

Ministerial Responsiveness in Westminster Systems

Institutional Choices and House of Commons Debate, 1832–1915*

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Abstract

In Westminster systems, governments enjoy strong agenda-setting powers but are accountable to an inquisitorial opposition. This paper provides insights into the origins of this arrangement from the British House of Commons, drawing primarily on a new dataset of half-a-million parliamentary speeches. We show that, according to a novel measure we develop, government ministers became more responsive to opposition members of parliament in the same period that the government’s agenda power was most conclusively strengthened—roughly, the two decades culminating in Balfour’s ‘railway timetable’ of 1902. We argue that this increase in responsiveness helps to explain why opposition MPs acceded

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to reductions in their procedural power. We thus highlight a link between government strength and opposition scrutiny in the historical development of the Westminster system.

1 Introduction

A noted characteristic of Westminster systems is that, in terms of parliamentary procedure, governments are strong and oppositions are weak (Lijphart, 1999). To impose their legislative will, governments can typically rely on pliant backbenchers (Cowley, 2002; Kam, 2009), large ‘manufactured’ majorities (Bogdanor and Butler, 1983) and the fact that there are few alternative sources of agenda-control (Powell, 2000). By contrast, opposition actors are reduced to a primarily inquisitorial role, questioning ministers (Chester and Bowring, 1962; Hibbing, 1988; Franklin and Norton, 1993) such that those with executive power are held accountable to both parliament and the country at large.

The purpose of the current paper is to document, and provide a possible data-supported explanation for, the emergence of this particular institution in the United Kingdom. This is an important task for five broad reasons. First, due to obvious historical forces, many other countries model their system of government on that of the UK (Rhodes and Weller, 2005; Rhodes, Wanna and Weller, 2009), and the inquisitorial role of the opposition is similar across Westminster systems (as suggested by “Question period” in Canada, “Question time” in Australia, “Oral questions” in New Zealand, and “Question hour” in India).¹ Thus understanding the case of the UK facilitates a comparative perspective on institutions and their development: a core interest in political science (e.g. North and Weingast, 1989; Hall and Taylor, 1996; Thelen, 1999; Greif and Laitin, 2004). Second, studying this problem means that we can contribute to a voluminous literature specifically on the evolution of the British state and the role of the cabinet therein (Bagehot, 1873/2011; Redlich, 1908; Trevelyan, 1922; Cox, 1987), an issue of clear and continuing concern to contemporary historians and students of politics. Third, beyond the British context, the creation of new opposition rights

¹Questions in parliament are, of course, of quite general interest in political science: see Jensen, Proksch and Slapin (2013) for a recent overview of this literature.

presents a profound and general puzzle to all scholars of legislatures; since oppositions are (almost always) in a numerical minority, they rely on a majority—with presumably inimical incentives—to protect and extend their prerogatives (see [Binder, 1996](#); [Dion, 1997](#); [Schickler, 2000](#)). Thus, by studying the emergence of ministerial accountability to the House of Commons, we shed light on the incentive structures and bargaining positions that make such moves possible. Fourth, systematically investigating the inquisitorial role of members of parliament (MPs) over time requires developing new methodological tools that can be used by other scholars interested in textual interchanges between political actors, a longstanding task for researchers in all subfields of the discipline (see [Grimmer and Stewart, 2013](#)). Finally, there is a normative interest in exploring the way that different ‘models’ of governance balance varying degrees of centralization of power with notions of accountability and responsibility (see [Powell, 2000](#); [Strom, 2000](#); [Gerring, Thacker and Moreno, 2005](#)). Understanding how a characteristic feature of a particular model—ministerial accountability in Westminster systems—came to operate allows us to contribute to that broader philosophical debate.

Our specific concern is the puzzle of opposition consent to government consolidation of agenda-setting power in the late 19th century. Culminating in Leader of the House Arthur Balfour’s famous “railway timetable” reforms of April 1902, by which “the government took control of virtually all the time of the House” ([Richards, 1988](#), 145), such moves had begun much earlier as ancient rights to contest and delay legislative action were removed steadily from the 1830s onwards (see [Cox, 1987](#)). These included the right to ask questions without notice, to raise issues of concern at almost arbitrary times, and to single-handedly adjourn proceedings. While it is unsurprising that cabinets would seek to streamline procedures to make policy-making easier, what is remarkable is the fact that opposition actors apparently consented to, and even embraced, these changes (e.g. [Chester and Bowring, 1962](#)). Put simply, why would non-government MPs (of both main parties, at different times) allow the

eradication of their rights to initiate debate, ask impromptu questions of (any) colleagues, and hold up government plans? As we explain in more detail below, though we have accepted theories of such supineness early in the century when parties were relatively weak and unable to defend their MPs from executive encroachment (see [Cox, 1987](#)), we lack plausible accounts for a period in which opposition parties were cohesive ([Lowell, 1902](#); [Berrington, 1968](#)). This is *a fortiori* true given we know that oppositions were generally assertive in pushing their interests for mutually beneficial reform during this period—albeit in private (see, e.g., [McLean, 2001](#), 82–83, on the ‘Arlington Street Compact’).

Below, we provide one possible answer to this puzzle using insight from new machine-readable speech data, linked to MPs and their covariates. Drawing on a novel analysis of over a half-million speeches in the House of Commons for the years 1832–1915, we show that governments were becoming more responsive to the opposition (in a sense we clarify below) precisely during the decades when governments were also consolidating their agenda power (leading up to Balfour’s reforms). We assert that this increasing responsiveness may help to explain why the opposition did not strenuously object to its diminished procedural powers: the opposition was receiving at the same time (and possibly as a concession) something more valuable — expanded opportunities to hold the government to account.² We argue further that the key to understanding why the opposition accepted this exchange in the late 19th century (and might not have done so earlier) lies in the development of a party-oriented electorate ([Cox, 1987](#)). With electors increasingly focused on the question of which party was more fit to govern (and less focused on whether their individual MP delivered local benefits), we suggest that the opposition derived relatively less benefit from the

²By linking the increase in responsiveness to the government’s increasing agenda power, we make the assumption that the rise in the government’s responsiveness was primarily a function of agenda-setting decisions made by government (perhaps as processed by the Speaker) rather than actions made by opposition MPs. An alternative account would have it that the government closed down other channels of opposition influence first, which induced the opposition to redirect its efforts toward scrutiny.

right to raise its own business in debate or even to hold up the business of the government; it derived relatively more benefit from the opportunity to demonstrate, in inquisitorial clashes with the government, that it deserved the opportunity to lead.³ While we cannot claim to comprehensively ‘test’ a theory of acquiescence, or to causally identify the exact mechanism at work, we aim to provide a helpful new take on the episode in question. By doing so, we speak to the literatures and debates we mentioned above: thus, from a specific case, we learn how oppositions manage their resources in the face of voter pressure, how government accountability is traded for other rights, and how to model parliamentary debates to answer questions of interest. In the next section, we review the literature relevant to our inquiries, before discussing our data and empirical analysis.

2 Literature and Orientation

The history of the Westminster legislature is a long one (von Gneist, 1889; Namier and Brooke, 1964; Thorne, 1986; Maddicott, 2010), and scholars have paid special attention to the period between the First and Fourth Reform Acts (Cunningham, 2001) during which the modern age of ‘democratic’ politics in Britain came to be. Within this era, the most prominent focus has been on franchise extension and its effects (Cowling, 1967; Acemoglu and Robinson, 2000; Lizzeri and Persico, 2004; Gash, 1952; Berlinski and Dewan, 2011), but our focus here is on endogenous institutional development. The seminal account in the latter literature is that of Cox (1987) (though see also earlier efforts from Redlich (1908) and Fraser (1960)), who contends that in the initial part of the Victorian period the cabinet systematically removed backbench MP rights to delay government legislative activities or initiate their own business. Several authors note that, as early prerogatives disappeared, MPs

³We note that we are not the first to model parliamentary speeches as a product of election pressures (see Proksch and Slapin, 2012), though our focus is on accountability within parliament and is unusually comprehensive in terms of historical breadth.

found a new avenue for their energies: putting questions to ministers (Howarth, 1956; Chester and Bowring, 1962; Hibbing, 1988; Cox, 1987). Though less painful to the government than direct disruption of its business, such interrogative activities were not above reform.⁴ Some of these changes came via Speaker rulings, an example being the general ability to ‘close’ debate after 1882 in response to Irish obstructionism (Rutherford, 1914). Other changes, including the requirement to give notice of questions, arose from the Commons acting as a corporate body via its standing orders. The importance of these actions notwithstanding, it is the Balfour ‘railway timetable’ reforms of 1902 that arguably created parliament’s present arrangement. Introducing two sittings on the four working days of the week, Balfour cut down the time for questions to 40 minutes (previously it was essentially unbounded), and moved (opposed) private business to the end of the session on any given day. The nature of questions themselves was also altered: MPs were limited to one supplemental question (formally, they could have as many as the Speaker believed were ‘in order’), and for oral answers MPs were now required to give more notice than previously.

