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"A Political Economy Model of Congressional Careers"

by

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A Political Economy Model of Congressional Careers*

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Abstract

Theories in political economy depend critically on assumptions about motivations of politicians. Our analysis starts from the premise that politicians, like other economic agents, are rational individuals who make career decisions by comparing the expected returns of alternative choices. The main goal of the paper is to quantify the returns to a career in the United States Congress. To achieve this goal we specify a dynamic model of career decisions of a member of Congress and we estimate this model using a newly collected data set. Given estimates of the structural model, we assess reelection probabilities for members of Congress, estimate the effect of congressional experience on private and public sector wages, and quantify the value of a congressional seat. Moreover, we use the estimated model to assess how the imposition of term limits would affect the career decisions of politicians and the returns to a career in Congress.

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1. Introduction

Understanding the goals of elected office holders is of fundamental importance in political economy. Since the appearance of Anthony Downs' (1957) seminal contribution, many theories of representative democracy have assumed that politicians care only about winning elections.[1] While useful in modeling many political decision processes, assuming that politicians are *solely* interested in the goal of reelection makes them seem like odd economic agents. In fact, reelection may be better understood as an (intermediate) objective to realize other goals, like monetary income, the pleasure and perks of a powerful public office, or the desire to implement certain policies.[2] This suggests an exploration of politicians' motivations in the context of their political careers, and raises the fundamental question of what are the returns to an individual from a career in politics.

A shift from a reelection focus to the study of political careers may have important policy-relevant implications. Consider, for example, the case of term limits. Empirical work on U.S. Congressional elections has generated concerns that very high incumbent reelection rates, and the prevalence of large victory margins, may have eroded public accountability of elected officials.[3] These concerns have led several interest groups to advocate the imposition of term limits as a possible remedy.[4] Simply focusing on electoral success, however, may underestimate the electoral risk of incumbents, since it does not account for exits by particularly vulnerable incumbents in anticipation of electoral defeat. Furthermore, by altering the incentives faced by politicians, term limits are likely to affect their career decisions and may therefore have important consequences for the composition of Congress.

Our analysis starts from the premise that politicians, like other economic agents, are rational individuals who make career decisions by comparing the expected returns of alternative choices. The main goal of the paper is to quantify the returns to a career in the United States Congress. To achieve this goal we specify a dynamic model of career decisions of a member of

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[1] These theories range from the study of electoral competition, as in Downs's own work, to the internal organization of Congress (see, e.g., Mayhew (1974a)).

[2] For models where politicians are *only* policy motivated see, e.g., Alesina (1988), Calvert (1985), and Wittman (1977). See also the related work on citizen candidates by Besley and Coate (1997) and Osborne and Slivinsky (1996).

[3] See, e.g., Bauer and Hibbing (1989), Jacobson (1987), and Mayhew (1974b).

[4] See, e.g., Benjamin and Malbin (1992).

the U.S. Congress and we estimate this model using a newly collected data set that contains detailed information on all members of Congress in the post-war period. A novel feature of the data is that it incorporates information about post-congressional employment of former members of Congress and their salaries in these occupations. This crucial piece of information allows us to estimate the returns to congressional experience in post-congressional employment, which may be an important component of the returns to congressional careers.

Our framework enables us to sort out the relative importance of two key factors that may induce people to pursue a political career: the utility politicians derive from being in office and the monetary returns to a career in Congress. Using our model, we (i) assess the selection bias in estimates of election probabilities based only on politicians who choose to run, and (ii) evaluate the effects of the imposition of term limits on the value of a congressional seat and on the career decisions of politicians.

The study of congressional careers has a long tradition in american politics (see, e.g., Schlesinger (1966) and Hibbing (1991)). Recently, several authors have undertaken empirical studies of the determinants of representatives' choices among the basic career options: (i) run for reelection; (ii) run for higher office (e.g., run for the Senate in the case of House members), and (iii) retire (see, e.g., Groseclose and Krehbiel (1994), Groseclose and Milyo (1999), Hall and van Houweling (1995), and Kiewiet and Zeng (1993)). Existing studies, however, suffer from four main limitations that we seek to address:

First, prior studies have estimated static choice models that do not take into account the dynamic aspects of politicians' career choices over the life-cycle. For example, the decision of a member of Congress to seek reelection is likely to depend not only on current payoffs, which depend, in turn, on the probability of winning today, but also on the option value of holding the seat, which may depend on the probability of winning a bid for higher office in the future. A second, closely related, problem, is that existing studies ignore the career prospects of politicians after they leave Congress (either voluntarily or via losing an election). In deciding whether to run for reelection, a politician may recognize that the distribution of his/her post-congressional wages would be influenced by additional congressional experience. If congressional experience is valuable in the private sector, then it may be optimal for politicians to opt out of Congress at particular points in their careers so as to maximize post-congressional payoffs.

A third limitation of most existing studies of congressional careers is that they typically ignore the selection bias created by politicians' decisions about whether to run for reelection.[5] For example, a representative's decision to give up his/her seat in the House in order to run for a seat in the Senate, is likely to be affected by the probability he/she will be successful. Ignoring the fact that samples of members of Congress who run for elections are choice based would result in biased estimates of the probabilities of winning elections (see, e.g., Heckman (1974, 1979)). A fourth, and related, problem is the failuure to deal with unobserved heterogeneity. While the importance of taking into account politicians' (unobservable) personal characteristics, such as "valence" or "charisma," has been recognized by the theoretical literature (see, e.g., Aragones and Palfrey (2002) and Groseclose (2001)), the empirical literature has so far neglected to incorporate politician's unobserved heterogeneity into the analysis of their career choices.

In this paper we provide a new, comprehensive framework for the empirical analysis of congressional careers that adresses these four limitations. Specifically, we develop a dynamic optimization model of the career decisions of a member of the U.S. Congress. To illustrate the basic features of our model, consider a sitting member of the House of Representatives. At the end of the two year House term, this individual must decide whether to run for reelection, run for a seat in the Senate (if available), retire from professional life, or leave Congress to pursue an alternative career. In order to solve this decision problem, the representative will compare the expected present value of the curremnt and future payoffs associated with the different alternatives. He/she is fully aware of the fact that current decisions will affect the distribution of future payoffs.

For example, if the politician decides to exit Congress and pursue an alternative career, he/she will draw from a distribution of post-congressional wages that is determined, in part, by his/her current stock of congressional experience. On the other hand, if the politician decides to run for reelection, and is succesful, he/she will remain in the House for two more years, collect the congressional wage rate along with any non-pecuniary payoffs from office, and face a similar decision problem at the end of the two-year House term. The politician recognizes that this additional term in Congress may improve his/her distribution of post-congressional wages, and

[5] See Groseclose and Krehbiel (1994) for an exception.

may enhance (or detract) from his/her probability of winning a bid for higher office in the future. The politician takes all these considerations into account when making the current decision.

A key innovation of our framework is that we explicitly model the career opportunities of politicians outside Congress. In particular, we assume that when a politician exits from Congress, he/she can choose between two employment options: one in the private sector and one in the public sector. The wage the politician would receive in each sector is a function of age, education, congressional experience (i.e., number of terms in the House, number of terms in the Senate, and committee assignments), and whether exit is voluntary or a consequence of an electoral defeat. In addition, we assume that politicians differ with respect to their (unobserved) skills, which together with their other (observed) characteristics may affect both their probability of winning an election and their post-congressional payoffs.[6]

Our main findings can be summarized as follows. First, congressional experience significantly increases wages in post-congressional occupations both in the private and in the public sector. However, the marginal effect of an additional term in Congress on post-congressional wages decreases quite rapidly with experience. Second, the non-pecuniary rewards from being in Congress are rather large (especially in the Senate), suggesting that policy motivations and/or the perks of office play an important role in the career decisions of politicians. In particular, monetary returns alone (that is, wages in Congress and post-congressional payoffs), cannot explain the observed behavior of politicians.

Third, politicians' unobserved attributes (i.e., valence or charisma), play an important role throughout their congressional careers, as "good" politicians have a substantially higher probability of winning elections. However, being a good politician does not seem to generate better job-market opportunities outside Congress. Thus, there is evidence of comparative advantage, since the relatively good politicians are not relatively productive in the private sector.

Fourth, we find that the selectivity bias induced by politicians' decisions whether to run for reelection is actually rather modest. Reelection probabilities in the House and Senate are indeed very high, even unconditionally. However, there is substantial selection in terms of who runs for higher office, so that the unconditional probability of a House member winning a bid for higher office is much lower than is suggested by the observed frequency of successful bids.

[6] For example, the ability of politicians to empathize with people may affect their reelection prospects and play an important role throughout their career.

Finally, we find that the imposition of term limits would substantially increase early voluntary exit from Congress and significantly reduce the value of a congressional seat. Moreover, our analysis indicates that the members of Congress who would be most negatively affected by term limits are those who have relatively better politicians' skills and are relatively older.

The remainder of the paper proceeds as follows. In Section 2, we present the model. In Section 3, we describe the data. In Section 4 we present our estimation results and discuss the fit of the model. In Section 5 we present the results of an experiment designed to assess the value of a congressional seat. Section 6 concludes by examining the results of a policy experiment on the imposition of term limits.

