Decreasing Electoral Risk and Strategic Retirement to Avoid Losing Election: Survival Analysis of Legislators' (Political) Life at Systematically Dependent Competing Risks *

Kentaro Fukumoto †

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Abstract

Legislators exit from the legislature due to death, retirement or electoral defeat. This paper demonstrates what factors affect these risks. I argue that seniority system brings about decreasing electoral risk and professinalization of the legislature results in constant retirement risk. Also, I hypothesize that, when they expect to be defeated at the next election, legislators strategically retire so as to avoid cost of electoral campaign and losing face. In order to test these hypotheses, I propose a systematically dependent competing risks model of survival analysis and also consider non-random censoring and ordered risks structure. Using a Japanese Diet members' dataset from 1947 to 1990, this paper confirms my hypotheses.

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†Visiting Scholar, Reischauer Institute of Japanese Studies, Harvard University, Cambridge, MA, and Associate Professor, Department of Political Science, Gakushuin University, Tokyo, E-mail: Kentaro.Fukumoto@gakushuin.ac.jp, URL: http://www-cc.gakushuin.ac.jp/ e982440/index_e.htm.

INTRODUCTION

Many scholars have studied what factors encourage candidates to enter the legislature, though few have shown what elements force them to exit from the legislature. Considering when, how and why lawmakers cease to be in the legislature, however, enables us to understand their individual activity and collective organization better.

Legislators exit from the legislature due to death, retirement or electoral defeat. This paper demonstrates what factors increase or decrease these risks. Especially, I pay attention to different time dependence of these risks and dependence between risks. Electoral risk decreases with the number of terms for which the legislator serves, while retirement risk and death one are constant. This is because seniority system brings about decreasing electoral risk, professinalization of the legislature results in constant retirement risk and politicians are not biologically different from citizens. Also, when lawmakers expect they would lose election even if they ran again, they will strategically choose to retire in order to to avoid cost of electoral campaign and losing face.

Methodologically, for studying dependence of competing risks, I propose a systematically dependent competing risks model of survival analysis. Previous works use frailty model, though it is extremely difficult to model more than two risks like the present case. I also tailor-make the model so that it captures the data generation process of legislators' exit more appropriately, considering non-random censoring and ordered risks structure.

This way, the present paper intends to contribute to better understanding of legislators' behavior and improvement of political methodology. The remainder of the paper is organized as follows. In the first section, I submit a theory which explains legislators' exit from the legislature and derive seven hypotheses. The next section develops a systematically dependent competing risks model of survival analysis. The third section applies the model to a Japanese Diet members' dataset from 1947 to 1990 and confirms the hypotheses. Finally, I conclude.

1 A THEORY OF LEGISLATORS' EXIT FROM THE LEGISLATURE

Legislators exit from the legislature for various reasons. In the U.S. Congressional case, Box-Steffensmeier and Jones (1997, 2004) identify four: retire, ambition (running for other public offices such as senator and governor), electoral termination at primary or general. In Japan, exit due to ambition is rare and comprehensive data is not available now. Also, there is no primary. Instead, 10% of members died while they serve, which is too frequent to ignore. Thus, I study three risks to terminate legislators' (political) life: death, retirement, and electoral loss. Lawmakers are at these competing risks while they work at the Diet. This paper studies what factors affect these risks. My primary interests lie in different time dependence of these risks and dependence between risks.

1.1 Different Time Dependence of Competing Risks

I predict electoral risk decreases with the number of terms for which the legislator serves, while retirement risk and death one are constant. This is because seniority system brings about decreasing electoral risk, professinalization of the legislature results in constant retirement risk, and politicians are biologically the same as other people.

Seniority system provides senior members with fringe benefit such as pork and committee chairmanship. As a result, they can afford to reward their own district so that they are more easily reelected. On the other hand, junior members are deprived of these leverages and should survive severe electoral competition. At the same time, due to limited amount of benefits, this system would not be sustainable unless many junior lawmakers are hindered from being promoted to senior ones. Thus, the longer they serve, the smaller electoral risk they are at.

Before the legislature is professionalized, its membership was not attractive enough for members to run for again (King, 1981; Moony, 1994; Squire, 1992). Only a few members remain for a long time. Thus, retirement risk should be decreasing as they accumulate terms. On the other hand, this is not the case if the legislature is the professionalized as it is. Then, there is no reason retirement risk is time varying. It is predicted to be constant.

Death risk for politicians is the same as ordinary people. Once age is controlled, why is not death risk constant through terms? From the above, I derive the following three hypotheses.

H1a: Seniority System Hypothesis: Electoral loss risk decreases with the number of terms for which the legislator serves.

H1b: Prefessionalization Hypothesis: Retirement risk is constant through the number of terms for which the legislator serves.

H1c: Ordinary Mortality Hypothesis: Death risk is constant through the number of terms for which the legislator serves, once age is controlled.

