Ministerial Responsiveness in Westminster Systems

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

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Abstract

Westminster systems feature a strong government and a weak opposition, but the origins of this arrangement—the tacit acquiesence to reduced minority rights by non-government parties in the late 19th Century House of Commons—present a profound puzzle to researchers. We argue that oppositions voluntarily surrendered initiation and amendment rights, making parliamentary business more efficient for governments, in exchange for more certain opportunities to hold cabinet ministers to account. We gather a new data set comprising half-a-million parliamentary speeches and biographical information on over 8000 MPs to investigate our claims. We estimate the parameters of a novel Markov-chain model of parliamentary discourse to measure ministerial 'responsiveness' over time, and present findings supporting our case. In particular, we show that the period 1880–1902 (culminating in Balfour's 'railway timetable') was critical for the emergence of this characteristically adversarial part 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). Loyally supported by a well-whipped and pliant 'manufactured majority' of backbenchers (Kam, 2009), the cabinet has little difficulty (though see Cowley 2002) in bending the legislature to its will: it has relatively few checks on its constitutional powers,[1] is essentially unfettered by committees as rival sources of executive capability (Powell, 2000), and it has almost complete agenda-control including the ability to dictate the timing of the introduction and discussion of bills. To the extent that the opposition parties have any rights at all, they are limited: they may, of course, vote against motions, though this is rarely successful *per se* (but see Dewan and Spirling 2011). Additionally, oppositions have a small number of ('opposition' or 'allotted') days set aside for the pursuit of their own agenda, though these do not typically endanger government legislative plans.[2] Finally, they may question ministers (Chester and Bowring, 1962; Hibbing, 1988; Franklin and Norton, 1993). This latter right is highly valued, particularly for 'showcase' events like Prime Minister's Questions in the United Kingdom House of Commons, wherein the opposition—especially its front bench—attempts to score electoral points by fiercely attacking the cabinet and its policies.

The origins and development of dominant cabinet agenda power in Westminster systems have generated much interest among scholars (e.g. Bagehot, 1873/2011; Redlich, 1908; Trevelyan, 1922; Cox, 1987), with agreement that the modern arrangement was set in place by the "railway timetable" reforms enacted in April 1902 (Richards, 1988; Rush, 2001; Power, 2007).[3]

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[1]We acknowledge that, even for the British parliament, there is some limit to this claim: see e.g. Steiner, Woods and Twigg-Flesner (2006) for a 'textbook' account of the relationship between European Union law and UK law.

[2]A rare example to the contrary occurred in April 2009, when the opposition defeated the government in matters pertaining to Gurkha soldiers and their right to reside in the UK.

[3]Introduced by Arthur Balfour, then Leader of the House.

As a product of those changes, "the government took control of virtually all the time of the House" (Richards, 1988, 145) for its own business, and the situation has altered little since. Seen in historical context, the reforms are a culmination of centralization and rationalization starting much earlier and dealing initially with the right to initiate legislation. Such moves gathered pace in the 1880s, as ancient rights to contest and delay legislative action were now removed (e.g. Cox, 1987, 59–60). These included the right to ask questions without notice, the opportunity to raise issues of concern on essentially any topic when the House moved into committee, and the right to (single-handedly) adjourn proceedings in order to press for more helpful responses (see Hibbing, 1988, for a discussion of the 'institutionalization' of questions).

From the perspective of a cabinet seeking to streamline procedures such that public policy could be discussed and enacted more efficiently, these reforms make perfect sense and broadly accord with the more nuanced account given by Cox (1987) (see also Cox and Ingram, 1992). What makes less sense, and emerges as a profound puzzle, is the role of the opposition at this time. According to both contemporary and secondary accounts (e.g. Chester and Bowring, 1962), there was little attempt to contest the vast bulk of the reforms—or the votes that introduced them—in any part of the House. Put simply, why would non-government Members of Parliament (MPs) consent to the eradication of their rights to initiate or continue debate, to ask impromptu questions of their colleagues, or to hold up cabinet plans? One conjecture, voiced by Cox (1987, 64–65) to explain earlier shifts in power, is that there was "no natural organization to protect backbench rights against frontbench encroachment." For the period under study here, this is an unsatisfying account. For a start, by the 1880s, the House of Commons was well-split along partisan lines, with cohesive party voting the norm along a government-opposition axis (Lowell, 1902; Berrington, 1968; Cox, 1987). Otherwise put, the opposition itself—increasingly cognisant of presenting itself as a 'government-in-

waiting'—could have at least tried to protect its frontbench and MPs from the onslaught of centralization, yet it did not. Notice further that the procedural revisions were not the product of a single party in power: both Conservatives (in 1902) and Liberals (in the 1880s) were active in restricting opposition rights during this time, and so any explanation flowing from some difference in partisan ideology towards reform seems unlikely to be correct. Finally, in spite of their silence on this issue, we know that oppositions were generally not shy in asserting their interests when matters of constitutional change were mooted—in the 1880s, for example, the Conservatives threatened to use the House of Lords to veto Liberal plans to create equally populated constituencies until they could agree mutually beneficial terms for the reform (see McLean, 2001, 82–83, on the 'Arlington Street Compact').