2.1 Opposition Acquiescence

It is not difficult to see why the cabinet would want to curtail the power of backbench MPs to raise their own business: it helped assure that government business would always be reached. Exactly why other MPs agreed to these various losses in their prerogative and power is more puzzling. Yet agree they did; Chester and Bowring (1962, 67) note that the debate surrounding the proposed changes “was on the whole favorable to the Government” and that “most were convinced that something required [sic] to be done.” In the event, the

⁴Newspapers of the day supported governmental efforts to reform in part because questions had become a obvious drain on legislative time. As an example, consider *The Spectator* (Feb 15, 1901, page 6) which noted that in 1901 alone there were “7180 questions [which] occupied... 15 eight-hour days of Parliamentary work” and asked rhetorically whether it is “in any way possible, regarding the House of Commons as an assembly of men entrusted with definite business to perform, to deny that there is something wrong here?” We are very grateful to an anonymous referee for this citation.

relevant standing order (spread over multiple roll calls) saw “the Government having a comfortable majority of around 80 in each” and, to the extent that there was criticism, it was over specifics connected with the timing of Questions in the day, notice requirements and whether or not all questions would receive an oral answer (Chester and Bowring, 1962, 75). So, all considered, the majority of Balfour’s “original structure remained. Only in respect of Questions had he to make any major concessions”: in particular, the government failed to extinguish the uses of supplementaries *in toto*, and questions were to remain in a prominent place, prior to public business being reached (Chester and Bowring, 1962, 84).⁵ Still, there is little doubt that the ‘railway timetable’ represented restrictions on previous agenda power for the opposition, but that the opposition did not make a concerted, united attempt to defeat the proposals; only when it came to the opposition’s inquisitorial powers was there a notable and successful effort to maintain the opposition’s privileges.

Cox (1987) makes a much cited and accepted argument to explain such acquiescence. In particular, he argues that the Cabinet was uniquely ready to accumulate responsibility, cheered on by the most experienced members of the House, while backbenchers lacked any formal institutional protection of their rights. This makes much sense for the period prior to the 1880s, but once party-discipline and government-opposition voting became the norm, it is less plausible: put crudely, the opposition was sufficiently cohesive and disciplined to at least make trouble for the government’s proposed reforms (even if informally—e.g. the ‘Arlington Street Compact’), yet seemingly did no such thing.

⁵Balfour also failed to implement new policies for punishing members who deviated from the new rules of behavior (see Dion, 1997, 221, for discussion).

2.2 Institutional *quid pro quo*?

One possibility is that the opposition found little to fear—and perhaps something to gain—in the proposals brought forward by Balfour. They, like all non-cabinet MPs, would lose the ability to introduce (private) business. But by curtailing the possibility for dilatory debate and private business and by outlining a predictable schedule for questions and other forms of government scrutiny, the new proposals also tended to make it more certain that the opposition would have the opportunity to hold the government to account. Our contention is that what was given up in these centralizing reforms was less valuable to the opposition than what was gained—predictable opportunities to scrutinize the government.

We think of opposition MPs as being broadly motivated by electoral concerns—both the desire to be re-elected, at an individual level, and the desire to see the party win more seats and enter into government—and we think of different legislative activities as having different electoral benefits for MPs. Consider two distinct ways in which a given chunk of legislative time can be spent: first, a series of debates on issues raised by various MPs; second, a series of confrontations between government ministers and opposition MPs. Both types of activities give opposition MPs the opportunity to speak, which could win them electoral support if voters are impressed with their performance and care about their personal qualities. But devoting legislative time to confrontations between government and opposition gives voters more information about whether the opposition is better suited to replace the government and lead the country. Clashing with the government could win opposition MPs electoral support if voters are impressed with their performance and care about the quality of the party in government. How the opposition prefers to spend legislative time thus depends on how well its MPs can perform, but also on what voters care about.

The increasing party orientation of the electorate through the middle of the 19th century

(Cox, 1987) would have affected the relative electoral value of these different legislative activities: clashes between government and opposition became more electorally consequential, and debates among MPs on the issues of the day less so, as voters increasingly ignored candidates' qualities and voted based on their perception of which party deserved to be in government. Our claim is that opposition acquiescence to the procedural reforms of the late 19th century is less puzzling once it is recognized that, given these well-documented changes in the electorate, opposition MPs by this time found it more valuable to showcase their party's fitness to govern than to showcase their own fitness as parliamentarians and representatives. Put differently, as voters became less sensitive to MPs' personal qualities, opposition MPs would have recognized that it was more electorally valuable to spend legislative time searching for opportunities to embarrass the government than burnishing their own individual reputations. The opposition thus accepted (even embraced) procedural changes that sacrificed *de jure* 'rights' that were *de facto* unhelpful in exchange for increased opportunities to publicly scrutinize the government.

We suggest therefore that the centralization of government powers that took place in the late 19th century can be viewed as an institutional *quid pro quo* in which the government strengthened its grip on procedural control in exchange for giving the opposition more extensive and predictable opportunities to confront ministers. The opposition accepted that exchange because, given the priorities of the electorate, it had become more valuable to shore up their inquisitorial powers than to cling to other procedural powers that no longer offered substantial electoral benefits.

The contours of our argument are consistent with statements made by Sir Henry Campbell-Bannerman, then Leader of the Opposition, in his speech occurring [*HC Deb*, 6 Feb 1902, vol 102, cols 548–650] at the introduction of Balfour's plans. Campbell-Bannerman notes that

introducing bills “is not now so important a function of the private Member as it was some twenty or thirty or forty years ago...” and that the rise of the press “... have taken away the necessity that then existed for an ample opportunity to private Members to introduce Motions for merely educative purposes.” He concedes openly that “the private Members have less and less chances of effective legislation; and the power to legislate falls more and more into the hands of the Government.” So, what was left and deserving of protection and extension was “the general right of the House to interrogate Ministers and discuss questions, and to inform the opinion of the country by so doing.” Campbell-Bannerman thus recognizes that the opposition should focus on scrutinizing the government with an eye toward the next election rather than trying to wield its limited procedural powers to alter the course of legislation.

Finally, he is quite explicit that motions that make the legislative process more efficient are reasonable, so long as they do not infringe on this opposition ability to hold the government to account:

we must take care that we do not, wittingly or unwittingly, exalt the power of the Executive and diminish the control of the House at large. Facilitate the progress of business as much as you like; make it as reasonable and as easy as you like; but do not do anything which will have the effect of placing the House of Commons more and more at the mercy of the Government of the day.

Subject to assurances on the “the power of putting Questions and the power of moving the adjournment of the House”, Campbell-Bannerman was certainly willing to listen to Balfour’s proposals; he ends his speech with the claim that he has “not wished to speak with any acrimony or disparagement of the proposals of the Government, which do them credit, and above all the speech of the right hon. Gentleman who introduced them.” In this sense there was sympathy and qualified support from the opposition, which we see as acquiescence to a new era of politics.

Not every member of the opposition was as sanguine in the face of the reforms as Campbell-Bannerman. Yet the words and identities of those disagreeing with Balfour are informative of themselves. For example, John Redmond [*HC Deb*, 6 Feb 1902, vol 102, cols 585–595], leader of the Irish Parliamentary Party, agreed with the notion of a “creeping paralysis” and claimed that he had “no objection whatever to rules calculated to facilitate the passage of good measures through this House”. His concerns were rather that the rules would not have their intended effects: that the government had set itself “an impossible task” since business would continue to expand while resources would be limited. Henry Labouchere [*HC Deb*, 6 Feb 1902, vol 102, cols 601–607], radical MP for Northampton was similarly unimpressed with details of Balfour’s proposals, though he would “admit that some of them are very good” and that “[s]omething must be done to alter these old-fashioned rules.” Intriguingly, Labouchere’s principal concern was that question answering by ministers would now be ‘piecemeal’, rather than as part of a general (adjournment) debate at the end of the day.

Our reading of the debates surrounding Balfour’s proposals is that members of the opposition did not much object to the logic of reforms that would address contemporary “[p]arliamentary anarchy” (James Lowther, MP for Thanet [*HC Deb*, 6 Feb 1902, vol 102, 633–636]), nor did they make much noise about the eclipse of the individual rights of backbench MPs. What mattered to Balfour’s critics was that the reforms protect the opposition’s ability to hold the government to account: they would accept rationalization of procedure and centralization of power as long as the opposition’s inquisitorial powers were maintained (and prioritized).

2.3 Empirical Task

Though Campbell-Bannerman’s words are in line with our claims, demonstrating the precise motivations of actors in making historical institutional choices is a difficult task. What we *can* undertake is a study of the effects of institutional change on the agents in question, and use this as a rough check of our theoretical priors. Again, we make no claims that this is a ‘test’ of a theory, but we do believe such efforts are illuminating. If, in fact, the opposition acquiesced to reforms that centralized government power in the late 19th-century in part because these reforms were accompanied by increases in the opposition’s opportunities to question ministers, and more generally to draw them into adversarial debate, we have an obvious empirical prediction. In particular, we should be able to show that during this period, government ministers became more accountable or ‘responsive’ to opposition MPs – not temporarily due to special circumstances like the rise of obstructionist practices by the Irish nationalists (see, e.g., [Dion, 1997](#), 200–214) or the Fourth Party (see, e.g. [Ramsden, 1999](#), 138–144) but rather in a persistent way.

3 Data

Since the goal is to examine the spoken interaction between executive and legislature, and to chart the ‘to and fro’ of Commons discussion, we need speeches of members. Our speeches are organized in “debates” which are available through the Hansard archive.⁶ Note that a “debate” is a generic term for a sequence of utterances pertaining to the same subject at a particular time as demarcated by parliamentary recorders (and given a particular ‘tag’ or label when marked up for external consumption), and includes open discussion, questions and answers or other statements. Importantly, what is classified as a “debate” is entirely exogenous to our particular study and in a way that appears consistent over time. This

⁶See <http://www.hansard-archive.parliament.uk/>

data is the product of a large digitization of hard copy volumes of the parliamentary record, undertaken by the Information Services division of the House of Commons. The current paper makes use of the third, fourth and fifth series of parliamentary debates, which begin in October of 1830, and run to March 1981, though here we focus on the period after the Great Reform Act of 1832, until the second year of the Great War. The speech data itself was downloaded as XML files then parsed and transformed into a relational database using Ruby on Rails.⁷

In principle, each speech in the XML is associated with a uniquely identified Member of Parliament. In practice, life was more difficult, since many speaker names in the XML are ambiguous. We spent much effort disambiguating where possible, and by the end of our process had (uniquely) identified some 93% of speakers. We subsequently assigned party affiliation to the MPs, and added information on their roles as cabinet ministers, including dates of service. Note that the data on speeches is organized within debates, within a given ministry—that is, by government—of which a given prime minister might have several while in office. In terms of designating ‘government’ or ‘opposition’ status, we designated any party that supported a government in *roll call* terms as being ‘in government’, whether or not they were formally in coalition and thus had cabinet representatives. In [Supp Info B](#) we give complete details of our data collection process, and in [Supp Info C](#) we give the full list of the ministries in our database.