1.2 Dependence between Competing Risks

These three risks are related. First, when lawmakers expect they would lose election even if they ran again, they will strategically choose to retire in order to avoid cost of electoral campaign and losing face. Thus, the higher electoral risk is, the higher retirement risk is.

Second, when death risk is large, Diet members decay physically. They may not be healthy enough to run for reelection and stump energetically. Or voters may well shun such candidates. As a result, larger death risk leads to larger retirement risk and electoral defeat one. These two predictions are summarized this way:

H2a: Strategic Retirement Hypothesis: Electoral loss risk increases retirement risk.

H2b: Physical Decay Hypothesis: Death risk increases retirement risk and electoral loss risk.

1.3 Party

If members belong to opposition parties, they have fewer government resources to take advantage of than governing party members. They can not boast of governments' achievement, either. On the other hand, they can blame governing parties for current social problems and mobilize unsatisfied voters. Here, however, comes the Japanese one party dominant regime. During the period studied (1947 to 1990) except before 1948, the Liberal Democratic Party (LDP) (or its predecessors) kept the majority status of the House of the Representatives and monopolized the Cabinet, and all elections were held under the LDP government. Thus, since all other parties were always opposition parties, they are expected to be weaker at the ballot box.

Also, there are two types of parties: cadre party and organizational one (Duverger, 1954; Sartori, 1976). Organizational party has more power over its Diet members than cadre party where all member can decide their own way. Though members are not willing to retire by themselves (at least in Japan), organizational parties are able to force members to retire for recruiting new members than cadre parties. Hence, I propose two more hypotheses.

H3a: Opposition Party Hypothesis: Members of opposition parties are at higher electoral loss risk.

H3b: Organizational Party Hypothesis: Members of organizational party are at higher retirement risk.

2 MODEL

For studying timing and type of end of duration such as legislators' (political) life, survival analysis is appropriate. Especially, in order to examine dependence between risks, a dependent competing risks model is necessary. First, I introduce a general model of competing risks and propose my systematically dependent competing risks model. Then, I specify the model so that it fits legislators' (political) life.

2.1 A General Model of Survival Analysis at Competing Risks

2.1.1 Competing Risks

I consider the case where there are three risks ($r \in \{1, 2, 3\}$, for example, 1=early exit (such as death), 2=retire, 3=electoral loss), though it is easy to model any number of risks. y indicates type of exit or censoring. When an event E_r due to risk r occurs, $y = r$. If duration of a subject is censored without any event (e.g., reelected), $y = 0$. y_r is a dummy variable which is one when an event E_r happens ($y = r$) and otherwise zero. $y_1 + y_2 + y_3 \in \{0, 1\}$ because only one event due to one risk is observed. T_r is the potential time when E_r would happen if other types of events did not happen and a subject (e.g., a legislator) were not censored. T is the observed time when a subject exits ($T = min(T_r)$) or is censored. x_r is covariates for risk r and $x = x_1 \cup x_2 \cup x_3$.

Once any event occurs on a subject, it exits (from all risk sets) and no more event happens. The probability density that an event y_r occurs at time t given that a subject "survives" at that time ($T_r \geq t$) and conditional on x_r, $p(y_r = 1, T_r = t|x_r, T_r \geq t) \geq 0$, is called hazard and denoted by $h_r(t|x_r)$. Let $h(t|x) = p(y_1 + y_2 + y_3 = 1, min(T_r) = t|x, min(T_r) \geq t)$, then,

$$h(t|x) = B(y_1|h_1(t|x_1)) \times B(y_2|h_2(t|x_2, y_1)) \times B(y_3|h_3(t|x_3, y_1, y_2)) \tag{1}$$

where $B(y|\theta)$ is the Bernoulli distribution with mean $0 < \theta < 1$, $B(y|\theta) = \theta^y(1 - \theta)^{1-y}$.

In the present subsection, I model hazard for risk r as proportional to baseline hazard for risk r, $h_{r(0)}(t)$, and make the rate a function of linear predictor of covariates x_r (proportional hazard model): $h_r(t|x_r) = \exp(x_r\beta_r)h_{r(0)}(t)$.[1]

2.1.2 Dependent Competing Risks

Non-Random Censoring. If censoring of every risk r duration by any other type of event y_s ($r \neq s$) or non event is uninformative (i.e., at random or statistically independent of $h_r(t|x_r)$), the conditional probabilities in Eq. (1) are reduced to marginal ones.

$$h(t|x) = B(y_1|h_1(t|x_1)) \times B(y_2|h_2(t|x_2)) \times B(y_3|h_3(t|x_3)) \tag{2}$$

Most of the previous studies (sometimes implicitly) assume random censoring and use this equation. In not a few cases, however, this assumption of random censoring is dubious. For example, (in continuous time model) retirement may be more likely to occur when electoral loss is more prospective (even if conditioned on covariates). In this case, censoring electoral defeat risk duration by retirement (y_2) is not at random but positively correlated with electoral defeat hazard ($h_3(t|x_3)$):

$$\frac{\partial h_3(t|x_3, y_2)}{\partial y_2} > 0 \tag{3}$$

If they are negatively correlated, the left hand side of Eq. (3) is less than zero. If they are not lineally correlated, it is equal to zero. Therefore, when censoring is not independent of other types of event occurrence, Eq. (1) should be used instead of Eq. (2).