Given that political scientists have a natural interest in the origin of institutions and their development (e.g. North and Weingast, 1989; Hall, and Taylor, 1996; Thelen, 1999; Greif and Laitin, 2004), and given that the Westminster system is an archetype of modern governance, it is *prima facie* surprising that relatively little attention has been paid to the issue of the opposition's role in the evolution of parliament at the end of the 19th Century.[4] At least part of the reason for this lacuna can be attributed to problems of data. To the extent that the 'railway timetable' reforms influence procedure and the way that government and opposition interact, the written record of parliament—*Hansard*—is the natural place to look for effects. Unfortunately, until very recently for the period of interest, *Hansard* reports existed only in paper form and members were identified in inconsistent and ambiguous ways. In particular, official parliamentary records at this time did not record the party affiliation of its members, and thus whether the MP in question was part of the government or opposition. As a result, scholars are forced to painstakingly disambiguate name entries—typically from

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[4]This stands in stark contrast to the case of the United States where much effort has been spent on generating and testing theories on minority rights (e.g Binder, 1996; Dion, 1997; Schickler, 2000)—logically a closely related issue.

electoral records—and thus for cost reasons limit themselves to studying one or a few sessions of Commons activity (e.g. Adyelotte, 1954; Aydelotte, 1963; Cromwell, 1982). Alternatively, scholars are compelled to study summary statistics—like the number of questions asked in a given session (Chester and Bowring, 1962; Cox, 1987; Hibbing, 1988)—which while informing us broadly about the total amount of business the Commons was engaged in, can tell us little about the way that opposition and government respond to one another on the floor of the chamber.

In the current paper, we address the theoretical puzzle outlined above, and bring new data to bear on our explanation. In particular, we argue that while the cabinet gained enormous agenda-control from the reforms at the turn of the 20th century, it offered up a much increased level of ministerial responsiveness to the House as a whole. Though it is true that opposition members lost the right to intercede in public business, they gained new and more certain opportunities to question the executive. For the opposition front-bench, presenting itself as a government-in-waiting, we contend that this was a reasonable trade. We provide suggestive evidence for our claims by investigating the interactions between opposition and cabinet (and government backbenchers and cabinet) on the floor of the House of Commons. In particular, we model the 'to-and-fro' of speakers of different roles (cabinet, government backbenchers, opposition) in a Bayesian Markov chain model of debate, and we introduce a new data set of over half a million speeches, organized into seventeen thousand debates for the years 1832–1915. We show that the (transition) probability that a government minister 'responds' to any (non-cabinet) member surges in the late 1880s. Importantly for our story, we show that opposition members experienced a significantly increased level for this probability relative to opposition MPs prior to the reforms, *and* the increase in this probability was significantly larger than the increase experienced by their colleagues on the government backbenches. Thus, we show that centralization and responsiveness went hand-in-hand. We

do not need to rely on (possibly misleading) summary statistics like 'number of questions', since we are able to study the interactions between ministers and opposition directly: we can (implicitly) include 'supplemental' requests for information (typically not recorded in aggregate figures), and get a true sense as to the degree to which opposition utterances were actually being *answered*, rather than simply the number of questions *asked*.

In the next section, we orientate the reader with literature on the period and the reforms in question, and set up the empirical problem. In Section 3 we introduce our new data, while Section 4 explains our modeling strategy. Section 5 reports our key results, and Section 6 concludes.

2   Literature and Orientation

As befits the 'Mother of Parliaments' the history of the legislature at Westminster is a long one, and researchers have expended much effort documenting its storied past (e.g. von Gneist, 1889; Namier and Brooke, 1964; Thorne, 1986; Maddicott, 2010). Of special interest to scholars concerned with democratization and development is the period between the First and Fourth Reform Acts (Cunningham, 2001): the former event demarcating the beginning of 'democratic' politics in Britain and the latter ushering in the 'modern' age with features relatively unchanged today (in particular, the end of male-only suffrage and the rise of a party system similar to the current one). While franchise extension has perhaps garnered the lion's share of attention in terms of the political machinations of the actors involved (see, e.g., Cowling, 1967; Acemoglu and Robinson, 2000; Lizzeri and Persico, 2004 and McLean, 2001, 61–70) or in terms of its ultimate effects (e.g. Gash, 1952; Berlinski and Dewan, 2011), it is endogenous institutional evolution and development during this period that is our focus here.

Insofar as the Westminster system is characterized by a dominant cabinet with agenda-setting power (Lijphart, 1999), it is unsurprising that the origins of this arrangement have attracted researchers' attentions (e.g. Redlich, 1908; Fraser, 1960). The seminal account is that of Cox (1987), who argues that—at least initially—the cabinet took control of the Commons agenda to avoid the chaos of hundreds of members of parliament, all with identical legislative prerogatives, clogging up proceedings with their own (private) business. The executive did this by removing the right of MPs to initiate parliamentary business, typically via standing orders: the 1830s saw the end of the ability of members to move amendments to the reading (*per se*) of the Orders of the Day, and no speeches could be given when public petitions were introduced. By the end of 1840s, members were no longer able to move any amendments when the Orders of the Day were introduced and the government had taken specific days on which on its business could be discussed.

Given the disappearance of avenues of legislative activities noted, it is hardly surprising that MPs found other outlets for their political ambitions. One option, noted by several authors (Howarth, 1956; Chester and Bowring, 1962; Hibbing, 1988; Cox, 1987) was to put inquiries to ministers, a norm and time for which existed by the end of the 1860s. With time the number of questions surged, increasing by more than an order of magnitude between 1847 and the turn of the century (Hibbing, 1988, 705). Contemporary observers note that question period became something of a "safety valve" for members (Chester and Bowring, 1962, 43): a relatively harmless alternative—from the cabinet's point of view—to initiating legislation and debate. But questions and the remaining rights of backbenchers to hold up proceedings were not above reform. Some of the subsequent changes were implemented by Speaker rulings, and he garnered new powers to rule questions out of order (1878), and then made it impossible to adjourn the House (used by MPs to start debate afresh) before public

business was reached for the day (1881). The speaker was also given the power to close debate from 1882 onwards, partially in response to Irish obstructionism (Rutherford, 1914, 175). The Commons as a corporate body introduced new practices via standing orders: in 1888, MPs were instructed to give notice to parliamentary clerks if they wanted to ask questions. Important though these changes were, 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. Also, 'printed answers' were introduced for some questions—thus saving time for the executive since they could be prepared in advance.