4 Modeling Responsiveness

Our forgoing claim is that ministers became disproportionately more ‘responsive’ to opposition MPs in the period of procedural change after 1880, and that this may explain why the

⁷See [Supp Info A](#) for an example of our data in XML form.

opposition acquiesced to such reform. One possibility for measurement of such a concept, and that used by previous scholars (e.g. [Cox, 1987](#); [Hibbing, 1988](#)), is to look at aggregate metrics like the ‘number of questions’ in a given session. While no means unreasonable as a method for assessing the amount of ‘business’ in the House, it is not ideal for our purposes, for at least three reasons. First, the aggregate number of questions does not tell us who asked questions or who answered them, and is thus uninformative about the responsiveness of government to opposition. Second, the number of recorded questions need not be the same as the number of questions actually asked on the floor: first, some questions (for various reasons, including the fact that the asker was not in the chamber in a given day ([Chester and Bowring, 1962](#))) were scheduled on the order paper but either not asked or not answered. More importantly, the order papers do not record the number of supplementals—that is, ‘follow ups’—asked by MPs of ministers. In earlier times—pre-1902 reforms—there could be more than one of these, asked by different MPs. We presumably want to take account of these communications if we can. Third, we are interested in interaction most generally, and this extends beyond questions. That is, we want to also include the interplay between cabinet members and MPs in debates not specifically set aside as question periods.

Our central behavioral assumption is that member *A* speaks directly after member *B*, *A* is *responding* to *B*.⁸ Below, we demonstrate the validity of this convention, but first we formalize the statistical model that this implies. We see each debate, however long, as a sequence of speakers. There is no requirement that any particular utterance be a substantive statement, and thus questions to cabinet members would fit within our framework. To simplify

⁸The Speaker—unless he is making a specific point of order or interest—is not included in our debates. As an aside, note that we make no attempt to explicitly model the process by which the Speaker recognizes MPs in debate. This makes life simpler of course, but we also proceed this way for substantive reasons: given prevailing rules, we found no evidence of MPs discussing Speaker constraints on recognition, nor do we see any commentary in the secondary literature to this effect (e.g. [Chester and Bowring, 1962](#)). Thus we presume that if MPs wish to speak, they may. We acknowledge that this is a somewhat distinct feature of Westminster practice, and not present in other parliamentary democracies.

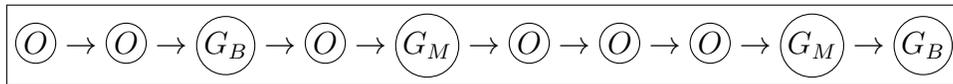


Figure 1: A ‘debate’ comprised of eight speakers with Government and Opposition roles. Individuals denoted G_M are Government ministers, while those denoted G_B are government party backbenchers. MPs denoted O are Opposition members.

matters, outside of their ministerial, backbencher or opposition role, we will not be directly interested in *who* makes the speeches—that is, we will drop any subscripts connoting specific individuals like Benjamin Disraeli with all his attendant features. What we *will* note in every case is the speaker’s status as a government minister (each such speaker is denoted G_M), a government backbencher (G_B) or an opposition member (O). This classification is mutually exclusive and jointly exhaustive.⁹ Figure 1 illustrates our understanding of a (short) debate for modeling purposes.¹⁰ Note that the O s may be the same opposition member, or they may not: we make no distinction and *mutatis mutandis* for the ministers and government backbenchers.

How then to model these debates? A simple way to proceed is to suppose that a debate sequence—as Figure 1—is a stochastic process, in which the random variables of interest are the roles of the speakers: G_M , G_B or O . A further assumption we make is that the particular process in question exhibits the Markov property. That is, that the current ‘state’, the realization of G_M , G_B or O in the sequence, depends probabilistically only on the directly preceding state. Otherwise put, once the current speaker’s identity (in terms of his role) is known, the next speaker’s identity is independent of the identity of all speakers occurring before this one. We treat each speech by a new speaker—no matter its actual length—as

⁹A natural concern is that we should distinguish between opposition frontbenchers and backbenchers, but this is difficult. While we do know who the leader of the opposition is, the notion of a ‘shadow cabinet’ is not well established for the first half of our period (Turner, 1969).

¹⁰Our use of directed graph notation here is deliberate, since we commit to a Markov chain arrangement below.

a step in a discrete chain and in our running example of an eight person debate we have $S_1 = O, S_2 = O, S_3 = G_B, \dots, S_8 = G_B$ where S_t is the t th speaker in the sequence.¹¹ Furthermore, we commit to a time-homogeneous (i.e. stationary) process in the sense that we assume that the probability of a debate moving from any particular role to another in the next stage (including to the same role) does not depend on the number of the speakers who have contributed thus far.

As usual with Markov chains, the probability of moving from state to state (here, role to role) is controlled by a transition matrix, P with typical entry $p_{ij} = \Pr(S_{t+1} = \text{role}_j | \Pr(S_t = \text{role}_i))$. The goal is to estimate the entries of P , which for our application is

$$\begin{array}{c} G_M \\ G_B \\ O \end{array} \begin{pmatrix} G_M & G_B & O \\ p_{MM} & p_{MB} & p_{MO} \\ \boxed{p_{BM}} & p_{BB} & p_{BO} \\ \boxed{p_{OM}} & p_{OB} & p_{OO} \end{pmatrix}$$

The cells enclosed in boxes are those where most of our substantive interest will focus: the probability of a transition from opposition member to minister (p_{OM}) and from government backbencher to minister (p_{BM})

There are several ways to estimate the entries of P . [Anderson and Goodman \(1957\)](#) give a maximum likelihood approach, which is consistent, though biased. Such a simple approach is unsatisfying, in part because it does not allow a data generating process that changes over time. In particular, we want to allow for debate-specific variation, arising from different

¹¹We note that there is work in computer science that considers inferring who is speaking to whom directly from texts themselves, though these tend to require third party reporting on social interactions (e.g. [Agarwal, Rambow and Passonneau, 2010](#)). There are also attempts to model distinct author styles in terms of written content, though this work typically deals with subject matter choice, rather than direction of interaction (e.g. [Rosen-Zvi et al., 2004](#)).

topics of discussion (or different formats, e.g. questions vs open debate), and ministry-specific variation arising from different personnel who hold office during particular periods. Notice here that observations are nested: speeches occur within debates which occur wholly within ministries. This suggests that a hierarchical model (in the sense of e.g., [Gelman and Hill, 2006](#)) is called for, with random effects for levels such that we can relax the rather strong assumption of exchangeability of observations (see also [Western, 1998](#), for discussion).

The specific technique we use is a random slopes multinomial logit model with unconstrained covariance matrices for the relevant (ministry and debate) random effects.¹² The fundamental logic of such an approach is easy to grasp: let the current state of the debate be $y_i \in \{G_M, O, G_B\}$ and suppose that we have the single predictor, $x_i \in \{G_M, O, G_B\}$ which is simply the (identity of the) previous speaker. We use the first speech in a debate as the first value of the covariate x_1 ; the identity of the second speaker becomes y_1 . Subsequently, this second speaker becomes x_2 , while the third speaker is y_2 ; y_2 becomes x_3 and so on.¹³ We make this set up more obvious with [Figure 2](#), where we show the way that a single debate (denoted d in the top row) would be rewritten in terms of x and y vectors.

We obtain the entries of P via the predicted probabilities from the model: thus, $\Pr(G_M|O)$ is the probability that we observe $y_i = G_M$ given that $x_i = O$; $\Pr(G_M|G_B)$ is the probability that we observe $y_i = G_M$ given that $x_i = G_B$ and so on. In the standard generalized linear set-up (in the sense of [McCullagh and Nelder, 1989](#)) these probabilities are straightforward to compute. Here life is slightly more complicated by the random effects, which necessitate

¹²Substantively, the random effects can be thought of as fillips to the probability that a particular transition takes place: thus, if a debate has a ‘large’ random effect for the predicted $\Pr(O|G_M)$, it might imply that it is of a type where ministers are especially responsive (perhaps a question period). Note that the model with debate level effects is less parsimonious than one without, but indications are that it fits better: see [Supp Info E](#) for more details.

¹³See [Epstein et al. \(2006\)](#) for a similar approach to modeling democratic transitions.

	S_1	S_2	S_3	S_4	S_5	S_6	S_7
d	O	O	G_B	O	G_M	G_M	G_B
\mathbf{x}	x_1	x_2	x_3	x_4	x_5	x_6	
\mathbf{y}	O	O	G_B	O	G_M	G_M	
		y_1	y_2	y_3	y_4	y_5	y_6
		O	G_B	O	G_M	G_M	G_B

Figure 2: A debate in y_i, x_i vector form. Note that the first speech becomes x_1 and is used to predict the second speech, which is y_1 . Then y_2 is used as x_2 and so on.

the use of a generalized linear *mixed* model. To fit this model, we take a Markov Chain Monte Carlo (MCMC) approach and use [Hadfield \(2010\)](#)’s `MCMCglmm` software package.¹⁴ Such an MCMC approach allows us to estimate the random effects directly, and from there obtain the auxiliary parameters—the predicted probabilities—we care about. All told, we can thus report estimated transition probabilities, while allowing for both debate and ministry effects. In [Supp Info E](#) and [Supp Info F](#) we give more precise details of our model and the fitting process. As a practical matter, we model only debates that are constituted of at least ten speeches, which is a little over the mean number of speeches per debate for our data. We impose a lower bound in part to ensure that we are not attempting to model announcements of policy (such that there may be just one or two speeches) or debates where (for some reason) large portions are missing from the historical record. This leaves us with 18,032 debates (534,627 speeches) over the period under study.