2. A Structural Model of Congressional Careers

We assume that politicians make decisions about running for reelection, running for higher office, and exit 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. To implement this procedure, we must specify a terminal period beyond which we do not model decisions. For simplicity, we assume that this terminal period occurs at age 80. If a politician lives to that age, then he/she must exit Congress at that point.[7] Furthermore, it greatly simplifies our problem 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. We also assume that the

[7] Despite some well publicized exceptions, staying in Congress after age 80 is quite a rare event in the data.

earliest age at which a person can be elected to Congress is age 30.[8] Given the two-year length of the decision period and the age 80 terminal period, this means there are 25 decision periods in our model.

When a politician exits Congress (either voluntarily or via electoral defeat), he/she chooses between two post-congressional career options or retirement (see Section 2.1). 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.

Our model can usefully be decomposed into several parts. These are: (i) post-congressional payoffs, (ii) the decisions of senators, (iii) the decisions of representatives, and (iv) probabilities of winning elections and the evolution of exogenous state variables. We now describe these in turn.

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

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), Becker (1964)), except for the inclusion of the congressional experience variables. Assume the wage functions take the form:

[8] Returning to Congress after an exit, and election prior to age 30, are both very rare events in our data, so we feel these are reasonable simplifications.

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

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 $Type_i$ indexes the (unobserved) endowment vectors. As we discuss in Section 4, we estimated models with up to four types, but found negligible improvements in fit in going beyond just two types. Thus, to simplify notation, we present the model with only two types. In that case, $Type_i$ is simply a dummy variable equal to 1 if the (unobserved) type of politician i is "good." The case where the dummy variable $Type_i = 0$ 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 term in the House, a representative had served on a major House committee.[9] 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

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

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 Section 3. For now, we just write the pension rule as:

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

which says 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 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 choice 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.[10] 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 the public sector. Similarly, the present discounted value of the retirement option is:

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

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.

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

We assume that politicians do not see the vector of taste shocks ξ_{it} prior to exiting Congress.[11] 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:

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

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

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

and

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

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:

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

[11] 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.

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

$$(11) \qquad A = \begin{pmatrix} a_{11} & 0 \\ a_{12} & a_{22} \end{pmatrix}$$

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:

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

If the politician chooses employment in either the private or public sector, a wage is observed, so we form must a choice probability conditional on the wage in order to obtain the appropriate likelihood function contribution (see equation (36) in the Appendix, which describes the construction of the likelihood function).

2.2 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.[12] 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 that are relevant to the decisions of senators. We have:

(13) $$XS_{it} = (XP_{it}, SOS_{it}, SOW_t, Party_i, ST_{it})$$

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 3. At this point 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.[13] 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).

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 retire, 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 2.4. 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

[12] If a senator does become a governor we treat it just like any other post-congressional political job.
[13] 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.

affects the politician's chances in the next election. We assume that political party is a fixed characteristic of the politician. 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 that we feel it is a reasonable approximation to ignore them.

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 retire. 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:

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

The first three terms in (14) capture the immediate payoff from staying in the Senate at age 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. 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:

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

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* 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). 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:

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

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.

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 $p_S(XS_{it})$. We allow the probability of winning to potentially depend on all the senator's state variables (including the unobserved type), as discussed in Section 2.4. 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):

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

Then we have:

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

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 $\alpha_{RS} + \mu_{RSit}$. 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:

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

where $\overline{V}_{RS}(XS_{it}, s) \equiv V_{RS}(XS_{it}, s) - \mu_{RSit}$. Expressions for the choice probabilities are similar to equation (17).

2.3 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.

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 (we assume representatives cannot change state), 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.

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 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:

$$(21) \qquad p_{(INC,ES),i,t+1}(m,n) = P(INC_{i,t+1}, ES_{i,t+1} \mid Cycle_{it}, INC_{it}, ES_{it}) \qquad m = 1,\dots,4;\ n = 1,\dots,4$$

The specification of these probabilities, which are constructed using empirical frequencies from our data set, is discussed more fully in Section 2.4.[14]

There are three other state variables relevant to a representative's electoral prospects. Most obviously, there is the political climate of his/her district in terms of election of Republicans vs. Democrats. We denote this by SOD_i, which we define analogously to SOS_{it}, except that we have defined SOD_i as a *fixed* characteristic of a representative's district. As *SOD = 1, 2* or *3*, the chances for election of a Democrat in the district are *typically* good, neutral, or bad, respectively. Thus, *SOS* and *SOW* also affect the probability of winning a house election. E.g., even if a Democratic representative sits in a district that is generally favorable for

[14] 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*.

Democrats, his/her reelection chances are relatively lower in years when SOS and/or SOW are more favorable for Republicans.

Note that SOS_{it} and SOW_t are also 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.

A further complication that must be considered is that membership on prestigious committees is of great importance for a House member. Recall that committee membership is indicated by the variable COM_{it}, which we defined in Section 2.1. We assume that after a representative is elected to the House, he/she receives a draw that determines committee status. We denote the probability of being named to a major House committee by $p_C(XC_{it})$, where XC_{it} is a vector of state variables. We describe $p_C(XC_{it})$ more fully in Section 2.4. Here we just note that XC_{it} will include prior committee status, terms in the House, age and the representative's type.

Denoting by XH_{it} the complete set of state variables that are relevant to the decisions of representatives, we have:

$$(22) \qquad XH_{it} = (XP_{it}, SOD_i, SOS_{it}, SOW_t, Party_i, ES_{it}, Cycle_{it}, INC_{it}, Cohort_i)$$

where XP_{it} denotes the vector of state variables relevant to post-congressional payoffs.[15]

The only variable in (22) that we have not yet discussed is $Cohort_i$. This takes the value 1, 2, or 3, depending on whether individual i enters Congress between 1947 and 1965, between 1967 and 1975, or between 1977 and 1993, respectively. The main reason we included *Cohort* as a state variable is that it has been widely noted that 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 2.4.[16]

---

[15] 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}.

[16] We also use the *Cohort* variable to capture the fact that congressional salaries have changed over time. To a good approximation, salary paths were very similar for members within each of the entering cohorts defined here, regardless of entry year. Thus, we let each cohort have its own salary path, which we constructed from the salary data using age-specific averages across all cohort members. Alternatively, we could have let each entering congressional class be its own cohort (i.e., have its own salary path), but this would drastically expand the size of the state space of our model and increase computational time substantially. This cost did not appear justified given the rather limited variation of salaries within the cohorts we define.

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, 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. 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. 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, and (ii) we allow the direct utility or disutility to a representative from running for a Senate seat, $\alpha_{HS} + \mu_{HSit}$, 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 is running for the seat. We describe $p_{HS}(XH_{it})$ in more detail in Section 2.4.

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 2.4. 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:

$$(25)\qquad EV_H(XH_{it},h) = W_H(t) + \alpha_H + p_C(XC_{it})\alpha_C + \delta(1-\pi_d(t))EV(XH_{i,t+1},h \mid XH_{it})$$

The first three 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 value of the expected utility of being named to a major House committee. This is multiplied by $p_C(XC_{it})$ to get the expected utility.

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 the five pieces of information that will be revealed after the representative is reelected at *t* but before he/she makes time *t+1* decisions. 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. 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*. If $ES = \ell$, where $\ell = 2, 3$ or 4, so that the option to run for Senate is available, then this has the form:

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

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

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 $\mu_{HSi,t+1} = \zeta_{1it} - \zeta_{3it}$ and $\mu_{RHi,t+1} = \zeta_{2it} - \zeta_{3it}$, 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. If *ES = 1*, so the only options are to run for reelection or leave Congress, then the expression is modified just by dropping the $\overline{V}_{RS}$ term. In this case we specify that the error standard deviation is ρ_{1H}.

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:

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

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 $\rho_{\ell H}$.

2.4 Probabilities of Winning and Evolution of Exogenous State Variables

In Sections 2.1 through 2.3 we have referred to functions that determine the probabilities of winning elections 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:

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

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.[17]

[17] Note that indicators for (*SOS*=2, R), (*SOW*=2, 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

Importantly, note that we let the intercept term in (29) depend on $Type_i$, 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. 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. At this point, we redefine the $Type_i$ variable discussed in Section 2.1 as indexing not just occupational skill endowment vectors, but the complete vector of occupational wage function intercepts and probability of winning function intercepts.

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

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

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

one *SOW* interaction, since the *SOW* interactions for Democrats are only identified by the differences across Democrats in those states. Thus, we also exclude (*SOW*=1, D).

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).[18]

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:

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

where v_{Cit} is another standard logistic error term. Again, the expression for the probability of being named to a major House committee, $p_C(XC_{it})$, 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 type.

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

[18] Note that indicators for (*SOD*=2, R), (*SOS*=2, R) and (*SOW*=2, 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, D) and (*SOW*=1, D), for reasons similar to those discussed in footnote 17 in the context of equation (29).

