The Impact of Individual and Collective Performance on Ministerial Tenure

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June, 2009

Abstract. Government ministers in Parliamentary democracies are career politicians for whom public service is an important source of motivation. The length of their tenure is controlled by the Prime Minister. We test a simple Principal-Agent model of parliamentary government in which the Prime Minister evaluates her ministers according to information available to her that is related to their performance. We study the effects of individual and collective ministerial performance on the length of time a minister serves in British government over the period 1945-97. We use the number of resignation calls for a minister as an individual performance indicator and the cumulative number of such calls as an indicator of government performance. A minister's hazard rate increases sharply after the first individual call for resignation and is decreasing in the cumulative number of resignation calls. These results are consistent with the Principal-Agent model and with the use of relative performance evaluation by the Prime Minister.

JEL classification: D72.

Keywords: Ministers; Principal-Agent; Tenure; Performance; Politicians; Great Britain.

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1. Introduction

In a parliamentary system, attaining ministerial status represents the peak of a political career. Whatever motivates entry to parliament – a desire for office perks, policy influence or social standing – achieving these goals means attaining ministerial status and maintaining it. Few ministers leave office voluntarily; when their stated reason for exit is a desire to spend more time with their family, few political commentators give such views much credence. Moreover, government ministers are rarely deselected by their constituents. Exit from ministerial life comes either when the government the minister serves is defeated (either by vote of confidence in the parliament or election of the opposition) or when a minister is fired due to perceived negligence or incompetence on his part. Adopting Diermeier, Keane, and Merlo (2005)'s parlance, government ministers in parliamentary democracies are "career politicians": they desire government service, and once appointed wish to remain in office for as long as possible.

Serving country and party is an important source of (intrinsic) motivation for a minister. However, this does not preclude the existence of an incentive problem between the Prime Minister and her ministers, as their objectives (or payoff functions) are not necessarily aligned.[1] In this context, the threat of dismissal gives the Prime Minister a powerful incentive device: she decides how long a minister will serve under her. We explore to what extent a minister's tenure is affected by the arrival of information about his performance and that of the government he serves. We ask whether the relations we observe are consistent with the theory of incentives according to which a principal (the Prime Minister) uses all evidence available to her to evaluate the performance of her agents (ministers).

Using data on the tenure of all ministers who have served in British government in the period 1945-97, we estimate Proportional Hazard models that condition on individual and government attributes. Our individual performance indicator is the number of resignation calls a minister faces during his time in office, as reported in the press. If someone in Parliament, media, or some non-political organization suggests the minister should resign, then it is defined as a "resignation call". The issue at stake might be directly related to aspects of a minister's task or to that of his department, or related to personal aspects

[1]Following standard use in principal-agent modeling we use the female pronoun for the principal (in this paper, the Prime Minister) and male pronoun for agents (in this paper, the minister).

of his behavior such as personal or financial misdemeanors. Our aggregate performance measure is the cumulative number of such calls by government.

We show that the hazard rate of a minister increases when he faces a resignation call with a steep increase in the probability of leaving government after a first call. Perhaps more surprising is that the hazard of any given minister is affected not only by his own performance, but also by that of his colleagues. Our main finding is that the hazard rate of a government minister decreases whenever the cumulative number of resignation calls for the government as a whole increases. This result is consistent with the use of relative performance evaluation by the Prime Minister, and is robust to a variety of different specifications of our model that control for observed and unobserved ministerial traits and features of the government in which a minister serves.

We provide a brief overview of our theoretical framework and related literature in Section 2. In Section 3, we explain the role of British ministers. In Section 4, we introduce our data and provide some descriptive statistics. In Section 5, we describe our empirical specification and in Section 6 present our results. Section 7 then concludes.

2. Performance and Tenure

Our work is related to a literature that uses principal-agent theory to understand the multiple relations in parliamentary democracies (see Strøm, Muller, and Bergman (2003)). This framework was developed by Strøm (1985), who described the existence of key agency relationships that link the chain of delegation in which civil servants are directly responsible to ministers, who in turn are responsible to the Prime Minister, who must maintain the confidence of the parliament, and ultimately the support of the electorate.[2]

Our analysis is in line with recent work that focusses on the moral hazard issue of policy implementation. In comparing parliamentary with presidential regimes, Strøm (2000) argues that, "parliamentary regimes may be better equipped to deal with problems of adverse selection.....the weaker capacity for ex post monitoring leaves parliamentarism more exposed to moral hazard." These issues may arise when government ministers represent parties with conflicting ideological interests and different institutional mechanisms allow for the partial resolution of such problems. For example, Thies (2001) focusses

[2]A wider theoretical analysis of principal-agent relations in politics and public life is given by Besley (2006).

on the division of ministerial posts within coalitions whereby senior ministers from one governing party are shadowed by junior ministers from another. Martin and Vanberg (2004) emphasize the role of parliamentary scrutiny. They show that proposals on which the government is divided take longer to pass than bills over which there is consensus amongst the governing parties.

Such ideological conflicts are less pertinent, though not entirely absent, in single-party governance. However, this does not preclude the existence of agency problems that may arise due to misalignment of incentives between the Prime Minister and her ministers. Relative to the concerns of the Prime Minister, a minister may place more weight on tasks that are uncorrelated with government performance. For example, relative to what the Prime Minister would have him do, a minister may wish to allocate more time to building relations within the party or with outside interests and less to developing government policy. An incentive problem arises as the Prime Minister does not directly observe the effort of her ministers which determines the outcome of a ministerial task. Instead, she observes a variety of performance measures such as, for example, the success or failure of the minister's policy initiatives and media evaluations of his performance.

Our focus is on a simple instrument that a Prime Minister has at her disposal: she decides how long a minister will serve under her and the threat of dismissal provides her with an incentive device that can align ministers' interests with her own. Our paper thus relates to a growing political science literature that investigates the causes and effects of ministerial turnover: Indridason and Kam (2008) have shown that cabinet reshuffles can be used to bring departmental spending under control; Dewan and Dowding (2005) showed that a Prime Minister has an incentive to respond to political scandals by firing the minister involved in order to correct for the negative effect of scandals on government popularity; and Dewan and Myatt (2007) showed that the prime minister can adopt a firing rule that provides incentives for ministers to implement desirable policy innovations. Huber and Martinez-Gallardo (2008) look at turnover in light of a Prime Minister's search for talented ministers, and Dewan and Myatt (2008) explore the determinants of the Prime Minister's firing rule when she has a limited supply of talented ministers available.

Although all Prime Ministers have control over this instrument, its use varies across parliamentary democracies. In multi-party governments the ability of the Prime Minister to

use her power to hire and fire is severely constrained by the need to maintain support of coalition partners. In Westminster systems, by contrast, the Prime Minister is usually head of a single-party government that almost always commands a parliamentary majority. The British Prime Minister, for example, has unusual flexibility and discretion in hiring and firing ministers; she is not subject to pressures from coalition partners, nor need she worry about negotiating the legislative survival of a minority government. Here we relate the Prime Minister's use of her firing prerogative to both the performance and tenure of ministers who serve under her, viewing the relationship between a Prime Minister and her ministers as one between principal and agent in which the Prime Minister provides incentives for better performance by her ministers through ministerial turnover.

How does the Prime Minister wield this instrument? The theory of incentives says that the principal should reward or punish an agent using any performance measure that (conditional on the other measures of performance used) has a positive informational content (Gibbons, 2005; Baker, Gibbons, and Murphy, 1994; Holmström and Milgrom, 1979; Holmström, 1982, 1979). The weight they should receive in the reward scheme will depend on the responsiveness of these measures to effort and quality of the agent, the degree of alignment of these measures with the objectives of the principal, and the level of risk they involve. *Ceteris paribus*, the more responsive, the higher the degree of alignment, and the lower the risk involved, the more weight the reward scheme should place on those measures.

