our analysis and in this paper we abstract from all strategic considerations.

the first seat scheduled to come up for election has an incumbent Republican, while the next has an incumbent Democrat.

Now we define values of the critical state variable *ES* ("election status"), which determines the set of options a representative faces. If $ES = 1$ there is no Senate seat up for election in the representative's state, so his/her only options are to run for reelection or leave Congress. If $ES = 2$, 3 or 4 then there is a Senate seat up for election in the representative's state. There is an incumbent Democrat or Republican senator running for reelection as $ES = 2$ or $ES = 3$, respectively. If $ES = 4$ the seat is open.

ES and *INC* evolve stochastically because of death and retirement by senators, and the uncertain outcome of future Senate elections. We specify that (INC_{it}, ES_{it}) evolves according to a conditional Markov process with transition probabilities:

$$(22) \qquad p_{(INC,ES),i,t+1}(m,n) = P(INC_{i,t+1}, ES_{i,t+1} \mid Cycle_{it}, INC_{it}, ES_{it}) \qquad m = 1,\ldots,4;\ n = 1,\ldots,4.$$

The specification of these probabilities, which are constructed using empirical frequencies from our data set, is discussed more fully in Section 4.[15]

Another state variable relevant to electoral prospects is SOD_i ("state of the district"), which measures whether a representative's district generally votes Republican or Democratic. We define SOD_i analogously to SOS_{it}, except that we treat *SOD* as a *fixed* characteristic of a representative's district. Thus, we assume that *SOS* and *SOW* capture all time varying aspects of the electoral climate. For instance, a Democratic representative in a strongly Democratic district will normally have a high probability of reelection, but this probability is lower in years when the state and/or national political climate are favorable for Republicans. Also note that SOS_{it} and SOW_t are relevant state variables for representatives for two other reasons: First, if a Senate seat is up for election they influence the chances of winning in a bid for higher office; Second, even if there is no Senate election in period *t*, SOS_{it} and SOW_t are still relevant, because they help to predict the probability of winning a Senate seat in the future.

Two other state variables that are relevant to a representative's electoral prospects are whether his/her current electoral district has been affected by redistricting (in which case the

[15] Note that *INC* and *ES* could be predicted perfectly using lagged *Cycle*, *INC* and *ES* if incumbent senators always ran for reelection, and never left office due to death, appointment to other offices or early retirement. Thus, these are the natural variables to use in predicting *INC* and *ES*.

dummy variable $Redist_{it}$ takes the value 1 and zero otherwise) and whether the politician is currently involved in a scandal ($Scandal_{it}$).

The last variable in (21) is $Cohort_i$, which indicates whether a politician entered Congress in 1947-1965, 1967-1975 or 1977-1993. As we noted when discussing senators, one reason we include this state variable is to capture changes in congressional wages over time. *Cohort* is important for representatives for an additional reason. As is well known, House reelection probabilities have changed over time. A preliminary analysis of our data suggested clear breaks between these cohorts. Thus we include *Cohort* in the reelection probability functions that we discuss in Section 4.

The timing of events in the decision process for a representative is as follows. At the end of his/her two-year term, the representative decides whether to exit, run for reelection, or, if the option is available, run for Senate. At the time this decision is made, the politician knows the state of his/her district (*SOD*), as well as *SOS* and *SOW* for the upcoming election. The representative also knows whether a Senate seat is up for election, whether an incumbent will run for the seat, and, if so, the party of that incumbent. All these variables, along with the stochastic realizations of *Redist* and *Scandal*, affect his/her reelection chances. If the politician decides to run for the House or Senate, he/she then gets a draw from a probability distribution that determines the election outcome. If the politician wins reelection to the House, he/she then gets a draw from a probability distribution that determines if he/she is made a member of a major committee. There is also the possibility that the representative will achieve an important legislative accomplishment. Then the process repeats itself. On the other hand, if the politician loses, then he/she chooses an exit option, and the process terminates.

Now consider a sitting representative's decision when $ES = 2$, 3 or 4, so that the option of running for Senate is available. The other two options are to run for reelection or to exit Congress. The value of running for Senate is:

$$(23) \qquad V_{RS}(XH_{it}, h) = p_{HS}(XH_{it})EV_S(XS_S, s) + (1 - p_{HS}(XH_{it}))V_E(XP_{it}^*) + (\alpha_{HS} + \mu_{HSit})$$

where h indicates that the politician is sitting in the House. Equation (23) resembles equation (19), the value to a sitting senator of running for Senate, except that: (i) the probability of winning, $p_{HS}(XH_{it})$, is different (in particular, it also depends on whether an incumbent senator is running for the seat), and (ii) we allow the direct utility or disutility to a representative from running for a Senate seat, (α_{HS} + μ_{HSit}), to differ from the utility or disutility that a sitting senator would receive. The probability that a representative wins a bid for a Senate seat is more complex than the probability a senator wins reelection, because $p_{HS}(XH_{it})$ depends not just on the representative's characteristics, the state of the state, and the state of the world, but also on whether an incumbent senator is running for the seat. We describe $p_{HS}(XH_{it})$ in detail in Section 4.

The value of running for reelection to the House is:

$$(24) \qquad V_{RH}(XH_{it},h) = p_H(XH_{it})EV_H(XH_{it},h) + (1 - p_H(XH_{it}))V_E(XP_{it}^*) + (\alpha_{RH} + \mu_{RHit})$$

Here, $p_H(XH_{it})$ is the probability of winning reelection to the House, which we describe more fully in Section 4.[16] As was the case with Senate elections, we do not model the outcome of House primaries and general elections separately. The term α_{RH} is the mean value of the direct utility that the representative gets from running for the House (which may be positive or negative, and whose sign is not obvious *a priori*), while μ_{RHit} is the idiosyncratic component of the utility of running for reelection, which is specific to House member *i* at time *t*.