¹⁴Note that we take a Bayesian approach here in the sense that we specify a prior, and will make inferences from a posterior (see, e.g., [Gill, 2002](#); [Jackman, 2009](#), for discussion of the use these techniques in social science.).

	oppn MPs	govt backbenchers	ministers
in data	0.50	0.36	0.15
of last speeches	0.42	0.33	0.24

Table 1: Proportion of speeches in the data and as last speeches in debate by role in the Commons.

4.1 Validating Sequences as Responsiveness

Our assumption is that when ministers speak after another member, they are in some sense ‘responding’ to the previous speaker. We validated this claim in three ways. First, assuming that those who ask questions or make points generally receive (ministerial) answers, an implication of our position is that ministers ought, disproportionately, to be the last speaker in a debate. That is, if a debate consists solely of ‘question’ followed by ‘answer’, it should be the MP answering—i.e. the minister—who speaks last. The null hypothesis against which to test this assertion is that the last speaker is simply a random draw from the appropriate (multinomial) distribution with characteristic probabilities given by the relevant proportions of the speaker type in the data. For example, if 14% of speeches are given by ministers in the data as a whole, but 30% of last speeches, we might suspect that ministers are indeed ‘responding’.

In Table 1 we present the relevant figures: the top row reports the proportion of speeches given in the data as a whole, and the bottom are last speeches. We conducted a χ^2 test with the alternative hypothesis that at least one of the role proportions was not equal across the two scenarios and we can reject the null on this basis ($p < 0.01$). We then combined the non-ministerial categories into one, and re-ran the test under the new null that this implied; once again, ministers were disproportionately more likely to be last speakers ($p < 0.01$). This is consistent with our claims that ministers ‘respond’ to others when they speak.

Second, we can look at speech ‘triples’: that is, speech sequences (within debates) consisting

	triple	frequency
1	minister, minister, minister	35
2	non-minister, minister, minister	430
3	minister, minister, non-minister	459
4	non-minister, non-minister, minister	33553
5	minister, non-minister, non-minister	34106
6	minister, non-minister, minister	37183
7	non-minister, minister, non-minister	68537
8	non-minister, non-minister, non-minister	324260

Table 2: Proportion of various ‘triples’ in the data.

of three speeches. Dividing MPs into ministers or non-ministers, we have a total of $2^3 = 8$ possibilities: {minister, non-minister, minister}, {non-minister, minister, non-minister} and so on. Table 2 gives the relevant sums across the entire data series. Notice that {non-minister, minister, non-minister} is more than twice as common as {minister, non-minister, non-minister} and {non-minister, non-minister, minister}. If we consider the former to be our prototypical notion of a minister engaging with the Commons—i.e. speaking between two non-Cabinet ministers, we have yet more evidence that our claims that ministers do indeed ‘respond’ to others are correct.

In Figure 3 we consider the time series (by ministry) of the ‘one minister’ triples (so, rows 4, 5 and 7 in Table 2). In particular we look at the share of these triples that ‘non-minister, minister, non-minister’ contributes. As can be seen, this suddenly increases around the 1880s (around the time of Gladstone’s 3rd Ministry). A natural thought is that as the state did more in the 19th century (see Cox, 1987), ministers would be compelled to say more in the Commons, though they need not be in any kind of response dynamic. But if that were true, we would expect all the triples involving a minister to increase over time, and thus for the line to be flat across the entire period: clearly it is not, and we have *prima facie* evidence that something else is going on.

Third, we turned to two (independent) human coders and asked them to read debate se-

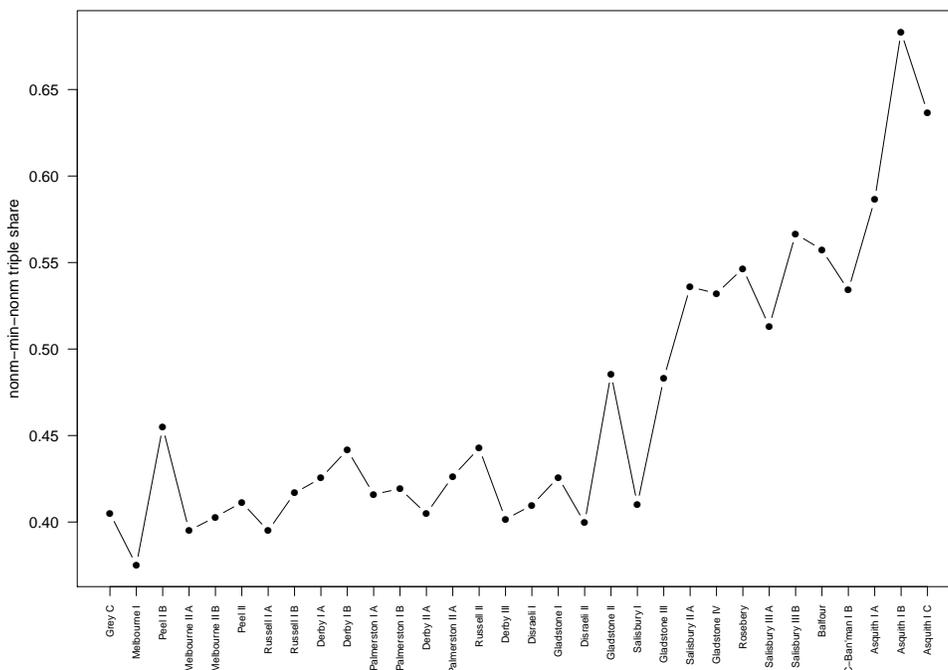


Figure 3: Share of one minister ‘triples’ held by the sequence ‘non-minister, minister, non-minister’ over time.

quences (around 500 in total) and comment on whether or not ministers were responding when they spoke after an MP. We give more details in [Supp Info D](#), but the essential fact is this: reading a sample of speeches in which a minister spoke after a non-minister, our research assistants (who had no prior knowledge of our measurement assumptions) consistently viewed the minister’s speech as a response to the preceding speech; this proportion was consistent throughout the period we examine.

5 Results

To recap, we have estimates for the relevant entries to the transition matrix: these are in the form of (posterior) predicted probabilities for every ministry, for every debate. For any given ministry, we have a distribution of these probabilities, which can we efficiently summarize as a boxplot. For the transition of a $O \rightarrow G_M$, that is from opposition member to a minister,

Figure 4 presents our results. Each light [blue] box is a Tory ministry, each dark [yellow] box is a Liberal ministry. The solid vertical line to the right of the plot marks the (approximate) date of the 1902 “railway timetable” reforms. The solid line moving left to right is a lowest for the mean probability for the ministries in the data. On the same scale, Figure 5 does the same for the government backbenchers. There are several immediate observations: first, it seems that ministers are more likely to find themselves responding to the opposition than to their own (government backbenchers). This can be seen from the relative height of the mean (or median) lines, or from the fact that, in general, the high ‘tails’ of the distribution of predicted probabilities in Figure 4 are more populated than for the same region in Figure 5. In terms of means, the probability of a minister responding to an opposition member (i.e. the probability that a minister speaks, conditioned on an opposition member speaking immediately prior) is 0.23 for the period under study, while for backbenchers it is 0.12. We can, of course, do formal tests: a t -test ($p < 0.01$), Wilcoxon signed rank test ($p < 0.01$) and Kolmogorov-Smirnov test ($p < 0.01$) all suggest that (on average) the probability of a minister responding to an opposition member is larger than the equivalent conditional probability for government backbenchers. We make use of these tests for all our comparisons in what follows.

A more subtle question concerns notions of the relative change in these differences. We first need to establish the nature of the time series in question. Recall that our claim is that as parties became party orientated, oppositions began to act as ‘governments- in-waiting’, and probe Cabinet ministers in the Commons. We would thus expect that any shifts in the relevant transition probabilities would not occur before the key reform acts that broadened the franchise in the middle of the 19th century (i.e. the Second Reform Act of 1868, and the Third Reform and associated Redistribution Acts of 1884–85). To check for shifts, we consider ‘change points’ in the data. First, we examine the series on a ministry-by-ministry