Straightforwardly we can think of a contract which specifies tenure as a function of a set of observed indicators. For example, we might believe that a resignation call is more likely to occur when the performance of a minister falls below some threshold. It signals that perhaps the minister concerned was distracted by issues other than performing at his government task. Importantly, a resignation call may provide information to the Prime Minister that was not available when she appointed her minister. As such a resignation call serves as a discrete indicator of ministerial performance and, intuitively, we would expect the relationship between it and observed tenure to be negative; a call for a minister to resign leads to shorter tenure, since a Prime Minister will sometimes accede to that call.

Of course, no performance measure is perfect. A resignation call is a noisy signal of the minister's performance, compounding features for which he is rightly responsible in his

capacity as minister with subsidiary factors, or random shocks, beyond his control. To illustrate, consider, for example, the issue of homeland security which in the British system of government is the responsibility of the Home Secretary. Suppose that a terrorist attack takes place on a particular day. The fact that the attack is successful may reveal vulnerabilities in preparation, flaws in information processing and in communication between departments, all of which are related to ministerial performance. But of course, whether a terrorist attack succeeds might be due to factors that are not under the control of the minister, such as the vigilance of the public. Furthermore, it is not always clear how accountable is the minister responsible at the time a problem emerges: the blame may be better directed at a previous incumbent.

Since a resignation call is a noisy signal of the minister's performance, the Prime Minister will likely include additional measures in her reward scheme. Random shocks which might affect the performance of a minister are likely to be correlated across government departments: an economic downturn caused by a change in oil prices can lead to a tightening of the budget and to pressures on service delivery across departments; a health scare, such as a virulent new flu strain, could affect health services, transport and education, amongst other things. Whereas different ministers are responsible for these areas, their performance is conditional on a common shock and the evaluation of that performance should reflect this common cause. Thus, one measure which might be used in addition to an individual performance measure is the performance of other ministers: if a minister is seen to fail at a time when others falter also, his performance may not be judged so harshly; conversely, if a minister is seen to succeed when others around him flounder, then his performance will be judged more positively. Indeed, to the extent that the performance of others can help eliminate noise in any individual measure of performance, it may be a good idea to include them in the reward structure of an agent.

In theory these shocks may be observed by a Prime Minister when deciding whether to fire or to retain a particular minister. In practice, and in order to test this theory, we would require measures for every possible common shock but this is not feasible. Nevertheless we can use a single measure which encompasses many of these common causes. As our measure we use the cumulative number of resignation calls over a government's life span.

We think that our cumulative, rather than an instantaneous measure, of collective performance might be a natural way for a Prime Minister to aggregate the relevant information. For example, whereas the performance of health and emergency services could be immediately assessed in light of a flu outbreak, the effects on educational performance (such as test scores) would be felt some time thereafter.

Our framework allows us to explore the relationship between the length of ministerial tenure and the performance of government ministers. Tenure has previously been studied by Berlinski, Dewan, and Dowding (2007) who showed that in the UK, individual characteristics such as ministerial experience, educational background, and gender, are strong predictors of the length of ministerial tenure even when controlling for various aspects of the governments in which ministers served. However, their approach does not identify how the arrival of information about the performance of the minister and the government he serves affects length of service; provides no insight into the strategic use of a Prime Minister's power of dismissal; and cannot separate the effect of background characteristics from performance.[3]

3. Background: The Role of Ministers in Britain

Before moving on to discuss our data and results we provide a brief overview of the British case under investigation. In the British system, which is the archetype of the Westminster model, government departments are led by ministers who are responsible for developing and implementing policy, though policy decisions are taken by a cabinet under the auspices of the Prime Minister.

Large departments are headed by full cabinet ministers (the most prestigious position in government), and also have lower-ranked ministers (we define them 'ministers of cabinet rank') with specific responsibilities. Ministers of cabinet rank head some smaller departments.[4] The third rank is 'junior minister'. Also subject to government discipline are

[3]Whilst our focus is on the impact of politicians' performance on tenure, a related question is the impact of tenure on performance. Padro í Miguel and Snyder (2006) analyze data from the North Carolina House of Representatives and show that a legislator's effectiveness is increasing in tenure.

[4]We define them as 'ministers of cabinet rank' since they can make presentations to the full cabinet in areas of their responsibility. Most of them are officially called 'Ministers of State' though some full cabinet ministers also have that title.

whips, whose main role is to ensure MPs vote in line with the government and to signal backbench discontent to the cabinet. The Chief Whip is on the government payroll and nowadays tends to be a member of the cabinet. The size of the full cabinet has not varied much since the Second World War, ranging from 18 to 23, though the government payroll has increased from approximately 80 in 1950 to approximately 110 in 2005 (Berlinski, Dewan, Dowding, and Subrahmanyam, 2008). Although most ministers are drawn from the House of Commons (that is, they are elected by popular vote), Ministers of State and junior ministers are sometimes drawn from the Lords in order to give that House a spokesperson for every departmental brief.

Under the British Constitution ministers hold their position at the pleasure of the Crown and are appointed on the recommendation of the Prime Minister (Jennings, 1959). There are no rules governing whom a Prime Minister can choose as a minister, though as they are accountable to parliament they should be drawn from one of its two houses. There is no formal investiture of ministers or government and no confidence vote in new ministers or government. Governments can face a motion of no confidence tabled by the opposition, or a Prime Minister can let it be known that a vote on a given bill is a vote of confidence.[5] Ministers are bound by the twin doctrines of individual and collective ministerial responsibility: under the former they are responsible for their own behavior and for the performance of their departments; under the latter they must be willing to defend government policies in public.

Conditional on the survival of the government, the length of time a minister serves is determined by the Prime Minister who may fire and bring in new faces as political and other circumstances allow. In making these decisions a Prime Minister is primarily concerned with the re-election of her government. A government where ministers perform well is more likely to be re-elected and so good ministerial performance provides an incentive for the Prime Minister to retain the minister. Thus one might view the length of time served as reward for ministerial performance. Whilst this implicit contract cannot be enforced in the courts, evidence of its existence may be found in the data; put simply, those ministers who perform more ably should survive longer than those whose performance is below par. Due to these clear objectives as well as the relatively unconstrained nature

[5]However, it is also known that to lose a vote on some aspects of legislation, such as a budget, would, in practical terms, be equivalent to a vote of no confidence.

of the British Prime Minister's powers, the British data presents a useful starting point for the analysis of the agency relations described earlier.

4. Data and Descriptive Statistics

To assess the empirical relevance of our argument we analyze data on all British ministers from 1945 to 1997. In all, our analysis spans nineteen terms from the first Attlee administration until the end of John Major's second term. Each minister is coded according to rank, the government and the Prime Minister under which he serves.[6] Each minister is also coded for date of birth, education, gender, and whether or not the minister is ennobled. Table A1 of the *Appendix* provides the definitions of each of the variables used in the analysis and provides basic descriptive statistics for the whole sample.

We analyze the length of time that elapses from when a minister enters government until he leaves or the government terminates. A minister leaves the government following an individual resignation or following a reshuffle. We treat the end of a government term as occurring either when there is an election or when there is a change of Prime Minister. We treat the starting day for each minister as occurring two weeks from the day the government is formed, thus allowing for a period during which the Prime Minister might shuffle her cabinet. Similarly, we censor all ministers two weeks before the end of government to avoid problems generated by coding errors at the end of governments.[7] For simplicity we refer to ministerial spells as ministers from now on.