The expected value of sitting in the House given reelection at time *t* is:

$$(25) \qquad \begin{aligned} EV_H(XH_{it},h) = {} & W_H(t) + \alpha_H + p_C(XH_{it}^*)\alpha_C + Achieve_i\, p_{AH}(XH_{it})\alpha_{AH} \\ & + \delta(1-\pi_d(t))EV(XH_{i,t+1},h \mid XH_{it}) \end{aligned}$$

The first four terms in (25) capture the current component of the payoff from sitting in the house at time *t*. $W_H(t)$ is the wage, and α_H is the monetized value of the utility of sitting in the House. The parameter α_C is the monetized values of the utility of being named to a major House committee and is multiplied by the probability of being named to a major House committee, $p_C(XH_{it}^*)$, to get the expected utility.[17] A representative of the type that values personal

[16] The probability of winning for a representative will depend both on the realization of $Scandal_{it}$ and whether he/she is subject to redistricting. But we assume a representative decides whether to run before these are realized. Thus, the probability of winning in (24) is an unconditional probability integrated over the realizations of $Redist_{it}$ and $Scandal_{it}$. The probability of redistricting is set at 0.2628, and the probability of a scandal in the House is set at 0.0080, which are equal to the frequencies in the data.

[17] At this point it is worth recalling that in equation (7) we defined XP_{it} as including the House committee status state variable COM_{it}, which is therefore included in XH_{it}. Hence, we let $XH_{it}*$ denote the vector of state variables XH_{it} where COM_{it} is replaced by COM_{it-1}.

legislative achievements (i.e., $Achieve_i = 1$) may also receive additional utility that is contingent on having an important legislative accomplishment in that period. We denote the probability of a political achievement by a representative by $p_{AH}(XH_{it})$, while α_{AH} is the monetized value of the utility increment generated by an achievement. Expected utility from legislative achievement is the product of these terms.[18]

The last term in (25) is the future component, which consists of the discount factor times the probability of survival to the next decision period, times the expected value of the state the representative will occupy at time t+1 when he/she next makes decisions about exiting Congress or running for office. This expectation is taken over five pieces of information that will be revealed after the representative is reelected at t but before he/she makes time t+1 decisions, and that affect the values that he/she will assign to the various choice options at t+1. These are whether the representative gets selected for a major committee after his/her reelection, along with *SOS* and *SOW* for the time t+1 election, and the status of the two Senate seats in his/her state at the time of the t+1 election.[19] Thus we have:

$$EV(XH_{i,t+1}, h \mid XH_{it}) =$$

$$(26) \qquad \sum_{COM=0}^{1} \sum_{SOW=1}^{3} \sum_{SOS=1}^{3} \sum_{ES=1}^{4} \sum_{INC=1}^{4} p_{C,i,t+1} p_{SOW,t+1} p_{SOS,i,t+1} p_{(INC,ES),i,t+1} \mathrm{E}V(XH_{i,t+1}, h)$$

In the term $EV(XH_{i,t+1}, h)$, the state variables *COM*, *SOW*, *SOS*, *ES* and *INC* are all conditioned on, so the expectation is taken only over the draws for the time t+1 taste shocks for running for House and Senate, $\mu_{HSi,t+1}$ and $\mu_{RHi,t+1}$, which the politician cannot anticipate at time t, the possibility of a legislative achievement at time t+1, and the possibilities of a scandal and redistricting at t+1. If $ES = \ell$, where ℓ = 2, 3 or 4, so that the option to run for Senate is available, then this has the form:

[18] The assumption that only "achievers" derive utility from accomplishments guarantees that α_H and α_{AH} are separately identified. Otherwise, identification would hinge subtly on variation of p_{AH}, the probability of achievement, with XH_{it}.

[19] Note that legislative accomplishments are also revealed between re-election and the time t+1 decision. But utility from these accomplishments is derived instantaneously during the representative's term, and so legislative accomplishments have no bearing on decisions at time t+1. Also, note that the values of *Redist* and *Scandal* at t+1 are not realized until after the time t+1 decision is made.

$$EV(XH_{i,t+1},h) = E\max\{V_{RS}(XH_{i,t+1},h), V_{RH}(XH_{i,t+1},h), V_E(XP_{i,t+1})\}$$

(27) $$= \rho_{\ell H}\ln(\exp(\overline{V}_{RS}(XH_{i,t+1},h)/\rho_{\ell H}) + \exp(\overline{V}_{RH}(XH_{i,t+1},h)/\rho_{\ell H}) + \exp(V_E(XP_{i,t+1})/\rho_{\ell H}))$$

where $\overline{V}_{RS}(XH_{i,t+1},h) \equiv V_{RS}(XH_{i,t+1},h) - \mu_{HSit}$, $\overline{V}_{RH}(XH_{i,t+1},h) \equiv V_{RH}(XH_{i,t+1},h) - \mu_{RHit}$, and we specify that $\mu_{HSi,t+1}$ = ζ_{1it} - ζ_{3it} and $\mu_{RHi,t+1}$ = ζ_{2it} - ζ_{3it}, where ζ_{1it}, ζ_{2it} and ζ_{3it} are mutually independent type I extreme value error terms. These have standard deviation ρ_{2H}, ρ_{3H} or ρ_{4H}, depending on whether *ES* = 2, 3 or 4. This distributional assumption allows us to again apply the Rust (1987) formula to achieve a simple close-form expression for the expected maximum.

Finally, given our distributional assumptions on the taste shocks, the probabilities that the representative chooses each of the three options at time *t* have simple forms. Let d_{it}^{k} be an indicator variable equal to 1 if option *k* is chosen and 0 otherwise, where *k* = *RH, RS, E*. Then, e.g., the probability that the representative decides to run for the Senate is simply:

(28) $$P(d_{it}^{RS} = 1|XH_{it},h) = \frac{\exp(\overline{V}_{RS}(XH_{it},h)/\rho_{\ell H})}{\exp(\overline{V}_{RS}(XH_{it},h)/\rho_{\ell H}) + \exp(\overline{V}_{RH}(XH_{it},h)/\rho_{\ell H}) + \exp(V_E(XP_{it})/\rho_{\ell H})}$$

where ℓ = 2, 3, or 4, depending on whether *ES* = 2, 3, or 4.

It is straightforward to work out the relevant value functions and probability expressions for a sitting representative's decision when *ES* = 1, where the option of running for Senate is not available. This simply involves working through the same steps as above with the terms involving $\overline{V}_{RS}$ eliminated where appropriate and ρ_{1H} replacing $\rho_{\ell H}$.