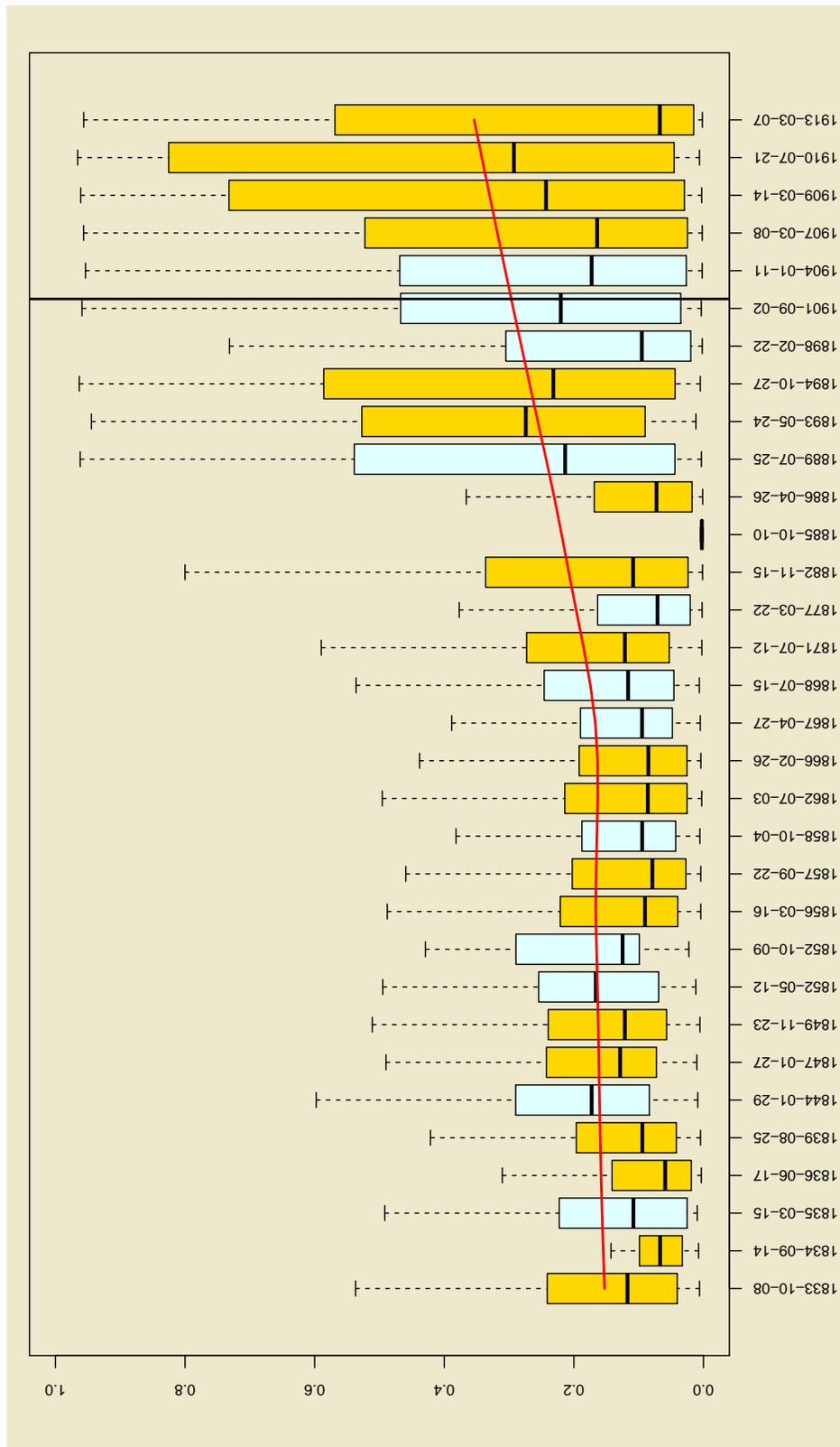


Figure 4: Boxplot of probability that a cabinet minister speaks after an opposition member. Each light [blue] box is a Tory ministry, each dark [yellow] box is a Liberal government. The solid vertical line to the right of the plot marks the (approximate) date of the 1902 “railway timetable” reforms. The solid line moving left to right is a lowest of the means in the data.

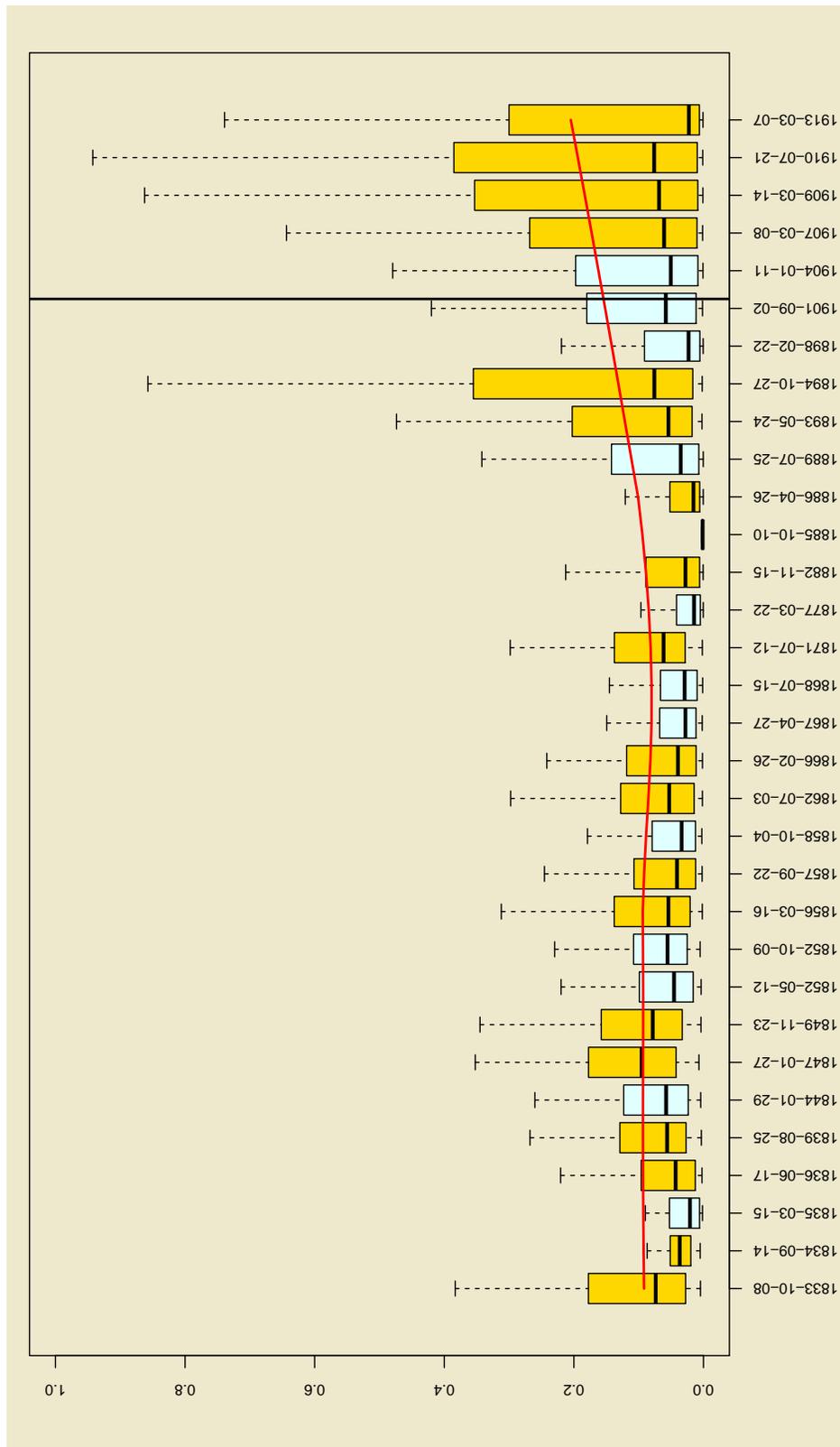


Figure 5: Boxplot of probability that a cabinet minister speaks after a government backbench member. Each light [blue] box is a Tory ministry, each dark [yellow] box is a Liberal government. The solid vertical line to the right of the plot marks the (approximate) date of the 1902 “railway timetable” reforms. The solid line moving left to right is a lowess of the means in the data.

basis using the (multiple) structural break approach described in [Bai and Perron \(2003\)](#) implemented by [Zeileis et al. \(2002\)](#), with standard defaults. Table 3 reports the results for both the time series—that is, ministers responding to both opposition and government backbench members—and in both cases the best fitting model (by Bayesian Information Criterion) suggests one break. These occur in Gladstone’s third ministry for the opposition time series, and Salisbury’s second ministry for the backbenchers, occurring around the period 1886–1889 (the median dates of those ministries).¹⁵ We can also report the mean probabilities either side of the break(s): for opposition responsiveness, the probability increases from 0.15 to 0.31 ($p < 0.01$). For the backbenchers, the probability increases from 0.08 to 0.17 ($p < 0.01$). We can also see that indeed, the (one) change when it came was between 1880 and the First World War: specifically around 1885 in both cases. These changes do not appear to be a limited term effect associated specifically with either Irish nationalists of the Fourth Party: that is, the increase in response rates continue into the twentieth century, long after these groups had ceased their obstructionism. Finally, the (absolute) increase in responsiveness for opposition members is around 0.16, larger than the increase for backbenchers, at 0.09. Assuming normality, we compared the difference between the opposition and government backbencher time series with a t -test (using the Gladstone ministry as the break): the difference in differences is significant ($p < 0.01$).¹⁶

¹⁵Note that our finding of the relevant break dates is robust to removing the Salisbury I ministry of October 1885: a short-lived government with seemingly very low responsiveness.

¹⁶Denote the opposition time series pre-break as x_1 and post-break as x_2 while the backbencher time series is y_1 and y_2 respectively. Then we compare means for $x_1 - y_1$ vs $x_2 - y_2$.

		number of breaks							(optimal) break
		0	1	2	3	4	5	6	
O	BIC	-58.42	-89.7	-84.93	-82.12	-77.5	-71.98	-65.17	1886 (Gladstone III)
	mean	0.15			0.31				
G_B	BIC	-91.1	-112.0	-109.2	-108.1	-102.9	-99.1	-92.8	1889 (Salisbury II)
	mean	0.08			0.17				

Table 3: Structural break tests, ministry-by-ministry basis. Note that BIC suggests one break is optimal for both O and G_B transition types, and that position of breaks is very similar (observation 22 and 23 respectively).