A Systematically Dependent Competing Risks Model. The most common way to model dependent competing risks is frailty model, which is a kind of random effect model (Box-

[1]If you do not employ proportional hazard model, you only have to replace β_r with $\beta_r(t)$.

Steffensmeier and Jones, 2004; Gordon, 2002):

$$
\begin{aligned}
h_r(t|x_r) &= \exp(x_r\beta_r + \nu_r)h_{r(0)}(t) \\
h_s(t|x_s) &= \exp(x_s\beta_s + \nu_s)h_{s(0)}(t) \\
(\nu_r, \nu_s) &= \text{Multivariate Normal}\big((0,0), \Omega\big)
\end{aligned}
$$

where νs are random variables independent of covariates and are called frailty, and Ω is a variance-covariance matrix. To estimate, one needs to integrate out frailties through Markov Chain Monte Carlo or numerical integration. In the case of more than two risks, however, it is very difficult to identify estimates. In addition, frailty model takes into consideration stochastic dependence only, not systematic dependence.

Instead, I propose a systematically dependent competing risks model, where hazard for one risk is conditional on the same linear predictor of covariates for another hazard (or those of other hazards). For two risks,

$$
\begin{aligned}
h_r(t|x_r) &= \exp(x_r\beta_r)h_{r(0)}(t) \\
h_s(t|x_s, h_r(t|x_r)) &= \exp(x_s\beta_s + \delta_{rs}(x_r\beta_r))h_{s(0)}(t)
\end{aligned}
\tag{4}
$$

where δ_{rs} is dependence parameter.[2] The more variables in x_r are contained in x_s, the more severe multicollinearity problem becomes (not vice versa). Also, for every pair of hazards, at most one hazard may have dependence parameter for the same reason. These limitations, though, pay because it forces us to consider the directions of causality very well. Compared with frailty model, this is able to model more than two risks and is easier and faster to

[2] To put it differently, this is a constrained model as follows:

$$
\begin{aligned}
h_r(t|x_r) &= \exp(x_r\beta_r)h_{r(0)}(t) \\
h_s(t|x_s, x_r) &= \exp(x_s\beta_s + x_r\beta_{rs})h_{s(0)}(t) \\
\beta_{rs} &= \delta_{rs}\beta_r
\end{aligned}
$$

estimate by maximum likelihood method.

2.2 The Specific Model for Legislators' Exit

So far, I have introduced dependent competing risks models in the general term. From this subsection, I tailor-make the model so that it captures data generation process of legislators' exit.

2.2.1 Discrete Time

I use discrete time model, not continuous one. There are a few reasons. First, time of my interest is not the exact duration of legislators' political life in months or days but the number of terms they serve in the legislature. The latter matters politically, say, to seniority, not the former. Second, it is easier and more flexible to incorporate time varying covariates such as age and electoral strength into discrete time model. Third, since discrete time model enables me to use inverse logistic link with which more political scientists are familiar (Beck, Katz and Tucker, 1998), it is easier to explain and estimate the model. In this case, hazard is not probability density which has only lower bound of zero but probability which ranges from zero to one.

2.2.2 Ordered Risks

In the present case, a subject becomes at one type of risk after it cease to be at the other types of risks. I call this risk structure ordered risks. Let me explain concretely. Only after a lawmaker survives early exit risk up to the end of term, they can decide whether they run for the next election. Before they reach the end of term, they can not retire nor be defeated at an election. Therefore, in the case where they die ($y_1 = 1$), there is any possibility of retirement or electoral loss neither before death nor after death: $h_2(t|x_2, y_1 = 1) = h_3(t|x_3, y_1 = 1) = 0$. Similarly, they become at risk of failure of reelection only if they choose not to retire. By contrast, when Diet persons retire ($y_2 = 1$), they never suffer electoral loss: $h_3(t|x_3, y_1 = 0, y_2 = 1) = 0$. Therefore, I abuse notation and redefine $h_2(t|x_2)$ and $h_3(t|x_3)$ as $h_2(t|x_2, y_1 = 0)$ and $h_3(t|x_3, y_1 = 0, y_2 = 0)$, respectively.[3] Hence,

$$h(t|x) = \begin{cases} h_1(t|x_1) & \text{if } y = 1 \\ [1 - h_1(t|x_1)] \times h_2(t|x_2) & \text{if } y = 2 \\ [1 - h_1(t|x_1)] \times [1 - h_2(t|x_2)] \times h_3(t|x_3) & \text{if } y = 3 \end{cases}$$

Usually, marginal hazard is model as the multinomial logit:

$$h(t|x, y_r = 1) = \frac{\exp(x_r\beta_r)}{1 + \sum\big(\exp(x_r\beta_r)h_{r(0)}(t)\big)}$$

Quantities of my interest are, however, not that but conditional hazard, which I parameterize as the binomial logit model:

$$h_r(t|x_r) = \frac{1}{1 + \exp(x_r\beta_r)h_{r(0)}(t)}$$

Here, odds of hazard, not hazard itself, is made proportional to $h_{r(0)}(t)$, odds of baseline hazard.