4. Probability Functions and Evolution of Exogenous State Variables

In Sections 1 through 3 we have referred to functions that determine the probabilities of winning elections, achieving important legislative achievements and being named to a major House committee, and the evolution of the exogenous state variables SOS_{it}, SOW_{it}, INC_{it}, and ES_{it}. In this section we describe the specifications we use in our analysis.

First consider Senate elections. The probability that a senator wins reelection or that a representative wins election to the Senate may be conveniently specified to have a logit form. Define the latent index U_{Sit} by the equation:

$$
\begin{aligned}
U_{Sit} &= \phi_0 + \phi_1 Skill_i + \phi_2 Age_{it} + \phi_3 Age_{it}^2 + \phi_4 TH_{it} * HSE_{it} + \phi_5 TH_{it}^2 * HSE_{it} + \phi_6 TS_{it} + \phi_7 TS_{it}^2 \\
&+ \phi_8 I[SOS_{it} = 1] * I[Party_i = D] + \phi_9 I[SOS_{it} = 1] * I[Party_i = R] \\
&+ \phi_{10} I[SOS_{it} = 2] * I[Party_i = D] + \phi_{11} I[SOS_{it} = 3] * I[Party_i = D] \\
&+ \phi_{12} I[SOS_{it} = 3] * I[Party_i = R] + \phi_{13} I[SOW_t = 1] * I[Party_i = R] \\
&+ \phi_{14} I[SOW_t = 2] * I[Party_i = D] + \phi_{15} I[SOW_t = 3] * I[Party_i = D] \\
&+ \phi_{16} I[SOW_t = 3] * I[Party_i = R] + \phi_{17} I[ES_{it} = 2] * I[Party_i = D] * HSE_{it} \\
&+ \phi_{18} I[ES_{it} = 2] * I[Party_i = R] * HSE_{it} + \phi_{19} I[ES_{it} = 3] * I[Party_i = D] * HSE_{it} \\
&+ \phi_{20} I[ES_{it} = 3] * I[Party_i = R] * HSE_{it} + \phi_{21} I[ES_{it} = 4] * I[Party_i = D] * HSE_{it} \\
&+ \phi_{22} I[ES_{it} = 4] * I[Party_i = R] * HSE_{it} + \phi_{23} Scandal_{it} + \nu_{Sit}
\end{aligned} \tag{29}
$$

where HSE_{it} is a dummy variable that takes the value 1 if individual i is running for a Senate seat in period t from the House and 0 otherwise, $I[.]$ is an indicator variable that takes the value 1 if the expression within brackets is true and 0 if it is false, and ν_{Sit} is a standard logistic error term. Then, defining $\overline{U}_{Sit} = U_{Sit} - \nu_{Sit}$, the probability of winning reelection to the Senate and the probability of winning election to a Senate seat from the House are simply:

$$
p_S(XS_{it}) = \frac{\exp(\overline{U}_{Sit})}{1+\exp(\overline{U}_{Sit})} \qquad \text{and} \qquad p_{HS}(XH_{it}) = \frac{\exp(\overline{U}_{Sit})}{1+\exp(\overline{U}_{Sit})} \tag{30}
$$

In the first expression in equation (30) we have $HSE_{it} = 0$, while in the second expression we have that $HSE_{it} = 1$. This specification allows the probabilities to depend on age, and previous congressional experience as captured by past terms in the House and Senate, as well as by the state of the state and the state of the world in terms of whether it is a good, bad or neutral for Democrats.[20]

Importantly, note that we let the intercept term in (29) depend on $Skill_i$, thus allowing for unobserved heterogeneity in the probability of winning. Analogous to the wage function intercepts, one may think of the probability of winning function intercepts as differing because politicians have different endowments of political campaigning skills. We interpret *Skill* as

[20] Note that indicators for (*SOS*=2*, Party=R*) and (*SOW*=2*, Party=R*) are excluded from (29). Thus, a Republican running in a neutral *SOS* and *SOW* is the base case. For Democrats, we can estimate a complete set of *SOS* interactions, because these are identified from differences with Republicans in those states. However, for Democrats we need to normalize on one *SOW* interaction, since the *SOW* interactions for Democrats are only identified by the differences across Democrats in those states. Thus, we also exclude the indicator for (*SOW*=1*, Party=D*).

capturing both occupational skill endowments and campaigning skill endowments. A key advantage of our framework is that it allows us to obtain estimates of the parameters of probability of winning functions like (29) that are adjusted both for such unobserved heterogeneity and for the selection bias created by politicians' decisions about whether to run.

Similarly, in order to specify the probability that a representative wins reelection to the House, define the latent index U_{Hit} by the equation:

(31)
$$
\begin{aligned}
U_{Hit} = {} & \psi_0 + \psi_1 Skill_i + \psi_2 Age_{it} + \psi_3 Age_t^2 + \psi_4 TH_{it} + \psi_5 TH_{it}^2 + \psi_6 COM_{it} \\
& + \psi_7 I[SOD_i = 1] * I[Party_i = R] + \psi_8 I[SOD_i = 2] * I[Party_i = D] \\
& + \psi_9 I[SOD_i = 3] * I[Party_i = D] + \psi_{10} I[SOD_i = 3] * I[Party_i = R] \\
& + \psi_{11} I[SOS_{it} = 1] * I[Party_i = D] + \psi_{12} I[SOS_{it} = 1] * I[Party_i = R] \\
& + \psi_{13} I[SOS_{it} = 2] * I[Party_i = D] + \psi_{14} I[SOS_{it} = 3] * I[Party_i = D] \\
& + \psi_{15} I[SOS_{it} = 3] * I[Party_i = R] + \psi_{16} I[SOW_t = 1] * I[Party_i = R] \\
& + \psi_{17} I[SOW_t = 2] * I[Party_i = D] + \psi_{18} I[SOW_t = 3] * I[Party_i = D] \\
& + \psi_{19} I[SOW_t = 3] * I[Party_i = R] + \psi_{20} I[Cohort_i = 2] + \psi_{21} I[Cohort_i = 3] \\
& + \psi_{22} I[Cohort_i = 2] * TH_{it} + \psi_{23} I[Cohort_i = 3] * TH_{it} + \psi_{24} I[Cohort_i = 2] * TH_{it}^2 \\
& + \psi_{25} I[Cohort_i = 3] * TH_{it}^2 + \psi_{26} Scandal_{it} + \psi_{27} \mathrm{Re}dist_{it} + \nu_{Hit}
\end{aligned}
$$

where v_{Hit} is another standard logistic error term. As we discussed earlier, we included cohort effects in (31) because prior research and our own preliminary data analysis suggested these are important. The expression for the probability of winning election to a House seat, $p_H(XH_{it})$, is then similar to the ones in (30).[21]