2.1 Opposition Acquiesence

It is not difficult to see the merit of these reforms for the cabinet: they essentially assured that government business would always be reached, and that ministers had great certainty in terms of the time limits placed on question period. Arthur Balfour was quite clear about the general thrust of reform:

> . . . the principle on which the Rules are constructed is the true principle, namely, that if there is to be uncertainty, it should be as far as possible transferred from the public business to the private business. [*HC Deb* 28 April 1902 vol 107, col 110]

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 surround-

ing the proposed changes "was on the whole favourable to the Government" and that "most were convinced that something required [sic] to be done." In the event, the 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 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 practices for the opposition, but that the opposition did not make a concerted, united attempt to defeat the proposals.

Cox (1987, 64–65) makes a four part argument to explain such acquiescence; first, that other than the cabinet there was no other ready institutional form to organize proceedings away from the 'tragedy of the commons'. Second, to the extent that institutional innovators and entrepreneurs existed who could have proposed alternative solutions, they tended to be (former) cabinet members and had a vested interest in the cabinet accumulating more responsibilities. Third (as noted above), that there was no obvious organization to protect backbenchers. Fourth, that the pace of reform was gradual, and backbenchers were thus not alerted to the consequences of their incremental consent. None of Cox's conjectures are unreasonable for the period before, say, 1880. But they are less plausible once party-discipline, and government-opposition voting, becomes the norm. This is because the 'opposition', broadly construed, was sufficiently cohesive and disciplined to make trouble for

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

the government as regards these reforms, but seemed to do little of this. Moreover while, by definition, they lacked a majority in the Commons there were other routes to settle disputes over reform; consider, for example, the 'Arlington Street Compact' in which the Conservatives met with leading Liberals to resolve their differences over the Redistribution of Seats Act (McLean, 2001, 82–83).

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, so the gains from the other parts of the reforms presumably left them better off. Our contention is two fold: first, by the 1880s and certainly by the turn of the twentieth century the opposition front bench (at least) saw itself as a government-in-waiting. As other authors (noted above) have discovered, party discipline and government-opposition voting was the norm rather than the exception by the 1880s. Once the cabinet had taken the lion's share of agenda control, by the mid-1860s or 1870s, such that it could be assured of pushing its own legislation through the house, we suspect the opposition had no interest in *de jure* 'rights' that were *de facto* unhelpful for making public policy. That is, oppositions accepted the logic laid out in Cox (1987)—that the cabinet alone could solve the tragedy of the commons by taking control of procedural rights—and this fundamentally altered the legislative opportunities they subsequently pursued. In particular, and the second part of our argument, is that oppositions were increasingly desirous of the right to have access to ministers in the legislature: to question them, harass them, harangue them and embarrass them—all in the name of scoring points with the electorate. And they wanted to do this to win elections. Hence, any changes to parliamentary procedure that made 'interaction' with ministers—caustic and adversarial though it might be—more certain would be approved (even embraced) by the opposition. Put crudely, the opposition

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and government were involved in an institutional *quid pro quo*: obstruction and uncertainty traded for accountability and responsiveness. We contend that the reforms, between the 1880s and the Great War in general, but especially those around the turn of the century, represent such a 'deal'.

2.2.1   Evidence for our mechanism

In terms of actors of the time, our position is perhaps best laid out 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." Our argument would be that Campbell-Bannerman was aware that questions offered oppositions an improved route by which to attack governments and show up their failings: ultimately enabling oppositions to win more general elections than they might otherwise have done. 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 acquiesence to a new era of politics.

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 non-trivial task: preferences are not directly observable at the best of times in political science (e.g. Frieden, 1999), and we certainly do not have *ex-post* access to the reasoning of long-dead members of parliament when making the choices they did. What we *can* undertake is a study of the effects of institutional change on the agents in question. Our central claim is that the opposition benefited from the institutional propositions mooted by the government(s) between 1880 and the First World War. We claim that the chief improvement was more opportunity to question ministers, and to generally draw them into adversarial debate, which those ministers would otherwise duck. More formally, our task is to show that

1. between 1880 and the First World War, ministers became more 'responsive' to (non-cabinet) MPs,

2. that the increase in 'responsiveness' disproportionately accrued to opposition speech-makers, relative to government backbenchers,

3. and that the increase is relatively sudden and lasting, and not a product of more gradual changes to procedure, electoral reforms or '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).

This will require introducing new data on members and speeches in the House of Commons, and new methods for measuring 'responsiveness' of ministers. We now address each in turn.

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, an online depository of information.[6] This 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 zip files (one per day of parliament sitting), with each debate marked up in XML, which we parsed using Ruby on Rails. An example of the data as it appears online is given in Figure 1. 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 a speakers 'responding' to one another is something we return to in more detail in our model below. 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

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[6]See http://www.hansard-archive.parliament.uk/

expressed his astonishment at the hon. Member for Berwick").

In principle, each speech in the XML is associated with a uniquely identified Member of Parliament. In practice, life is more difficult, since many speaker names in the XML are (very) ambiguous. In 1841 for example, while there were 3949 speeches made, some 2957 (75%!) *cannot* 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 are, 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 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.[7] 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

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[7] http://hansard.millbanksystems.com/

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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>
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Figure 1: An example of debate from the parliamentary archive, marked up in XML.

their service) from standard sources: Cook and Keith (1975) and Butler and Butler (1994). 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.