To check robustness of this timing result, we also ran mean segmentation (change point) tests on all the data, disaggregated out across time (so not grouped by ministry)—in the sense of [Barry and Hartigan \(1993\)](#)—and our findings are essentially unchanged: the change points are in the 1890s, and the change in ministerial responsiveness to the opposition is larger than for the government backbenchers.¹⁷ Although our break point findings are broadly consistent with our priors above, we note that 1902 is not estimated as the precise location with either technique. At least one reason for this is that the process of responsiveness is a noisy one, and it is of course conceivable that several other (more minor) factors are involved in driving the patterns we see—the next section considers some alternative explanations. More generally, the key result we take from this analysis is that whatever the consequence of the rationalizing reforms of 1902, it was certainly not a *decrease* in responsiveness. That is, even if it did not produce change of itself, we can claim that the ‘railway timetable’ was at the very least part

¹⁷ See [Supp Info G](#) for more details.

of a codification of a new incentive structure for government and opposition.

6 Alternative Explanations

Above, we explained the opposition’s acquiescence to centralizing reforms by showing a contemporaneous increase in government responsiveness to the opposition. There are, of course, other possibilities. One is that the opposition ‘acceded’ because it would be pointless to attempt to defeat the government. A second is that the opposition knew it would benefit the new agenda setting powers when it eventually won power. Although it is difficult to rule out either possibility, both stories raise a new puzzle: if it was not attempting to ‘buy off’ of the opposition, why would the government become more responsive to the opposition than its own backbenchers, and why specifically *during the last two decades of the 19th century*?

One possible solution to this puzzle comes from noting that the government, along with the opposition, might wish to expose itself to more scrutiny during this period. To see this, recall that as *per* [Cox \(1987\)](#)’s account, we contend that voters increasingly cast their ballots by considering MPs as parties of governing teams, rather than as individual legislatures. Learning about the quality of such a team in part comes from observing (via e.g. newspaper reports) the relative performance of the parties in government-versus-opposition clashes, but also by observing the extent to which governments made themselves available for such battles. The logic here is one of costly signaling (in the sense of [Spence, 1973](#)) to a (by then) sufficiently party-orientated electorate: low quality governments would hide from opposition probing in the Commons.¹⁸ Whether or not one views government responsiveness as a concession to the opposition, this could explain why governments would be willing to extend scrutiny rights.

¹⁸See [Supp Info H](#) for more information on such an approach.

An alternative explanation focusses on the divergence between the interests of the opposition *front bench* (emerging as a distinct entity in the middle of our period (Turner, 1969)) and opposition backbenchers. Ultimately, it was those in the shadow cabinet who stood to play the most prominent role in any government scrutiny, and these same MPs would benefit most from centralized power once in government. Meanwhile, their backbench colleagues relied more heavily on the rights being surrendered (for personal status, or to accrue rents). But even if we see the reforms as the triumph of the front bench over the backbenchers, the basic mechanism is similar: backbenchers gave up prerogatives that did little to garner them reelection among party-orientated voters, and perceived that their futures depended on the ability of the shadow cabinet to prove their party's worth as a possible government. A different take on the front bench-backbench struggle is provided by extending Cox (1987)'s 'tragedy of the commons' logic: in particular, that the latter part of the 19th century was a chaotic period of fractious (especially Irish) obstructionism in which the cabinet and (mainstream) opposition recognized that government consolidation of power was a Pareto improvement for everyone other than the "permanent minority" (in Redmond's words). In this story, the opposition frontbench seeks assurances that it will still be able to appeal to voters via scrutiny, while simultaneously gutting the ability of others to hold up this and other business.

We provided a parsimonious *quid pro quo* account to explain an increase in government responsiveness that coincided with a consolidation of government procedural control. Other explanations are possible, and ultimately observationally equivalent given current data. Nonetheless, we wish to emphasize that all the alternative explanations have a single similar thread: the shift in the electorate toward party-line voting and away from personalistic competition.

7 Conclusion

The rights of minorities are a core concern of those interested in the organization of democracy (Madison, 2009; de Tocqueville, 2004; Mill, 2006). This extends to electoral system choice, and the way that legislatures are structured (Lijphart, 1999; Powell, 2000). Generally speaking, though majorities have much to gain from reduced minority rights, minorities themselves would prefer not to lose their prerogatives (Binder, 1996; Dion, 1997; Schickler, 2000). In this paper we took this logic to the puzzle of the Westminster system. In particular, we asked under what circumstance would minorities (for us, oppositions) accede to reforms in which their rights are curtailed. Our argument was that, by the late 19th century, opposition MPs benefited little from *de jure* rights to initiate or amend legislation; this is because of well-recognized changes in British politics over the previous several decades that made cabinets strong, parties cohesive, and voters party-oriented (Cox, 1987). Instead, oppositions focussed on holding the executive to account: that is, they prioritized the garnering of regular and unfettered access to ministers. They sought to question them, to debate them and generally present themselves as a ‘government-in-waiting’ to voters who cared above all about which party would better lead the country. We have shown via a historically important case that oppositions can act in rational ways when bargaining over future procedural rights, especially as electoral incentives change – an observation that should be of interest even to scholars not directly concerned with Westminster systems.

We showed that ministerial ‘responsiveness’ rose quickly between the 1880s and Balfour’s ‘railway timetable’ reforms at the turn of the 20th century and remained high thereafter. While government backbenchers certainly found their inquiries more likely to be answered too, the biggest (absolute) increase is reserved for opposition members. That is, while their rights to contribute to legislation directly were reduced, their rights to be adversarial in the

chamber were enhanced. We showed this using a (novel) Markov chain model of debate, and we estimated its parameters using Bayesian techniques relatively well-known to political scientists. To undertake our project, we gathered a massive new data set—with information on approximately 7000 MPs, a half million speeches, ministerial records and more—that we hope to put in the public domain.

We used a new metric of responsiveness which relies on sequences of speeches between members of different types and we were able to validate our approach in several ways. In this sense then, we have contributed to the political scientist’s tool kit a new method for modeling debate. Scholars may be interested in applying this logic to legislatures with different institutional structures to see how, and why, rates of responsiveness differ from the Commons. There is also data for the post-Great War period in Britain that we do not utilize: it might be interesting to see how debate has developed into the modern era as the Labour party has replaced the Liberals, and as the evolution toward party-centered elections has continued.

As we noted throughout the paper, precisely ‘testing’ our theory of change is difficult: here, we simply have aggregate evidence broadly consistent with our claims. One possibility is to obtain a more precise measure of government agenda-control: this way, we could statistically condition on the relative weakness of the opposition at any given time, and better understand the timing of changes to their rights. Finding such a measure is non-trivial, though the changing contents of the speeches over time might be a place to begin looking. Approaches using ‘topic models’ (Quinn et al., 2010)—might address such a concern: we would expect more subtle inferences about *how* and *for what* ministers were held accountable. This might help us understand the nature of policy competence, or perceived responsibilities over time and thus give us a sense of the way that the British state developed. We leave such efforts for future work.

Supporting Information (SI)

Supp Info A Example of Debate Segment

An example of our data as it appears online is given in Figure 6. This particular snippet is from a discussion of a colliery accident in Wigan in 1847; in this case, Sir George Grey, the Home Secretary, makes a statement which is challenged by Thomas Duncombe, Member of Parliament for Hertford. This general idea, of speakers ‘responding’ to one another is at the center of our study here. As can be seen from the text in the figure, at this time the parliamentary record used the third person for reporting purposes (“Mr. Duncombe expressed his astonishment at the hon. Member for Berwick”).

Supp Info B Data: Organization and Processing

To give some sense of the disambiguation task we faced, consider the following example: in 1841, while there were 3949 speeches made, some 2957 (75%!) could *not* initially be ascribed unambiguously to a particular speaker. For instance, the record includes speeches by ‘Mr. R. Bernal’, ‘Captain Bernal’, ‘Mr. Bernal’ and ‘Capt. Bernal’. The problem is that the House of Commons at this time contains two MPs named Bernal, one the father of the other. There were, in addition, numerous misspellings and unusual or alternative spellings. We expended considerable effort and time to correct and/or disambiguate these cases where possible, and were able to make substantial improvements in terms of allocating speeches to specific MPs; using 1841 as an example, our final data set had just 271 speeches that year unaccounted for—meaning that some 93% of speakers had been identified.