As a performance measure we use a call that is made for a minister's resignation. This data has been collected from *The Times* newspaper which provides the most systematic data over the time period with an online coverage for the whole period. For later years, where coverage is available, other newspapers were consulted online via Lexis. We found that all calls by serious commentators or editorials in major newspapers had also been reported in *The Times*. As the language of Parliament and the press has not remained

[6] Virtually all ministers that appear in Butler and Butler (2000) are included in our sample. The very few ministers that were excluded lack information on age or there were inconsistencies in Butler and Butler (2000) that we were not able to rectify from other sources.

[7] We chose this rule since Butler and Butler (2000), from which we get most of our data, report different end dates for ministers following the formation of a new government. Some are given as ending just before the new government forms. There are no cases of genuine resignation during the last two weeks of government.

TABLE 1. Number of resignation calls for British ministers facing resignation calls between 1945 and 1997.

Resignation calls	1945-1997	1945-1970	1970-1997
One	105	34	71
Two	43	13	30
Three or more	10	2	8
Total	158	49	109

[a] Description of variables in Table A1

constant over the period we coded not only those cases where an explicit call for a resignation was made, but also those where the minister was "severely criticized", described as "being in difficulty" or asked to "consider his position". All of these cases are referred to as "resignation calls". A resignation call is recorded on the date the issue first came to light. If a minister is asked to resign repeatedly over the same issue and without new information coming to light we record only one resignation call for this issue. Fuller details are provided in the *Appendix*.

As we can see from Table 1, there are 158 ministers for whom a resignation call is made. Of these, 105 receive only one such call, 43 receive two, and only 10 receive 3 or more. Ministers with more than one resignation call in our data are ministers whose second call is related to: (i) an issue different to that raised in their first resignation call; or (ii) new damaging information that is revealed about the first call, thus leading to a renewal of the initial call for resignation. In total there are 225 resignation calls in the data. The ministerial spells we observe are evenly split between the periods $1945-1970$ and $1970-1997$. In the latter period there are a larger number of resignation calls with a more or less proportional increase in the number of ministers receiving one, two or more such calls. Thus we observe that resignation calls have grown over time and this may be due to governments facing ever closer scrutiny from the media.

Of the 225 resignation calls we record, only a minority are related to either personal (16) or financial (12) misdemeanors. By contrast 111 resignation calls are due to perceived problems in the running of the minister's department or some perceived failure of policy. Under the doctrine of collective ministerial responsibility a minister must resign if he is

TABLE 2. Resignation calls by reason

Ministerial or departmental error	111
Personal or Financial scandals	28
Policy disagreement	70
Other controversy	16
Total	225

[a] Description of variables in Table A1

unable to publicly defend government policy, and some resignation calls (70 in all) reflect such perceived divisions in the government ranks. It may not be immediately clear that such issues fall under our account of performance evaluation. However, the extent of a minister's opposition to a bill may not have been foreseen by the Prime Minister at the time of making the appointment. The resignation call may provide new information about the loyalty of a minister and add to the embarrassment of the government as a whole. Information on the breakdown of resignation calls by type is recorded in Table 2.

As an aggregate measure of government performance we use a cumulative index of resignation calls over the period the government is in office. Table 3 shows the total number of resignation calls that are made during the course of each government. The largest number of resignation calls (33) came under John Major's second premiership, though both Wilson (1966-70) and Thatcher (1979-83) led governments in which there were more than 20 calls. Table 3 also records the duration of each government in months, ranging from the shortest of 2 months under Eden in 1955 to the longest of 55 months under Attlee from 1945. Finally, Table 3 records basic information about the number of government ministers by government which ranges from a minimum of 75 in Attlee's 1945 government, to a maximum of 109 in John Major's second government.

We aim to improve our understanding of ministerial tenure by focussing on individual ministerial performance and the collective performance of the government. We initially explore these effects in Figure 1 and 2, where we plot the ministerial survivor functions for our sample of ministers. The survivor function denotes the probability that the time to an event is greater than some time interval of length t. Equivalently, the survivor function shows the proportion of the sample surviving beyond some specified time-point,

TABLE 3. Resignation calls by government duration and size

Government	Resignation calls	Government duration (months)	Government size
Attlee 1945-50	9	55	75
Attlee 1950-51	12	20	83
Churchill 1951-55	6	41	78
Eden 1955	0	2	82
Eden 1955-57	6	19	81
Macmillan 1957-59	10	33	80
Macmillan 1959-63	19	48	81
Douglas-Home 1963-64	2	12	90
Wilson 1964-66	5	17	106
Wilson 1966-70	23	50	111
Heath 1970-74	12	44	82
Wilson 1974	3	7	85
Wilson 1974-76	15	18	104
Callaghan 1976-79	12	37	108
Thatcher 1979-83	21	49	101
Thatcher 1983-87	17	48	99
Thatcher 1987-90	16	41	103
Major 1990-92	4	16	106
Major 1992-97	33	61	109

[a] Description of variables in Table A1

in the sense that, for that proportion of the sample, the event has not occurred at t. For convenience, we plot the survivor functions for ministers with time recorded as months.

Figure 1 explores the effect of our individual performance measure on ministerial tenure. It provides a graphical representation of the survival probability of a minister during his first five years in office, breaking down the sample according to those ministers who have not faced a resignation call ($r = 0$) at time t and those who have faced at least one such call ($r = 1$) at time t. As one would expect, the survivor function falls more sharply for ministers experiencing one or more resignation calls. In governments which see out their term of office, 70 percent of ministers who have not been involved in a resignation call

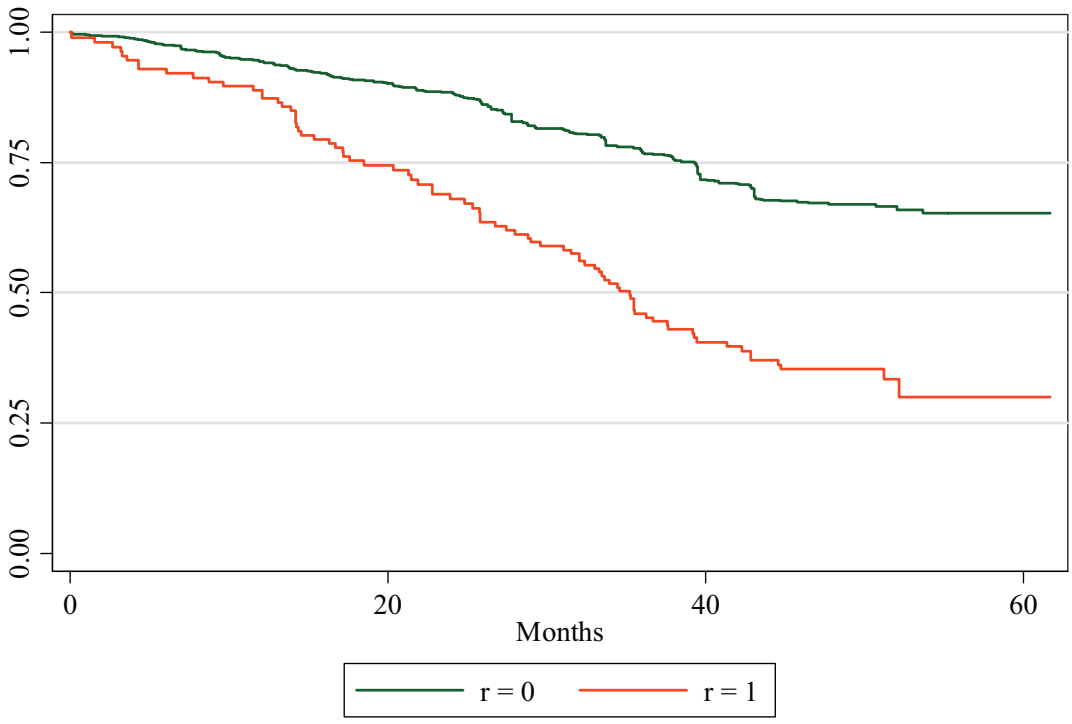

FIGURE 1. Survivor function by resignation call

survive; in contrast only 30 percent of ministers who have faced one or more resignation calls see out their term.