For reasons that will become clear when we describe our modeling strategy below, we were required to make a decision over which parties could be regarded as being 'in government' and 'in opposition' at any one time. In practice, 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. 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. Appendix A gives more details

on the ministerial breakdown of our data.[8]

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 is why the 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, and for at least three reasons. First, we do not know crucial information about the identity of the question askers or those who answer. That is, our claim is specifically about opposition vs cabinet members vs government backbenchers in terms of responsiveness: the total number of questions does not tell who (in terms of parliamentary role) is questioning whom. 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.

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[8]Once 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.

We want to study the way that debate (broadly construed) moves between speech-makers. If, say, ministers tend to speak after backbenchers, we might sensibly assume that one set of actors is 'responding' to the other.[9] This means that the sequence of speakers—in the thousands of debates, in the ministries—contains information that we wish to exploit. We wish to model that in a systematic way. We now try to formalize such notions. To fix ideas, define a 'debate' in the House of Commons as a formal discussion of a particular topic, with speakers taking turns to make utterances. A particular debate may, in principle be very long, involving tens (or even hundreds) of members of parliament rising, in turn, to make comments. Of course, the same speakers may contribute multiple times. For the purposes of definition, we do not require speakers to make substantive points: they may ask questions to Department representatives, and we would consider 'Questions to the Prime Minister' (oft abbreviated as PMQs) to be simply a special case of a 'debate.' Rather than seek to model the actual words spoken, we will focus on the identity of the speakers and the order in which they contribute. We define a speech as an utterance which ends when the next (i.e. different) speaker begins. A particular speech is given by a particular member, and our background information can be used to tell us which party he belongs to.

Because we know what party an MP represents, we also know his status as a government or opposition member. Furthermore, we know what office(s) he held at what time(s), so we can straightforwardly demarcate an MP as being government minister or Cabinet member, which we would write as G_M. One of his colleagues on the Government backbenches—i.e.

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[9]Note that the Speaker—unless he is making a specific point of order or interest—is not included in our debates. An obvious concern is that ministers may not, in general, be responding to the MP speaking before them. On reading records of debates and questions we saw little reason to believe this was the case: that is, our assumption appears correct. We also studied the structure of debates, and can show that ministers are disproportionately likely to be the last speaker in debate as befits a 'question-and-answer' dynamic. In Supp Material A we provide more information on our validation exercise.

$$\boxed{O \rightarrow O \rightarrow G_B \rightarrow O \rightarrow G_M \rightarrow O \rightarrow O \rightarrow O \rightarrow G_M \rightarrow G_B}$$
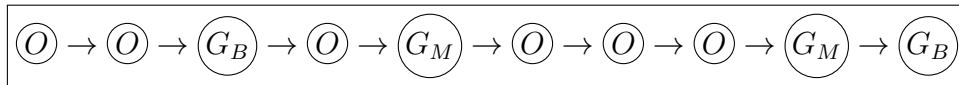
Figure 2: A 'debate' comprised of eight speakers with Government and Opposition roles. Individuals denoted G_M are Government ministers, while those denoted G_B are government party backbenchers. MPs denoted O are Opposition members.

the ith member of the governing party who happens not to hold ministerial office—will be denoted G_B. By contrast, all members of the other party (or parties) will by convention be part of the official Opposition, and may be denoted O. As a simplifying move, 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. Thus, though Disraeli was the Prime Minister in 1868, while Gathorne-Hardy was the Home Secretary, both will be denoted as G_M. Similarly, William Gladstone (*de facto* leader of the Opposition in 1868) will be denoted in the same way as any other non-Tory member, as O.[10] A consequence of this rationalization is that periods when there were more than two parties in the Commons involve no increase in the possible roles taken by a member in debate, which remains at three: G_M, G_B or O. So, for example, when MPs from the various parties representing Irish interests (such as the Home Rule members under Isaac Butt) emerge as a Commons force in the latter half of the 19th Century, they are labeled O as members of the Opposition (at least prior to entering an alliance with the Liberals in Gladstone's third ministry). Figure 2 illustrates our understanding of a (short) debate for modeling purposes[11] Note that the Os maybe the same opposition member, or they may not: we make no distinction and *mutatis mutandis* for the minsters and government backbenchers.

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[10] A 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).

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

4.1 Debate as a Markov Chain

How then to model these debates? A simple way to proceed is to suppose that a debate sequence—as Figure 2—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. To clarify formalities, we are specifically assuming a discrete time chain here, in the sense that each state realization is a 'step' in the chain that can be indexed with an integer; substantively, each speech by a new speaker—no matter its actual length—is a step and in our running example of an eight person debate we have $S_1 = O, S_2 = O, S_3 = G_B, \ldots, S_8 = G_B$ where S_t is the tth speaker in the sequence. Furthermore, we commit to a time-homogenous (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. In Figure 3 we give a heuristic picture of a ministry in data terms: each row is a debate, each column is a speech in that debate. Notice that some debates are longer—involve more speakers—than others. Our behavioral assumption about the chain is that the states are 'responses' to one another: perhaps in the sense that we saw in Section 3 where a backbencher disagreed with the Home Secretary on a policy issue or where an MP has his question answered by another. It is, in principle, possible that the states have nothing whatsoever to do with one another in terms of speech or topic or argument 'flow' but this seems unlikely given that they occur within the same debate.