The transition probabilities for *SOS* and *SOW* are also assumed to evolve according to two (independent) Markov processes with transition probabilities $P(SOS_{i,t+1} \mid SOS_{it})$ and $P(SOW_{t+1} \mid SOW_t)$, 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 the following simple logistic form for the retirement probability after age 62 (we assume that the retirement probability before age 62 is equal to zero):

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

The parameters π_0 and π_1 are estimated jointly with the other parameters of the model.

A detailed discussion of the technical issues related to the solution and estimation of the model (including the derivation of the likelihood function), can be found in the Appendix.

3. Data

To estimate our model we use a newly collected data set. The data set contains detailed information on the careers of all House and Senate members who entered Congress between 1947 and 1993 (i.e., the beginning of the 80th and 103rd Congress, respectively). Our data set ends in 1994 (i.e., the end of the 103rd Congress). Thus, we have complete histories on members who left Congress in or before 1994. We have right-censored histories on members who, in November of 1994 (the end of our sampling period), 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 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 1% of the cases—only the first spell is recorded. Individuals in our data set can either serve only in the House; or in the

House, then the Senate (uninterrupted); or only in the Senate. Members who serve in the Senate and then in the House—an extremely rare event—are not included in our sample. Our final sample contains 1,899 career histories.[19]

For each individual in our sample the data set contains the following information: (a) biographical data (i.e., age, educational background, party affiliation, record of congressional service); (b) the record of committee membership and congressional wages; (c) opportunities data (i.e., opportunities to run for a Senate seat, seat vacant or incumbent present, party affiliation of the incumbent); (d) post-congressional data (i.e., type of first job after service, first annual salary, pension benefits).

The following sources were used to construct the different parts of the data set.

(a) Biographical Data:

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 as well as 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.[20] The *Biographical Directory* was also used to collect data on each member's educational background (i.e., whether they have a college degree and whether they have a law degree).

(b) Committee 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*. Information on the annual salaries of the members of the U.S. Congress was obtained from the relevant issues of the *Congressional Quarterly Almanac*.[21] All nominal wages were converted into 1995 CPI dollars.

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[19] Ambiguous entries (e.g., missing information concerning the middle name may not allow us to distinguish between members of Congress with the same first and last name) as well as observations with inconsistent or incomplete congressional records were dropped from our data set.

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

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

(c) Opportunities Data:

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 (1789-1993)*, supplemented by relevant issues of the *Congressional Quarterly Almanac* for elections to the 103rd Senate.

(d) Post-Congressional Data:

For most members of Congress, the official *Biographical Directory of the U.S. Congress (1789-present)* 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 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 (1997) 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).[22] 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

[22] 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.

U.S. including their address, field of practice, law school attended, year of admittance to bar, and membership of state bar associations.[23] The *Directories of Registered Professional Lobbyists* contain similar information for licensed lobbyists in each state.[24] 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 (1997), 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.[25]

(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).[26]

(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

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[23] 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.

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

[25] If the location of the law practice was not known, the billing rates for the city that is closest to the place of residence were used.

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

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.

Table 1 contains descriptive statistics of the characteristics of the 1,899 people in our sample when they first enter Congress. As we can see from this table, 89% of the sample begins their congressional career in the House while the remaining 11% enters the Senate directly. Consistent with the fact that the Democratic party controlled the majority of the House throughout our sampling period, Democrats account for a majority (56%) of the sample. While an overwhelming majority (86%) of the politicians in our sample have a bachelor's degree, nearly half (49%) of them do not have a law degree. On average, a member of the U.S. Congress starts his or her congressional career at age 48.

Out of the 1,899 people in our sample, 95 die in office and 413 are still in Congress at the end of our sampling period. For 1,141 people out of the 1,391 who are observed to leave Congress, we have information about their post-congressional careers. In 720 of these cases, we have information about either their salary or their pension. The average annual salaries of a former member of Congress in the private and the public sectors in 1995 dollars are $252,583 and $122,576, respectively (the standard deviations are $67,392 and $43,319, respectively).

As indicated in the previous section of the paper, we need to construct three additional variables that are relevant to the decisions of House members and Senators. These variables are *SOW* (the aggregate state of the nation), *SOS* (the state of the state in which each Senator or representative has his/her seat), and *SOD* (the state of each representative's district). We classify the overall state of the world 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.[27] 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 = 1*). 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

[27] 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.

good for Republicans (*SOW = 3*). 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 = 1*) 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 = 3*) if the difference is less than –4.[28] These cutoffs again generate a distribution with roughly a third of observations in each range.

Finally, we need to construct *SOD*, which is a (constant over time) measure of the typical political climate in a district.[29] First, we 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 the Democrats relative to the state the districts belongs to (*SOD = 1*) if the average difference is greater than 0.25, as "bad" (*SOD = 3*) if it less than –0.25, and as neutral (*SOD = 2*) otherwise.[30] These cutoffs again generate a distribution with roughly a third of observations in each range.

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.

[28] We use the presidential vote shares rather than state-wide House vote shares to construct *SOS* because state-wide House vote shares may be dominated by local personalities, especially in states with only a few congressional districts. We hope the influence of the personalities of particular presidential candidates will cancel out when we take the difference in state vs. national presidential votes.
[29] Our decision to make *SOD* constant over time stemmed from computational considerations. We found that if *SOD* was allowed to vary over time (like *SOW* and *SOD*) then the integration problem in equation (26) became excessively time consuming. Since a preliminary data analysis suggested that *SOD* did not vary much over the tenure of representatives in the vast majority of districts, we decided to assume that *SOD* was constant.
[30] 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.

4. Results

Tables 2-6 present the maximum likelihood estimates of the parameters of the model. Although all the parameters are estimated jointly, for ease of exposition it is useful to divide them into groups depending on where they enter the model.[31]

4.1 Probabilities of Winning Elections and Being Named to Committees

Tables 2, 3 and 4 report estimates of the parameters of the logistic functions for the probability of winning House elections, winning Senate elections, and being named to a major House committee, respectively. Several interesting results emerge from these tables. Accumulated experience or seniority in the House (measured by the number of terms in the House), significantly affects the probability of winning reelection in the House, the probability of being named to a major House committee and the probability of moving from the House to the Senate.[32] On the other hand, accumulated experience or seniority in the Senate (measured by the number of terms in the Senate), does not significantly affect the probability of winning reelection in the Senate. Holding everything else constant, age also has a significant effect on all these probabilities, indicating that general experience may also be a factor. Prior committee status (measured by the indicator variable COM_{t-1}), is a strong predictor of the probability of being named to a major House committee, indicating a high degree of persistence in the composition of such committees (as is consistent with a seniority norm).

Unobserved heterogeneity in politicians' abilities (captured by the indicator variable *Type*), plays an important role in determining their chances of winning elections in both chambers of Congress (but not of being named to one of the major House committees). On average, our estimates imply that a House member with a valence or charisma advantage (which we refer to as a "good" politician), has a 98.3% chance of winning a reelection bid in the House, compared to only an 85.5% victory probability for a "normal" type.[33] Similarly, a senator who is a good politician has, on average, an 88.9% chance of winning a reelection bid in the Senate,

[31] The maximized value of the Log-Likelihood function is equal to -7423.68.
[32] Also note the presence of significant cohort effects in the probability of winning reelection in the House.

compared to only a 69.7% victory probability for a normal type. And a good politician in the House has, on average, a 26.0% chance of winning a bid for the Senate, compared to only a 9.3% chance for a normal type.

To help interpret the estimates of the other parameters in the probability of winning functions, we present the following example. Consider a 48-year-old (the average age in the sample) Democratic representative who is serving his first House term in the 100th Congress, is not a member of a major House committee and is a normal type. Suppose an open Senate seat is up for election in his state and *SOD*, *SOS* and *SOW* are all equal to 2, meaning the political climate is neutral for Democrats. In this situation, our estimates imply that the probability of winning a reelection bid for the House is 87.6%, while the probability of winning a bid for the open Senate seat is 19.4%. In contrast, if *SOD*, *SOS* and *SOW* were all equal to 3, meaning the political climate favors Republicans, these probabilities drop to 49.9% and 13%, respectively. On the other hand, if *SOD*, *SOS* and *SOW* were all equal to 1, meaning the political climate favors Democrats, but an incumbent Democrat is running for reelection in the Senate, the probability of winning reelection in the House rises to 99%, but the probability of winning a Senate bid drops to only 5.2%. Similar examples can be constructed for all possible configurations of the state variables.

As we pointed out earlier, by explicitly modeling the dynamic career decisions of the members of Congress and incorporating into our framework their unobserved heterogeneity, our empirical analysis accounts for the selection due to the politicians' decisions about whether or not to run for elections. Ignoring the fact that samples of members of Congress who run for elections are choice based would generate biased estimates of the probabilities of winning elections. To assess the importance of selection on observed victory probabilities, we simulated career histories from our model, and compared average victory probabilities between politicians who chose to run vs. those who did not run.