Figure 2 explores the impact of the government's performance, illustrating the survivor function evaluated at different levels of our cumulative resignations index. In particular, we look at the survivor function of ministers in governments where this cumulative index is less than 8 at time t and more than 8 at time t, with 8 being the median number of resignation calls during all our spells. Ministers serving in governments that experience more cumulative calls than the median tend to survive longer, although the difference seems small.

A key message illustrated in these graphs is that a minister's probability of survival depends not only on his own performance but also on that of his colleagues. Of course, if we are to identify the effects of our performance indicators, we must also take account into account the characteristics of different ministers in our sample. The likelihood of a resignation call may reflect observed personal characteristics of a minister, that are known to the Prime Minister when she formed her government. To evaluate the effect of additional

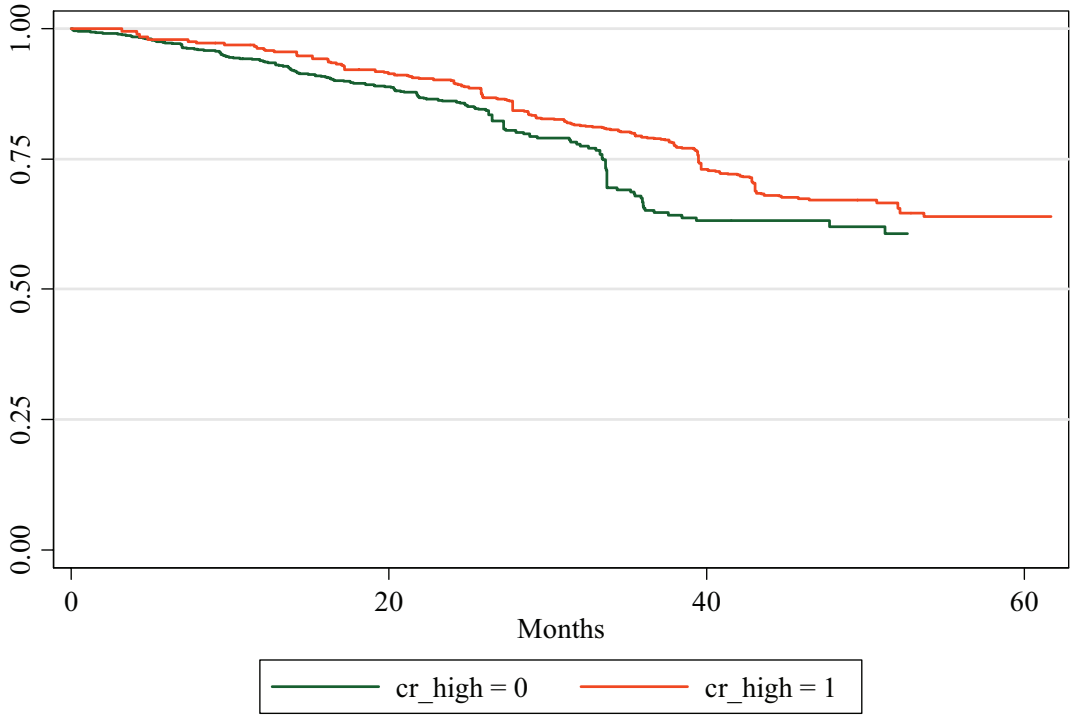

FIGURE 2. Survivor function by cumulative resignation calls

information that a Prime Minister receives we need to factor out the effect of these characteristics on a minister's hazard. Similarly, the cumulative number of resignation calls may simply reflect fixed characteristics of the government in which a minister serves. Our empirical strategy, to which we now turn, helps disentangle these effects from those of our performance indicators.

5. EMPIRICAL STRATEGY

To test our key hypotheses, we estimate Cox Proportional Hazard models. For reasons well discussed in the political science literature, Ordinary Least Squares estimates of time to an event are problematic (Box-Steffensmeier and Jones, 1997); this is due to issues of data censoring, and, perhaps more importantly, due to the likely violation of the assumption of normally distributed error terms in such analysis. Here we focus our attention instead on estimations of the hazard rate of ministerial spells at any given point in time t, conditional upon the spell being of a duration at least equal to t. The hazard rate is the ratio of the failure rate – that is the instantaneous probability that a minister will resign – to the survival function.

We define t_{ig} as the spell of minister i in government g where an individual starts a new ministerial spell every time he enters government independently of having had spells in previous governments. Therefore, expressed in the proportional hazards format, we adopt the following empirical specification:

$$h_{igt} = \lambda(t_{ig}) \times \exp\left[\psi_1 r1_{igt} + \psi_2 r2_{igt} + \beta cr_{gt}\right], \tag{1}$$

where $\lambda(t_{ig})$ is the minister's baseline hazard at t_{ig}. The first two terms in the bracketed expression are individual measures of ministerial performances: $r1_{igt}$ is a dummy variable equal to one after a minister receives a first resignation call (zero otherwise) and $r2_{igt}$ is equal to one after a minister receives a second or higher resignation call (zero otherwise). cr_{gt} is our measure for government performance: the cumulative number of resignation issues at any given point in time for the current government. In some of our models we also include interactions between the individual performance indicators and our government performance measure; this allows the Prime Minister's response to an individual resignation to vary with the cumulative number of such calls.

Our first hypothesis is that the Prime Minister will reward those ministers who perform well with longer tenure relative to those who perform poorly. This hypothesis suggests that a minister's hazard rate is higher when facing a resignation call; as these calls provide new information on the minister's performance, so we expect ψ_1 and ψ_2 to be positive. In estimating two dummy variables, one for a first resignation call and one for later calls, we allow the effect of the first new piece of information to be to different from that of information associated with a subsequent resignation call.

Our second hypothesis is that, since the Prime Minister is often forced to rely on noisy information about individual ministers' performance, she should turn to information on the performance of all ministers, and reward and punish individual ministers according to their performance relative to the government's overall. In using all the information that is available to evaluate the performance of her ith minister the Prime Minister will compare the individual measures of performance against the level of cr_{gt}. Keeping constant individual performance an increase in cr_{gt} should make the minister less vulnerable. It follows that, if relative performance evaluation is an important determinant of ministerial tenure, expected tenure should be decreasing in cr_{gt} and so we expect β to be negative.

It is worth pointing out that when a minister receives, for example, a first resignation call then both $r1_{igt}$ and cr_{gt} increase by one unit. If we consider the logarithm of the relative hazard rates (LRH) of equation 1,

$$LRH = \text{Log}[\lambda(t_{ig})] + \psi_1 r1_{igt} + \psi_2 r2_{igt} + \beta cr_{gt}, \tag{2}$$

the direct marginal effect on the hazard rate due to a change in $r1_{igt}$ from 0 to 1 and from a given cr_{gt} to $cr_{gt} + 1$ is the exponentiated sum of ψ_1 and β. We can test whether this total effect is statistically different from zero by using a Wald test for the null hypothesis $\psi_1 + \beta = 0$ in the LRH model. In the presence of interactions between individual and collective calls for resignations the marginal effect depends on the level of cumulative calls for resignation.[8]

Of course, resignation calls may be correlated with initial traits that characterize the government rather than with the arrival of new information. For example, a government that has been elected by a large margin may face a weak opposition and therefore the actions of its ministers are less likely to be called into question. If, independent of any resignation calls, ministers elected by a large majority are likely to serve longer, any estimate of the effect of individual and collective calls for resignation that does not account for this effect will be biased and inconsistent.