As usual with Markov chains, the probability of moving from state to state (here, role to

	S_1		S_2		S_3		S_4		S_5		S_6		S_7	$\ldots$
d_1	G_M	$\rightarrow$	O	$\rightarrow$	O	$\rightarrow$	O							
d_2	O	$\rightarrow$	O	$\rightarrow$	G_B	$\rightarrow$	O	$\rightarrow$	G_M	$\rightarrow$	G_M	$\rightarrow$	G_B	
d_3	G_B	$\rightarrow$	G_M	$\rightarrow$	G_B	$\rightarrow$	G_M							
d_4	G_B	$\rightarrow$	O	$\rightarrow$	G_B	$\rightarrow$	G_B	$\rightarrow$	G_B	$\rightarrow$	O			
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\ddots$

Figure 3: A 'Ministry' in debate terms: each row is a debate, each column is a speaker.

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

$$
\begin{array}{cc}
 & \begin{array}{ccc} G_M & G_B & O \end{array} \\
\begin{array}{c} G_M \\ G_B \\ O \end{array} &
\left(\begin{array}{ccc}
p_{MM} & p_{MB} & p_{MO} \\
\boxed{p_{BM}} & p_{BB} & p_{BO} \\
\boxed{p_{OM}} & p_{OB} & p_{OO}
\end{array} \right)
\end{array}
$$

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})

For a given debate, a straightforward way to proceed is to calculate simple proportions: the probability of a transition, p_{ij}, is the number of transitions specifically from i to j divided out by the total number of transitions from i to any other state. This straightforward approach is, in fact, the (closed form) maximum likelihood estimator as given by Anderson and Goodman (1957) and it is therefore consistent, though biased. If we are willing to commit to debates independent of one another in transition probability terms, and ministries similarly independent, we could straightforwardly maximize a likelihood for the entirety of

21

the present problem.

In practice, such a scheme is unsatisfying. For a start, while we may believe that the data generating process is broadly consistent over time—in the sense that the assumption of a Markov process for any particular debate is reasonable—we would like to cater for possible debate-specific or ministry-specific variation. That is, we can surely imagine that debates dealing with some topics, or involving certain MPs, 'move' around the various actors in a slightly different way to others. Similarly, it seems prudent to allow the transition probabilities to alter in accordance with varying governments—their party makeup, Prime Ministerial personalities and so forth. One way to incorporate such information is via an 'effect' for each unit (debate and ministry). Notice here that the 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).

But such a task precludes the simple approach alluded to above. Instead, we will pursue a logit linear approach. For now, assume that we are dealing with a particular debate, within a particular ministry—we will allow for more complexity momentarily. In particular, 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. Subject to some identifiability constraint pertaining to a comparison category, we would then typically have the multinomial logit model, $\Pr(y_i = k) = \frac{\exp(x_i \beta_k)}{1 + \sum_{j=1}^{J} \exp(x_i \beta_j)}$. Once the various elements of the $\boldsymbol{\beta}$-vector are estimated, a predicted probability for $y_i = k$ is forthcoming conditioned on some value of x_i. That is, given the previous speaker's identity, we have a predicted probability for the next speaker's identity. That probability is (an estimate of) the

	S_1		S_2		S_3		S_4		S_5		S_6		S_7
d_2	O	$\to$	O	$\to$	G_B	$\to$	O	$\to$	G_M	$\to$	G_M	$\to$	G_B
$\mathbf{x}$	x_1		x_2		x_3		x_4		x_5		x_6		
	O		O		G_B		O		G_M		G_M		
$\mathbf{y}$			y_1		y_2		y_3		y_4		y_5		y_6
			O		G_B		O		G_M		G_M		G_B

Figure 4: 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.

relevant entry from the matrix P, as given above. 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. We make this set up more obvious with Figure 4, where we show the way that a single debate (d_2 of Figure 3) would be rewritten in terms of x and y vectors.

4.2   Mixed Modeling

As described so far, we could use a standard generalized linear model set-up (in the sense of McCullagh and Nelder, 1989) to estimate the relevant parameters. Once we wish to include random effects, however, we must move to a generalized linear *mixed* model. What has occurred, essentially, is that our multinomial logit which previously involved the term $\exp(\boldsymbol{X\beta})$ now contains $\exp(\boldsymbol{X\beta} + \mathbf{Zu} + \mathbf{e})$ where $\mathbf{Z}$ is a design matrix much like $\boldsymbol{X}$, while $\mathbf{u}$ is a parameter vector, analogous to $\boldsymbol{\beta}$ (and $\mathbf{e}$ is a residual term). Specifically we pursue a (basic) *random slopes* multinomial logit approach with unconstrained covariance matrices for the relevant (ministry and debate) random effects.

There are various technologies for such problems (e.g. Breslow and Clayton, 1993; Train, 2003). We take a Markov Chain Monte Carlo (MCMC) approach. Hadfield (2010) devotes considerable effort to designing software for such models, and we use his `MCMCglmm` package. He makes use of efficient 'parameter expansion' techniques in the sense of (e.g. Gelman et al., 2008) that makes for relatively speedy convergence to the posterior of interest. Though not synonymous with MCMC *per se*, we do take a Bayesian approach here in the sense that we specify a prior, and will make inferences from a posterior. Since the philosophical arguments in favor of Bayesian methods are well rehearsed, we refer readers elsewhere for discussion (e.g. Gill, 2002; Jackman, 2009). From a pragmatic perspective, such a Bayesian 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 Material B and Supp Material C 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 17881 debates (531,822 speeches) over the period under study.