Our model implies that the average probabilty of winning reelection to the House among members who choose to run is 91.0%, while the average victory probability among those who choose not to run is 87.5%. Unconditionally, the victory probability is 90.7%. These figures are

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[33] These figures are obtained by averaging over all the states that actually occurred in the data. These are unconditional probabilities, in the sense that observations are included in the average regardless of whether the politician actually chose to run.

open to different interpretations. Obviously, there is selection, in that victory probabilities are higher among those House members who run for reelection than among those who don't. On the other hand, the difference is modest, and the unconditional victory probability is nearly as high as the probability conditional on running. We conclude that very high House reelection probabilities are a real phenomenon, and not an artifact of selection.

The pattern is similar in the Senate. Our model implies that the average victory probabilty among senators who choose to run for reelection is 81.5%, while the average victory probability among those who choose not to run is 78.0%. Unconditionally, the victory probability is 81.0%.

Selection is much more quantitatively important for the probability of winning a bid for higher office. Our model implies that the average victory probabilty among House members who make a bid for a Senate seat is 38.0%. But the unconditional probability of winning a bid for the Senate is only 17.0%. This suggests that decisions of representatives about whether to run for higher office are quite sensitive to their chances of success.

4.2 Post-Congressional Wage Functions

The top panel of Table 5 contains estimates of the parameters of the wage functions.[34] These estimates allow us to quantify the job-market returns to congressional experience, which is one of the primary goals of our research. Our findings indicate that congressional experience significantly increases wages in post-congressional occupations both in the private and in the public sector. However, the marginal effect of an additional term in Congress decreases rather rapidly with experience. Holding everything else constant, winning reelection in the House (Senate) for the first time increases post-congressional wages by 4.3% (16.1%) and 6.1% (20.1%) in the private and public sectors, respectively. On average, the marginal effect on post-congressional wages of an additional term in the House (Senate) is equal to 2.2% (4.5%) in the private sector and 2.5% (1.9%) in the public sector.

[34] Our estimates implied that the stochastic terms in the two wage functions were close to perfectly correlated, because estimates of the parameter a_{22} in equation (11) were insignificantly different from zero. Thus, we decided to peg a_{22}=0 and estimate only a_{11} and a_{12}. This means we are estimating a one-factor model for wages, where a_{11} and a_{12} simply scale the error standard deviation in each sector. A one-factor structure is not surprising, given that we only observe one wage at exit. The point estimates for the error standard deviations were a_{11} = 0.3706 and a_{12} =

Several additional observations are noteworthy. All the other coefficients of the wage functions have reasonable signs and magnitudes. Interestingly, leaving Congress voluntarily is associated with *lower* wages in the private sector (but not in the public sector). As we alluded to earlier, this effect may arise because leaving Congress voluntarily indicates a politician's desire to "slow down," which would induce him/her to pursue lower paying but also less demanding jobs in the private sector. On the other hand, leaving as a "loser" may preclude a member of Congress from pursuing some other political offices.

An important finding is that a politician's unobserved type has no effect on post-congressional wages either in the private or in the public sector. Politicians' unobserved attributes, such as valence or charisma, that, as illustrated above, play an important role throughout their congressional careers by increasing their probability of winning elections, do not seem to directly translate into better job-market opportunities outside of Congress. Thus, good politicians are not more productive in post-congressional employment.

The finding that unobserved heterogeneity does not affect the wage functions does not imply that we could have estimated these functions independently of the other parameters of the model using OLS. There is still selection in terms of which post-congressional career option (private sector, public sector or retirement) is chosen. Variables like congressional experience, voluntary exit, education and committee status will be correlated with the error terms in the wage functions among the selected samples of Congress members who chose a particular exit options, and are therefore endogenous. To illustrate this point, in the bottom panel of Table 5, we report OLS estimates of the (log) wage functions (which obviously do not contain the unobservable variable *Type*).

Comparing the OLS estimates to their counterparts in the estimated model, the differences are rather striking. The OLS estimates imply much smaller effects of both House and Senate experience on wages in the private sector. The OLS estimates imply an implausible negative effect of House experience on public sector wages. Moreover, the OLS coefficient for JD is implausibly large in the private sector equation, while both BA and JD have the wrong sign in the public sector equation.

0.4462, with standard errors equal to 0.0257 and 0.0304, respectively. Thus, the stochastic component of wage draws is more variable in sector 2 (the public sector).

4.3 Utility Function and Other Parameters

The top three panels of Table 6 present estimates of the utility function parameters in our model. In addition to the monetary returns to working in Congress (that is, wages in the House and Senate, and post-congressional payoffs), there may be additional non-pecuniary rewards. These rewards may be generated by the utility politicians derive from affecting policy outcomes, or from additional perks and benefits enjoyed by the members of Congress.[35] The parameters α_H and α_S measure the monetized value of these non-pecuniary rewards from serving a two-year term in the House or the Senate, respectively. The parameter α_C measures the monetized value of the additional non-pecuniary rewards from serving a two-year term as a member of a major House committee.

As we can see from the estimates reported in the top panel of Table 6, these non-pecuniary rewards amount to over $200,000 a year for a senator and to either about $35,000 or $20,000 a year for a representative, depending on whether or not he/she is a member of a major House committee. To provide a term of comparison, note that the average annual salary of a member of Congress in 1995 dollars over our sampling period is equal to $120,000.[36] We conclude that the non-pecuniary rewards from being in Congress are rather large (especially in the Senate), perhaps suggesting that policy motivations play an important role in the career decisions of politicians.[37]

The second panel of Table 6 reports estimates of the monetized values of the utilities of running for office. These estimates imply that House and Senate members get utility from running for reelection, which in our view is quite plausible. The estimate of α_{HS} implies that there is substantial disutility for a House member in making a bid for the Senate. This seems plausible, given the inherent difficulty in making such a bid.

The third panel of Table 6 contains estimates of utilities upon exit. The estimate of α_L implies a monetized value of leisure of about $127,500 per year. The estimate of α_{VE}, a

[35] Data limitations do not allow us to separately estimate these two (unobservable) components of the non-pecuniary rewards from being in Congress.
[36] To convert nominal amounts into real we used the CPI deflator and set 1995 as the base year.

parameter we discussed at some length earlier, implies that members of Congress who voluntarily exit Congress exhibit a greater taste for leisure when making post-congressional decisions, making them more likely to retire completely from the labor market at exit. The positive estimate of α_{2W} implies that politicians, who, as we have seen, get utility from sitting in Congress, also get utility from other political jobs outside Congress. This seems quite plausible. Finally, the estimates of α_{1C} and α_{2C} imply that members of important committees get above average utility from political jobs after exiting congress, and below average utility in private sector jobs (but these effects are not significant).

Table 6 also contains estimates of the remaining parameters of the model. The most important of these is the population frequency for the good type politician, which we estimate to be 37.5%. Finally, bearing in mind that the length of a period in our model is two years, our 0.8617 estimate of the discount factor corresponds to an annual interest rate of about 8%.[38]

4.4 Goodness-of-Fit

Before we evaluate the fit of our model, some comments are in order regarding how we arrived at a specification with two unobserved types. We also estimated an extended version of our model in which there were four unobserved types of politicians. In this extended model, we also allowed the utility function parameters α_H and α_S to differ across types. This meant that the extended model had 18 additional parameters. These additional parameters led to a trivial 3.9 point improvement in the log likelihood, and no improvement in the fit of the model along any important dimension we could discern. Thus, we decided to choose the two-type model, and remain with the homogenous specification for α_H and α_S.

Our final model is quite parsimonious, given the number of outcomes and behaviors that the model must fit (i.e., winning probabilities, committee appointments, choice probabilities

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[37] Not withstanding the caveat in footnote 35, this conjecture is supported by the fact that the estimated value of α_{2W}, which measures the monetized value of the additional utility from another political job after exiting Congress, is also large.

[38] Turning to the less interesting parameters, the scaling parameters for the logistic taste shocks for House members, ρ_{1H} through ρ_{4H}, which apply in the electoral situations ES=1,..,4, are all about equal, suggesting is was not necessary to allow them to differ. The scaling parameters for the taste shocks confronting senators, ρ_{1S} through ρ_{3S}, are monotonically increasing, suggesting more variability in senators' decisions as they near the end of their terms. The retirement logit parameters π_0 and π_1 imply that the retirement hazard has a peak at 65 and then declines thereafter, which is consistent with retirement hazard estimates for the general population.

while in Congress, wages, occupational choices and retirement after exiting Congress). Our logit functions for probabilities of winning elections and appointment to committees have a large number of parameters, but the specifications of these functions are quite natural in light of the existing literature. Our wage functions are quite simple, and seem to be rather natural extensions of standard Mincer earnings functions to include congressional experience variables.

The only component of the model where we obviously have a great deal of leeway in terms of specification is in the utility function, but here we adopted a very simple specification with only 11 fundamental parameters. We would argue that this is extremely parsimonious, given the need to capture both decisions while in Congress (6 dedicated parameters) and post-congressional occupational choices (5 dedicated parameters).

To assess the overall fit of our model we begin by presenting Table 7 and Figures 1-3, where we focus on different aspects of the data on congressional careers and compare the predictions of the model to their empirical counterparts.[39] Overall the model tracks the behavior of politicians throughout their congressional careers remarkably well.