Similarly, the probability that a representative is named to a major House committee after being elected to the House can also be conveniently specified to have a logit form. Define the latent index U_{Cit} by the equation:

[21] Note that indicators for (*SOD*=2, *Party=R*), (*SOS*=2, *Party=R*) and (*SOW*=2, *Party=R*) are excluded from (31). Thus, a Republican running in a neutral *SOD*, *SOS* and *SOW* is the base case. We also normalize by omitting indicators for (*SOD*=1, *Party=D*) and (*SOW*=1, *Party=D*), for reasons similar to those discussed in footnote 20 in the context of equation (29).

$$
(32)\quad \begin{aligned}
U_{Cit} = \gamma_0 &+ \gamma_1 Skill_i + \gamma_2 Age_{it} + \gamma_3 Age_t^2 + \gamma_4 COM_{i,t-1} \\
&+ \gamma_5 I[SOD_i = 1] * I[Party_i = R] + \gamma_6 I[SOD_i = 2] * I[Party_i = D] \\
&+ \gamma_7 I[SOD_i = 3] * I[Party_i = D] + \gamma_8 I[SOD_i = 3] * I[Party_i = R] \\
&+ \gamma_9 I[SOS_{it} = 1] * I[Party_i = D] + \gamma_{10} I[SOS_{it} = 1] * I[Party_i = R] \\
&+ \gamma_{11} I[SOS_{it} = 2] * I[Party_i = D] + \gamma_{12} I[SOS_{it} = 3] * I[Party_i = D] \\
&+ \gamma_{13} I[SOS_{it} = 3] * I[Party_i = R] + \gamma_{14} I[SOW_t = 1] * I[Party_i = R] \\
&+ \gamma_{15} I[SOW_t = 2] * I[Party_i = D] + \gamma_{16} I[SOW_t = 3] * I[Party_i = D] \\
&+ \gamma_{17} I[SOW_t = 3] * I[Party_i = R] + \gamma_{18} I[COM_{i,t-1} = 1] * TH_{it} \\
&+ \gamma_{19} I[COM_{i,t-1} = 0] * TH_{it} + \gamma_{20} I[COM_{i,t-1} = 1] * TH_{it}^2 \\
&+ \gamma_{21} I[COM_{i,t-1} = 0] * TH_{it}^2 + v_{Cit}
\end{aligned}
$$

where v_{Cit} is another standard logistic error term. Again, the expression for the probability of being named to a major House committee, $p_C(XH_{it}^*)$, is similar to the one in (30). Like the probability of winning functions, this function also allows for heterogeneity in the intercepts, so that the probability of being named to a committee may also depend on the politician's skill-type.

The probability functions of achieving important legislative accomplishments by representatives and senators, $p_{AH}(XH_{it})$ and $p_{AS}(XS_{it})$, are also specified to have a logistic form. To minimize the number of additional parameters that need to be estimated, we adopt a simple specification where p_{AH} is only a function of *Achieve*, *TH*, *Party* and *COM*, and p_{AS} of *Achieve*, *TS* and *Party*. In particular, unobserved heterogeneity in preferences affects the probability of achieving important legislative accomplishments, and we assume that only "achievers" can obtain such accomplishments.[22]

As noted above, we specify that (*INC, ES*) evolves according to a conditional Markov process with transition probabilities $P(INC_{i,t+1}, ES_{i,t+1} \mid Cycle_{it}, INC_{it}, ES_{it})$. Of the 768 elements in this transition matrix, only 240 are feasible and, within this subset, only 56 are positive. Note that, unlike the probabilities of winning elections or being appointed to committees, it is assumed that these probabilities do not depend on unobserved heterogeneity and are not affected by selection. Thus, rather than impose any structure on these probabilities, we estimate them in an

[22] Since only "achievers" derive utility form legislative accomplishments it is reasonable to assume that they are the only politicians who will seek them.

unrestricted way from the data. We then treat those values as known in the solution and estimation of our model.

The transition probabilities for *SOS* and *SOW* are also assumed to evolve according to two (independent) Markov processes with transition probabilities $P(SOS_{i,t+1}|SOS_{it})$ and $P(SOW_{t+1}|SOW_t)$, respectively. Again, we estimate these probabilities in an unrestricted way from the empirical transition frequencies, and use those values in estimation. The same is true for the death probabilities, π_d, which are also estimated from the data for each age in an unrestricted way. Since information on retirement from post-congressional occupations is for the most part unavailable, the same procedure cannot be used to obtain estimates of the retirement probabilities, π_r. Instead, we specify a logistic form for retirement probabilities after age 60:

$$(33) \qquad \pi_r = \frac{\exp(\pi_0 + \pi_1(Age - 60))}{1 + \exp(\pi_0 + \pi_1(Age - 60))}$$

and estimate the parameters π_0 and π_1 jointly with the other parameters of the model (we assume that the retirement probability before age 60 is equal to zero).

5. Computational Issues

Estimation of a model like that described above proceeds iteratively. Given an initial guess for the values of the complete vector of model parameters, one solves the DP problem at those values. Then, given the solution of the DP problem, the likelihood is straightforward to construct, because, as we have seen, the choice probabilities are rather simple expressions, as are the wage densities for the wage data at the point of exit from Congress. At that point one forms derivatives of the likelihood, and determines a step for updating the parameter vector. Once the parameter vector is updated, one solves the DP problem again, obtains a new likelihood, and determines another step. And so on.

The computational problem in estimating this type of model arises because hundreds or thousands of steps are typically required before the search algorithm converges to an optimum. And, on each step, the DP problem must be solved again at a new parameter vector. Thus, it must be possible to solve the DP problem quickly if estimation is to be feasible. Computational time depends critically on the size of the state space, since the value of each possible state must be computed to solve the DP problem.