[3] A general remark is in order. If ordered risks are independent conditioned on previous events, that is, if covariates of any hazard never share those of other hazard in Eq. (4), each hazard is parametrically independent and possible to estimate by nested (multinomial) logistic regression by using those observations only which are at the risk (e.g., for electoral loss hazard, only analyzing legislators who run for the election). Box-Steffensmeier and Jones (1997) take this strategy, though without mentioning non-random censoring and insufficiently in the sense that they do not omit primary election losers when they study general election defeat. In their latest work, Box-Steffensmeier and Jones (2004) do not even introduce this nested logistic regression. That is regrettable because nested (multinomial) logistic regression is easily available through any canned software and is appropriate only if scholars can assume competing risks are ordered and parametrically independent.

2.2.3 Baseline Hazard: The Odds Gompertz Model

In discrete time model, if one uses dummy variables for every term (Cox model), one does not have to assume any shape of baseline hazard. Since events may be relatively rare for some terms, however, estimates of these dummies are less efficient. Besides, my primary interest does not lie in the exact shape of baseline hazard but in whether it increases or decreases as a legislator serves for more terms. Then, it suffices to model log odds of baseline hazard as a linear function of the number of terms: $h_{r(0)}(t) = \exp(\gamma_{rc} + \gamma_{rt}t)$, where γ_{rc} is a constant term and γ_{rt} is a time dependence parameter. This can be regarded as discrete time version of the Gompertz model, where log, not log odds like the present model, of baseline hazard is a linear function of time. Thus, I call this the odds Gompertz model.

2.2.4 Repeated Events: The Conditional Variance-Corrected Model

Even if lawmakers retire or are defeated at an election once, they may be elected and enter the risk set again. Thus, we may observe repeated events per a single subject. Though there are a few methods to model repeated events, I follow the conditional variance-corrected model. In this model, a subject belongs to different duration levels[4] which depend on the number of previous failures and where baseline hazards are different (The same covariates are used for the same risk hazard even if duration levels are different). Also, a subject begins to be at a higher duration level only after it experiences the previous duration level event (this is called left truncation). For example, let us consider a legislator loses an election at $t = 2$, are elected again and retires at $t = 4$. I denote baseline hazard of duration level l by $h_{r(0|l)}(t)$. Then, this lawmaker survives $h_{r(0|l=1)}(t = 1)$, fails to overcome $h_{r=3(0|l=1)}(t = 2)$, enters the second duration levels at $t = 3$, not restart from $t = 1$, and survives $h_{r(0|l=2)}(t = 3)$, and fails to overcome $h_{r=2(0|l=2)}(t = 4)$. The Diet member is never at risk of $h_{r(0|l=2)}(t = 1, 2)$.

Here, I use elapsed time since entry to the first duration level, not interevent time since

[4]In the conventional term of survival analysis, what I refer to as different duration levels are called strata.

exit from the previous duration level; that is, time counter in the next duration level restarts from the time when the previous duration level ends, not from one again. Duration time "clock" just stops, is not reset (Box-Steffensmeier and Jones, 2002). It is reasonable (at least in Japanese politics, unlike American Congress committee seniority) to consider that, for example, a legislator, who serves five terms, retires, and get elected again, face the same risk as those who serve one terms, retires, get elected again, and serve four more terms (the same elapsed time, $t = 6$), not as those who serves one terms, retires, get elected again (the same interevent time, $t = 1$).

I assume odds of baseline hazards of the same risk but different duration levels are proportional to each other. In addition, since there are not so many observations of the third or higher order duration levels and they would make estimation inefficient, I collapse all of them into the second duration level. For whatever reason representatives exit once, they would enter the second duration level for all risks. In the above example, the legislator is at risk of $h_{r=1,2(0|l=2)}(t = 3)$, not $h_{r=1,2(0|l=1)}(t = 3)$ even if the legislator has experienced neither death nor retirement up to the third term. Then,

$$h_{r(0)}(t) = \exp(\gamma_{rRe}Re)\exp(\gamma_{rc} + \gamma_{rt}t) = \exp(\gamma_{rc} + \gamma_{rt}t + \gamma_{rRe}Re)$$

where Re is a dummy of the second duration level and $\gamma_{rRe}Re$ is a reentry parameter.