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 the transition of a $O \rightarrow G_M$, that is from opposition member to a minister, Figure 5 presents our results. Each circular point occurs in a Tory ministry, each square is a debate while a

Liberal government holds sway. 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 joins the mean probability for the ministries in the data. On the same scale, Figure 6 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 their own (government backbenchers). This can be seen from the relative height of the mean lines, or from the fact that, in general, the high 'tails' of the distribution of predicted probabilities in Figure 5 are more populated than for the same region in Figure 6. 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 possible 'change points' in the two data generating processes, before studying the 'effect' (in terms of mean changes) around the breaks. We proceed in two ways. First, we examine the data on a ministry-by-ministry basis. We used the (multiple) structural break approach described in Bai and Perron (2003) implemented by Zeileis et al. (2002), with standard defaults. Table 1 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
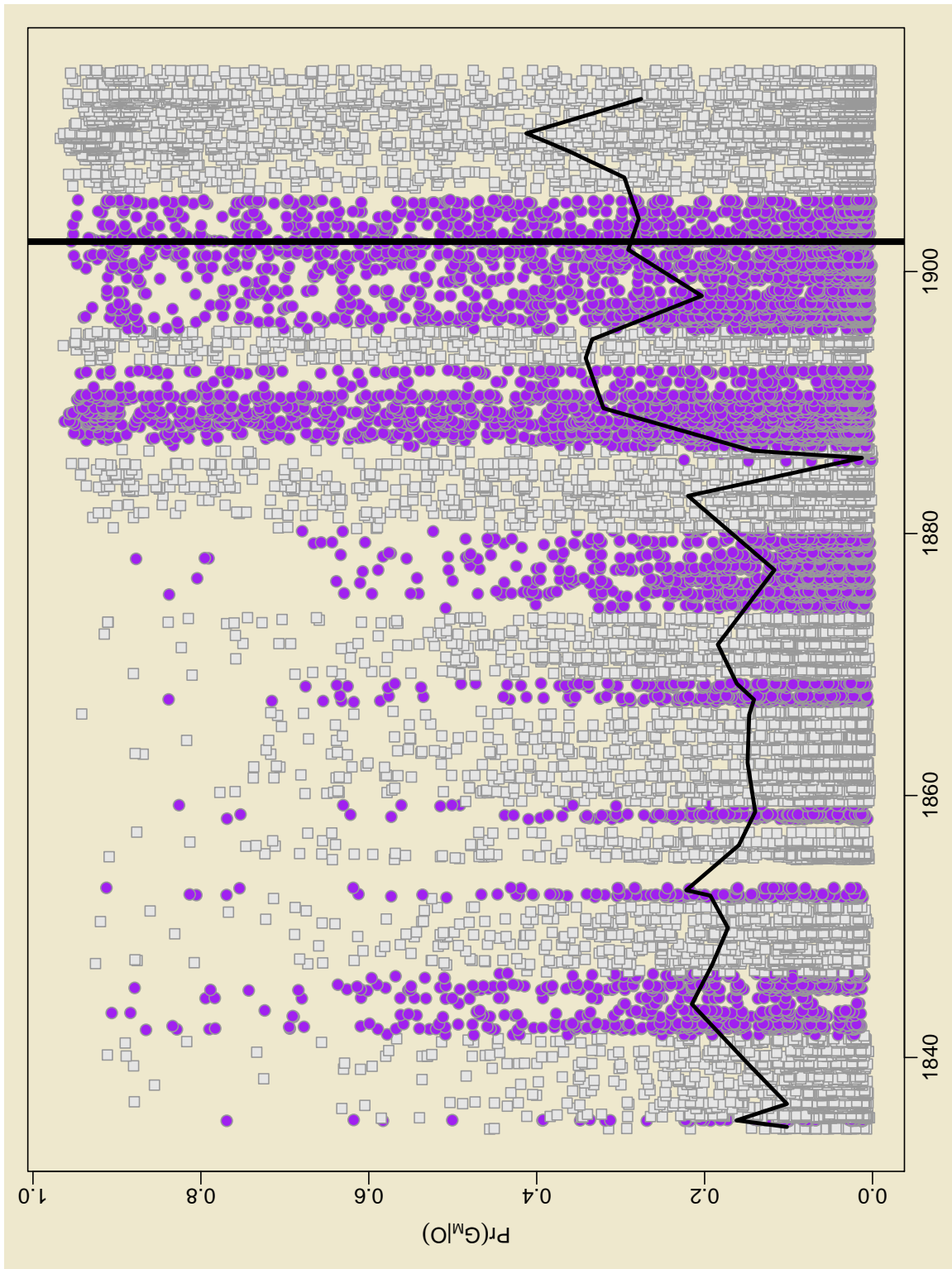
Figure 5: Probability of cabinet minister speaking after an opposition member. Each circular point occurs in a Tory ministry, each square is a debate while a Liberal government holds sway. The solid vertical line to the right of the plot marks the (approximate) date of the 1902 "railway timetable" reforms. The solid line moving left to right joins the (mean) probability for the ministries in the data.
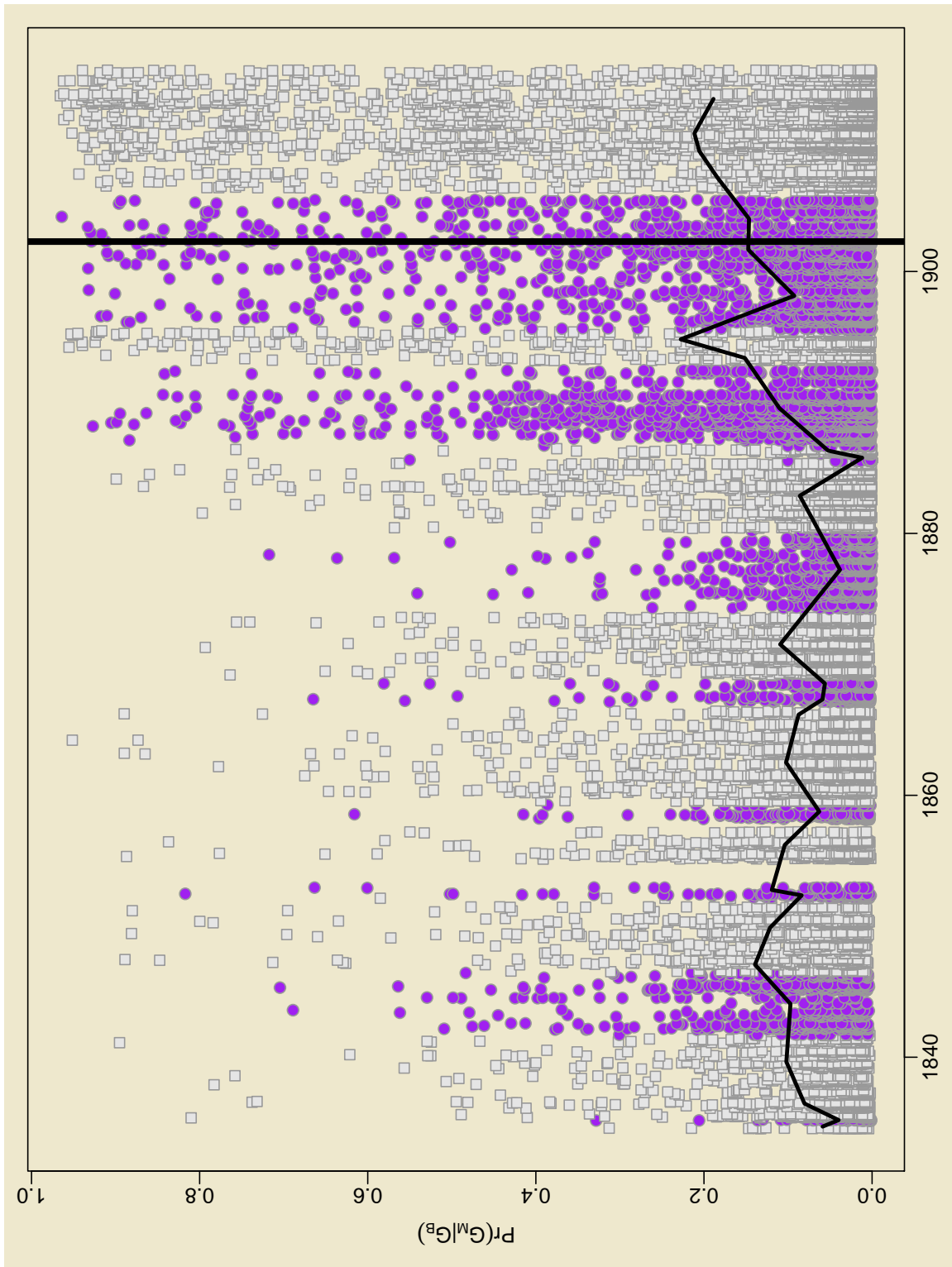
Figure 6: Probability of cabinet minister speaking after a government backbench member. Each circular point occurs in a Tory ministry, each square is a debate while a Liberal government holds sway. The solid vertical line to the right of the plot marks the (approximate) date of the 1902 "railway timetable" reforms. The solid line moving left to right joins the (mean) probability for the ministries in the data.