In spite of the fact that the DP problem described above is very large in terms of the size of the state space, our distributional assumptions allow us to obtain an "exact" solution. This means that we are able to calculate the value functions at every point in the state space, and we do not resort to approximate solution methods such as those described in Keane and Wolpin (1994) or Rust (1997), in which one only solves for value functions at randomly selected subsets of the state points and then interpolates to the remaining points.[23] Given the large number of state variables in our model, and hence the large size of the state space, it is rather unusual that we can adopt an exact approach of solving at every state point. Thus, in this section, we provide some discussion of how this is feasible.

Consider the size of the state space. In period t = 23, politicians can be in approximately 300,000 states, given our specification of the state space. This is the largest size that the state space ever takes on. In period t = 24 the size of the state space falls, because politicians know that if they are elected to Congress at t = 24 they will have to exit at t = 25 (when they reach 80). Thus, variables which enter the state space at t only because they are relevant for forecasting the opportunity for running for higher office or getting re-elected at t+1 are irrelevant at t = 24. At t = 25, when agents must exit Congress, the state space becomes much smaller, because many of the state variables are not relevant to $V_E(XP_{it})$, the value of exiting Congress. The relevant set of state variables, XP_{it}, is a rather small subset of the complete set of state variables. In fact, we calculate that at t = 25 politicians can only be in about 1,800 different states that are relevant to post-congressional payoffs.

When we sum over all periods t = 1,…,25, we calculate that there are approximately 4 million points in the entire state space, but only about 24,000 points in the state sub-space spanned by the state variables in XP. The fact that the number of possible values of the vector of state variables XP_{it} that are relevant to post-congressional payoffs is (relatively) small is crucial to our being able to solve the DP problem exactly. The most computationally burdensome part of the solution of the DP problem is the evaluation of the integrals in (10), and this only needs to be done at this rather small subset of state points.

[23] We put "exact" in quotes because, as always, the evaluation of integrals, transcendental functions, etc. on a digital computer is a numerical procedure subject to various forms of rounding and approximation error. In particular, in our case we use Monte-Carlo integration to evaluate the integrals over wage draws in (10) and (12). We use 100 draws to evaluate these integrals. Results were not sensitive to increasing the number of draws.

In general, in our exposition of the model, we showed how only certain subsets of the complete state space, which we denoted by *XP*, *XH*, *XS*, and XH^*, were relevant for decision-making in various contexts. Most of the calculations needed to solve the DP problem only need to be done at the state points in one of these subsets. Then, these sub-calculations can be added up (a fast operation) to form the value functions at all points in the complete state space.

Next we consider the inclusion of unobserved heterogeneity in the model. A difficulty that arises in the estimation of dynamic discrete choice models with unobserved heterogeneity is that the DP problem must be solved for each type of agent. In forming the likelihood one then weights choice probabilities conditional on the agent being each type by the probability the agent is each type. The need to solve the DP problem for each type makes it infeasible to assume a continuous distribution of types or even a large, discrete number of types. It was computationally feasible to estimate our model with four types.

6. The Likelihood Function

It is useful to write the likelihood function in terms of separate components. The likelihood contribution at exit is:

$$(34) \qquad L_{it}^{E} = \left[\prod_{j=1}^{2} P\left(d_{ijt} = 1 \mid XP_{it}\right)^{d_{ijt}} \phi_j\left(W_{ijt} \mid XP_{it}\right)^{d_{ijt} o_{it}} \right] P\left(d_{i3t} = 1 \mid XP_{it}\right)^{d_{i3t}}$$

Here, the first term is the likelihood contribution if the politician takes a job in the private sector (j = 1) or in the public sector (j = 2). $\phi_j\left(\cdot \mid XP_{it}\right)$ denotes the wage density in sector j. This term only enters the likelihood for the subset (42%) of observations where we observe the wage. o_{it} is a dummy variable which indicates if the wage is observed. The second term is the likelihood contribution if the politician retires (j = 3). Note that XP_{it} is the same regardless of whether the politician exits Congress voluntarily (VE_{it} = 1) or via losing an election (VE_{it} = 0), except for the component VE_{it} (see equation (7)). Note that all the components of XP_{it} are observed by the econometrician except for $Skill_i$. For our further exposition of the likelihood function, it will be useful to make the dependence of L_{it}^{E} on VE_{it} and $Skill_i$ explicit by writing $L_{it}^{E}\left(VE_{it}, Skill_i\right)$.

Next, consider the likelihood contribution for a sitting senator at time t. Recall that if ST_{it} = 1 or 2 the senator's choice is to stay in the Senate or exit Congress. If $ST_{it} = 3$ then it is the end of the senator's six-year term and the choice is to run for reelection or exit Congress. If $ST_{it} = 3$ then we have:

$$L_{it}^{S}\left(Type_i\right) =$$

$$(35) \quad \left\{P\left(d_{it}^{RS} = 1 \mid XS_{it}, s\right)\left[WIN_{it}\, p_S(XS_{it}) L_{it}^{A}(XS_{it}) + LOSE_{it}(1 - p_S(XS_{it})) L_{it}^{E}(0, Skill_i)\right]\right\}^{d_{it}^{RS}} \times \left\{P\left(d_{it}^{E} = 1 \mid XS_{it}, s\right) L_{it}^{E}(1, Skill_i)\right\}^{d_{it}^{E}}$$

Here we have defined $Type_i = (Skill_i, Achieve_i)$. The first term in (35) is the likelihood contribution if the senator runs for reelection. In this case, he/she will either win ($WIN_{it} = 1$) or lose ($LOSE_{it} = 1$). If the politician wins (i.e., $WIN_{it} = 1$), the winning probability $p_S(XS_{it})$ enters the expression. In addition, there will then be a realization for whether the politician attains a major legislative accomplishment in the next Congress. The term $L_{it}^{A}\left(XS_{it}\right)$ is the likelihood contribution that derives from this event. It is defined as:

$$(36) \quad L_{it}^{A}\left(XS_{it}\right) = \left[ACH_{it}\, p_{AS}(XS_{it}) + (1 - ACH_{it})(1 - p_{AS}(XS_{it}))\right]^{Achieve_i}$$