In the top panel of Table 7, we summarize the behavior of representatives for each possible "election status" as described by the state variable *ES*. Recall that if $ES = 1$ there is no Senate seat up for election in the representative's state. If $ES = 2$ or 3 a Senate seat is up for election in the representative's state, and an incumbent Democratic or Republican senator is running for reelection, respectively. If $ES = 4$ the Senate seat is open. The model predicts representatives' choices in each context so accurately that, if we were to round to the nearest integer, the choice frequencies would be exact, with one exception. When there is an open seat ($ES = 4$), the model predicts that 86% of representatives run for reelection, while in the data only 85% run. To compensate, the model under-predicts exit in this case (by 0.8%), and slightly under-predicts the fraction of representatives who run for the open seat (7.9% vs. 8.4%).

As we can see from Table 7, the overwhelming majority of House members rerun for their seat, regardless of *ES*. Only a small fraction of representatives choose to give up their seat in the House to run for a seat in the Senate. This fraction is about four times larger when no incumbent senator is running for reelection.

[39] The model predictions are based on simulations of the estimated model. The simulated sample contains 10,000 individuals with the same distribution of initial conditions as in the data.

In the bottom panel of Table 7, we summarize the behavior of senators for each possible value of *ST* ("Senate term"), which is equal to 1, 2 or 3 as the senator has served 2, 4 or the full 6 years of his/her term, respectively. Again the predictions of the model are extremely accurate. The probability a senator runs for reelection is slightly overstated (85% vs. 84%). Note that the fraction of senators who run for reelection is considerably smaller than that for representatives—but still very high.

In Figures 1 and 3, we plot the survival functions for a member of the House and the Senate, respectively.[40] In Figure 2, we plot the survival function for a House member only with respect to the "risk" of running for the Senate. Interestingly, as we can see from Figure 2, the members of the House who choose to run for the Senate do so relatively early in their careers as representatives. If a representative does not run for the Senate by about his/her 5th term, he/she is very unlikely to ever do so. The model accurately captures this pattern.

In Table 8, we summarize the career decisions of politicians after they exit Congress, distinguishing between politicians who leave Congress voluntarily (in which case the state variable $VE = 1$) and politicians who are forced out via losing an election (in which case $VE = 0$). Like in the previous table, in Table 8 we compare the predictions of the model to the empirical distribution.

After exiting Congress, the majority of politicians pursue alternative professional careers either in the private or in the public sector (with relatively more going into the private sector). The fraction of former members of Congress who choose to retire is much larger among politicians who exit Congress voluntarily (23%) than among those who exit Congress by losing an election (4%).[41] Those who voluntarily exit are also much less likely to enter the private sector. This observation is consistent with our earlier finding in Section 4.2 that politicians who exit Congress voluntarily are offered lower wages in the private sector. By and large, the model reproduces the key features of the post-congressional behavior of politicians quite well.[42]

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[40] In the data, conditional on being elected to the House, the average number of terms served as a representative before exiting Congress is 4.9 and conditional on being elected to the Senate, the average number of terms served as a senator before exiting Congress is 1.9. The average numbers of House and Senate terms predicted by the model are equal to 4.5 and 2.1, respectively.

[41] In the data, the fraction of politicians who leave Congress voluntarily is equal 47.3%. The fraction predicted by the model is equal to 43.5%.

[42] In the case of post-congressional salaries, recall that the average annual salaries of former members of Congress in the private and in the public sector in 1995 dollars are equal to $252,583 and $122,576, respectively. The average salaries in the two sectors predicted by our model are equal to $265,925 and $132,296, respectively.

5. The Value of a Seat in Congress

In this section we use our model to assess the value of a seat in Congress. Much of the recent literature on retirements from Congress has focused on monetary incentives, such as the possibility of converting unspent campaign funds to personal use (Groseclose and Krehbiel (1994) and Groseclose and Milyo (1999)). Our model allows us to address the following more general question: How much money would a member of Congress need to be paid to make him/her *ex ante* indifferent between giving up his/her seat prior to the expiration of his/her current term and continuing his/her congressional career? Let $Value_{it}$ denote the answer to this question for politician i at time t, which we interpret as the monetized value of a seat in Congress for a sitting member of Congress. Using our model, this value can be easily calculated and is equal to the *ex ante* difference between the value function of remaining in Congress and the value function of voluntarily exiting Congress.[43] In particular, for a sitting member of the House we have:

$$(34) \qquad Value_{it} = \begin{cases} \overline{V}_{RH}(XH_{it}, h) - V_E(XP_{it}) & if \quad ES = 1 \\ \max\{\overline{V}_{RH}(XH_{it}, h), \overline{V}_{RS}(XH_{it}, h)\} - V_E(XP_{it}) & if \quad ES = 2,3,4 \end{cases}$$

while for a sitting member of the Senate we have:

$$(35) \qquad Value_{it} = \begin{cases} \overline{V}_{S}(XS_{it}, s) - V_E(XP_{it}) & if \quad ST = 1,2 \\ \overline{V}_{RS}(XS_{it}, s) - V_E(XP_{it}) & if \quad ST = 3 \end{cases}$$

[43] Note that by *ex ante* we mean before the politician's taste shocks at the time of the decision to run for reelection are realized. The continuation of the politician's congressional career may entail him/her exiting Congress after the shocks are realized. If the ex-ante value functions are equalized, there is a 50/50 chance the politician will choose to exit. This is identical to the definition used in Groseclose and Milyo (1999).

The mean and standard deviation of the monetized value of a House seat in 1995 dollars computed using our estimated model are equal to \$683,739 and \$197,826, respectively.[44] For a Senate seat, they are equal to \$1,729,621 and \$327,812, respectively.[45]

Table 9 contains estimates of the coefficients of OLS regressions of the natural logarithm of the monetized values of a congressional seat, $ln(Value_{it})$, on individual characteristics (i.e., *BA*, *JD*, *Age* and *Type*), congressional experience, and the estimated probability of winning reelection, for members of the House and the Senate, respectively. Several interesting findings emerge from this table. As we would expect, *ceteris paribus*, individual characteristics that increase the outside opportunities of a member of Congress (like having a BA or a JD) lower the value of a seat in Congress. On the other hand, being a "good" politician increases the value of a House seat by 20% and that of a Senate seat by 8%. For a sitting member of the House, being on a major committee also increases the value of a set in Congress by about 15%. Holding everything else constant, a 1% increase in the probability of winning reelection translates in approximately a 1% increase in the value of a congressional seat.

It is interesting to compare our estimates of the values of House and Senate seats to estimates that have been obtained using alternative approaches, particularly Groseclose and Milyo (1999). As discussed by Groseclose and Krehbiel (1994), a 1979 amendment to the Federal Election Campaign Act prohibited members of the House from transferring unspent campaign funds to personal use after they left office.[46] However, this amendment also contained what came to be known as the "golden parachute provision," which granted to all members of the House elected prior to 1980 grandfather status until 1992, when a second amendment that passed into law in 1989 abolished it. Hence, in 1992, 158 members of the House were presented with a one-time choice between voluntarily exiting Congress and keeping their campaign war chests for personal use, or running for reelection and forever foregoing this opportunity. While not directly comparable, this situation provides at least a benchmark to assess the outcome of our

[44] Like all other model predictions, these values are obtained by simulating 10,000 career histories using our estimated model. The simulated sample has the same distribution of initial conditions as in the data.

[45] Note that these amounts do not correspond to what individuals who are not in Congress would be willing to pay to *obtain* a seat in Congress. In fact, our counterfactual experiment holds any accumulated congressional experience (and the present discounted value of all future returns it is expected to generate) as constant and simply compares the *ex ante* values of continuing in Congress vs. that of exiting prior to the termination of a congressional term. To answer the alternative question about value of entry, we would need to collect additional data on unsuccessful candidates and then model the initial decision to run for Congress. We intend to pursue this line of inquiry in future work.

counterfactual experiment. In particular, from the politicians' decisions to forego specific amounts of money we can make some inference regarding properties of the distribution of the value of a House seat. Using the Groseclose and Krehbiel (1994) data, for the 158 members of the House who faced this decision, we computed descriptive statistics of the dollar amounts in their campaign war chest depending on whether they actually chose to rerun or exit Congress.[47] The mean and standard deviation of these amounts (in 1995 dollars) for the 33 members of the House who voluntarily exited Congress are \$307,280 and \$235,028, respectively. For the remaining 125 House members who decided to rerun for their seat, they are equal to \$234,809 and \$232,711, respectively.

Using this data Groseclose and Milyo (1999) estimate a model of the decisions of the affected House members to run for reelection in 1992 vs. exit Congress. The amounts in each member's campaign war chest then provides an arguably exogenous source of variation in the value of the exit option, which helps to identify the model parameters. Groseclose and Milyo assume politicians' utility is a concave (CRRA) function of their wealth, and use imputed measures of the personal wealth of House members to estimate their utility from the convertible campaign cash. Their maximum likelihood estimates imply that the value of a House seat for a member of median age and median wealth is about three million dollars.