In practice, these issues can be resolved by conditioning on government traits. In our benchmark model we include the following government controls that are fixed at the start of the government spell: majority (percentage share of the house commanded by the governing party), and government size (number of ministers appointed within the first three weeks of government). We also allow include dummies for the term currently being served by the Prime Minister, and allow this to vary with the party in power (by interacting the prime ministerial term dummy with a dummy for government party).

The proportional hazard specification implies that changes in these controls shift the hazard rate proportionally for every minister. Additionally, we stratify our estimates by

[8]The logarithm of the relative hazard rate (LRH) in this case is:

$$LRH = \text{Log}[\lambda(t_{ig})] + \psi_1 r1_{igt} + \psi_2 r2_{igt} + \beta cr_{gt} + \gamma_1 r1_{igt} cr_{gt} + \gamma_2 r2_{igt} cr_{gt}.$$

Thus, for example, the direct marginal effect on the hazard rate that is due to a change in $r1_{igt}$ from 0 to 1 and from a given cr_{gt} to $cr_{gt} + 1$ is the exponential of the following expression: $[\psi_1 + \beta + \gamma_1(cr_{gt} + 1)]$.

Prime Minister. Therefore, we control on Prime Ministerial fixed traits without imposing the proportionality assumption, and so allow the hazard rate of a minister to vary according to the Prime Minister he serves under.[9]

It will also be the case that individual factors are correlated with the scandal arrival rate and with the durability of ministers. For example, cabinet ministers are more likely to be exposed to resignation calls but should also be more qualified for such responsibilities. A negative correlation arises between the innate quality of a minister and the rate at which scandals arrive. This problem can be solved by conditioning on the post a minister is assigned to. In fact, in our benchmark model we can condition on an array of observable ministerial characteristics at the start of the government spell: a public school dummy (equal to one if attended public school – i.e., private education in the UK – and zero otherwise), an Oxbridge dummy (variable equal to one if attended university at Oxford or Cambridge and zero otherwise), a female dummy, age in years at the start of ministerial spell, a noble dummy (variable equal to one if un-elected peer and zero otherwise), an experience dummy (variable equal to one if a minister has served under previous governments and zero otherwise), and a past issues dummy (variable equal to one if a minister had resignation calls in a previous government and zero otherwise). We also include three time varying dummies to control for the level of the post held by the minister.

In summary, since ministerial and government performance could be correlated with systematic features of government and intrinsic traits of individuals, our benchmark proportional hazards model is

$$h_{igt} = \lambda_{PM}(t_i) \times \exp\left[\psi_1 r1_{igt} + \psi_2 r2_{igt} + \beta cr_{gt} + X_{ig}\gamma' + B_g\pi'\right], \tag{3}$$

where $\lambda_{PM}(t_i)$ is the minister's baseline hazard at t_i in a given Prime Ministerial term, X_{ig} a vector of individual characteristics, and B a set of government characteristics.[10]

[9] We estimate the model with stratification by PM using the STATA command strata.

[10] The proportional hazard model assumes that a change in the covariates has a proportional impact on the hazard rate. An alternative and more flexible way of estimating the model is to structure the data so that the observations are recorded in discrete intervals, for example year, and applying a logit model. These procedures are described by Box-Steffensmeier and Jones (1997). As our data are recorded in days, the continuous time hazard model allows for more efficient use of the information available. In particular it allows us to exploit the difference between cases where ministers resign at different time points within the discrete time period, be it month or year. We report specification tests for the proportional hazards assumptions alongside our estimates.

Not all elements in the portfolio of skills that a minister brings into government, and that are observable to the Prime Minister, are readily observable to the political analyst. One such example is the capability of taking the most appropriate decision when given a menu of options. Although such skills may prove invaluable to the Prime Minister, their impact hampers our ability to identify the effect of our variables of interest. The argument is simple: suppose that a skillful minister is better equipped to foresee the likely arrival of resignation calls; if, foreseeing a bumpy road ahead, such ministers choose to leave government with their ministerial badge intact, then the arrival rate of scandals is correlated with a low-quality group of ministers with inherently lower durability.[11] This effect can create a spurious correlation between the arrival of information and the tenure of ministers. In order to tackle this issue we also factor out fixed unobservable ministerial characteristics by stratifying our estimates by individual. This is to say, we control on individual fixed traits allowing every individual to have a different hazard rate.

The Cox proportional hazards model makes no restrictions on the shape of the underlying baseline hazard. However, it does not allow the effect of our performance indicators to be affected by the length of time the government has been in existence. This assumption appears strong, as one might expect the Prime Minister to react differently to resignation calls occurring early in the mandated term. To explore this issue we look at two sub-samples: one includes the first 18 months in government only; and the other includes the first 36 months in government.

Finally, we account for the fact that both the number and the effect of resignation calls may vary over different time periods in our sample. There are two reasons why this might be the case. One reason is that the meaning of the doctrines of individual and collective ministerial responsibility has changed over time. Whereas previously ministers were held to account for errors that occurred in their departments, and were expected to shield civil servants from blame when such errors came to light, this is no longer the case. A systematic increase in the number of resignation calls made over time (see Table 1) thus corresponds to a difference in the information content of such calls. Whilst, on the one hand, the lines of ministerial responsibility have become more blurred, on the

[11]For example, younger ministers might calculate that it is optimal to quit a government with unpopular policies, as this may enhance their chances of achieving high office in a later government, particularly if the issue they choose is unpopular with their party. Harold Wilson resigned over policy as a junior minister under Attlee, only to return as leader of his party, gaining the premiership thirteen years later.

other, ministers are more likely to publicly deny any wrongdoing rather than carry the can for those who work under them. A second reason is that media exposure of ministers may vary systematically during our period of analysis. An issue brought to the public attention in 1997 may not have been made public had it occurred some decades earlier.

This analysis suggests that the information content of a resignation call may vary over time, and so the Prime Minister's response to such calls may vary also. To deal with this we split our data set and compare estimates across different time periods. Specifically we look at the period 1945-1970 and the period 1970-1997, the latter period being one in which we observe a larger number of resignation calls reported by the media.

6. Hazard Rate Estimates

In Table 4, we present estimates of the hazard rate of ministers, conditional on both individual performance and characteristics as well as the performance and characteristics of the government in which they serve. The first column presents results for a model that includes only our performance measures. It shows that the hazard rate for a minister facing his first resignation call is roughly twice that of a minister who has not (yet) faced such a call. The hazard rate of a minister facing a second resignation call is roughly 7 times higher than that of a minister with one resignation call and about 13 times higher than that of a minister without resignation calls to his name. A unit increase in the cumulative number of resignation calls reduces the hazard by roughly 3 percent.