Thus, if the politician wins and he/she is the achiever type ($Achieve_i = 1$), this additional likelihood contribution involves the probability of an achievement $p_{AS}(XS_{it})$ and an indicator, which we denote ACH_{it}, for whether an achievement is realized. Returning to the main expression in (35), we note that, in the event of a loss, the senator exits Congress, and gets the exit likelihood contribution associated with involuntary exit, $L_{it}^{E}\left(0, Skill_i\right)$. The second term in (35) is the likelihood contribution if the senator chooses to exit Congress. In this case, the senator gets the exit likelihood contribution associated with voluntary exit, $L_{it}^{E}\left(1, Skill_i\right)$. If ST_{it} = 1 or 2, so that the senator is simply deciding whether to continue serving for the next two years, we have the simpler expression:

(37) $$L_{it}^{S}(Type_i)=\left[P\left(d_{it}^{S}=1\mid XS_{it},s\right)L_{it}^{A}(XS_{it})\right]^{d_{it}^{S}}\left[P\left(d_{it}^{E}=1\mid XS_{it},s\right)L_{it}^{E}(1,Skill_i)\right]^{d_{it}^{E}}$$

Next, consider the likelihood contribution of a sitting member of the House at time t. In the case that ES_{it} = 2, 3 or 4, so that the option to run for Senate is available, this is:

(38) $$\begin{aligned} &L_{it}^{H}(Type_i)= \\ &\left\{P\left(d_{it}^{RH}=1\mid XH_{it},h\right)\left[WIN_{it}\,p_H(XH_{it})L_{it}^{C}(XH_{it})+LOSE_{it}(1-p_H(XH_{it}))L_{it}^{E}(0,Skill_i)\right]\right\}^{d_{it}^{RH}} \\ &\times\left\{P\left(d_{it}^{RS}=1\mid XH_{it},h\right)\left[WIN_{it}\,p_{HS}(XH_{it})L_{it}^{A}(XS_{it})+LOSE_{it}(1-p_{HS}(XH_{it}))L_{it}^{E}(0,Skill_i)\right]\right\}^{d_{it}^{RS}} \\ &\times\left\{P\left(d_{it}^{E}=1\mid XH_{it},h\right)L_{it}^{E}(1,Skill_i)\right\}^{d_{it}^{E}} \end{aligned}$$

The first term is the likelihood contribution if the House member runs for reelection. In this case, he/she will either win or lose. In the event of a win, the representative will receive a draw for whether he/she is appointed to a major House committee, and whether he/she attains a major legislative accomplishment during the next term. The term $L_{it}^{C}(XH_{it})$ is the likelihood contribution that derives from the realizations of these events. It is defined as:

(39) $$L_{it}^{C}(XH_{it})=COM_{it}\,p_C(XH_{it}^{*})L_{it}^{A}(XH_{it},1)+(1-COM_{it})(1-p_C(XH_{it}^{*}))L_{it}^{A}(XH_{it},0)$$

Here, $L_{it}^{A}(XH_{it},k)$ for k = 0,1 denote the likelihood contributions from achievement given that the politician was not or was named to a major committee, respectively. Recall that the probability of achievement in the House depends on whether the representative is a member of a major committee. The expression for $L_{it}^{A}(XH_{it},k)$ is similar to equation (36), except that $p_{AH}(XH_{it},k)$ replaces $p_{AS}(XS_{it})$. Returning to the main expression in equation (38), obviously, the second term is the likelihood contribution if the representative decides to run for the Senate, and the third term is the likelihood contribution if he/she voluntarily exits Congress. Note that, if the representative wins election to the Senate, his/her likelihood contribution is the probability of winning a Senate bid from the House, $p_{HS}(XH_{it})$ times the term $L_{it}^{A}\left(XS_{it}\right)$ that arises from whether the person realizes a major legislative accomplishment in the Senate.

Now, consider a person who is first elected to the House at time t_0, serves in the House for R+1 terms (i.e., he/she is reelected R times) and exits at t_0+R+1. His/her likelihood contribution is:

$$(40) \qquad L_i = \sum_{Type=1}^{4} P(Type) \prod_{t=t_0+1}^{t_0+R+1} L_{it}^{H}(Type)$$

where $P(Type)$ for $Type$ = 1,…,4 are the type proportions.

We allow the probabilities that a politician is each of the four possible types to depend on a set of six background characteristics that we assume are exogenous. These are the following: *Enter Senate* is a dummy equal to 1 if the person starts his/her career in the Senate; *Age at Entry* indicates the member's age when they first enter Congress; *Family* is an indicator for whether an individual has relatives who had served in Congress; *Home* is an indicator for whether an individual serves in the same state where he/she was born; *Polexp* is an indicator for whether an individual had political experience prior to entering Congress; and *Party* is an indicator of the politician's party (1 if a Republican, 0 if a Democrat). The variables *Family*, *Home*, *Polexp*, *Enter Senate* and *Age at Entry* are not state variables in our model. However, we use them, together with party affiliation, to help predict the unobservable type of a politician. Specifically, we assume that the probability that $Skill_i$ = 1 and the probability that $Achieve_i$ = 1 are logistic functions of these six variables. The probability that a politician is each of the four types can then be calculated by appropriately multiplying together the probabilities that he/she is a "skilled" type and an "achiever" type.

Next, consider a person who enters Congress via election to the Senate at time t_0. Suppose he/she chooses to remain in the Senate and/or is reelected in S consecutive two-year periods and then exits Congress. His/her likelihood contribution is:

$$(41) \qquad L_i = \sum_{Type=1}^{4} P(Type) \prod_{t=t_0+1}^{t_0+S+1} L_{it}^{S}(Type)$$

Finally, consider a person who is first elected to the House at time t_0, is reelected to the House R times, then is elected to the Senate at time t_0+R+1, and then chooses to remain in the Senate and/or is reelected in S consecutive two-year periods before exiting Congress. His/her likelihood contribution is:

$$(42) \qquad L_i = \sum_{Type=1}^{4} P(Type) \prod_{t=t_0+1}^{t_0+R+1} L_{it}^{H}(Type) \prod_{t=t_0+R+2}^{t_0+R+S+2} L_{it}^{S}(Type)$$

We maximized the log likelihood function using the BHHH algorithm.

7. Data Description

We construct a data set containing detailed information on careers of all House and Senate members who entered Congress from 1947 (the 80th Congress) to 1993 (the 103rd Congress). Our data end in 1994, so we have complete histories on members who left Congress in January 1995. But histories are right-censored for members who, in 1994, were reelected to serve in the 104th Congress.