Unfortunately, Hansard at this time did not routinely record the party affiliation of speakers

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- <p id="S3V0094P0-00140">
  <member>SIR GEORGE GREY</member>
- <membercontribution>
  , in reply, stated that he had not as yet received any reply from the coroner of the
  district, to whom, as well as to the magistrates, he had written; neither had he
  received any communication from the magistrates tending to confirm the charges
  made against the owners of the colliery. He had, in consequence of the statement
  which had been made by the hon. Member for Finsbury respecting the accident,
  addressed a communication to the magistrates and coroner of the district, offering
  any assistance which could be given by the Home Office to forward the inquiry;
  and he had directed the magistrates to inquire rigidly into the means adopted for
  saving the lives of the persons who had been left in the pit, and to investigate the
  substance of the charges made against the proprietors of the colliery. He had just
  received a letter, dated the 6th of July, from the magistrates, in which they stated,
  that in consequence of the letter from the Home Office, they had directed their
  clerk to call a meeting of the magistrates, and that they had heard the statements
  of several parties upon the subjects alluded to in the communication. The result of
  the inquiry was, that they had come to an unanimous opinion as to cause of the
  accident. As that question, however, was still under the consideration of the
  coroner's inquest, he (Sir G. Grey) did not think it would be right for him to state
  the nature of their opinion until the verdict of the coroner's jury should have been
  ascertained. As to the question of the subsequent conduct of the owners of the
  colliery in preventing persons from descending into the pit to rescue those who
  might
  <image src="S3V0094P0I0035" />
  <col>49</col>
  have been left alive in it, the magistrates were convinced that no man left in the pit
  after the explosion could have been alive, and that every exertion that could have
  been made was made to get them out. That letter was signed by five magistrates.
  As he had before stated, he had received no letter from the coroner, whose
  investigation was still proceeding; but he would observe, that the gentleman who
  had been alluded to by the hon. Member for Fins-bury had had every opportunity
  during the inquest of examining and cross-examining any witnesses he chose.
  </membercontribution>
  </p>
- <p id="S3V0094P0-00141">
  <member>MR. DUNCOMBE</member>
  <membercontribution>expressed his astonishment at the hon. Member for Berwick
  denying the grounds for the statement which he had made. He had informed
  Gentlemen who was his authority. The man himself had been in London, and might
  have been examined in the lobby of the House by the hon. Member, had he chosen
  to satisfy himself upon the subject. And now he (Mr. Duncombe) was prepared to
  support the statement he had made. If the masters could have contradicted those
  statements, they had had opportunities of going before the coroner, whose inquiry
  had been adjourned from Thursday last to that very day. But he would state what
  one of the owners, Mr. Robert Lankester, had himself stated. Mr. Robert Lankester
  said the men were bricked up and could not escape.</membercontribution>
  </p>
  </section>
- <section>

```

Figure 6: An example of debate from the parliamentary archive, marked up in XML.

in parliament. We obtained the universe of possible Members of Parliament for this period from the electoral contest statistics recorded by [Craig \(1989\)](#), [Craig \(1974\)](#) and [Walker \(1978\)](#), which also recorded party. The task of disambiguation above thus partly involved connecting the names from these sources to the individuals in the debate records. One helpful starting point for us was provided by Millbank Systems, a website set up by individuals working with the Hansard Digitisation Project.¹⁹ That site contained information on dates of birth, death, constituency names and alternative titles for MPs—though not always matched correctly to the speaker records (if matched at all).

We obtained information on individual MPs' roles as Cabinet members (and the dates of their service) from standard sources: [Cook and Keith \(1975\)](#) and [Butler and Butler \(1994\)](#). To reiterate, for the purpose of modeling, our data is considered by ministry, some of which overlap different parliaments, since the norm in the 19th century was not necessarily to go to the country upon a new government taking office. These ministries are essentially defined by (1) a change in lead cabinet personnel, which typically refers to a change in the party identification of the Prime Minister, if not the Prime Minister himself; and/or (2) an intervening general election that reshuffles party strengths in seat terms. This means that, for example, we 'count' three Liberal administrations under Asquith as Prime Minister: the first beginning in 1908 when he succeeds Campbell-Bannerman who resigned in ill health, the second beginning after the January 1910 general election, and the third beginning after the election of December the same year.

After completing the work above, we were required to make a decision over which parties could be regarded as being 'in government' and 'in opposition' at any one time. As noted in text, we designated any party that supported a government in *roll call* terms as being

¹⁹<http://hansard.millbanksystems.com/>

‘in government’, whether or not they were formally in coalition and thus had cabinet representatives. Thus, the Liberal Unionists post-1885 are considered part of the Conservative government (when so formed), whereas the various Irish Nationalists are considered part of the Gladstone government of 1892-1894. The one ministry we exclude *a priori* is that of the Earl of Aberdeen, 1852–1855. We do this because that government and its supporting backbenchers was partly composed of Peelites, who we cannot identify separate to Protectionist Tories in the data (all such Conservative MPs ran under the Tory/Conservative label in the 1852 general election). We therefore cannot easily distinguish government and opposition MPs for that period. We also exclude very short administrations, for which we have fewer than 100 speeches made in parliament—Wellington’s caretaker administration in 1834 being an example of such. [Supp Info C](#) gives more details on the ministerial breakdown of our data.²⁰

²⁰Once we impose the constraints above, we have 32 ministries and our model is fit to that whole set of governments. In our (time series) analysis below though, we drop the small number of observations/predictions from the Grey *C* and Palmerston I *B* ministry since (from the historical record) we were not completely certain of the precise dates on which the debates in those ministries occurred.

Supp Info C Ministries in the Data

Ministry	Prime Minister	Parties of Government	Start date	End date
Grey C	Earl Grey (Charles Grey)	L	1833-01-08	1834-07-09
Melbourne I	Viscount Melbourne (William Lamb)	L	1834-07-16	1834-11-14
Wellington	Duke of Wellington (Arthur Wellesley)	C	1834-11-17	1834-12-09
Peel I A	Sir Robert Peel	C	1834-12-10	1835-02-19
Peel I B	Sir Robert Peel	C	1835-02-19	1835-04-08
Melbourne II A	Viscount Melbourne (William Lamb)	L	1835-04-18	1837-08-18
Melbourne II B	Viscount Melbourne (William Lamb)	L	1837-08-19	1841-08-30
Peel II	Sir Robert Peel	C	1841-08-30	1846-06-29
Russell I A	Lord John Russell	L	1846-06-30	1847-08-26
Russell I B	Lord John Russell	L	1847-08-26	1852-02-21
Derby I A	Earl of Derby (Edward George Geoffrey Stanley)	C	1852-02-23	1852-07-31
Derby I B	Earl of Derby (Edward George Geoffrey Stanley)	C	1852-08-01	1852-12-17
Aberdeen	Earl of Aberdeen (George Hamilton-Gordon)	P	1852-12-19	1855-01-30
Palmerston I A	Viscount Palmerston (Henry John Temple)	L	1855-02-06	1857-04-24
Palmerston I B	Viscount Palmerston (Henry John Temple)	L	1857-04-25	1858-02-19
Derby II A	Earl of Derby (Edward George Geoffrey Stanley)	C	1858-02-20	1859-05-18
Derby II B	Earl of Derby (Edward George Geoffrey Stanley)	C	1859-05-19	1859-06-11
Palmerston II A	Viscount Palmerston (Henry John Temple)	L	1859-06-12	1865-07-24
Palmerston II B	Viscount Palmerston (Henry John Temple)	L	1865-07-25	1865-10-18
Russell II	Lord John Russell	L	1865-10-29	1866-06-26
Derby III	Earl of Derby (Edward George Geoffrey Stanley)	C	1866-06-28	1868-02-25
Disraeli I	Mr Benjamin Disraeli	C	1868-02-27	1868-12-01
Gladstone I	Mr William Ewart Gladstone	L	1868-12-03	1874-02-17
Disraeli II	Mr Benjamin Disraeli	C	1874-02-20	1880-04-21
Gladstone II	Mr William Ewart Gladstone	L, L/Lab	1880-04-23	1885-06-09
Salisbury I	Viscount Cranborne (Robert Arthur Talbot Gascoyne Cecil)	C	1885-06-23	1886-01-28
Gladstone III	Mr William Ewart Gladstone	L	1886-02-01	1886-07-20
Salisbury II A	Viscount Cranborne (Robert Arthur Talbot Gascoyne Cecil)	C, LU, LU (L), LU (Ind L), Ind L (LU), LU/Crf, LU C, U	1886-07-25	1892-07-26
Salisbury II B	Viscount Cranborne (Robert Arthur Talbot Gascoyne Cecil)	C, LU, LU (L), LU (Ind L), Ind L (LU), LU/Crf, LU C, U	1892-07-27	1892-08-11
Gladstone IV	Mr William Ewart Gladstone	L, L/Crf, PN, APN, N	1892-08-15	1894-03-02
Rosebery	The Earl of Rosebery (Archibald Philip Primrose)	L, L/Crf, PN, APN, N	1894-03-05	1895-06-21
Salisbury III A	Viscount Cranborne (Robert Arthur Talbot Gascoyne Cecil)	C, LU, LU (C), C (L), LU (Ind L), LU*, C (Ind C), LU (L), Ind C (L), Ind. U(R), Ind. U	1895-06-25	1900-10-24
Salisbury III B	Viscount Cranborne (Robert Arthur Talbot Gascoyne Cecil)	C, LU, LU (C), C (L), LU (Ind L), LU*, C (Ind C), LU (L), Ind C (L), Ind. U(R), Ind. U	1900-10-25	1902-07-11
Balfour	Mr Arthur James Balfour	C, LU, LU (C), C (L), LU (Ind L), LU*, C (Ind C), LU (L), Ind C (L), Ind. U(R), Ind. U	1902-07-12	1905-07-12
Campbell-Bannerman I A	Sir Henry Campbell-Bannerman	L, L (Ind L), L/Lab	1905-12-05	1906-02-08
Campbell-Bannerman I B	Sir Henry Campbell-Bannerman	L, L (Ind L), L/Lab	1906-02-09	1908-04-03
Asquith I A	Mr Herbert Henry Asquith	L, L (Ind L), L/Lab	1908-04-05	1910-02-20
Asquith I B	Mr Herbert Henry Asquith	L, L (Ind L), L/Lab	1910-02-21	1910-12-19
Asquith I C	Mr Herbert Henry Asquith	L, L (Ind L), L/Lab, N, Ind. N (OB), Ind. N, Ind. N (H)	1910-12-20	1915-05-25