27

ministry for the backbenchers which are the 20th and 21th observation respectively, occurring around the period 1886–1889 (the median dates of those ministries). 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 ($p < 0.01$). In terms of expectations consistent with our theory, laid out in Section 2, we have found that the change in both series appears to be 'once and for all' (there is only one break point), and the means increased. We can also note that, indeed, the change when it came was between 1880 and the First World War: specifically around 1885 in both cases. Notice further that 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 obstructionist tactics. Finally, the (absolute) increase in responsiveness for opposition members is around 0.16, larger than the increase for backbenchers, at 0.09. Finally, assuming normality, we compare 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 ($p < 0.01$).[12]

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[12]Denote 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	-53.1	-81.7	-76.9	-74.4	-69.7	-64.3	-55.8	obs 20, 1886 (Gladstone III)
	mean	0.15		0.31					
G_B	BIC	-83.3	-103.7	-100.9	-99.3	-95.3	-91.9	-84.0	obs 21, 1889 (Salisbury II)
	mean	0.08		0.17					

Table 1: 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 20 and 21 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. See Supp Material D for more details.

6   Discussion

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) voluntarily give up rights to a majority party? Our argument was that once cabinets began to take

control of proceedings, for reasons Cox (1987) lays out, opposition MPs found themselves with nothing to gain from uncertain opportunities to initiate or amend legislation. Instead, they 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 a newly party-orientated electorate.

We showed that ministerial 'responsiveness' rose quickly, and once-and-for-all, between the 1880s and Balfour's 'railway timetable' reforms at the turn of the 20th Century. 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 8000 MPs, a half million speeches, ministerial records and more—that we hope to put in the public domain.

Skeptical readers may not convinced by our metric of responsiveness which relies on sequences of speeches between members of different types. Yet, as noted in Footnote 9, we were able to validate our approach by showing that 'last' speeches in debates were disproportionately likely to be made by ministers and that the speech 'triple' of 'non-minister, minister, non-minister' is much more common than we would expect by chance in our data; moreover, it becomes increasingly frequent at just the time our model based estimates exhibit a change point (see Supp Material A for more details). In this way then, we have contributed a new method for modeling debate to the political scientist's tool kit: scholars

may be interested in applying this logic to other legislatures such as the US House to see how, and why, they 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 elections have increasingly focussed on selecting Prime Ministers as leaders of the country rather than the particular identity and attributes of local MPs.

We have said little about the changing contents of the speeches over time. 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—one of the more unitary in existence—developed. We leave such efforts for future work.

Appendix A   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

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

Table 2: Proportion of speeches in the data and as last speeches in debate by role in the Commons.