In column 2, we add controls for ministerial traits such as gender, educational background, age and nobility as well as for ministerial attributes which relate to a minister's service in previous governments. Specifically we control for whether a current minister has past experience of government and whether during that time he received a resignation call. Whilst these variables are fixed within a government term we also control for a minister's position in the government rank which may change.[12]

[12]In addition to rank we might also control for a minister's departmental brief. However, since 1945 there have been many reorganizations of government with some departments having contracted whilst others have expanded. Indeed over the fifty years the same or similar job titles have covered very different responsibilities. To provide some analysis we coded all departments in 9 categories (Home Office, Foreign Affairs, Treasury, Other Economic, Environment, Defence, Education, Agriculture and Other) bundling together jobs with similar responsibilities and importance in government. However the inclusion of controls for these departments does not affect our results and so we do not report them here.

TABLE 4. Impact of individual and government calls for resignation on ministerial tenure. Hazard ratios from Cox models

	(1)	(2)	(3)	(4)
First individual call for resignation	1.970***	2.459***	2.431***	2.518***
	[0.296]	[0.390]	[0.387]	[0.405]
Second or higher individual call for resignation	6.824***	9.137***	8.787***	8.814***
	[1.274]	[1.832]	[1.778]	[1.812]
Cumulative government resignation calls	0.971***	0.964***	0.929***	0.822***
	[0.009]	[0.009]	[0.013]	[0.021]
Minister controls	No	Yes	Yes	Yes
Government controls	No	No	Yes	Yes
Stratification by Prime Minister	No	No	No	Yes
Schoenfeld global test (d.f.)	16.55(3)	25.30(13)	48.70(20)	19.87(20)
p-value	[0.0009]	[0.0211]	[0.0003]	[0.4658]
Observations	25,572	25,572	25,572	25,572

[a] Standard errors in parentheses,*** p<0.01, ** p<0.05, * p<0.1. See Table A1 for definition of variables. Observations based on 2,220 ministerial spells.

Estimates for this model reveal that the hazard rate for a minister facing his first resignation call is 2.5 times higher than that of a minister who has not yet faced such a call; a minister facing a second resignation call has a hazard rate 9.2 times that of a minister with one resignation call to his name. In this model, a unit increase in the cumulative number of resignation calls reduces the hazard rate by roughly 3.5 percent.

In the remaining models estimated in Table 4 we vary the controls for fixed attributes of the government in which a minister serves. Column 3 adds controls for the size of the government majority, government size, which party is in power, a government term and an interaction between these two. Finally, in column 4 we stratify by Prime Minister as well. This allows the baseline hazard to be different for ministers serving under different Prime Ministers. In all, these variables have almost no effect on the estimates of our

individual performance measures on tenure, though the reduction in the hazard rate due to a one-unit increase in our collective performance measure tends to be larger.

In summary, the estimates show that the hazard rate for a minister facing his first resignation call is between 2 and 2.5 times that of a minister with no resignation call to his name. A minister facing a second resignation call has an even steeper increase in his hazard rate.[13] Finally, a unit increase in the cumulative number of resignation calls reduces the hazard by between 3 and 18 percentage points, with the largest estimates derived from a model which stratifies the baseline hazard by Prime Minister. As we explained in the previous section, when calculating the direct marginal effect that is due to a change in $r1_{igt}$ or $r2_{igt}$ from 0 to 1 we must take into account the effect on the cumulative resignation calls of a change in these variables. A straightforward calculation on the full model estimated in column 4 of Table 4 reveals that the hazard ratio for a first individual call is 2.115 with a p-value 0.0001, and that a second resignation call increases this hazard rate by 7.35 with a p-value of 0.0001.

We report the test statistic from the Schoenfeld global test which tests the hypothesis that the covariates have a proportional effect on the hazard rate by regressing the residuals of the model on time (or some function of time).[14] Models $1-3$ reject the proportionality assumption. This result also holds when we use Prime Minister fixed effects.[15] Whilst a fixed-effects specification treats the change in the baseline hazard as a constant, stratification goes one step further in allowing the shape of the hazard to vary by Prime Minister. In doing so, as in model 4, we cannot reject the null hypothesis of proportionality whilst the magnitude of the substantive effects of interest remain largely unaltered.

Our initial estimates are consistent with predictions based on the theory of performance evaluation when applied to ministerial tenure. The largest direct effect upon a minister's hazard rate is his own performance, particularly if he receives a second call. Consistent

[13]Of those who only receive one resignation call 48 percent eventually resign, of those who face two resignation calls 63 percent resign some time after the second resignation call, and, amongst the small minority with three or more resignation calls, 50 percent resign. After the first call emerges it takes 22 months (on average) for a minister with one resignation call to resign, whilst for those ministers that receive a second call for resignation it takes on average only 2 months to resign after the call is made. The difference in the hazard rate between these cases is then driven by the difference in the length to resignation after the information comes to the public's attention.

[14]We implement this using the available STATA command that is based on the generalization of the Schoenfeld test by Grambsch and Therneau (1994).

[15]This does not affect our estimates but in the interests of space we do not report the results here.

with relative performance evaluation, an increase in the cumulative resignations index reduces a minister's hazard rate. Therefore, our data fit what we expect to see from an application of the theory of incentives to cabinet government.

In Table 5, which has a similar structure to Table 4, we estimate a model which includes an interaction term between our individual and collective performance measures. We observe that the likelihood of leaving government upon receiving a resignation call is increasing in the cumulative number of calls. In particular, upon receiving a first resignation call, a minister's hazard rate increases by 6 percent for each previous call made to any minister in the government he serves. We find no evidence of a similar interaction effect when considering second or higher resignation calls. As in the previous table, the hazard rate of a minister increases steeply with a second resignation call and a unit increase in the cumulative number of resignation calls reduces the hazard of a minister.

Our analysis reveals interesting aspects of the inter-dependence of cabinet careers. Upon receiving a first resignation call a minister's hazard is higher when other ministers of the same government have faced similar calls; thus, a minister must bear some of the brunt of his colleagues' failures. Our findings are consistent with expectations based on the doctrine of collective responsibility, according to which a minister cannot absolve himself from joint responsibility for government policy.[16] Whilst political scientists and legal scholars have long analyzed this convention (Jennings, 1959; Doig, 1993; Gay and Powell, 2004), to our knowledge ours are the first measurable estimates of its effect.

Our results show that, when controlling for observable traits of ministers and the governments they serve, there are clear and discernable effects of our individual and collective performance measures on ministerial hazard rates. However, to estimate the total effect of a resignation call on a minister's hazard rate we need to consider the interaction between these variables. These calculations are presented in Table 6 which provides a substantive account of the total effect of a resignation call by calculating the effects of an individual resignation call at various values of the cumulative resignation calls. We include the p-value for the test that these effects are statistically different than zero. The first column shows the total effect of a first resignation call and reveals that the hazard ratio increases

[16] As Gallagher, Laver, and Mair (2006), p. 41. argue "Cabinets often have to take politically unpopular decisions, and there is comfort for ministers in the knowledge they can shelter from the fallout of these decisions under the cloak of collective responsibility".