Supp Info D Human Validation of Responsiveness

In our first test, we gave a Research Assistant (RA) 101 2-speech sequences which involved a minister and a non-minister. In 85% of the cases involving a ‘true’ response, the RA identified it correctly. A binomial test suggests the RA was not guessing: the null hypothesis of 0.5 is easily rejected.

In our second test, we produced a sample of 400 speeches in which a minister followed a non-minister, drawn from parliaments spread across the period we study. We then asked a (different, independent) RA to judge whether, based on the first 1000 characters of the speech, the minister was (1) not responding to the previous speaker, (2) possibly responding to the previous speaker, or (3) responding to the previous speaker. In 83.5% of cases (334/400) the minister was judged to be either responding (code 3) or possibly responding (code 2) to the previous speaker; in well over half of the cases (249/400, or 62%) the research assistant marked a 3, indicating that the minister was clearly responding to the previous speaker. The proportion of speeches marked 2 or 3 was fairly stable at around 80% for the whole period; the proportion marked 3 as opposed to 2 appears to increase over time, indicating that relatively more of the speeches were clearly responding to the previous speech. Breaking down the data according to whether the minister followed a government backbencher or a member of the opposition, we find that a somewhat higher proportion of the speeches following opposition members were clearly responses.

Supp Info E Mixed Modeling of Debates

Fitting the Correct Model

The goal is to fit a random-slopes multinomial logistic regression. We have Y taking one of three values 1, 2, 3 and a single nominal explanatory variable X similarly taking one of three values. We have two random effects of interest, one pertaining to a debate (subscript d) and one pertaining a ministry (subscript m). Debates are nested within ministries.

In terms of latent variables ('traits' in the biological literature), we have two of interest:

$$l_{i,\text{state } 2} = \log \left(\frac{\pi_{mdi}^{(2)}}{\pi_{mdi}^{(1)}} \right) = [\beta_1^{(2)} + u_{d1}^{(2)} + u_{m1}^{(2)}] + [\beta_2^{(2)} + u_{d2}^{(2)} + u_{m2}^{(2)}] I_{(X_{mdi}=2)} + [\beta_3^{(2)} + u_{d3}^{(2)} + u_{m3}^{(2)}] I_{(X_{mdi}=3)}$$

and

$$l_{i,\text{state } 3} = \log \left(\frac{\pi_{mdi}^{(3)}}{\pi_{mdi}^{(1)}} \right) = [\beta_1^{(3)} + u_{d1}^{(3)} + u_{m1}^{(3)}] + [\beta_2^{(3)} + u_{d2}^{(3)} + u_{m2}^{(3)}] I_{(X_{mdi}=2)} + [\beta_3^{(3)} + u_{d3}^{(3)} + u_{m3}^{(3)}] I_{(X_{mdi}=3)}$$

where i is a speech given by an MP with a particular role, within some debate d , within some ministry m . The indicator X_{mdi} is a dummy variable.

Note that in this formulation we have a total of 6 different fixed effects (the β s, above) and 12 different types of random effects. In practice, we have 531822 speeches in 17841 debates in 32 ministries. We have six (possible) random effects for each debate (so, 6×18032), six (possible) random effects for each ministry (6×32), and six 'fixed effects' yielding a total of $6 + 108192 + 192 = 108390$ estimated quantities.

We favor the model with random effects on theoretical grounds, but we note in passing

that it fit better statistically than one with fixed effects only. This is somewhat difficult to test formally (we can use intra-class correlations in the binary logit case but there is no well-accepted alternative for the multinomial case), so we treated the outcome (y) as a continuous variable taking values 1, 2, 3 and the covariate x in the same way. We then regressed y and x in a linear model for each ministry, including a debate-effect in one specification, but not in another. In every ministry, the model with the debate-effects had a higher adjusted- R^2 .

Predicted Probabilities

We want to estimate the predicted probabilities for particular transitions, such as $\Pr(Y = 2 \rightarrow Y = 3)$. We wish to do this for a (every) given debate in a (every) given ministry. Note that, with the MCMC approach, we have estimates (‘predictions’) of the random effects themselves u_m and u_d for all debates and ministries. The general formula is as the standard multinomial logit, except that we need to include the random effects in each case. So, recalling that $\exp(l_1) = 1$ we want

$$\Pr(Y = j) = \frac{\exp(l_j)}{1 + \exp(l_2) + \exp(l_3)}$$

Conditioning on a given value of $X = h$, for the i th speech in debate d in ministry m , we want

$$\Pr(Y = j|X = h) = \frac{\exp(l_j)}{1 + \exp(l_2) + \exp(l_3)}$$

where

$$l_2 = [\beta_1^{(2)} + u_{d1}^{(2)} + u_{m1}^{(2)}] + [\beta_h^{(2)} + u_{dh}^{(2)} + u_{mh}^{(2)}]I_{(X_{mdi}=h)}$$

and

$$l_3 = [\beta_1^{(3)} + u_{d1}^{(3)} + u_{m1}^{(3)}] + [\beta_h^{(3)} + u_{dh}^{(3)} + u_{mh}^{(3)}]I_{(X_{mdi}=h)}.$$

Thus, for speech i , in debate d in ministry m , we have

$$\hat{\Pr}(Y_{mdi} = h | X_{mdi} = k, u_d, u_m) = \frac{\exp([\hat{\beta}_1 + \hat{u}_{d1}^{(h)} + \hat{u}_{m1}^{(h)}] + [\hat{\beta}_k^{(h)} + \hat{u}_{dk}^{(h)} + \hat{u}_{mk}^{(h)}] I_{(X_{mdi}=k)})}{1 + \exp([\hat{\beta}_1 + \hat{u}_{d1}^{(h)} + \hat{u}_{m1}^{(h)}] + [\beta_k^{(h)} + \hat{u}_{dk}^{(h)} + \hat{u}_{mk}^{(h)}] I_{(X_{mdi}=k)})}$$

Consider for example, the predicted probability of moving from an opposition member (state 1) to a cabinet member (state 3), in debate 73806, taking place in the ‘Gladstone II’ ministry.

Then, we have

$$\hat{\Pr}(Y = 3 | X = 1, u_{73806}, u_{\text{Glad II}}) = \frac{\exp(\hat{\beta}_1 + \hat{u}_{d73806,1}^{(1)} + \hat{u}_{\text{Glad II},1}^{(1)})}{1 + \exp(\hat{\beta}_1 + \hat{u}_{d73806,1}^{(1)} + \hat{u}_{\text{Glad II},1}^{(1)})}$$

Supp Info F Priors and Convergence

Our priors on the fixed effects are normal with mean zero, variance of one billion. On the random effects (G-structure)—for both ministry and debate-level—our (co)variance priors are inverse-Wishart represented as multivariate diagonal matrices with a value of $V = 0.02$ for the scale and using 7 as the degree of belief parameter (ν). The prior for the residual (R-structure) is inverse-wishart also, $V = 0, \nu = 0.002$. We ran the sampler for 60,000 iterations, with a burn-in of 10,000 iterations. We thinned at a rate of $\frac{1}{100}$, giving posterior samples of 500 a piece.

For the fixed effects posteriors (of which we have a manageable number) our model output passed the Heidelberger and Welch convergence diagnostic test (Gill, 2002, 428) for the first five parameters, standard defaults (implemented using Plummer et al. (2006)). We struggled to obtain convergence for the final fixed effect ($\beta_3^{(3)}$ in Supp Info E) though we consoled ourselves with the fact that the posterior looked reasonably normal.

Supp Info G Change Point(s): Disaggregated Data

Working ministry-by-ministry is somewhat unsatisfying and we might prefer to use all our estimates, rather than aggregations. Unfortunately, with over eighteen thousand debate-observations, using regression techniques like that of [Bai and Perron \(2003\)](#) is difficult. Instead, we use the mean segmentation approach of [Barry and Hartigan \(1993\)](#), implemented (with standard defaults) by [Erdman and Emerson \(2007\)](#).

Now, any given debate has some associated probability of being a change point. For the opposition time series, excluding end points, the most plausible ($p = 0.93$) day for a change point is June 26, 1890 (during Salisbury's Second ministry). Prior to that day, the average predicted probability of a ministerial response to an opposition MP was 0.19. After that day, the probability rises to 0.29 ($p < 0.01$). What of government backbenchers? Interestingly, mean segmentation suggests that the most plausible change points for them occurred well towards the end of the data: the 'top ten' possibilities are all between 1913 and 1914. Nonetheless, there are several dates in the late 19th century which are picked up as changes too (with $p = 1$): February 17, 1896 being an example. For that date, the mean probability of a ministerial response prior to the change is 0.10 and after is 0.16 (though not significantly different by the Wilcoxon test). So, an increase of 0.06 relative to an increase for the opposition of 0.1 in probability terms. The difference in differences (around June 26, 1890) is significant ($p < 0.01$). As an aside, the *median* probability of a ministerial response to a backbencher actually decreased over this period, while the median for the opposition increased. So, even when looking at the data in this disaggregated way, we see that the change for the opposition members was larger than that for the government backbenchers, and that the period between 1880 and the 'railway timetable' of 1902 was key.

Supp Info H Towards a Signaling Model of Government Quality

To be clearer about how signaling applies to holding ministers accountable, consider the following two-period model. In the first period the government chooses to either hold a ‘battle’ with the opposition (the winner of which is determined probabilistically based on each party’s hidden type (high quality or low quality)) or engage in some other activity (‘private business’) that yields a fixed benefit to the parties; in the second period the electorate votes and a new government is chosen. Voters care about, among other things, the quality of the government; they form beliefs about quality based on the government’s decision to hold a battle and, if a battle is held, the outcome of that battle. The equilibrium of such a model depends on how much voters care about party quality vs. other factors. If voters care sufficiently about party quality, then there may be a pooling equilibrium in which all types of government propose a battle. The reason is that not proposing a battle would reveal the government to be low quality, which would be too electorally costly even for a party that is actually low type and thus is likely to lose the battle. Similarly, in [Spence \(1973\)](#)’s classic model of job market signaling all workers may in equilibrium acquire costly education if the productivity differential between high and low quality workers is high enough, simply because no low quality worker wants to reveal his type.

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