Supp Material A Validating Sequences as Responsiveness

Our claim is that when ministers speak after another member, they are in some sense 'responding' to the previous speaker. 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: no matter how many members choose to contribute, the speech pairing 'question-answer' dictates such a pattern. 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 a whole, but 30% of last speeches, we might suspect that ministers are indeed 'responding'.

In Table 2 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.

	triple	frequency
1	minister, minister, minister	36
2	non-minister, minister, minister	423
3	minister, minister, non-minister	451
4	non-minister, non-minister, minister	33318
5	minister, non-minister, non-minister	33880
6	minister, non-minister, minister	37069
7	non-minister, minister, non-minister	68201
8	non-minister, non-minister, non-minister	322769

Table 3: Proportion of various 'triples' in the data.

Secondly, we looked at speech 'triples': that is, speech sequences (within debates) consisting 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 3 gives the relevant sums across the entire data series. Notice that {non-minister, minister, non-minister} is more than twice as common than {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 7 we consider the time series (by ministry) of the 'one minister' triples (so, rows 4, 5 and 7 in Table 3). 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), with a once-and-for-all shift upwards in responsiveness.
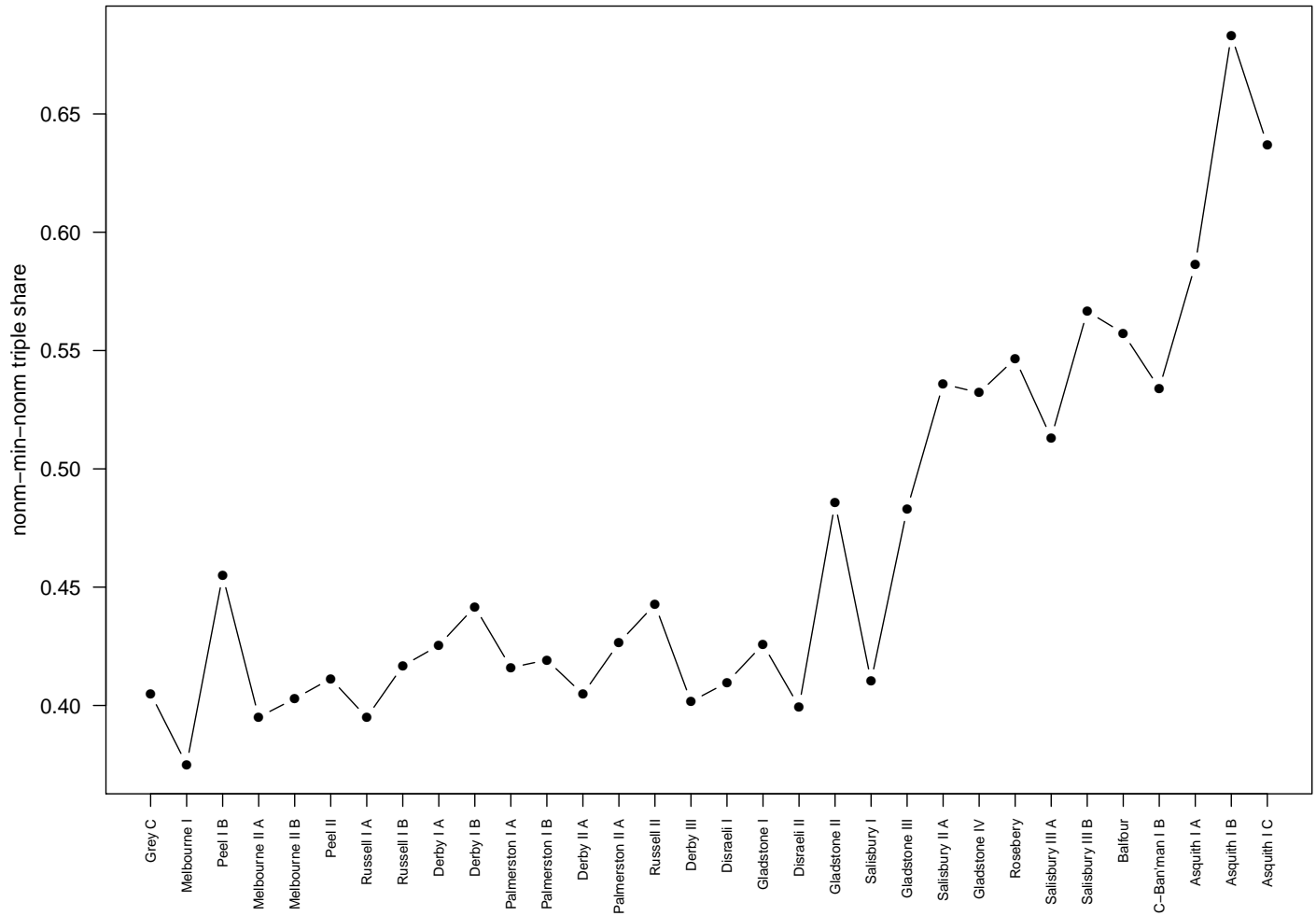
Figure 7: Share of one minister 'triples' held by the sequence 'non-minister, minister, non-minister' over time.

Supp Material B   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 βs, 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, 6×17841), six (possible) random effects for each ministry (6×32), and six 'fixed effects' yielding a total of $6 + 107046 + 192 = 107244$ estimated quantities.

Predicted Probabilities

We want to estimate the predicted probabilities for particular transitions, such as $\Pr(Y = 2 \to Y = 3)$. 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 ith 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

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

Supp Material C   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 Material B) though we consoled ourselves with the fact that the posterior looked reasonably normal.

Supp Material D   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 seventeen thousand debate-observations, using regression techniques like that of Bai and Perron (2003) is difficult. In-

stead, 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.

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