2.2.5 Nested Independent Competing Risks

To be accurate, early exit (E_1) is composed of two events: death and other events such as resignation. It is reasonable to consider that death and other early exits are independent of each other. Let hazard of death and that of other early exit denoted by $h_{1(d)}(t|x_1)$ and $h_{1(e)}(t)$, respectively. Since I divide these two risk in order to purify death hazard by purging other ones, the latter is not quantity of political interest and is modeled not with its own covariates but only as baseline hazard.

Though Box-Steffensmeier and Jones (2004, 168-75) introduce multiple binomial logistic regressions and single multinomial logistic regression using all observations for independent competing risks, the former is not appropriate. Multiple binomial logistic regressions do not constrain the data generation process so that only one event is observed. Thus, I use single multinomial logistic regression. I parameterize these as follows.

$$
\begin{aligned}
h_1(t|x_1) &= h_{1(d)}(t|x_1) + h_{1(e)}(t) \\
h_{1(d)}(t|x_1) &= \frac{\exp(x_1\beta_1)h_{1(d)(0)}(t)}{1 + \exp(x_1\beta_1)h_{1(d)(0)}(t) + h_{1(e)(0)}(t)} \\
h_{1(e)}(t) &= \frac{h_{1(e)(0)}(t)}{1 + \exp(x_1\beta_1)h_{1(d)(0)}(t) + h_{1(e)(0)}(t)} \\
h(t|x) &= \begin{cases} h_{1(d)}(t|x_1) & \text{if death occurs} \\ \\ h_{1(e)}(t) & \text{if other early exit occurs} \end{cases}
\end{aligned}
$$

2.2.6 Likelihood and Left Truncation

Generally speaking, in discrete time model, an observation of a legislator i at term t appears in the dataset only if the legislator survives the previous terms. I denote the likelihood of legislator i's exit type y at term t by $L_i(y|t)$. When any event occurs,

$$
\begin{aligned}
L_i(y > 0|t) &= p[y_{1i} + y_{2i} + y_{3i} = 1, min(T_{ri}) = t|min(T_{ri}) \geq t] \\
&= h(t)_i
\end{aligned}
$$

By contrast, when no event occurs during the term, the lawmaker is reelected and survives, and the term is censored. Then,[5]

$$
\begin{aligned}
L_i(y=0|t) &= 1 - \sum_{r=1}^{3}[h(t|y_r=1)_i] \\
&= [1-h_1(t)_i] \times [1-h_2(t|)_i] \times [1-h_3(t|)_i]
\end{aligned}
$$

Besides, the present data observation begins in 1947 and prior terms are not observed (left truncation). Thus, prewar legislators' term counts from greater than one, even though that term is the first appearance in the dataset. Suppose a legislator i is observed from t_{is} to t_{ie} and there are n legislators. Then, total likelihood L is

$$
L = \prod_{i=1}^{n} \prod_{t=t_{is}}^{t_{ie}} L_i(y|t)
$$

3 AN APPLICATION TO THE JAPANESE CASE

3.1 Data

Dataset is about members of the House of Representatives in Japanese Diet from the 1947 general election (when the current constitution was established) to the 1990 general election. There are 16 electoral terms, $n = 1939$ members, and $N = 7805$ observations (member-term).[6]

[5]This is conditional survival function.

[6]I make this dataset by referring to Shugiin and Sangiin (1990), which is the official record of Diet members and most comprehensive in this kind. Basic summary and detailed coding scheme of the dataset is introduced in Fukumoto (2004). Fukumoto (2003) performs survival analysis of discrete time of year to figure that the difference between members of both houses which is caused by institutional design.

3.1.1 Dependent Variables

TYPE represents exit type (y). Among all observations, death (TYPE=1(d)) is 2.7%, other early exit (TYPE=1(e)) is 1.1%, retirement (TYPE=2) is 4.7%, Electoral defeat (TYPE=3) is 21.0%. Censored cases (reelection, TYPE=0) is 70.4%.

TERM is the number of terms for which the legislator has served (t). *LEVEL* is the number of times the legislator has exited plus one. Among all members (not observations), mean of maxima of TERM is 4.5 and 64.3% of them experience at most one exits (LEVEL=1).

3.1.2 Covariates for Death Hazard

There are two covariates for death hazard (x_1). *AGE* is measured by year (by month divided by 12) at the time when the legislator enters the Diet in the term (which is not the same as the general election if they are elected through by-election). *EXPOSURE* is length of the term from members' entry into the Diet to the next general election by year (not to the actual early exit, e.g., due to death). I expect that, the older they are or the longer they are exposed to death risk during the term, the more likely they are to die. Thus, both coefficients should be positive.

3.1.3 Covariates for Retirement Hazard

As for retirement hazard covariates (x_2), I use five opposition party dummies: from left, *COMMUNIST*, *SOCIALIST*, *CENTRIST* (the Democratic Socialist Party), *BUDDHISM*, and *OTHERS* (other miscellaneous parties and independents). Reference party is the LDP, which is the most right party. According to Organizational Party Hypothesis (H3b), I predict that members of COMMUNIST, SOCIALIST and BUDDHISM tend to retire more frequently than other parties and coefficients of these three dummies are positive.