TABLE 5. Impact of individual and government calls for resignation and their interaction on ministerial tenure. Hazard ratios from Cox models

	(1)	(2)	(3)	(4)
First individual call for resignation	1.089***	1.330***	1.348***	1.514***
	[0.292]	[0.363]	[0.368]	[0.409]
Second or higher individual call for resignation	8.620***	11.136***	9.592***	9.572***
	[3.198]	[4.280]	[3.655]	[3.605]
Cumulative government resignation calls	0.965***	0.957**	0.924***	0.820***
	[0.009]	[0.010]	[0.013]	[0.021]
First individual call x cumulative calls	1.064***	1.0677***	1.063***	1.053***
	[0.022]	[0.022]	[0.022]	[0.021]
Second individual call x cumulative calls	0.983	0.985	0.994	0.994
	[0.028]	[0.029]	[0.028]	[0.027]
Minister controls	No	Yes	Yes	Yes
Government controls	No	No	Yes	Yes
Stratification by Prime Minister	No	No	No	Yes
Schoenfeld global test (d.f.)	15.44(5)	25.56(15)	49.18(22)	20.19(22)
p-value	[0.0086]	[0.0429]	[0.0008]	[0.5713]
Observations	25,572	25,572	25,572	25,572

[a] Standard errors in parentheses,*** p<0.01, ** p<0.05, * p<0.1. See Table A1 for definition of variables. Observations based on 2,220 ministerial spells.

sharply as more ministerial colleagues face similar calls for their resignation. The hazard ratio for a minister receiving his first resignation call when serving a government where there have been such 15 resignation calls is roughly twice that of a minister in a government where his is the first such a call. From column 3 we observe that, although a second resignation call has a large effect on the hazard rate of an individual minister this effect is fairly constant.

In Table 7 we estimate the same models, whilst stratifying by individual to control for any unobservable individual traits. Because they are not identified in this model we exclude

TABLE 6. Total impact of individual and government calls for resignation and their interaction at different levels of cumulative government resignation calls. Models estimated with ministerial controls and stratification by Prime Minister

Hazard ratios from Cox models		
Cumulative government resignation calls	First individual call	Second individual call
First call	1.341	8.276
	[0.2509]	[0.0001]
Second call	1.412	8.273
	[0.1514]	[0.0001]
Third call	1.487	8.270
	[0.0795]	[0.0001]
Fourth call	1.565	8.267
	[0.0351]	[0.0001]
Fifth call	1.648	8.263
	[0.0126]	[0.0001]
Tenth call	2.133	8.244
	[0.001]	[0.0001]
Fifteenth call	2.758	8.218
	[0.0001]	[0.0001]
Twentieth call	3.567	8.186
	[0.0001]	[0.0001]
Twenty fifth call	4.615	8.144
	[0.0001]	[0.0001]
Thirty calls	5.970	8.090
	[0.0001]	[0.0001]

[a] Calculations from estimates reported in model 4 of Table 5. Estimates based on 25,572 observations from 2,220 ministerial spells. p-values from Wald tests indicated in brackets

from columns $(2)-(4)$ all ministerial controls that are not time varying. Thus in this analysis we exclude individual traits such as gender, experience, and education, whilst still allowing a ministers hazard to be affected by changes in his status, such as promotion or demotion within the cabinet. Although effects of our individual performance measure

TABLE 7. Impact of individual and government calls for resignation on ministerial tenure. Hazard ratios from Cox models with stratification by individual

	(1)	(2)	(3)	(4)
First individual call for resignation	1.144	0.824	0.887	0.832
	[0.687]	[0.593]	[0.657]	[0.701]
Second or higher individual call for resignation	6.056	6.320	3.332	2.481
	[10.076]	[11.070]	[6.024]	[4.532]
Cumulative government resignation calls	0.966***	0.911**	0.864***	0.806***
	[0.022]	[0.029]	[0.034]	[0.045]
First individual call x cumulative calls	1.150**	1.130	1.124	1.144
	[0.081]	[0.087]	[0.092]	[0.110]
Second individual call x cumulative calls	1.182	1.194	1.276	1.313
	[0.229]	[0.225]	[0.247]	[0.252]
Minister controls	No	Yes	Yes	Yes
Government controls	No	No	Yes	Yes
Prime Minister fixed effects	No	No	No	Yes
Stratification by individual	Yes	Yes	Yes	Yes
Schoenfeld global test (d.f.)	5.81(5)	9.23(12)	18.79(19)	25.55(28)
pvalue	[0.3249]	[0.6835]	[0.4732]	[0.5977]
Observations	25,572	25,572	25,572	25,572

[a] Standard errors in parentheses,*** p<0.01, ** p<0.05, * p<0.1. See Table A1 for full description of variables. Only time-varying ministerial controls – Cabinet Ministers, Ministers of Cabinet rank, Junior ministers, Whips and Members of HM Household – included in estimation. Observations based on 2,220 ministerial spells.

are very imprecisely estimated, the effect of our collective performance measure is robust. Thus, whilst we cannot be certain that individual resignation calls have an effect on ministerial tenure independent of the traits of the ministers who serve, our data strongly suggests that ministers are subject to performance evaluation relative to their peers.

In the first two columns of Table 8 we explore whether the impact of resignation calls differ if they occur during the first 18 months of government or during the first 36 months

TABLE 8. Impact of individual and government calls for resignation and their interaction on ministerial tenure. Estimates from models that split the data by number of months in office and for two separate eras $1945-1970$ and $1970-1997$. Hazard ratios from Cox models

	(1)	(2)	(3)	(4)
First individual call for resignation	1.375	1.018	2.014**	1.341
	[0.653]	[0.345]	[0.711]	[0.672]
Second or higher individual call for resignation	28.869***	5.281***	5.989***	25.649***
	[23.378]	[2.436]	[3.740]	[12.849]
Cumulative government resignation calls	0.420***	0.608***	0.392***	0.905**
	[0.042]	[0.032]	[0.040]	[0.038]
First individual call x cumulative calls	1.190**	1.117***	1.031	1.068**
	[0.087]	[0.040]	[0.033]	[0.033]
Second individual call x cumulative calls	0.923	1.083*	0.977	0.968
	[0.110]	[0.047]	[0.050]	[0.033]
Minister controls	Yes	Yes	Yes	Yes
Government controls	Yes	Yes	Yes	Yes
Stratification by Prime Minister	Yes	Yes	Yes	Yes
Schoenfeld global test (d.f.)	77.79(21)	39.86(21)	80.49(20)	438.82(21)
p-value	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Observations	10,600	20,525	10,008	15,564

[a] Standard errors in parentheses,*** p<0.01, ** p<0.05, * p<0.1. See Table A1 for full description of variables. Column 1 is estimated on the first 18 months of government only, and column two is estimated up to 36 months in office. Column 3 is estimated with those governments between 1945 and 1970, and column 4 is estimated with governments from 1970 to 1997 (see Table 3 for details of these governments). Observations in model 1 based on 1954 ministerial spells. Observations in model 2 based on 2139 ministerial spells. Observations in model 3 based on 1087 ministerial spells. Observations in model 4 based on 1143 ministerial spells.

of government. In Table 8, for brevity, we only present models with the full set of controls as in column (4) of Table 6. In column 1, we look at the first 18 months only and in column 2 at the first 36 months. The effect of a second resignation call has a larger effect when both calls occur within the first 18 months of government. In both cases the direct effect of

government performance decreases the hazard, but the magnitude of this effect appears to be stronger in the first 18 months of government.

In columns 3 and 4 of Table 8 we look at whether the effect of resignation calls differ over time: column 3 of this table estimates the model for the period 1945 to 1970 (including the Wilson $1966 - 1970$ government); column 4 estimates the model for the subsequent period. Results tend to be qualitatively similar with a few exceptions: ministers facing their first call were more at risk in the earlier period; ministers facing more than one resignation call appear to have a higher hazard rate in the latter period; the cumulative effect of resignation calls had a stronger effect between 1945 and 1970. On this evidence we would conclude that higher exposure to the media has not drastically changed the way the Prime Minister reacts to resignation calls. However, we should be cautious in interpreting these results as for these estimations we can not reject the hypothesis that the covariates have a non-proportional effect on the hazard rate.