It is important to point out, however, that the Groseclose and Milyo estimates of the value of a congressional seat are very sensitive to the coefficient of risk-aversion in the politicians' utility function, and the likelihood function of their model is very flat in this parameter. According to Groseclose (2002) their estimate of the value of a House falls to only about a quarter of a million dollars if they assume a linear utility function. Given the flatness of their likelihood surface, they cannot reject linear or nearly linear utility, so in fact their estimate does not strongly contradict ours.[48]

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[46] This amendment did not affect the members of the Senate since this option was never available to them.
[47] All amounts were converted into 1995 dollars using the CPI deflator.
[48] A second important point is that the House members who were grand-fathered by the 1979 amendment to the Federal Election Campaign Act and were still serving in 1992 were not a random sample of the population of all members of Congress. This sample only includes those members with unspent campaign funds who were not defeated and chose not to exit Congress prior to 1992. Those House members who repeatedly rejected the option of leaving during the 1980-1990 period (during which they could have exited at any time and taken the campaign cash), are likely to be members who had relatively high values of remaining in Congress. Hence, any inference based solely on their observed behavior may not generalize to the overall population.

6. Term Limits

An appealing feature of our approach to the study of congressional careers is that we can use the estimated model to evaluate the effects of various policy experiments on the career decisions of politicians and the value of a congressional seat. Here, we analyze the effects of the introduction of term limits.[49] In particular, we consider an environment where politicians can serve a maximum of four terms in the House and two terms in the Senate. This situation corresponds to an actual proposal that was considered in the early 1990s. In fact, between 1990 and 1994, many states approved initiatives to limit the number of terms served by their state legislators, and proposed to extend these limits to their members of Congress (see, e.g., Benjamin and Malbin (1992)).[50]

We begin by presenting Table 10, where we summarize the behavior of members of the House and the Senate, respectively, with and without term limits.[51] In the top panel of Table 10, for each possible election status (*ES = 1,..,4*) we describe the choices of House members under the two different scenarios prior to their fourth term in office (when, under the term limit scenario, they would have to exit the House). In the bottom panel of Table 10, for each possible point in the Senate term (*ST = 1,2,3*) we describe the choices of Senate members under the two different scenarios prior to their second term in the Senate (when, under the term limit scenario, they would have to exit the Senate).

Perhaps not surprisingly, we find that the presence of term limits substantially increases early voluntary exit both from the House and the Senate. Averaged over all states, the probability a House member runs for reelection (to a 2nd or 3rd term) drops from 93.3% to 81.8%. And the probability a senator runs for a 2nd term drops from 87.7% to 79.9%. For the members of the House, the imposition of term limits also increases their probability of running for the Senate.[52]

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[49] In future work, we will evaluate the effects of changes in the pension regime, changes in the wages in Congress, changes in the seniority rule for committee appointments, and the introduction of restrictions on the post-congressional occupations of former members of Congress.
[50] These proposals range from imposing limits of as little as 3 terms to as many as 6 terms in the House. In our analysis, we experimented with all possible combinations. Qualitatively, the results that obtain from all the different cases remain the same.
[51] All the numbers reported in this section are based on simulations of 10,000 career histories using our estimated model.
[52] These findings are consistent with the observed behavior of state legislators following the introduction of term limits in the California state legislature in 1994 (see, e.g., Caresa (1996)).

A perhaps more interesting question, however, is whether term limits impact all individuals in the same way or whether politicians with different observable and unobservable characteristics are affected differently. We find that the imposition of term limits has a relatively larger impact on the behavior of relatively more skilled politicians and, to a lesser degree, politicians who are relatively older. On average, the imposition of term limits reduces the probability that a politician of normal type runs for reelection (to a 2nd or 3rd term) in the House from 92.8% to 82.4%—a 10.4% decline. But for a good politician this probability goes from 94.1% to 81.0%—a 13% decline. Thus, after term limits, the good politician is actually slightly less likely to run for reelection than the normal type. The story is similar in the Senate. The imposition of term limits reduces the probability that a politician of normal type runs for a 2nd term in the Senate from 85.0% to 76.7%—an 8.3% decline. But for a good politician this probability goes from 89.8% to 79.3%—a 10.5% decline.

Differences are also apparent by age. On average, the imposition of term limits reduces the probability that a relatively young politician (i.e., less than or equal to the mean age of 48) runs for reelection to a 2nd or 3rd term in the House from 93.8% to 82.9% —a 10.8% decline. But for an older politician this probability goes from 92.8% to 80.5% —a 12.3% decline. Thus, term limits reduce the probability of running for reelection somewhat more for older politicians.[53]

We conclude our analysis by evaluating the effect of term limits on the value of a congressional seat. Overall, the imposition of term limits reduces the average value of a seat in the House by 31.4% and the average value of a seat in the Senate by 34.6%. Consistently with our previous findings, the members of Congress who are most negatively affected by term limits are those who have relatively better politicians' skills, such as valence, competence or charisma, and are relatively older. Many arguments have been proposed to illustrate the *pros* and *cons* of legislative term limits (see, e.g., Benjamin and Malbin (1992) for a survey). Most have emphasized that since reelection prospects create incentives for politicians to serve their constituents, imposing term limits may induce politicians to exercise less effort on behalf of their voters (see, e.g., Banks and Sundaram (1998) and Besley and Case (1995)). The results of our analysis suggest that another potential effect of term limits is that they may discourage relatively "good" politicians from pursuing a career in Congress. Our results suggest that term limits might

[53] We find no significant differential effect by age for senators. Also, we find that the imposition of term limits has no significant effects on the post-congressional behavior of politicians.

tend to tilt the composition of Congress toward younger and less skilled politicians. It is well beyond the scope of our analysis to comment on this from a social welfare perspective.

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APPENDIX : Solution of the DP Problem and Estimation

A.1 Computational Issues

Estimation of a model like that described in Section 2 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 in Section 2 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.[54] 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 1800 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.

In general, in our exposition of the model in Section 2, we showed how only certain subsets of the complete state space, which we denoted by XP, XH, XS, and XC, 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. Recall that the log wage function intercepts β_{0j} and β_{1j} are assumed to be specific to both an individual and an occupation.

[54] 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 wages draw in (10) and (12). We use 100 draws to evaluate these integrals. Results were not sensitive to increasing the number of draws.

This allows for the possibility that individuals have different initial endowments of skill that is useful for each occupation (see Keane and Wolpin (1997)). We also allow for heterogeneity in the intercepts of the functions that determine probabilities of winning elections and of being named to important House committees. 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 versions of our model with up to four types. But, as noted in Section 4.4, improvements in fit were trivial when we went beyond two types, so we chose a model with two types as our preferred specification.

A.2 Likelihood Function

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

$$(36)\qquad L_{it}^{E} = \left[\prod_{j=1}^{2} P\left(d_{ijt} = 1 \mid XP_{it}\right)^{d_{ijt}} \phi_j\left(W_{ijt} \mid XP_{it}\right)^{d_{ijt} o_{it}} \right] P\left(d_{i3t} = 1 \mid XP_{it}\right)^{d_{i3t}}$$

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). Also note that all the components of XP_{it} are observed by the econometrician except for $Type_i$. For our further exposition of the likelihood function, it will be useful to make the dependence of L_{it}^{E} on VE_{it} and $Type_i$ explicit by writing $L_{it}^{E}\left(VE_{it}, Type_i\right)$.

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:

$$(37)\qquad \begin{aligned} L_{it}^{S}\left(Type_i\right) = &\left\{ P\left(d_{it}^{RS} = 1 \mid XS_{it}, s\right)\left[WIN_{it} p_S(XS_{it}) + LOSE_{it}(1 - p_S(XS_{it})) L_{it}^{E}(0, Type_i) \right] \right\}^{d_{it}^{RS}} \\ &\times \left\{ P\left(d_{it}^{E} = 1 \mid XS_{it}, s\right) L_{it}^{E}(1, Type_i) \right\}^{d_{it}^{E}} \end{aligned}$$

The first term is the likelihood contribution if the senator runs for reelection. In this case, he/she will either win ($WIN_{it} = 1$) or lose ($LOSE_{it} = 1$), so the winning probability $p_S(XS_{it})$ enters the expression. In the event of a loss, the senator exits Congress, and gets the exit likelihood contribution associated with involuntary exit, $L_{it}^{E}\left(0, Type_i\right)$. The second term 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, $L_{it}^{E}\left(1, Type_i\right)$. If $ST_{it} = 1$ or 2 then we have the simpler expression:

$$(38)\qquad L_{it}^{S}\left(Type_i\right) = P\left(d_{it}^{S} = 1 \mid XS_{it}, s\right)^{d_{it}^{S}} \left[P\left(d_{it}^{E} = 1 \mid XS_{it}, s\right) L_{it}^{E}(1, Type_i) \right]^{d_{it}^{E}}$$

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:

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

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. The term $L_{it}^{C}\left(XC_{it}\right)$ is the likelihood contribution that derives from this committee assignment. It is defined as:

$$(40)\qquad L_{it}^{C}\left(XC_{it}\right)=COM_{it}p_C(XC_{it})+(1-COM_{it})(1-p_C(XC_{it}))$$

Returning to the main expression in equation (39), 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.