3.1.4 Covariates for Electoral Loss Hazard

Many covariates (x_3) explain electoral loss hazard. First, the number of votes the legislator gets in the previous election, v, seems to be a promising factor. We should, however, pay attention to the electoral system, the single non-transferable voting system (SNTV). Here, each district returns $3 \leq M \leq 5$ members though a voter has one non-transferable vote. Thus, the same number of votes means different electoral strength depending on the district size. Though a few measurement of electoral strength are proposed, I pick up Cox and Rosenbluth's (1995) proportion to Droop quota and define it as *VOTE*:

$$VOTE = \frac{v}{\left(\frac{\sum v}{M+1}\right)}$$

where $\sum v$ is the total number of votes all legislator in the district get. Droop quota is the sufficient number of votes to be elected.[7] Besides, if a lawmaker is elected through by-election, VOTE may be overevaluated reliable because only one seat is fought over. Hence, a dummy variable *BY-ELECTION* is included.

Those who have experienced local public office may have stronger hold of votes. A dummy variable *LOCAL* is one if the legislator used to be members of local parliament, mayor, or governor before coming to the Diet.

Representatives who are born and grown up in the district have more stable social network to mobilize in the electoral campaign. *OUTSIDER* is a dummy variable which indicates the lawmaker's registered original address (*honseki*, in Japanese) is not in the same prefecture as the district.

Last, the same five opposition party dummies as retirement hazard covariates are included. From the above, coefficients of party dummies (Opposition Party Hypothesis (H3a)) and OUTSIDER are positive, while others are negative.

[7] As the data source of the number of votes, I refer to Kawato and Kawato (1997) and Reed (1992).

3.2 Results

Table 1 reports the results.[8] In the following, I examine those parameters only which are significantly different from zero. Quantities of most interest are time dependence parameters of baseline hazard, γ_{rt}'s, and between-hazards dependence parameters, δ's.

3.2.1 Different Time Dependence of Competing Risks

Figure 1 depicts baseline hazards along electoral TERMs by duration LEVELs when covariates are set at its mean values (for continuous variables) or zero (for dummies) (which are referred to in the fourth column in Table 1 as x_{from} and I call the reference values). As Hypothesis H1s predicted, among time dependence parameter of baseline hazard, γ_{rt}'s, only γ_{3t} for electoral defeat is negative. That is, the longer Diet members serve (larger TERM, t), the less likely they are to fail to be reelected (smaller hazard, $h_3(t)$). Therefore, Seniority System Hypothesis (H1a) is confirmed. Baseline Hazards for death or retirement ($h_{1(d)}(t)$ and $h_2(t)$) are constant (once AGE is controlled). Thus, Ordinary Mortality Hypothesis (H1c) and Professionalization Hypothesis (H1b) are verified. Besides, once they exit, they get more vulnerable at the election ($\gamma_{3Re} > 0$) but less willing to retire ($\gamma_{2Re} < 0$).

3.2.2 Dependence between Competing Risks

All between-hazards dependence parameters, δ's, are positive. Figure 2(1) shows how each hazard at the first term (TERM=1) of the first duration level (LEVEL=1) changes when the linear predictor of covariates for death hazard ($x_1\beta_1$) moves from its empirical minimum to maximum and covariates for other hazards (x_2, x_3) are set at their reference values in the previous paragraph. Figure 2(2) is the case where $x_3\beta_3$ moves and $x_1 as well as x_2$ take the reference values. The more likely legislators are to fail to be reelected (larger electoral hazard, h_3), the more likely they are to retire (larger h_2 and positive δ_{32}. See Figure 2(2)).

[8] I write codes and estimate parameters of the model on a statistics software `R`.

	Est.	St.D.	p	x_{from}	x_{to}	Δh_1	Δh_2	Δh_3
Baseline Hazard								
$\gamma_{1(e)c}$	−4.44	0.11	0.00					
$\gamma_{1(d)c}$	−9.20	0.76	0.00					
$\gamma_{1(d)t}$	0.03	0.03	0.23					
$\gamma_{1(d)Re}$	−0.01	0.15	0.96					
γ_{2c}	−9.02	0.59	0.00					
γ_{2t}	0.01	0.02	0.56					
γ_{2Re}	−0.27	0.12	0.03					
γ_{3c}	0.32	0.25	0.21					
γ_{3t}	−0.14	0.01	0.00					
γ_{3Re}	0.41	0.07	0.00					
Dependence								
δ_{12}	1.56	0.27	0.00					
δ_{13}	0.42	0.08	0.00					
δ_{23}	0.81	0.10	0.00					
Death								
AGE	0.08	0.01	0.00	54.50	64.50	1.90	4.50	6.40
EXPOSURE	0.33	0.06	0.00	2.70	3.70	0.60	1.30	2.60
Retirement								
COMMUNIST	−0.02	0.33	0.96	0.00	1.00	0.00	1.60	15.70
SOCIALIST	0.54	0.15	0.00	0.00	1.00	0.00	1.70	1.60
CENTRIST	−0.01	0.28	0.96	0.00	1.00	0.00	−0.10	−0.30
BUDDHISM	1.43	0.28	0.00	0.00	1.00	0.00	6.00	−0.10
OTHERS	0.17	0.34	0.61	0.00	1.00	0.00	1.10	6.40
Electoral Loss								
VOTE	−3.81	0.19	0.00	0.90	1.10	0.00	−1.00	−11.60
BY-ELECTION	−0.53	0.38	0.16	0.00	1.00	0.00	−0.70	−8.50
NEIGHBOR	0.02	0.09	0.80	0.00	1.00	0.00	0.00	0.40
LOCAL	0.03	0.06	0.65	0.00	1.00	0.00	0.00	0.50
COMMUNIST	0.73	0.15	0.00					
SOCIALIST	0.09	0.07	0.23					
CENTRIST	−0.01	0.13	0.91					
BUDDHISM	−0.01	0.15	0.97					
OTHERS	0.32	0.15	0.03					