7. Conclusions

We provide an analysis of the effects of individual and collective ministerial performance on the length of time a minister serves in British government for the period 1945-97, using the number of resignation calls for a minister as an individual performance indicator and the cumulative number of such calls as an indicator of government performance. Our analysis shows the data to be consistent with a simple theory of incentives. A resignation call increases the likelihood that a minister returns to the backbenches, but as the number of colleagues who have faced similar calls rises his hazard diminishes. A minister's tenure thus reflects not only his own performance but it is also directly responsive to that of his colleagues. Indeed our results indicate support for the hypothesis that a minister's performance is evaluated relative to that of his fellow ministers. Whilst the paper adds to previous empirical analysis of how the Prime Minister manages her cabinet (Indridason and Kam, 2005, 2008; Dewan and Dowding, 2005; Huber and Martinez-Gallardo, 2004), it presents the first real evidence of relative performance effects upon ministerial tenure.

As well as providing evidence for the role of incentives in cabinet government, our results also bring to light systematic features of British government. We show that, when a minister faces a resignation call, his hazard rate is increasing in the number of resignation calls

cumulated over the lifespan of the government. Thus ministers share collective responsibility in a real sense: their expected tenure upon receiving a resignation call is shorter as they are more exposed to losing their jobs due to the failures of their colleagues. Our analysis also lends support to a "two-strike rule" operating in British government: ministers facing a second call for their resignation have a significantly higher hazard than those facing their first, irrespective of the performance of the government. Our results are thus of relevance to previous formal analysis of ministerial turnover. For example, Dewan and Myatt (2007) have developed a model based on an (assumed) "two strikes rule" whereby a minister is always fired when faced with a second resignation call. Our empirical results, provide strong empirical evidence for the existence of such a rule and thus justification for its use as a modeling assumption.

In summary our analysis of the data provides evidence that is supportive of the principal agent view of relations in parliamentary government. Ministers in Parliamentary democracies are career politicians: they desire government service and once appointed wish to remain in office as long as possible; serving their country and party are important sources of (intrinsic) motivation for them. This does not preclude the misalignment of objectives between the Prime Minister and her ministers. Lacking control over monetary rewards, a Prime Minister has a variety of tools available to achieve her objectives and the threat of dismissal is a powerful instrument that can help a Prime Minister to align the incentives of her ministers with her own.

We have found clear evidence of these relationships in the data from the UK, but our single-country analysis does not account for the type of institutional variation that would allow us to test whether these effects vary across institutional environments. For example, with the exception of the brief period (1976-79) of minority government under James Callaghan, all governments we analyze are single-party majority governments. The Prime Ministers we analyze thus operate under different constraints to those found in parliamentary democracies with multi-party governing majorities or minority governments. But we should not take this too far: British Prime Ministers operate under constraints that are similar to those found elsewhere; they must maintain the support of key factions within their party or risk putting their own position in jeopardy. Moreover, we

find that our results are robust to significant variation in the size of the governing majority, a variable that captures key constraints on British, as well as other, Prime Ministers.

Although the British Prime Minister has discretion over hiring and firing not afforded to all Prime Ministers, she is not unique in this regard. Indeed our results suggest that we might expect to find further evidence for the principal-agent model described here in countries where single-party government is the norm, or alternatively where governing coalitions are clearly dominated by a single party. Moreover, we might also expect these relations to be observed in countries where, as in the UK, governments and ministers do not face a formal vote of investiture.

Do our lessons travel beyond such cases? We should not rule this out. All Prime Ministers in parliamentary democracies have some power to hire and fire ministers albeit under differing constraints. Moreover the mechanism that underpins our analysis is that the Prime Minister uses the threat of firing her ministers to induce better performance. All prime ministers, whether leaders of single-party majorities or otherwise, are affected by the negative publicity that surrounds their government when ministerial performance falls short and is called into question. In short, all prime ministers have some incentive to remove poorly performing ministers.[17] Although the strategic elements are more complicated in coalition governments than in the single-party British case, to be sure, we should nevertheless expect to find some relationship between ministerial tenure and performance in all parliamentary democracies.

In the last resort, however, the extent to which the relations we have uncovered in the British data hold in other parliamentary democracies, or are masked by factors such as the need to maintain coalition governments, remains an empirical topic for investigation. At least our estimates serve as a comparative benchmark for such analysis.

APPENDIX

The resignation data were collected using the following methods: originally (i) all ministers noted from Butler and Butler (2000) and official sources. (ii) *The Times* index consulted year-by-year noting all references to departments, ministers by job and ministers

[17] Though supporting unpopular ministers from other coalition parties (or rival factions within a single-party government) might bring benefits to the Prime Minister's party (or faction) if the bad publicity damages the rival party (or faction) more than her own (Dowding and Dumont, 2009).

by name and cross-referred to events to build up a comprehensive picture of the major political events of each year. (iii) All potential resignation issues are consulted in *The Time*s on microfilm. Since the advent of *The Times* online, ministers have been surfaced together with stories cross-referenced with words "resign*", "difficulty", "trouble", "consider AND position". Checks were made against the microfiche technique and *The Times* online for earlier years and the microfiche coding was found to be robust.

The Times provides the most systematic data over the time period, although the *Daily Telegraph* was used during a period of a strike at The Times. For later years other newspapers were consulted online via Lexis. Very few new non-resignation cases were found and these only in editorials or opinion pieces. All calls by serious commentators or editorials in major newspapers had also been reported in *The Times*.

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Table A1: Definition of Variables and Descriptive Statistics

Variable	Definition	Mean (Std. Dev.)
Tenure	Ministerial tenure in months by government. Failure is defined as leaving government at least two weeks before the end of government. There are no left censored variables. Right censoring occurs when someone is still in post two weeks before the end of a government term. Ministers who fail during the first two weeks of government are dropped.	26.89 (16.46)
Individual calls for resignation	Number of individual calls for resignation (See Appendix for sources).	0.04 (0.20)
Cumulative government resignation calls	Number of resignation calls accumulated by the government. Change occurs each time there is a resignation call for a government minister.	2.28 (4.28)
Public school	Dummy variable equal to one if attended public school (i.e., private education in the UK) and zero otherwise.	0.62
Oxbridge	Dummy variable equal to one if attended university at Oxford or Cambridge and zero otherwise.	0.50
Age	Age in years at the start of ministerial spell.	49.17 (8.78)
Female	Dummy variable equal to one if female and zero otherwise.	0.05
Some experience	Dummy variable equal to one if a minister has served under previous governments and zero otherwise.	0.61
Resignation calls in the past	Dummy variable equal to one if a minister had resignation calls in a previous government and zero otherwise.	0.06
Noble	Dummy variable equal to one if unelected peer and zero otherwise.	0.21
Cabinet Ministers	Dummy variable equal to one if cabinet minister and zero otherwise.	0.16
Ministers of Cabinet rank	Dummy variable equal to one if minister of cabinet rank and zero otherwise.	0.30
Junior Ministers	Dummy variable equal to one if junior minister and zero otherwise.	0.35
Whips and Members of HM Household	Dummy variable equal to one if whip or member of HM Household and zero otherwise.	0.19
Majority	Majority is defined as the percentage share of the house commanded by the governing party at the beginning of government.	54.35 (4.01)
Government Size	Government size measured as all the ministers that start their jobs within the first three weeks of government.	94.16 (12.47)
Labour	Dummy variable equal to one if Prime Minister belongs to the Labour party and zero otherwise.	0.37
Term	Term currently being served by the Prime Minister (first, second or third). When conditioning on this variable in the regression analysis 2 dummies are used.	
Prime Minister	Eleven Prime Minister identifiers. When conditioning on this variable in the regression analysis 10 dummies are used.	

Notes: Data source is Butler and Butler (2000). There are 2,230 spells in total.