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:

$$(41)\qquad L_i=\sum_{Type=1}^{2}P(Type)\prod_{t=t_0+1}^{t_0+R+1}L_{it}^{H}(Type)$$

where $P(Type)$ for $Type = 1,2$ are the type proportions, which are parameters that have to be estimated.

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:

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

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:

$$(43)\qquad L_i=\sum_{Type=1}^{2}P(Type)\prod_{t=t_0+1}^{t_0+R+1}L_{it}^{H}(Type)\prod_{t=t_0+R+2}^{t_0+R+S+2}L_{it}^{S}(Type)$$

Table 1: Descriptive Statistics at Entry

Variable	Mean	Standard Deviation	Minimum	Maximum
Age	48	9	30	78
BA	.86	.34	0	1
JD	.51	.50	0	1
Party = D	.56	.50	0	1
Party = R	.44	.50	0	1
HSE	.89	.32	0	1
Cohort = 1	.45	.50	0	1
Cohort = 2	.20	.40	0	1
Cohort = 3	.35	.48	0	1

Table 2: Probability of Winning House Election

Variable	Coefficient	S. E.
Intercept	-3.8016	0.3180
*I[SOW=1]*I[Party=R]*	0.8641	0.2770
*I[SOW=2]*I[Party=D]*	0.8036	0.1521
*I[SOW=3]*I[Party=D]*	1.1528	0.1740
*I[SOW=3]*I[Party=R]*	-1.3891	0.1731
*I[SOS=1]*I[Party=D]*	-2.0679	0.3044
*I[SOS=1]*I[Party=R]*	0.7927	0.2664
*I[SOS=2]*I[Party=D]*	-1.4349	0.2759
*I[SOS=3]*I[Party=D]*	-0.7644	0.2557
*I[SOS=3]*I[Party=R]*	-0.7170	0.2743
*I[SOD=1]*I[Party=R]*	1.1564	0.2418
*I[SOD=2]*I[Party=D]*	0.5190	0.1805
*I[SOD=3]*I[Party=D]*	2.1619	0.2526
*I[SOD=3]*I[Party=R]*	0.0888	0.2622
TH	0.2658	0.0552
TH^2	-0.0129	0.0036
COM	0.3185	0.2268
Age	0.2495	0.0087
Age^2	-0.0029	0.0001
I[COHORT=2]	0.8572	0.2907
*I[COHORT=2]*TH*	-0.3260	0.1163
$I[COHORT=2]*TH^2$	0.0227	0.0096
I[COHORT=3]	0.1555	0.2537
*I[COHORT=3]*TH*	0.3177	0.1412
$I[COHORT=3]*TH^2$	-0.0608	0.0163
Type	2.6029	0.3268

Table 3: Probability of Winning Senate Election

Variable	**Coefficient**	**S. E.**
Intercept	0.4492	0.3340
*I[SOW=1]*I[Party=R]*	-0.0699	0.1427
*I[SOW=2]*I[Party=D]*	0.5028	0.1835
*I[SOW=3]*I[Party=D]*	0.6010	0.1925
*I[SOW=3]*I[Party=R]*	-0.4439	0.1741
*I[SOS=1]*I[Party=D]*	0.1442	0.2925
*I[SOS=1]*I[Party=R]*	0.5617	0.1999
*I[SOS=2]*I[Party=D]*	0.1196	0.2921
*I[SOS=3]*I[Party=D]*	-0.1206	0.2906
*I[SOS=3]*I[Party=R]*	-0.0775	0.2167
*I[ES=2]*I[Party=D]*HSE*	-4.8981	0.4093
*I[ES=2]*I[Party=R]*HSE*	-3.4083	0.3365
*I[ES=3]*I[Party=D]*HSE*	-4.0872	0.3704
*I[ES=3]*I[Party=R]*HSE*	-4.4189	0.4513
*I[ES=4]*I[Party=D]*HSE*	-3.5721	0.3643
*I[ES=4]*I[Party=R]*HSE*	-2.9244	0.3475
*TH*HSE*	0.3158	0.0720
TH^2*HSE	-0.0344	0.0081
TS	-0.1637	0.3369
TS^2	0.0715	0.0796
Age	0.0756	0.0074
Age^2	-0.0012	0.0001
Type	1.3521	0.2818

Table 4: Probability of Committee Appointment

Variable	Coefficient	S. E.
Intercept	-8.0203	0.3192
*I[SOW=1]*I[Party=R]*	0.1089	0.1956
*I[SOW=2]*I[Party=D]*	-0.6173	0.1741
*I[SOW=3]*I[Party=D]*	-0.3036	0.1652
*I[SOW=3]*I[Party=R]*	0.3420	0.1926
*I[SOS=1]*I[Party=D]*	0.9549	0.3191
*I[SOS=1]*I[Party=R]*	0.5564	0.2629
*I[SOS=2]*I[Party=D]*	0.8447	0.3144
*I[SOS=3]*I[Party=D]*	0.8571	0.2796
*I[SOS=3]*I[Party=R]*	0.1004	0.2756
*I[SOD=1]*I[Party=R]*	0.3385	0.2212
*I[SOD=2]*I[Party=D]*	0.2129	0.1704
*I[SOD=3]*I[Party=D]*	0.1082	0.2000
*I[SOD=3]*I[Party=R]*	-0.0828	0.2508
$I[COM_{t-1}=1]*TH$	0.1559	0.0999
$I[COM_{t-1}=1]*TH^2$	-0.0065	0.0059
$I[COM_{t-1}=0]*TH$	0.3359	0.0667
$I[COM_{t-1}=0]*TH^2$	-0.0497	0.0062
COM_{t-1}	5.9180	0.4221
Age	0.1765	0.0080
Age^2	-0.0018	0.0001
Type	0.1931	0.2594

Table 5: Wage Functions

	Private Sector		Public Sector	
Variable	**Coefficient**	**S. E.**	**Coefficient**	**S. E.**
Model Estimates				
Intercept	11.8721	0.0468	10.6654	0.0826
BA	0.0578	0.0277	0.0884	0.0510
JD	0.0387	0.0197	0.0142	0.0373
TH	0.0487	0.0069	0.0716	0.0143
TH^2	-0.0030	0.0005	-0.0053	0.0012
TS	0.2905	0.0523	0.4056	0.0837
TS^2	-0.0649	0.0147	-0.1025	0.0231
COM	0.0267	0.0429	-0.1475	0.0875
VE	-0.0727	0.0226	0.0144	0.0431
Age	0.0076	0.0011	0.0299	0.0020
Age^2	-0.0001	0.0000	-0.0003	0.0000
Type	-0.0362	0.0506	-0.1373	0.0958
OLS Estimates				
Intercept	11.0245	0.5039	11.8627	0.8130
BA	0.1832	0.3120	-0.1199	0.1181
JD	0.7230	0.1784	-0.0889	0.0621
TH	0.0284	0.0147	-0.0473	0.0345
TH^2	-0.0020	0.0009	0.0057	0.0029
TS	0.1306	0.0761	0.2270	0.1345
TS^2	-0.0305	0.0230	-0.0738	0.0386
COM	0.0516	0.0518	-0.1560	0.0859
VE	-0.0321	0.0358	0.1466	0.0632
Age	0.0047	0.0170	0.0089	0.0308
Age^2	0.0000	0.0002	-0.0001	0.0003
R^2	*0.2312*		*0.1168*	

Table 6: Utility Function and Other Parameters

Parameter	**Estimate**	**S. E.**
Utilities from Sitting in Congress		
α_H	43,117	24,216
α_C	29,106	17,142
α_S	441,414	82,545
Utilities from Running		
α_{RH}	239,910	22,920
α_{HS}	-696,584	108,360
α_{RS}	376,813	275,165
Utilities on Exit		
α_L	255,081	9,338
α_{VE}	61,226	9,165
α_{2W}	178,048	9,159
α_{1C}	-18,613	14,066
α_{2C}	14,064	12,341
Standard Deviations of Taste Shocks in the House		
ρ_{1H}	239,150	25,231
ρ_{2H}	236,846	24,404
ρ_{3H}	235,662	24,725
ρ_{4H}	230,389	27,244
Standard Deviations of Taste Shocks in the Senate		
ρ_{1S}	402,814	76,164
ρ_{2S}	543,585	106,550
ρ_{RS}	937,652	220,008
Standard Deviations of Taste Shocks on Exit		
ρ_E	99,485	18,627
Other Parameters		
π_0	0.8036	1.2625
π_1	-0.8397	0.3882
δ	0.8617	0.0206
Pr(Type="good")	0.3754	0.0642

Table 7: Decisions of Members of Congress

	Data	Model
Decisions of Representatives		
ES = 1		
% rerun for House	93.15	93.18
% exit Congress	6.85	6.82
ES = 2		
% rerun for House	91.06	90.95
% run for Senate	2.15	2.35
% exit Congress	6.79	6.70
ES = 3		
% rerun for House	91.12	90.76
% run for Senate	2.34	2.15
% exit Congress	6.54	7.09
ES = 4		
% rerun for House	84.76	86.34
% run for Senate	8.42	7.88
% exit Congress	6.82	5.78
Decisions of Senators		
ST = 1		
% stay in Senate	98.17	98.42
% exit Congress	1.83	1.58
ST = 2		
% stay in Senate	95.34	95.36
% exit Congress	4.66	4.64
ST = 3		
% rerun for Senate	83.85	85.37
% exit Congress	16.15	14.63