Table 1: A Systematically Dependent Competing Risks Model of Japanese Legislators' Exit

Strategic Retirement Hypothesis (H2a) is affirmed. Those who are at higher risk to die (larger h_1) also are prone to retire (larger h_2 and positive δ_{12}) and not to be reelected (larger

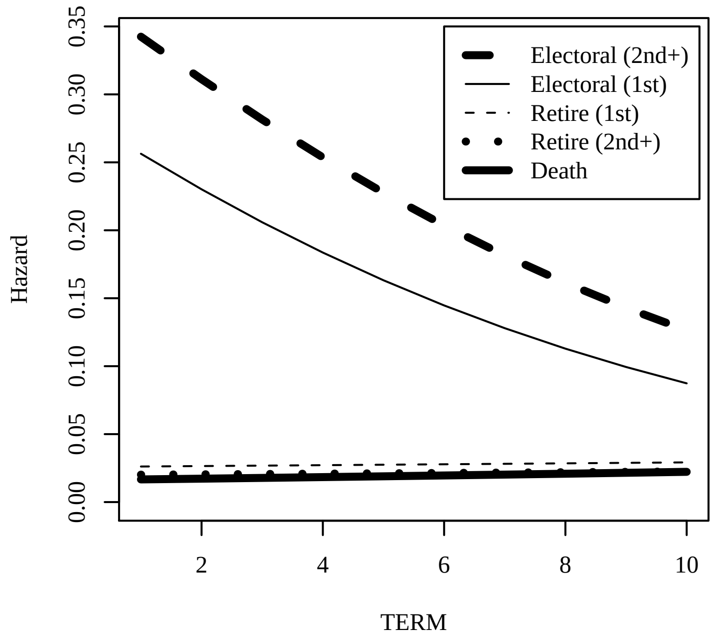

Figure 1: Time Dependence of Baseline Hazards by Risk

h_3 and positive δ_{13}. Since δ_{13} is smaller, h_3 in Figure 2(1) is flatter than other hazard curves). Physical Decay Hypothesis (H2b) is concluded.

3.2.3 Covariates

How about covariates for each hazard? Signs of all coefficients are as expected if they are significantly different from zero. Table 1 includes first differences (Δh_r's, in percentage) which is change in hazard at the first term (TERM=1) of the first duration level (LEVEL=1) when one covariate moves from its reference value (x$_{from}$) by one standard deviation (to x$_{to}$, for continuous variables) or from zero to one (for dummies) and other covariates remains at the reference values: $\Delta h_r = h_{r(0|l=1)}(t = 1|x_i = x_{to}, x_{-i} = x_{from}) - h_{r(0|l=1)}(t = 1|x_{from})$

A 10 years older (AGE) representative has 1.9 points larger death hazard ($\Delta h_1(d)$). AGE