We define a career as uninterrupted service in Congress. A career is terminated the first time a member leaves Congress and either (i) chooses some other full-time occupation (either in the private or the public sector), (ii) retires from professional life, or (iii) dies. If a member has multiple spells or interrupted service—an event that occurs in less than 5% of the cases—only the first spell is recorded. Individuals in our data set may serve only in the House; or in both the House and then the Senate (uninterrupted); or only in the Senate. Our final sample contains 1,899 career histories.[24]

For each individual in our sample, the data set contains the following information: (a) biographical data and record of congressional service; (b) record of committee membership, possible scandals while serving in Congress and congressional wages; (c) redistricting and congressional opportunities data; (d) record of important legislative accomplishments; (e) post-

[24] Ambiguous entries (e.g., missing information on a person's middle name may prevent us from distinguishing members with the same first and last name) and observations with inconsistent or incomplete congressional records were dropped from the data. Members who serve in the Senate and then in the House—an extremely rare event—are also dropped.

congressional data. We describe each part of the data set and the sources we used to construct it in turn.

(a) Biographical Data and Record of Congressional Service:

The main building block of our data set is the *Roster of U.S. Congressional Office Holders* (1789-1993) (ICPSR #7803) for the 80th to 103rd Congress. This data set contains 101 variables that provide information about the members' biographical characteristics, party affiliation and a complete record of their congressional service, including the reason why a member left Congress (e.g., because he/she was defeated in an election, retired, died in office, etc.). The official *Biographical Directory of the U.S. Congress (1789-present)* was used to check each relevant entry in our data set.[25] The *Biographical Directory* was also used to collect data on each member's age when entering Congress, whether they represented their state of birth, their educational background (i.e., whether they have a college degree and whether they have a law degree), whether they had relatives who had served in Congress, and whether they had political experience (i.e., they held another public office at the local, state, or federal level) prior to service in Congress.

(b) Committee, Scandal and Congressional Wage Data:

The Kiewiet and Zeng (1993) data set was used to obtain information about committee assignments for the 80th to 99th House. Additional committee data for the 100th to 103rd House were collected using the relevant issues of the *Congressional Quarterly Almanac*. The Kiewiet and Zeng data set was also used to obtain information about scandals involving alleged sexual or financial misconduct by members of Congress for the 80th to 99th House. Additional data about the occurrence of scandals for the 100th to 103rd House and for all senators in our sample were collected using the same procedures and definitions used by Kiewiet and Zeng from the archives of the *New York Times*. Information on the annual salaries of the members of the U.S. Congress was obtained from the relevant issues of the *Congressional Quarterly Almanac*.[26] All nominal wages were converted into 1995 CPI dollars.

[25] The directory is also available online at http://bioguide.congress.gov/biosearch/biosearch.asp.

[26] This information is also available online at http://www.congresslink.org/sources/salaries.html.

(c) Redistricting and Congressional Opportunities Data:

A data set assembled by Gary Jacobson was used to obtain information about all the occurrences of redistricting that affected any of the House members in our sample. Note that although most redistricting activity occurs after a Decennial census, many instances of redistricting occur every election year because of State Supreme Court rulings. Information on opportunities for House members to run for a Senate seat and on the identity and party affiliation of the incumbent (if present) was obtained from the *Roster of U.S. Congressional Office Holders*, supplemented by relevant issues of the *Congressional Quarterly Almanac* for elections to the 103rd Senate.

(d) Legislative Achievements Data:

The Mayhew (2000) data set contains detailed information about important legislative accomplishments by members of Congress (which Mayhew refers to as important "actions in the public sphere") from the 1st through the 100th Congress.[27] These legislative achievements include the sponsoring of a major piece of legislation, the delivery of a famous speech, the casting of a decisive vote on an important policy issue etc. Using the same definitions and procedures used by Mayhew, we extended his data set to include important legislative achievements in the 101th to 103rd Congress based on the information reported in the relevant issues of the *Congressional Quarterly Almanac*.

(e) Post-Congressional Data:

For most members of Congress, the official *Biographical Directory of the U.S. Congress* gives a short description of a member's professional life immediately after leaving congressional service, including the date of death if applicable. Based on the available descriptions we assigned all individuals who did not die in office and were not still in Congress at the end of our sampling period to one of the following categories: (i) private sector, (ii) public sector, or (iii) retired.

(i) Private Sector: The vast majority of former members of Congress who take jobs in the private sector work as lawyers, lobbyists, or political consultants. In these cases the description contained in the *Biographical Directory* is often sufficiently detailed to identify

[27] According to Mayhew's (2000, pp. x-xi) definition "`Actions' are, in principle, moves by members of Congress that are to a significant degree autonomous and consequential—or at least potentially consequential—and that are noticed by an alert stratum of the public exactly because of their perceived current or potential consequentiality."

the specific law firm they join, or at least its location. To obtain estimates of the annual salaries of former members of Congress who choose these post-congressional occupations we relied on survey information. In particular, we used the wage function estimates based on a survey of Chicago lawyers conducted for the years 1975 and 1995 by Sandefur and Laumann (1997). For each of these two years, Sandefur and Laumann estimate a wage function for lawyers and lobbyists by regressing their log wages on biographical variables such as age, gender, ethnicity and father's occupation, as well as tenure, whether they attended an elite or prestigious law school, whether they were on their school's Law Review, size of their practice, field of practice and their position within the firm (e.g., whether they are partners or associates).[28] To obtain information on all these variables for the relevant members of Congress in our sample we used the *Biographical Directory*, the *Martindale-Hubbell archive* and *State Directories of Registered Professional Lobbyists*. The *Martindale-Hubbell archive* provides detailed information about practicing lawyers in the U.S. including their address, field of practice, law school attended, year of admittance to bar, and membership of state bar associations.[29] The *Directories of Registered Professional Lobbyists* contain similar information for licensed lobbyists in each state.[30] Individuals that left Congress before 1985 were assigned estimates from the 1975 wage function; the others were assigned estimates from the 1995 wage function. Both estimates are in 1995 dollars. In addition, since only Chicago lawyers participated in the survey used by Sandefur and Laumann, the imputed wages for each of the relevant individuals in our sample were adjusted to account for the actual location of their practice. To make this adjustment we used data on billing rates for partners in law firms in different U.S. cities that we obtained from various issues of the *Lawyer's Almanac*. We then computed the ratios of average billing rates in each U.S. city relative to Chicago and multiplied the estimated wage for each individual by the appropriate coefficient depending of the location of their practice.[31] It is important to note

[28] Law schools are coded as "elite" or "prestigious" according to whether they are ranked in the top-ten or top-twenty schools, respectively, in the U.S. News and World Report surveys. Also note that the data used by Sandefur and Laumann does not contain information on congressional experience.