Table 8: Post-Congressional Career Decisions

	Data	**Model**
VE = 1		
% private sector	41.61	40.61
% public sector	35.00	31.23
% retire	23.39	28.06
VE = 0		
% private sector	61.27	55.06
% public sector	35.11	39.41
% retire	3.61	5.54

Table 9: OLS Regressions of log Value of a Congressional Seat

Variable	Coefficient	S. E.
Value of a House Seat		
Intercept	12.5200	0.0135
BA	-0.0684	0.0015
JD	-0.0349	0.0010
Age	0.0222	0.0005
Age^2	-0.0003	0.0000
TH	-0.0597	0.0005
TH^2	0.0002	0.0000
COM	0.1451	0.0014
Type	0.2000	0.0011
p_H	0.9149	0.0042
$R^2 = 0.9131$		
Value of a Senate Seat		
Intercept	12.3572	0.0468
BA	-0.0286	0.0044
JD	-0.0214	0.0029
Age	0.0558	0.0017
Age^2	-0.0006	0.0000
TH	-0.0480	0.0023
TH^2	0.0029	0.0004
TS	-0.0823	0.0050
TS^2	0.0066	0.0009
Type	0.0814	0.0047
p_S	1.1117	0.0197
$R^2 = 0.9378$		

Table 10: Decisions of Members of Congress under Term Limits

	Baseline Model	**Term Limits**
Decisions of Representatives		
ES = 1		
% rerun for House	95.78	87.12
% exit Congress	4.22	12.88
ES = 2		
% rerun for House	93.04	80.22
% run for Senate	2.18	5.84
% exit Congress	4.78	13.94
ES = 3		
% rerun for House	92.90	80.56
% run for Senate	2.18	5.86
% exit Congress	4.92	13.58
ES = 4		
% rerun for House	87.34	74.23
% run for Senate	8.08	14.71
% exit Congress	4.58	11.07
Decisions of Senators		
ST = 1		
% stay in Senate	99.24	96.93
% exit Congress	0.76	3.07
ST = 2		
% stay in Senate	97.11	93.96
% exit Congress	2.89	6.04
ST = 3		
% rerun for Senate	87.67	79.85
% exit Congress	12.33	20.15

Figure 1: Survival Function for House

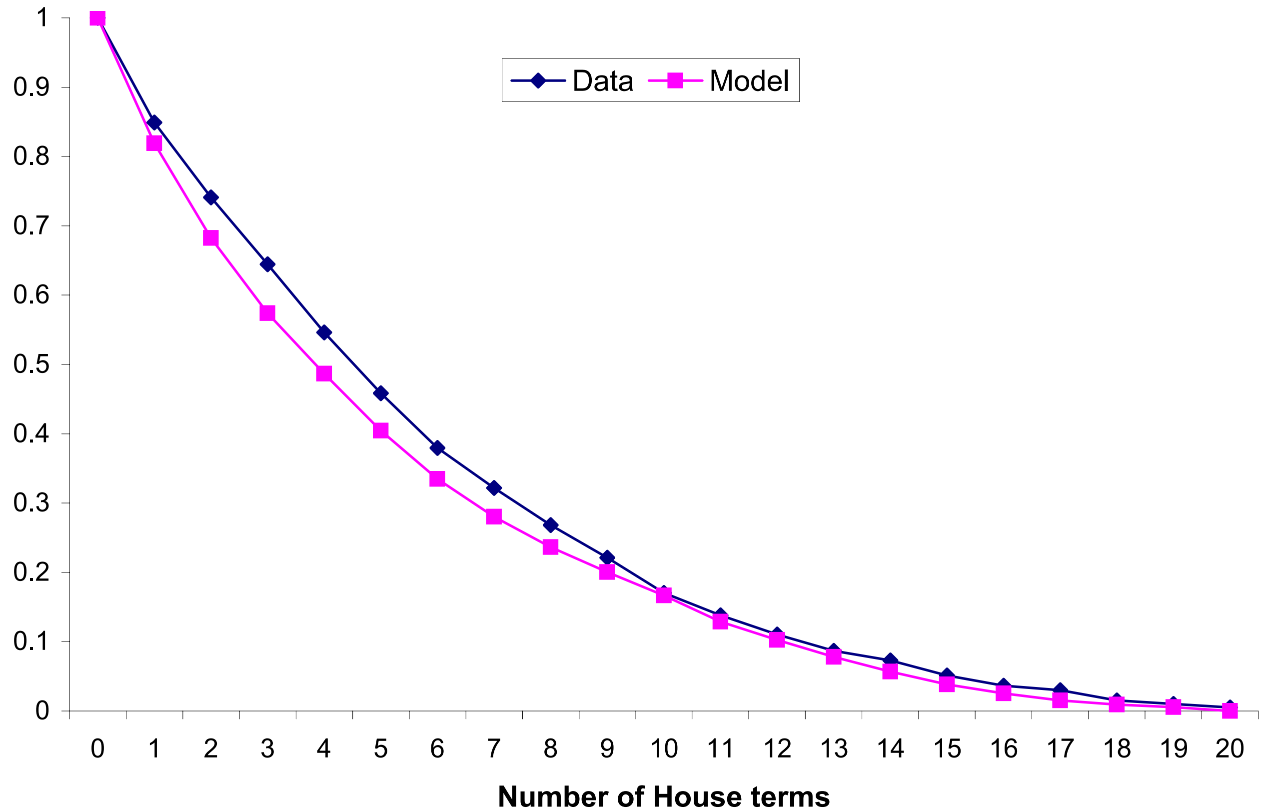

Figure 2: Survival Function for House--Not Running for Senate

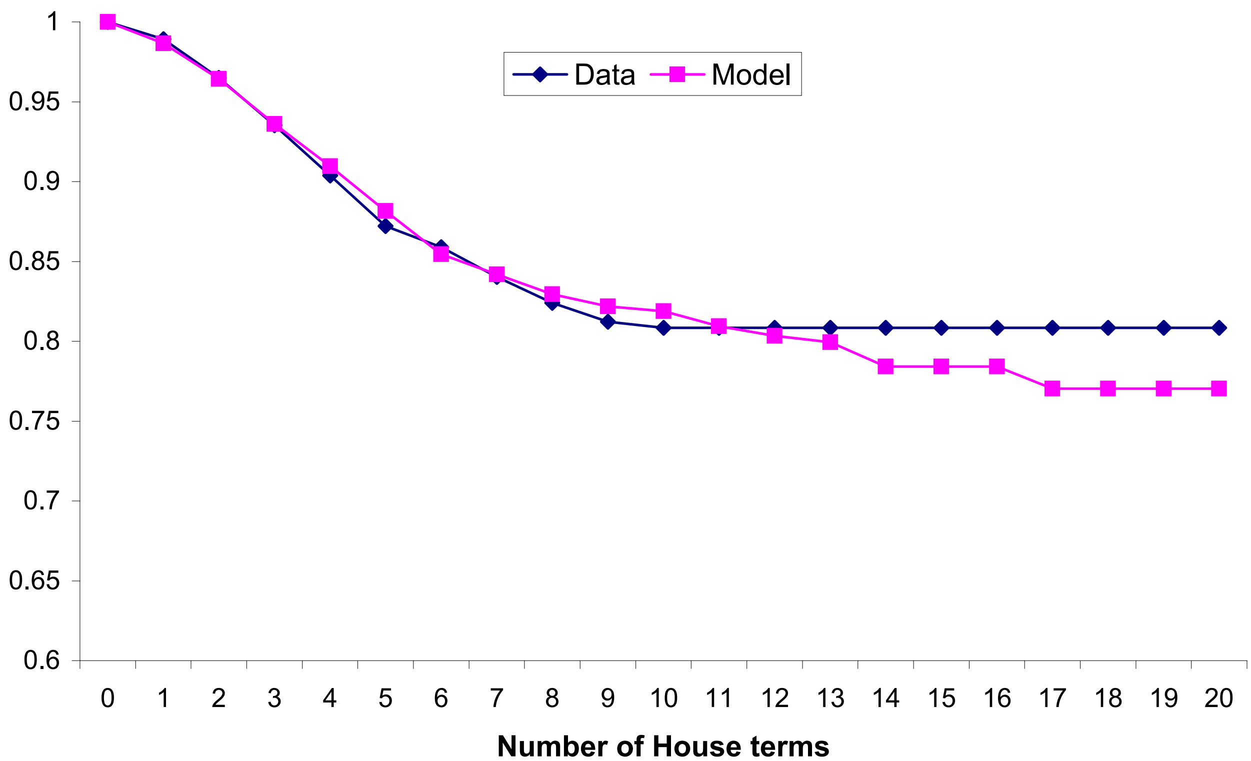

Figure 3: Survival Function for Senate