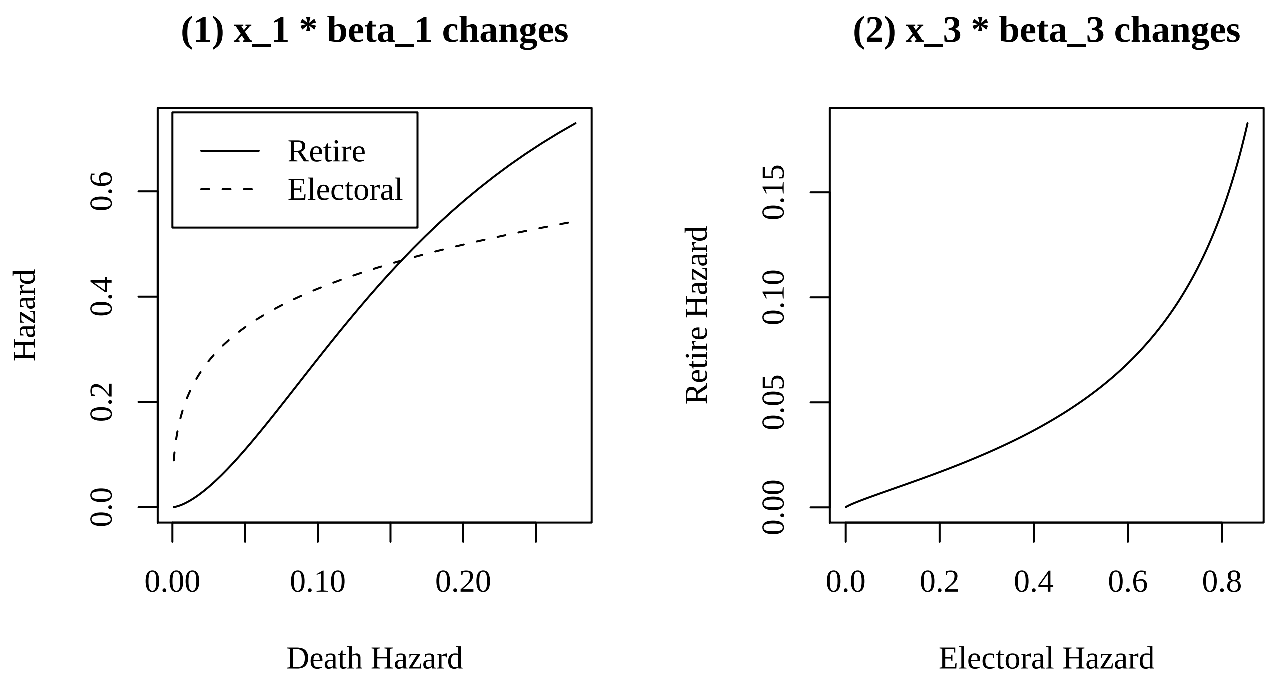

Figure 2: Dependence between Competing Risks

also has effects on retirement and electoral hazards, though these are indirect one through between-hazards dependence parameters. Since I have already examined them, I do not repeat them here and similar cases in the following. One year longer term (EXPOSURE) increases death hazard by 0.6 points.

Retirement hazards (Δh_2) of members of BUDDHISM party and SOCIALIST are 6 points and 1.7 points higher than the LDP, respectively. Organizational Party Hypothesis (H3b) is established.[9]

When the number of VOTEs increase from 90% of the sufficient number (Droop quota) to its 110%, electoral hazard (Δh_3) dramatically ameliorates by 11.6 points. COMMUNISTs

[9]The effect of COMMUNIST on electoral hazard reaches retirement hazard through dependence parameter δ_{32}. That may be why the coefficient of COMMUNIST on retirement hazard does not seem to be significant.

and OTHER minor parties members have 15.7and 6.4higher hazards than the LDP, respectively. Other opposition parties are as electorally strong as ever dominant LDP. Opposition Party Hypothesis (H3a) is not supported by the data. Legislators who are elected through BY-ELECTION, are OUTSIDERs, and have LOCAL politician experience, do not have different electoral hazard from the others, either.

CONCLUSION

When, how and why do legislators exit from the legislature? Most of my hypotheses are confirmed analyzing the Japanese case.

Time dependence of exit risks are different. First, electoral loss risk decreases as they serve for a long time. This is caused by seniority system, which allocates fewer resources to junior members and make them more vulnerable in the election. Second, in the age of professionalized legislature, retirement risk is constant, not high in the initial stage as it used to be, because membership is too attractive to quit. Third, death risk has nothing to do with political career, once age is controlled. Politicians are just as biologically mortal as ordinary people.

These three risks are dependent on each other. Lawmakers strategically retire when they find their electoral prospect to be bad. Those who come near dying also can neither afford to run nor win in the election due to the same physical decay.

Organizational parties are more likely to force members to retire than cadre parties. The former has more political power over their members, while the opposite is the case in the latter. Against my expectation, even perpetual opposition party members do good electoral job, once they enter the legislature.

In order to show that these hypotheses are true, I construct a systematically dependent competing risks model of survival analysis. This enables us to estimate more than two dependent competing risks, which is almost impossible for currently popular frailty model. My model also takes into consideration non-random censoring and ordered risks structure. Political science is full of cases whose data generation process is well represented by dependent competing risks model. To name only a few, cabinet resolution, war or peace duration, and survival of administrative organization are promising applications.

I hope this paper contributes to legislative studies as well as political methodology, though there remain a lot of problems. I just mention only a few here. Causal mechanism among risks has to be studied more deeply and there should be other covariates to explain hazards' variation. Especially, politicians' activity during the term such as legislation, pork, or public office holding (say, chairmanship) may well affect their returnablity. In pursuing them, methodologically, it is desirable and (probably) possible, but not yet done, to combine my systematically dependent risks model and stochastically one such as frailty model. They are not exclusive. But these are future agendas.

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