[29] Recent editions of the archive are available online at http://www.martindale.com. For earlier years, printed editions of the archive were used. In some cases we used phone interviews to determine the year when an individual had joined a law firm and their position within the firm.

[30] Most of these directories are available online. Printed editions are also available for each state.

[31] If the location of the law practice was not known we used the billing rates for the closets city to the place of residence.

that although our procedure for imputing post-congressional wages in the private sector has limitations (for example, it is likely to understate the actual variation in wages), it nevertheless allows us to capture important features of the data. A key observation is that by and large, when former members of Congress work as lawyers or lobbyists, they are hired as partners of the firms they join (which entails a substantial wage premium over associates positions), in spite of the fact that their experience as lawyers or lobbyists would typically not justify their being offered these positions. In other words, individuals with a similar vector of characteristics (ignoring congressional experience) would not be partners in the data set used by Sandefur and Laumann. Thus, we expect that the effect of congressional experience on one's post-congressional wage (as a lawyer) will largely be captured by the effect of this experience on the chances of being made a partner. There are two other important related observations. First, the variance of wages of partners within law firms is rather small (which is due to the fact that partners share profits). Second, the variance of wages of partners across law firms is in large part explained by differences in location, size and field of practice (which are all factors we take into account in our imputation procedure, and which congressional experience presumably affects as well). The residual variation in wages, however, is clearly not zero, and hence the wage imputation procedure we use will in general understate the actual variation in wages.

(ii) Public Sector: To obtain the annual salary of individuals who served in a federal public office in the first year after leaving Congress we used the relevant sections of the *United States Code* for the years 1948-1995. For members who served in a state-level public office after leaving Congress we used the relevant sections of the *Book of the States* for the years 1948-1995. Salary information about members who served in a county/city-level public office after leaving Congress was collected by directly contacting the relevant institution (e.g., the mayoral office).[32]

(iii) Retired: Information about pensions was collected using the relevant sections of the *United States Code* as well as the *Federal Pensions Regulations* for the years 1948-1995. These sources contain detailed information about eligibility requirements. For instance, annuities are paid only to members who are at least 62 years old and who have completed at least six years of service, members who are at least 60 years old and who have completed at

least ten years of service, and members who are at least 50 years old and who have completed at least twenty years of service. In all these cases, members have to be separated from the service to be eligible for benefits. Annuities are equal to 2.5% of a member's average annual salary while in Congress for each year of service, up to 80% of his or her salary prior to exiting Congress.

Finally, to construct the *SOD*, *SOS* and *SOW* variables we used the Brady and Rivers (unpublished) electoral data set (1952-1996), which is based on the relevant issues of the *Congressional Quarterly Guide to U.S. Elections* as well as the *America Votes* series. The procedures we used to construct these variables are as follows. We classify the overall state of the world (*SOW*) to be good, neutral, or bad for the election of Democrats based on the overall vote in all congressional elections to the House of Representatives.[33] Define the normalized Democratic national vote share as $D(n)/[D(n) + R(n)]$, where $D(n)$ is the total vote for Democrats in House elections nationally, and $R(n)$ is the total vote for Republicans. If the normalized national vote share is more than 58% Democratic, we classify *SOW* as good for Democrats (*SOW* = 3). If the vote share is in the 55-58% range we classify *SOW* as neutral (*SOW* = 2), and if the vote share is less than 55% Democratic we classify *SOW* as relatively good for Republicans (*SOW* = 1). The bias in these figures reflects the fact that Democrats received the majority of the national vote in House elections in all years of our sample period. These cut off points generate a distribution where each value of *SOW* occurs roughly a third of the time. Next, we construct *SOS* to be a measure of the state of a state *relative* to the national political climate. Define $D(s)/[D(s) + R(s)]$ as the normalized vote share for the Democrat in the presidential election in state *s* in a particular year. Comparing the state level vote share to the national presidential vote share, *SOS* is classified as good for the Democrats (*SOS* = 3) if the difference in vote shares is greater than 4%. *SOS* is classified as neutral (*SOS* = 2) if the difference is between 4% and –4%, and *SOS* is classified as bad for Democrats (*SOS* = 1) if the difference is less than –4.[34] These cutoffs again generate a distribution with roughly a third of observations in each

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[32] All nominal figures were converted into 1995 dollars using the CPI deflator.

[33] We use the overall House vote rather than the presidential vote for two reasons. First, the presidential vote occurs only every four years. Second, the presidential vote may be dominated by the particular personalities of the presidential candidates, and not accurately reflected circumstances in local elections. In contrast, the cumulative House vote should not be dominated by individual personalities.

[34] Here we use the presidential vote rather than the state-wide House shares because state-wide House vote shares may be dominated by local personalities, especially in states with only a few congressional districts. We hope the

range. Finally, to construct *SOD*, which is a (constant over time) measure of the typical political climate in a district, we first construct the intermediate variable *ASOD* using the same procedure we used to construct *SOS*, except that it is based on the district level presidential vote relative to the national vote. Next, to convert this to a constant over time measure, we use the following procedure: For each representative *i* we compute the average difference between SOS_{it} and $ASOD_{it}$ over his/her career horizon and we classify a district as good for Democrats relative to the State the district belongs to (*SOD* = 3) if the average difference is greater than 0.25, as bad (*SOD* = 1) if it less than –0.25, and as neutral (*SOD* = 2) otherwise. These cutoffs again generate a distribution with roughly a third of observations in each range. Finally, note that although we assume that the state of the district a representative is in remains constant over his/her time horizon, the state of a district is allowed to change as the identity of the representative of that district changes.

influence of the personalities of particular presidential candidates cancel out when we take the difference in state vs. national presidential votes.

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